

LIP, LIF Exposed Linear Encoders

Accuracy grades better than $\pm 3 \mu\text{m}$



The exposed linear encoders of the **LIP** and **LIF** types are characterized by small measuring steps together with high accuracy. The measuring standard is a phase grating applied to a substrate of glass or glass ceramic.

LIP and **LIF** encoders are typically used for:

- Measuring machines and comparators
- Measuring microscopes
- Ultra-precision machines such as diamond lathes for optical components, facing lathes for magnetic storage disks, and grinding machines for ferrite components
- Measuring and production equipment in the semiconductor industry
- Measuring and production equipment in the electronics industry

LIP 300 Series

- **Very high resolution** with measuring steps to 1 nanometer
- Very high repeatability through an extremely fine signal period
- Defined thermal behavior thanks to a measuring standard on Zerodur[®] glass ceramic

LIP 400 Series

- Small dimensions
- Measuring steps to $0.005 \mu\text{m}$
- Scale available with various thermal expansion coefficients

LIP 500 Series

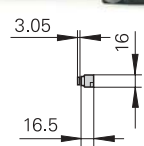
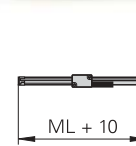
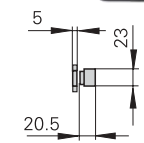
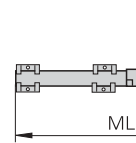
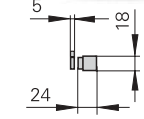
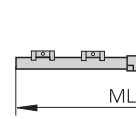
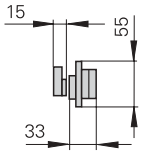
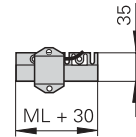
- Measuring lengths up to 1440 mm
- Measuring steps to $0.05 \mu\text{m}$

LIF 400 Series

- **Fast, simple scale fastening** with PRECIMET adhesive film
- Relatively insensitive to contamination thanks to SUPRADUR graduation
- Position detection through limit switches and homing track



ML = 70 mm



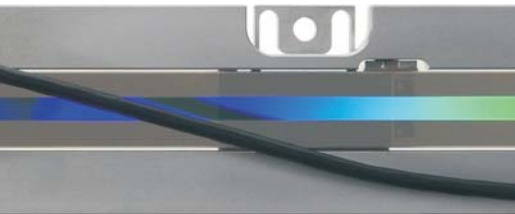
	Incremental		
	LIP 382 LIP 372	LIP 481 LIP 471	LIP 581 LIP 571
Measuring standard	DIADUR phase grating on Zerodur glass ceramic	DIADUR phase grating on glass or Zerodur [®] glass ceramic	DIADUR phase grating on glass
Expansion coefficient	$\alpha_{\text{therm}} \approx (0 \pm 0.1) \times 10^{-6} \text{ K}^{-1}$	$\alpha_{\text{therm}} \approx 8 \times 10^{-6} \text{ K}^{-1}$ (glass) or $\alpha_{\text{therm}} \approx (0 \pm 0.1) \times 10^{-6} \text{ K}^{-1}$ (Zerodur)	$\alpha_{\text{therm}} \approx 8 \times 10^{-6} \text{ K}^{-1}$
Incremental signals	LIP 382: $\sim 1 \text{ V}_{\text{PP}}$ LIP 372: \square TTL	LIP 481: $\sim 1 \text{ V}_{\text{PP}}$ LIP 471: \square TTL	LIP 581: $\sim 1 \text{ V}_{\text{PP}}$ LIP 571: \square TTL
Signal period	LIP 382: $0.128 \mu\text{m}$ LIP 372: $0.004 \mu\text{m}$	LIP 481: $2 \mu\text{m}$ LIP 471: $0.4 \mu\text{m}/0.2 \mu\text{m}$	LIP 581: $4 \mu\text{m}$ LIP 571: $0.8 \mu\text{m}/0.4 \mu\text{m}$
Accuracy grade	$\pm 0.5 \mu\text{m}^{1)}$	$\pm 1 \mu\text{m}; \pm 0.5 \mu\text{m}^{1)}$	$\pm 1 \mu\text{m}$
Recommd. meas. step	1 nm	$1 \mu\text{m}$ to $0.005 \mu\text{m}$	$1 \mu\text{m}$ to $0.05 \mu\text{m}$
Measuring lengths ML	70 to 270 mm	70 to 420 mm	70 to 1440 mm
Reference mark	None	One	One or distance-coded

¹⁾ Other accuracy grades available on request

PP Exposed Linear Encoders

Two-coordinate encoders

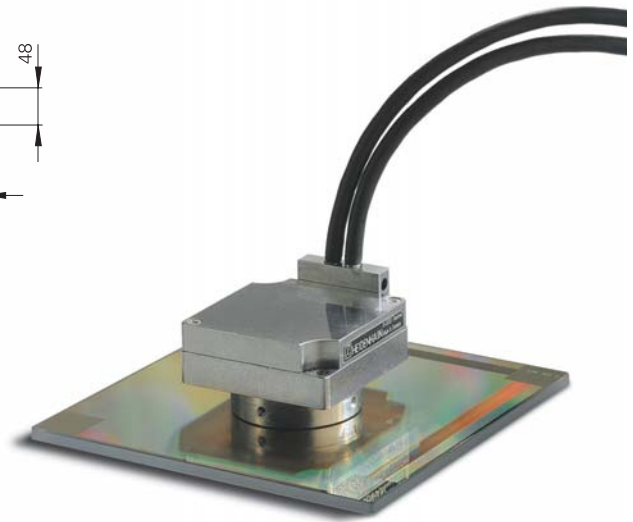
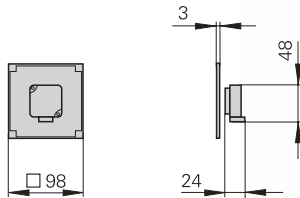
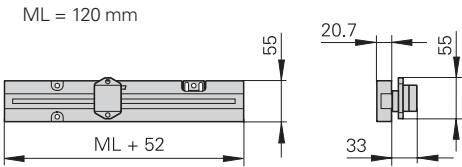
G. E. Van Wert Co Inc,
461 Boston St.,
Topsfield, Ma 01921
(978) 887-3389 gevanwert.com



The **PP** two-coordinate encoders feature as measuring standard a planar phase-grating structure on a glass substrate. This makes it possible to measure positions in a plane.

Applications include:

- Measuring and production equipment in the semiconductor industry
- Measuring and production equipment in the electronics industry
- Extremely fast X-Y tables
- Measuring machines and comparators
- Measuring microscopes



LIF 481 LIF 471
SUPRADUR phase grating on glass $\alpha_{\text{therm}} \approx 8 \times 10^{-6} \text{ K}^{-1}$
LIF 481: $\sim 1 \text{ V}_{\text{PP}}$ LIF 471: $\square \square \text{ TTL}$
LIF 481: $4 \mu\text{m}$ LIF 471: $0.8 \mu\text{m}$ to $0.04 \mu\text{m}$
$\pm 3 \mu\text{m}$
$1 \mu\text{m}$ to $0.1 \mu\text{m}$
70 to 1020 mm (up to 3040 mm on request)
One

	Incremental PP 281 PP 271
Measuring standard Expansion coefficient	DIADUR phase grating on glass $\alpha_{\text{therm}} \approx 8 \times 10^{-6} \text{ K}^{-1}$
Incremental signals	PP 281: $\sim 1 \text{ V}_{\text{PP}}$ PP 271: $\square \square \text{ TTL}$
Signal period	PP 281: $4 \mu\text{m}$ PP 271: $0.8 \mu\text{m}/0.4 \mu\text{m}$
Accuracy grade	$\pm 2 \mu\text{m}$
Recommended measuring step	To $0.01 \mu\text{m}$
Measuring range	68 mm x 68 mm; other measuring ranges upon request
Reference mark	One per coordinate

LIDA Exposed Linear Encoders

Accuracy grades to $\pm 5 \mu\text{m}$



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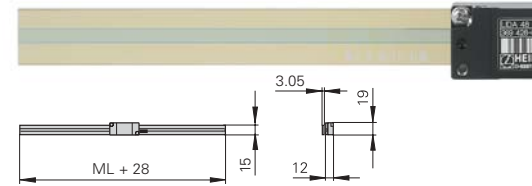
The **LIDA** exposed linear encoders are specially designed for **high traversing speeds** up to 10 m/s, and are particularly easy to mount with various mounting possibilities. Steel scale tapes, glass or glass ceramic are used as carriers for METALLUR graduations, depending on the respective encoder.

LIDA exposed linear encoders are typically used for:

- Coordinate measuring machines
- Testing machines
- PCB assembly machines
- PCB drilling machines
- Precision handling devices
- Position and velocity measurement on linear motors

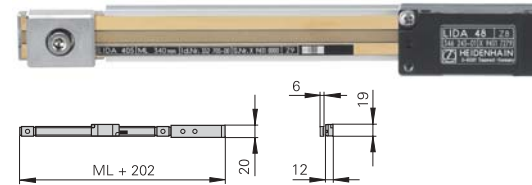
LIDA 403 Series

- **Thermal adaptation** through graduation carriers with different coefficients of expansion
- Scale cemented to mounting surface
- Limit switches



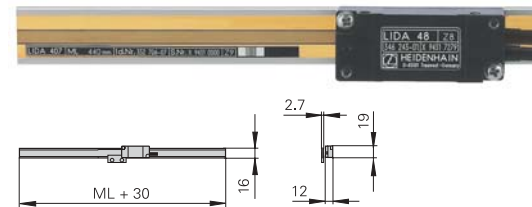
LIDA 405 Series

- **Large measuring lengths** up to 30 m
- One-piece steel scale tape drawn into an aluminum extrusion and tensioned at its ends
- Limit switches



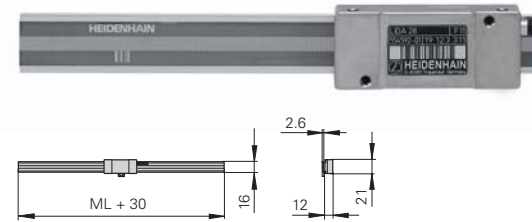
LIDA 407 Series

- **Fast, simple scale fastening** of the aluminum extrusion with PRECIMET adhesive film
- One-piece steel scale tape drawn into an aluminum extrusion and fixed at center
- Limit switches



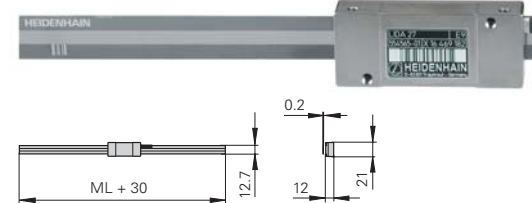
LIDA 207 Series

- **Scale tape cut from roll**
- **Fast, simple scale fastening** of the aluminum extrusion with PRECIMET adhesive film
- One-piece steel scale tape drawn into an aluminum extrusion and fixed at center



LIDA 209 Series

- **Scale tape cut from roll**
- One-piece steel scale with PRECIMET mounting adhesive film **cemented on mounting surface**



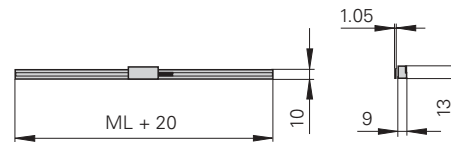
	Incremental		
	LIDA 483 LIDA 473	LIDA 485 LIDA 475	LIDA 487 LIDA 477
Measuring standard Expansion coefficient	METALLUR graduation on glass ceramic or glass $\alpha_{\text{therm}} \approx 8 \times 10^{-6} \text{ K}^{-1}$ (glass) $\alpha_{\text{therm}} \approx 0 \times 10^{-6} \text{ K}^{-1}$ (Robax glass ceramic) $\alpha_{\text{therm}} \approx (0 \pm 0.1) \times 10^{-6} \text{ K}^{-1}$ (Zerodur glass ceramic)	METALLUR steel scale tape $\alpha_{\text{therm}} \approx 10 \times 10^{-6} \text{ K}^{-1}$	
Incremental signals	LIDA 483: $\sim 1 \text{ V}_{\text{PP}}$ LIDA 473: $\square \text{ TTL}$	LIDA 48x: $\sim 1 \text{ V}_{\text{PP}}$ LIDA 47x: $\square \text{ TTL}$	
Signal period	LIDA 483: 20 μm LIDA 473: 4 $\mu\text{m}/2 \mu\text{m}/0.4 \mu\text{m}/0.2 \mu\text{m}$	LIDA 48x: 20 μm LIDA 47x: 4 $\mu\text{m}/2 \mu\text{m}/0.4 \mu\text{m}/0.2 \mu\text{m}$	
Accuracy grade	$\pm 5 \mu\text{m}$	$\pm 5 \mu\text{m}$	$\pm 15 \mu\text{m}$
Recommd. meas. step	1 μm to 0.1 μm	1 μm to 0.1 μm	
Measuring lengths ML	240 to 3040 mm (Robax glass ceramic up to 1640 mm)	140 to 30040 mm	240 to 6040 mm
Reference mark	One (distance-coded upon request)	One	



The exposed linear encoders of the **LIDA 503** series are specially designed for limited installation space. They consist of a compact scanning head and a glass scale that is simply cemented directly to the machine with PRECIMET adhesive film.

The LIDA 503 is used wherever space is insufficient for encoders of the LIDA 400 series, such as on:

- XY tables
- Measuring microscopes
- PCB assembly machines
- Compact positioning units



LIDA 287 LIDA 277	LIDA 289 LIDA 279
Steel scale tape $\alpha_{\text{therm}} \approx 10 \times 10^{-6} \text{ K}^{-1}$	
LIDA 28x: $\sim 1 \text{ V}_{\text{PP}}$ LIDA 27x: \square TTL	
LIDA 28x: 200 μm LIDA 27x: 20 $\mu\text{m}/4 \mu\text{m}/2 \mu\text{m}$	
$\pm 30 \mu\text{m}$	
5 μm to 0.5 μm	
Scale tape from the roll 3 m/5 m/10 m	
Selectable every 100 mm	

	Incremental LIDA 583 LIDA 573
Measuring standard Expansion coefficient	METALLUR graduation on glass $\alpha_{\text{therm}} \approx 8 \times 10^{-6} \text{ K}^{-1}$
Incremental signals	LIDA 583: $\sim 1 \text{ V}_{\text{PP}}$ LIDA 573: \square TTL
Signal period	LIDA 583: 20 μm LIDA 573: 4 $\mu\text{m}/2 \mu\text{m}/0.8 \mu\text{m}/0.4 \mu\text{m}$
Accuracy grade	$\pm 5 \mu\text{m}$
Recommended measuring step	1 μm to 0.1 μm
Measuring lengths ML	70 to 1020 mm
Reference mark	One

HEIDENHAIN-CERTO Length Gauges

Accuracy $\pm 0.1 \mu\text{m}$

HEIDENHAIN-CERTO length gauges feature a large measuring range, provide high linear accuracy and offer resolution in the nanometer range. They are used predominantly for production quality control of high-precision parts and for the monitoring and calibration of reference standards. Length gauges reduce the number of working standards required to calibrate gauge blocks.

Accuracy

The total error of HEIDENHAIN-CERTO length gauges lies within $\pm 0.1 \mu\text{m}$. After linear length error compensation in the evaluation electronics of the ND 28x, for example, HEIDENHAIN guarantees accuracy of $\pm 0.03 \mu\text{m}$ for the CT 2500 and $\pm 0.05 \mu\text{m}$ for the CT 6000. These accuracy grades apply over the entire measuring range at ambient temperatures between 19 °C and 21 °C and with a temperature variation of $\pm 0.1 \text{ K}$ during measurements using the CS 200 gauge stand for HEIDENHAIN-CERTO.

Plunger actuation

The plungers of the **CT 2501** and **CT 6001** are extended and retracted by an integral motor. It can be actuated by the associated switch box, which can also be controlled by external signal.

CT 2502 and **CT 6002** have no plunger drive. The freely movable plunger is connected by a separate coupling with the moving machine element.

Mounting

The CT 2500 length gauge is fastened by its 16-mm diameter clamping shank. The CT 6000 is fastened with two screws on a plane surface.



	Incremental			
	CT 2501	CT 2502	CT 6001	CT 6002
Measuring standard	DIADUR phase grating on Zerodur glass ceramic Coefficient of linear expansion: $\alpha_{\text{therm}} \approx 0 \pm 0.1 \times 10^{-6} \text{ K}^{-1}$			
Incremental signals	$\sim 11 \mu\text{APP}$			
Signal period	2 μs			
System accuracy¹⁾	$\pm 0.1 \mu\text{m}$ $\pm 0.03 \mu\text{m}^2$		$\pm 0.1 \mu\text{m}$ $\pm 0.05 \mu\text{m}^2$	
Recommended measuring step	0.01 μm and 0.005 μm with ND 28x display unit			
Measuring path	25 mm		60 mm	
Plunger actuation	Motor driven	Via coupling	Motor driven	Via coupling
Reference mark	One			

¹⁾ At 19 °C to 21 °C; permissible temperature fluctuation during measurement: $\pm 0.1 \text{ K}$

²⁾ With linear length-error compensation in the evaluation electronics