

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

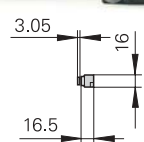
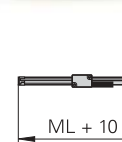
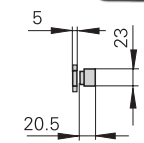
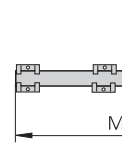
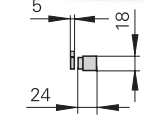
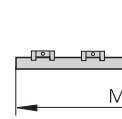
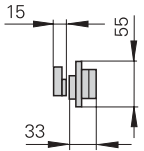
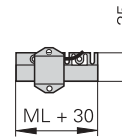
- Measuring lengths up to 1440 mm
- Measuring steps to $0.05 \mu\text{m}$

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



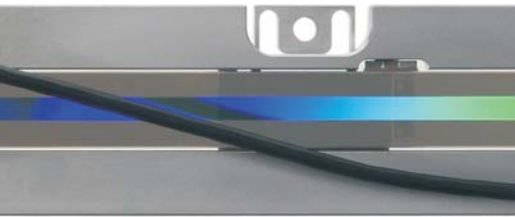
| | Incremental | | |
|-----------------------------|---|--|--|
| | LIP 382 LIP 372 | LIP 481 LIP 471 | LIP 581 LIP 571 |
| Measuring standard | DIADUR phase grating on Zerodur glass ceramic | DIADUR phase grating on glass or Zerodur [®] glass ceramic | DIADUR phase grating on glass |
| Expansion coefficient | $\alpha_{\text{therm}} \approx (0 \pm 0.1) \times 10^{-6} \text{ K}^{-1}$ | $\alpha_{\text{therm}} \approx 8 \times 10^{-6} \text{ K}^{-1}$ (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

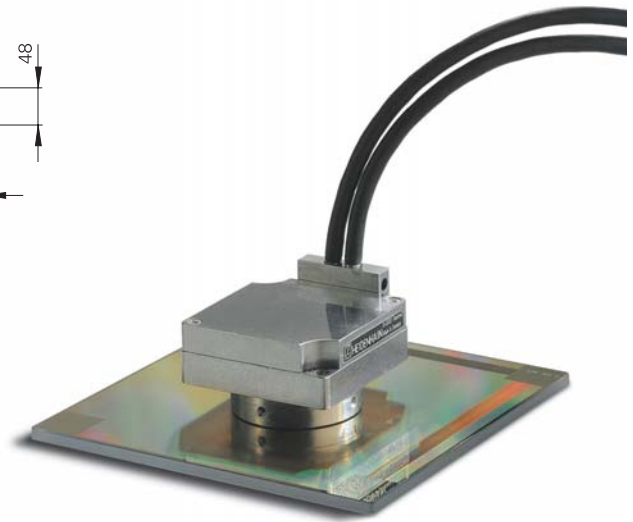
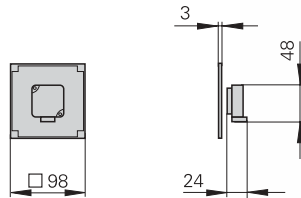
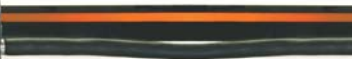
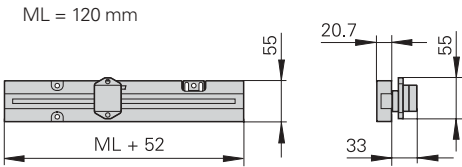
G. E. Van Wert Co Inc,
461 Boston St.,
Topsfield, Ma 01921
(978) 887-3389 gevanwert.com



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 $\pm 5 \mu\text{m}$



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

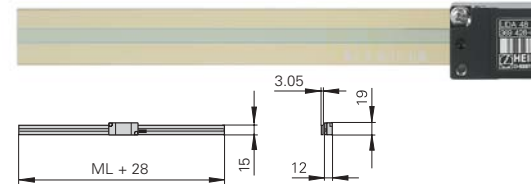
The **LIDA** exposed linear encoders are specially designed for **high traversing speeds** up to 10 m/s, and are particularly easy to mount with various mounting possibilities. Steel scale tapes, glass or glass ceramic are used as carriers for METALLUR graduations, depending on the respective encoder.

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

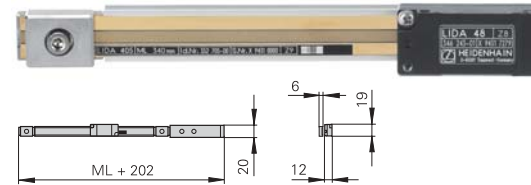
LIDA 403 Series

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



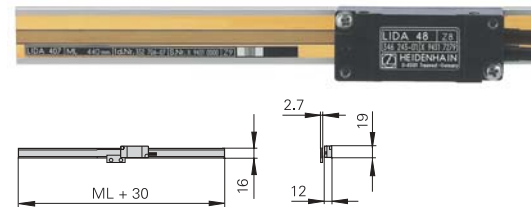
LIDA 405 Series

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



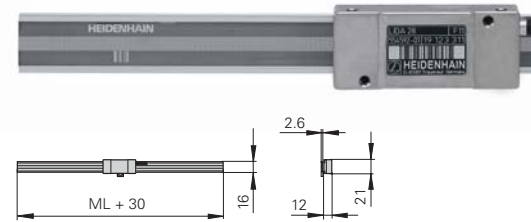
LIDA 407 Series

- **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



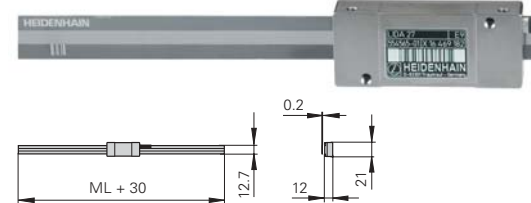
LIDA 207 Series

- **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**



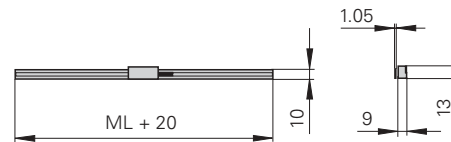
| | Incremental | | |
|--|--|---|----------------------|
| | LIDA 483 LIDA 473 | LIDA 485 LIDA 475 | LIDA 487 LIDA 477 |
| Measuring standard Expansion coefficient | METALLUR graduation on glass ceramic or glass $\alpha_{\text{therm}} \approx 8 \times 10^{-6} \text{ K}^{-1}$ (glass) $\alpha_{\text{therm}} \approx 0 \times 10^{-6} \text{ K}^{-1}$ (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: $\square \sqcup \text{TTL}$ | LIDA 48x: $\sim 1 \text{ V}_{\text{PP}}$ LIDA 47x: $\square \sqcup \text{TTL}$ | |
| 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