Product Information

LIC 4100
Absolute Exposed Linear Encoders
Absolute linear encoders for measuring lengths of up to 3 m
- For measuring steps of down to 1 nm
- Glass or glass ceramic measuring standard
- Consisting of a linear scale and scanning head (with straight or angled cable outlet)
- Version available for use in a high vacuum (see separate Product Information document)

Scale, clamped

Scale, adhesively bonded

Mounting options for scanning head
(shown without fixing clamps)

Ordering designation*  EnDat22  E30-RB
fanuc05  Mit03-4  Mito3-2  Pans02  YEC07

Measuring step*  1 nm  10 nm, 5 nm, 1 nm

Calculation time tcal
Clock frequency
≤ 5 µs
≤ 16 MHz

Traversing speed2) ≤ 600 m/min

Interpolation error
≤ 20 nm

Electrical connection*
Cable length (with HEIDENHAIN cable)
≤ 100 m  ≤ 50 m  ≤ 30 m  ≤ 50 m

Supply voltage
DC 3.6 V to 14 V

Power consumption3) (max.)
At 3.6 V:  ≤ 700 mW
At 14 V:  ≤ 850 mW

Current consumption (typical)
At 6 V: 75 mA
At 12 V: 35 mA

Vibration 55 Hz to 2000 Hz
≤ 500 m/s² (without load)
≤ 1000 m/s² (without load)

Shock 6 ms
≤ 18 g (without cable)

Operating temperature
-10°C to 70°C

Mass
Scanning head:
≤ 18 g (without cable)

Cable:
M12 coupling and D-sub connector: 20 g/min; MINI-SNAP connector: 15 g/min

Connectors:
M12 coupling: 15 g; D-sub connector: 32 g; MINI-SNAP: 8 g

* Please select when ordering
2) See General electrical information in the Interfaces of HEIDENHAIN Encoders brochure
3) See General electrical information in the Interfaces of HEIDENHAIN Encoders brochure

Robax is a registered trademark of Schott-Glaswerke, Mainz, Germany

Product Information: LIC 4100  11/2023

LIC 4113, LIC 4133, LIC 4193

Frequent flexing
Rigid configuration
1 = Gap is adjusted with a spacer shim during mounting
2 = Depending on the measuring length (ML), use an additional pair of fixing clamps
3 = Adhesive
4 = Mounting clearance between scanning head and linear scale
5 = Optical centerline
6 = Direction of motion of the scanning unit for increasing position values

Product Information: LIC 4100  11/2023
**LIC 4115, LIC 4135, LIC 4195**

Absolute linear encoders for measuring lengths of up to 28 m
- For measuring steps of down to 1 nm
- Steel scale tape pulled through aluminum extrusions and tensioned
- Consisting of a linear scale and scanning head (with straight or angled cable outlet)

### Scale LIC 4005

- **Measuring standard:** Steel scale tape with absolute and incremental METALLUR track
- **Coefficient of linear expansion:** Depends on the mounting surface
  - \( \pm 5 \mu m \)
- **Accuracy grade:**
  - \( \pm 0.750 \mu m/50 \text{ mm} \) (typical)
- **Baseline error:**
  - \( \geq 40 \text{ mm} \)
- **Measuring length (ML)**
  - Greater MLs (up to 28440 mm) with a single-section scale tape and individual scale carrier sections
- **Mass:**
  - Scale tape: 31 g; assembly parts: 80 g + \( n \) g; scale tape carrier: 187 g

### Scanning head LIC 411, LIC 413, LIC 419F, LIC 419M, LIC 419P, LIC 419Y

- **Interface:**
  - EnDat 2.2
  - EnDat 3
  - Fanuc Serial Interface
  - Mitsubishi high speed interface
  - Panasonic Serial Interface
  - Yaskawa Serial Interface
- **Ordering designation:**
  - EnDat22
  - E30-RB
  - E30-R4
  - Fanuc05
  - Mit03-4
  - Mit03-2
  - Pana02
  - YEC07
- **Measuring step:**
  - \( 2) 10 \text{ nm}, 5 \text{ nm}, 1 \text{ nm} \)
- **Calculation time:**
  - \( t_{calc} \)
  - \( \leq 5 \mu s \)
  - \( \leq 16 \text{ MHz} \)
- **Traversing speed:**
  - \( \leq 600 \text{ m/min} \)
- **Interpolation error:**
  - \( \leq 20 \text{ nm} \)
- **Cable length:**
  - \( \leq 100 \text{ m} \)
  - \( \leq 50 \text{ m} \)
  - \( \leq 30 \text{ m} \)
- **Electrical connection:**
  - Cable (1 m or 3 m) with 8-pin M12 coupling (male) for all interfaces; EnDat 3: E30-RB, 15-pin D-sub connector (male) (for all interfaces; EnDat 3: E30-RB), or 4-pin MINI-SNAP connector (male) (EnDat 3: E30-R4)
  - 15-pin D-sub connector (male) (for all interfaces; EnDat 3: E30-RB), or 4-pin MINI-SNAP connector (male) (EnDat 3: E30-R4)
- **Cable length (with HEIDENHAIN cable):**
  - \( \leq 100 \text{ m} \)
  - \( \leq 50 \text{ m} \)
  - \( \leq 30 \text{ m} \)
  - \( \leq 50 \text{ m} \)
- **Supply voltage:**
  - DC 3.6 V to 14 V
- **Power consumption (max.):**
  - At 3.6 V: \( \leq 700 \text{ mW} \)
  - At 14 V: \( \leq 800 \text{ mW} \)
- **Current consumption (typical):**
  - At 3.6 V: \( \leq 700 \text{ mW} \)
  - At 14 V: \( \leq 850 \text{ mW} \)
  - At 12 V: \( \leq 35 \text{ mA} \) (without load)
- **Vibration:**
  - 55 Hz to 2000 Hz
  - 500 m/s\(^2\) (EN 60068-2-6)
- **Shock:**
  - 6 ms
  - \( \leq 500 \text{ m/s}^2 \) (EN 60068-2-27)
  - \( \leq 1000 \text{ m/s}^2 \) (EN 60068-2-27)
  - \( \leq 1000 \text{ m/s}^2 \) (EN 60068-2-27)
- **Operating temperature:**
  - \(-10 \text{°C} \) to \( 70 \text{°C} \)
- **Mass:**
  - Scanning head: \( \leq 18 \text{ g} \) (without cable)
  - **Cable:**
    - M12 coupling and D-sub connector: 20 g/m
    - MINI-SNAP connector: 15 g/m
  - **Connectors:**
    - M12 coupling: 15 g; D-sub connector: 52 g; MINI-SNAP 8 g

---

*Please select when ordering*

\( n \) = 1 for ML 3140 mm to 5040 mm; \( n = 2 \) for ML 5140 mm to 7040 mm; etc.

\( \star \) Mitsubishi: 1 mm: ML \geq 2040 mm; 5 mm: ML \geq 10040 mm; 10 mm: ML \geq 2040 mm

\( \star \) Yaskawa: 1 mm: ML \geq 1840 mm; 5 mm: ML \geq 9040 mm; 10 mm: ML \geq 18040 mm

See General electrical information in the Interfaces of HEIDENHAIN Encoders brochure
**Scale LIC 4007**

<table>
<thead>
<tr>
<th>Measuring standard</th>
<th>Steel scale tape with absolute and incremental METALLUR track.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coefficient of linear expansion*</td>
<td>$n_{linear} = 10 \times 10^{-6}$ K$^{-1}$</td>
</tr>
<tr>
<td>Accuracy grade**</td>
<td>$\pm 3 \mu m$ (up to ML 1040), $\pm 5 \mu m$ (for ML 1240 or greater), $\pm 15 \mu m$</td>
</tr>
<tr>
<td>Baseline error</td>
<td>$\leq \pm 0.750 \mu m/50$ mm (typical)</td>
</tr>
<tr>
<td>Measuring length (ML) in mm</td>
<td>240 - 440, 640 - 840, 1040 - 1240, 1440 - 1640, 1840 - 2040, 2240 - 2440, 2640 - 2840, 3040 - 3240, 3440 - 3640, 3840 - 4040, 4240 - 4440, 4640 - 4840, 5040 - 5240, 5440 - 5640</td>
</tr>
<tr>
<td>Mass</td>
<td>Scale tape: 31 g/m; assembly parts: 20 g; scale tape carrier: 68 g/m</td>
</tr>
</tbody>
</table>

**Scanning head LIC 411 LIC 413 LIC 419 F LIC 419 M LIC 419 P LIC 419 Y**

<table>
<thead>
<tr>
<th>Interface</th>
<th>EnDat 2.2</th>
<th>EnDat 3</th>
<th>Fanuc Serial Interface</th>
<th>Mitsubishi high speed interface</th>
<th>Panasonic Serial Interface</th>
<th>Yaskawa Serial Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ordering designation*</td>
<td>EnDat22</td>
<td>E30-RB E30-R4</td>
<td>Fanuc05</td>
<td>Mit03-4 Mit03-2 Para02</td>
<td>YEC07</td>
<td></td>
</tr>
<tr>
<td>Measuring step*2)</td>
<td>10 nm, 5 nm, 1 nm</td>
<td>1 mm</td>
<td>10 mm, 5 mm, 1 mm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calculation time $t_{calc}$</td>
<td>$\leq 5 \mu s$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clock frequency</td>
<td>$\leq 16$ MHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traversing speed*3)</td>
<td>$\leq 600$ m/min</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interpolation error</td>
<td>$\leq 20$ nm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical connection**</td>
<td>Cable (1 m or 3 m) with 8-pin M12 coupling (male) (for all interfaces; EnDat 3: E30-RB), 15-pin D-sub connector (male) (for all interfaces; EnDat 3: E30-RB), or 4-pin MINI-SNAP connector (male) (EnDat 3: E30-R4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable length (with HEIDENHAIN cable)</td>
<td>$\leq 100$ m</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply voltage</td>
<td>DC 3.6 V to 14 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power consumption*3) (max.)</td>
<td>At 3.6 V: $\leq 700$ mW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>At 14 V: $\leq 850$ mW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current consumption (typical)</td>
<td>At 5 V: 75 mA (without load)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>At 12 V: 35 mA (without load)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>At 5 V: 95 mA (with load)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration 55 Hz to 2000 Hz</td>
<td>$\leq 500$ m/s$^2$ (EN 60068-2-6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shock 6 ms</td>
<td>$\leq 1000$ m/s$^2$ (EN 60068-2-27)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating temperature</td>
<td>$-10$ °C to 70 °C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>Scanning head: $\leq 18$ g (without cable)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cable: M12 coupling and D-sub connector: 20 g/m, MINI-SNAP connector: 15 g/m</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Connectors: M12 coupling: 15 g, D-sub connector: 32 g, MINI-SNAP: 8 g</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Please select when ordering |
** $\pm 5 \mu m$ after linear length-error compensation in the downstream electronics |
*1 $\pm 5 \mu m$ after linear length-error compensation in the downstream electronics |
*2 Mitsubishi: ML $\leq 2040$ mm; Yaskawa: ML $\leq 1840$ mm |
*3 See General electrical information in the Interfaces of HEIDENHAIN Encoders brochure
LIC 4119, LIC 4139, LIC 4199

Absolute linear encoders for measuring lengths of up to 1 m
- For measuring steps of down to 1 nm
- Steel scale tape adhesively bonded to mounting surface
- Consisting of a linear scale and scanning head (with straight or angled cable outlet)

Scale

<table>
<thead>
<tr>
<th>LIC 4009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring standard: Steel scale tape with absolute and incremental METALLUR track</td>
</tr>
<tr>
<td>Coefficient of linear expansion* : ( n_{\text{therm}} = 10 \times 10^{-6} \text{ K}^{-1} )</td>
</tr>
<tr>
<td>Accuracy grade* : ( \pm 3 \mu \text{m} ), ( \pm 15 \mu \text{m} )</td>
</tr>
<tr>
<td>Baseline error : ( \leq 0.750 \mu \text{m} / 50 \text{ mm} ) (typical)</td>
</tr>
<tr>
<td>Measuring length (ML)* in mm :</td>
</tr>
<tr>
<td>70 120 170 220 270 320 370 420 520 620 720 820 920 1020</td>
</tr>
<tr>
<td>Mass: 31 g</td>
</tr>
</tbody>
</table>

Scanning head

<table>
<thead>
<tr>
<th>LIC 411</th>
<th>LIC 413</th>
<th>LIC 419F</th>
<th>LIC 419M</th>
<th>LIC 419P</th>
<th>LIC 419Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EnDat 2.2</td>
<td>EnDat 3</td>
<td>Fanuc Serial Interface</td>
<td>Mitsubishi high speed Interface</td>
<td>Panasonic Serial Interface</td>
<td>Yaskawa Serial Interface</td>
</tr>
<tr>
<td>Ordering designation*:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EnDat22</td>
<td>E30-RB</td>
<td>E30-R4</td>
<td>Fanuc05</td>
<td>Mit03-4</td>
<td>Mit03-2</td>
</tr>
<tr>
<td>Measuring steps*:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 nm, 5 nm, 1 nm</td>
<td>10 nm, 5 nm, 1 nm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clock frequency:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \leq 5 \mu \text{s} )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \leq 16 \text{ MHz} )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traversing speed*:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \leq 600 \text{ mm/min} )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interpolation error:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \leq 20 \mu \text{m} )</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Electrical connection*

- Cable (1 m or 3 m) with 8-pin M12 coupling (male) (for all interfaces; EnDat 3: E30-RB), 15-pin D-sub connector (male) (for all interfaces; EnDat 3: E30-RB), or 4-pin MINI-SNAP connector (male) (EnDat 3: E30-R4)

Cable length (with HEIDENHAIN cable):
- \( \leq 100 \text{ m}^{11} \)
- \( \leq 50 \text{ m} \)
- \( \leq 30 \text{ m} \)
- \( \leq 50 \text{ m} \)

Supply voltage:
- DC 3.6 V to 14 V

Power consumption\(^ {12} \) (max.):
- At 3.6 V: \( \leq 700 \text{ mW} \)
- At 14 V: \( \leq 800 \text{ mW} \)

Current consumption (typical):
- At 5 V: 75 mA (without load)
- At 12 V: 35 mA (without load)

Vibration 55 Hz to 2000 Hz:
- \( \leq 500 \text{ m/s}^2 \) (EN 60068-2-6)
- \( \leq 1000 \text{ m/s}^2 \) (EN 60068-2-27)

Shock 6 ms:
- \( \leq 50 \text{ g} \) (without load)
- \( \leq 100 \text{ g} \) (without load)

Operating temperature:
- \(-10 \text{ °C} \) to \( 70 \text{ °C} \)

Mass:
- Scanning head: \( \leq 18 \text{ g} \) (without cable)
- Cable: M12 coupling and D-sub connector: 20 g/m, MINI-SNAP connector: 15 g/m
- Connectors: M12 coupling: 15 g; D-sub connector: 22 g; MINI-SNAP: 8 g

* Please select when ordering
\(^ {1} \) \( \pm 5 \mu \text{m} \) after linear length error compensation in the downstream electronics
\(^ {2} \) Mitsubishi: ML ≤ 2040 mm / Yaskawa: ML ≤ 1840 mm
\(^ {11} \) See General electrical information in the Interfaces of HEIDENHAIN Encoders brochure
\(^ {12} \) With LIC 411 FS scanning head clock frequency: 9 MHz
Electrical connection

EnDat 3 adapter cable and connecting cable (MINI-SNAP, E30-R4)

<table>
<thead>
<tr>
<th>PUR</th>
<th>Adapter cable with 4-pin MINI-SNAP connector (female) and 15-pin D-sub connector (male)</th>
<th>Connecting cable with 4-pin MINI-SNAP connector (female) and 4-pin MINI-SNAP connector (male)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(2 × 0.25 mm²) + (2 × 0.09 mm²) Ø 5.2 mm; Ap = 0.25 mm²</td>
<td>1362192-xx</td>
<td>1363049-xx</td>
</tr>
</tbody>
</table>

EnDat 3 pin layout

<table>
<thead>
<tr>
<th>8-pin M12 coupling (E30-RB)</th>
<th>15-pin D-sub connector (E30-RB)</th>
<th>4-pin MINI-SNAP connector (E30-R4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>Serial data transmission</td>
<td></td>
</tr>
<tr>
<td>M12</td>
<td>8 2 5 1 3 4 7 6</td>
<td></td>
</tr>
<tr>
<td>MINI-SNAP</td>
<td>4 12 2 10 5 13 8 15</td>
<td></td>
</tr>
<tr>
<td>U_p</td>
<td>Sensor</td>
<td>Sensor</td>
</tr>
<tr>
<td>Brown/Green</td>
<td>Blue</td>
<td>White/Green</td>
</tr>
<tr>
<td>Sensor</td>
<td>0 V</td>
<td>0 V</td>
</tr>
<tr>
<td>SD+_NEXT</td>
<td>SD-_NEXT</td>
<td>SD+</td>
</tr>
<tr>
<td>SD–</td>
<td></td>
<td>SD–</td>
</tr>
</tbody>
</table>
| Cable shield connected to housing; \( U_p \) = Power supply voltage

Sensor: The sense line is connected in the encoder with the corresponding power line.
Vacant pins or wires must not be used!

For information about connecting cables and pin layouts, please refer to the Cables and Connectors brochure.

This Product Information document supersedes all previous editions, which thereby become invalid. The basis for ordering from HEIDENHAIN is always the Product Information document edition valid when the order is placed.

Further information:
Comply with the requirements described in the following documents to ensure correct and intended operation:
- Brochure: Exposed Linear Encoders 208960-xx
- Brochure: Cables and Connectors 1206103-xx
- Brochure: Interfaces of HEIDENHAIN Encoders 1078628-xx
- Technical Information document: EnDat 383942-18

HEIDENHAIN
DR. JOHANNES HEIDENHAIN GmbH
Dr.-Johannes-Heidenhain-Straße 5
83301 Traunreut, Germany
Tel. +49 8669 31-0
Fax +49 8669 32-5061
info@heidenhain.de
www.heidenhain.com