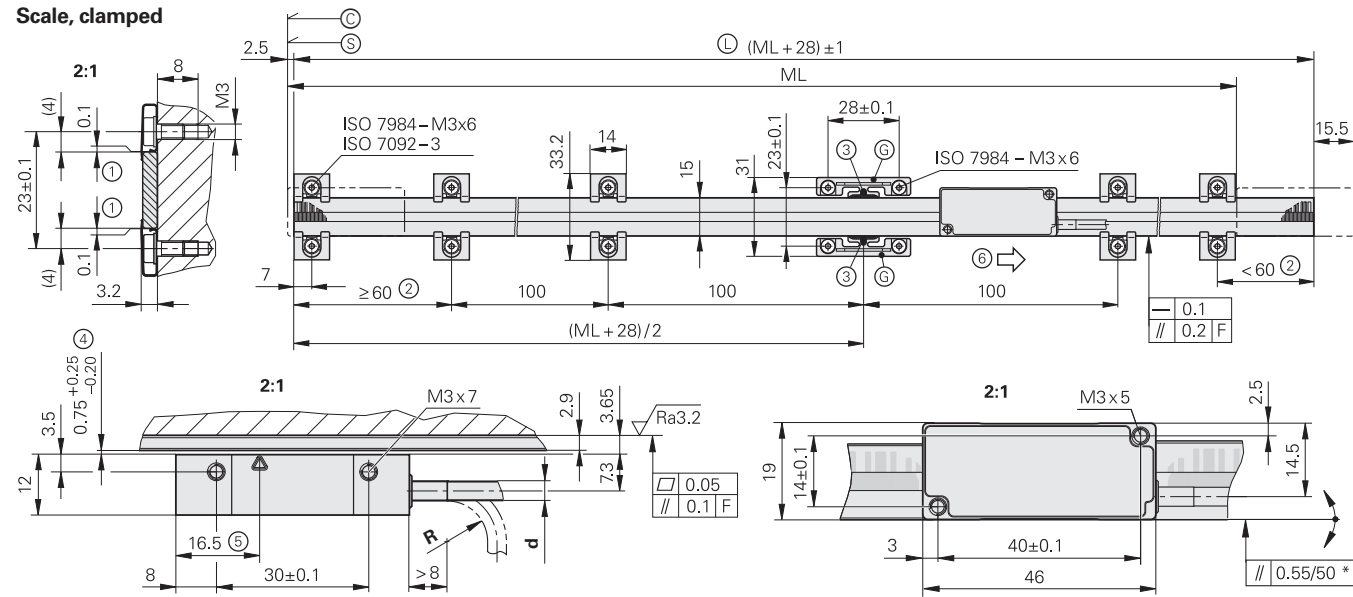


LIC 4113, LIC 4133, LIC 4193

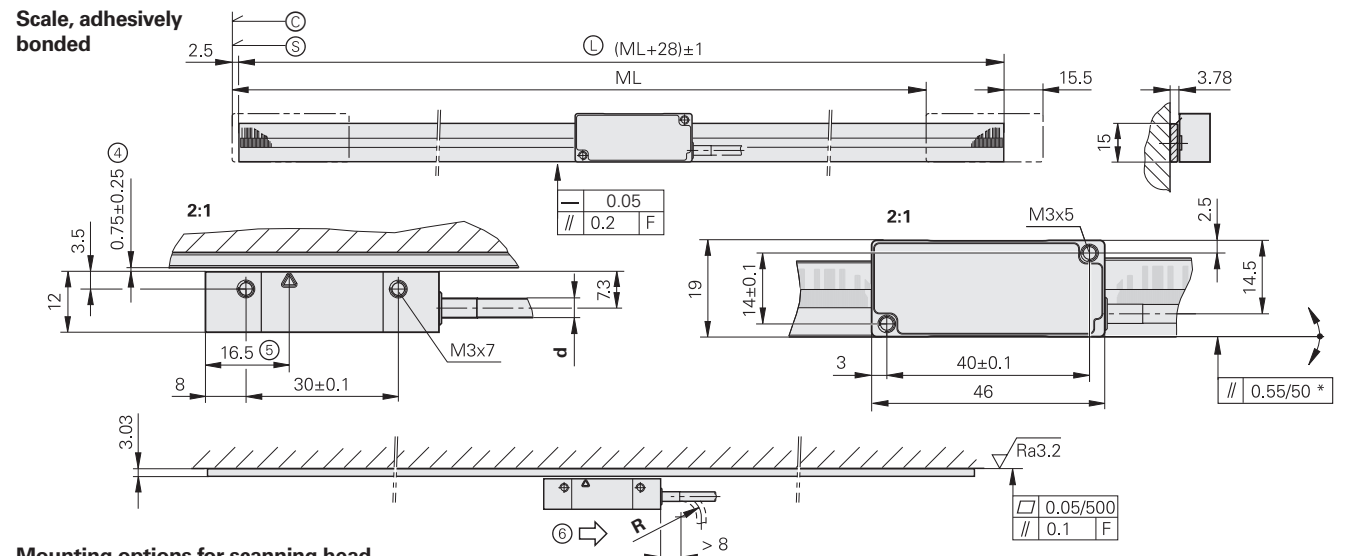
Absolute linear encoders for measuring lengths of up to 3 m

- Measuring steps of down to 1 nm
- Glass or glass ceramic measuring standard
- Measuring standard secured with adhesive film or fixing clamps
- Consisting of a linear scale and scanning head (with straight or angled cable outlet)
- Available version for use in a high vacuum (see separate Product Information document)

Scale, clamped

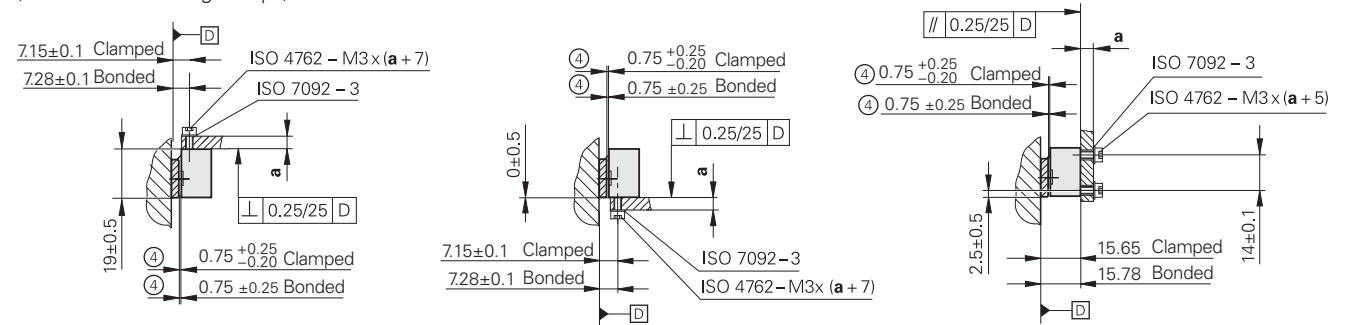


Scale, adhesively bonded



Mounting options for scanning head

(shown without fixing clamps)



F = Machine guideway

* = Mounting error plus dynamic guideway error

Ⓢ = Beginning of measuring length (ML)

© = Code start value: $\geq 100 \pm 1$ mm

Ⓛ = Scale length

© = Fixed-point element for defining the thermal fixed point

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 gap between scanning head and scale

5 = Optical centerline

6 = Direction of motion of the scanning unit for increasing position values

mm



Tolerancing ISO 8015
ISO 2768:1989-mH
≤ 6 mm: ±0.2 mm

	d	R	
PUR	Ø 3.7 mm	> 8 mm	≥ 40 mm
Vacuum	Ø 3.5 mm	> 10 mm	≥ 50 mm
PUR	Ø 2.9 mm	> 6 mm	≥ 30 mm



Linear scale	LIC 4003
Measuring standard Coefficient of linear expansion*	METALLUR grating on glass or glass ceramic $\alpha_{\text{therm}} \approx 8 \cdot 10^{-6} \text{ K}^{-1}$ (glass) $\alpha_{\text{therm}} = (0 \pm 0.5) \cdot 10^{-6} \text{ K}^{-1}$ (Robax glass ceramic)
Accuracy grade*	$\pm 1 \text{ }\mu\text{m}$ (only for Robax glass ceramic), $\pm 3 \text{ }\mu\text{m}$, $\pm 5 \text{ }\mu\text{m}$
Baseline error	$\leq \pm 0.275 \text{ }\mu\text{m}/10 \text{ mm}$
Measuring length (ML)* in mm	240 340 440 640 840 1040 1240 1440 1640 1840 2040 2240 2440 2640 2840 3040 (Robax glass ceramic only up to ML of 1640)
Mass	3 g + 110 g/m of measuring length

Scanning head	LIC 411	LIC 413	LIC 419F	LIC 419M		LIC 419P	LIC 419Y
Interface	EnDat 2.2	EnDat 3	Fanuc Serial Interface α i	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* ¹⁾	10 nm, 5 nm, 1 nm	1 nm	10 nm, 5 nm, 1 nm				
Calculation time t_{cal} Clock frequency	$\leq 5 \mu s$ $\leq 16 \text{ MHz}$	–					
Traversing speed ²⁾	$\leq 600 \text{ m/min}$						
Interpolation error	$\pm 20 \text{ nm}$						
Electrical connection*	Cable (1 m or 3 m) with 8-pin M12 coupling (male) (for all interfaces except EnDat 3: E30-R4) or 15-pin D-sub connector (male) (for all interfaces except EnDat 3: E30-R4) or 4-pin MINI-SNAP connector (male) (for 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 ²⁾ (max.)	At 3.6 V: $\leq 700 \text{ mW}$ At 14 V: $\leq 800 \text{ mW}$	At 3.6 V: $\leq 850 \text{ mW}$ At 14 V: $\leq 950 \text{ mW}$					
Current consumption (typical)	At 5 V: 75 mA (without load)	At 12 V: 35 mA (without load)	At 5 V: 95 mA (without load)				
Vibration 55 Hz to 2000 Hz Shock 6 ms	$\leq 500 \text{ m/s}^2$ (EN 60068-2-6) $\leq 1000 \text{ m/s}^2$ (EN 60068-2-27)						
Operating temperature	-10°C to 70°C						
Mass	Scanning head: $\leq 18 \text{ g}$ (without cable) Cable: <i>M12 coupling and D-sub connector:</i> 20 g/m; <i>MINI-SNAP connector:</i> 15 g/m Connectors: <i>M12 coupling:</i> 15 g; <i>D-sub connector:</i> 32 g; <i>MINI-SNAP:</i> 8 g						

* Please select when ordering

¹⁾ *Mitsubishi*: ML ≤ 2040 mm / *Yaskawa*: ML ≤ 1840 mm

²⁾ See *General electrical information in the Interfaces of HEIDENHAIN Encoders* brochure

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

Absolute linear encoders for measuring lengths of up to 28 m

-
- LIC 4100
www.heidenhain.de
- LIC 4005 NL 440 mm ID 674 049-09 SN 53 417 741 T5

Technical drawing of a 1000mm long extruded aluminum profile. The drawing includes a side view and a cross-section view. The side view shows the profile with various dimensions and callouts. The cross-section view shows the internal structure and dimensions. The drawing is labeled with 'ML ≤ 2040' and '1000'.

Dimensions and Callouts:

- Side View Dimensions:**
 - Overall length: 1000
 - Section line: E-E
 - Section line: B-B
 - Section line: C-C
 - Section line: S
 - Section line: T
 - Section line: U
 - Section line: V
 - Section line: W
 - Section line: X
 - Section line: Y
 - Section line: Z
 - Section line: AA
 - Section line: BB
 - Section line: CC
 - Section line: DD
 - Section line: EE
 - Section line: FF
 - Section line: GG
 - Section line: HH
 - Section line: II
 - Section line: JJ
 - Section line: KK
 - Section line: LL
 - Section line: MM
 - Section line: NN
 - Section line: OO
 - Section line: PP
 - Section line: QQ
 - Section line: RR
 - Section line: SS
 - Section line: TT
 - Section line: UU
 - Section line: VV
 - Section line: WW
 - Section line: XX
 - Section line: YY
 - Section line: ZZ
- Cross-section View Dimensions:**
 - Overall width: 100
 - Section line: E-E
 - Section line: B-B
 - Section line: C-C
 - Section line: S
 - Section line: T
 - Section line: U
 - Section line: V
 - Section line: W
 - Section line: X
 - Section line: Y
 - Section line: Z
 - Section line: AA
 - Section line: BB
 - Section line: CC
 - Section line: DD
 - Section line: EE
 - Section line: FF
 - Section line: GG
 - Section line: HH
 - Section line: II
 - Section line: JJ
 - Section line: KK
 - Section line: LL
 - Section line: MM
 - Section line: NN
 - Section line: OO
 - Section line: PP
 - Section line: QQ
 - Section line: RR
 - Section line: SS
 - Section line: TT
 - Section line: UU
 - Section line: VV
 - Section line: WW
 - Section line: XX
 - Section line: YY
 - Section line: ZZ

Surface Finish and Tolerances:

- Surface finish: 0.05, 0.1, 0.2, 0.5, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0, 10.0, 12.0, 15.0, 20.0, 25.0, 30.0, 40.0, 50.0, 60.0, 70.0, 80.0, 90.0, 100.0
- Tolerances: ±0.1, ±0.2, ±0.3, ±0.4, ±0.5, ±0.6, ±0.7, ±0.8, ±0.9, ±1.0, ±1.2, ±1.5, ±2.0, ±2.5, ±3.0, ±4.0, ±5.0, ±6.0, ±7.0, ±8.0, ±9.0, ±10.0, ±12.0, ±15.0, ±20.0, ±25.0, ±30.0, ±40.0, ±50.0, ±60.0, ±70.0, ±80.0, ±90.0, ±100.0

[illegible]

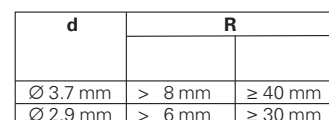
- | d | R | |
|----------|--------|---------|
| | | |
| Ø 3.7 mm | > 8 mm | ≥ 40 mm |
| Ø 2.9 mm | > 6 mm | > 30 mm |

Scale	LIC 4005														
Measuring standard Coefficient of linear expansion *	Steel scale tape with absolute and incremental METALLUR track Depends on the mounting surface														
Accuracy grade*	±5 µm														
Baseline error	≤ ±0.750 µm/50 mm (typical)														
Measuring length (ML)* in mm	140 1540	240 1640	340 1740	440 1840	540 1940	640 2040	740	840	940	1040	1140	1240	1340	1440	
	Greater MLs (up to 28440 mm) with a single-section scale tape and individual scale carrier sections														
Mass	Scale tape: 31 g/m; assembly parts: 80 g + n ¹⁾ · 27 g; scale tape carrier: 187 g/m														

* Please select when ordering ¹⁾ n = 1 for ML 3140 mm to 5040 mm; n = 2 for ML 5140 mm to 7040 mm; etc.*
²⁾ *Mitsubishi*: 1 nm: ML ≤ 2040 mm; 5 nm: ML ≤ 10040 mm; 10 nm: ML ≤ 20040 mm
Yaskawa: 1 nm: ML ≤ 1840 mm; 5 nm: ML ≤ 9040 mm; 10 nm: ML ≤ 18040 mm
³⁾ See *General electrical information* in the *Interfaces of HEIDENHAIN Encoders* brochure

Absolute linear encoders for measuring lengths of up to 6 m

-
- A close-up photograph of the Heidenhain LIC 4100 encoder cable. The cable is black and flexible, connected to a silver-colored metal housing. The housing has a label with the following information: LIC 4100, ML 440 mm, ID 674 050-03, SN 53 417 725, TS, and a barcode. The Heidenhain logo and website (www.heidenhain.de) are also visible on the housing.



* Please select when ordering

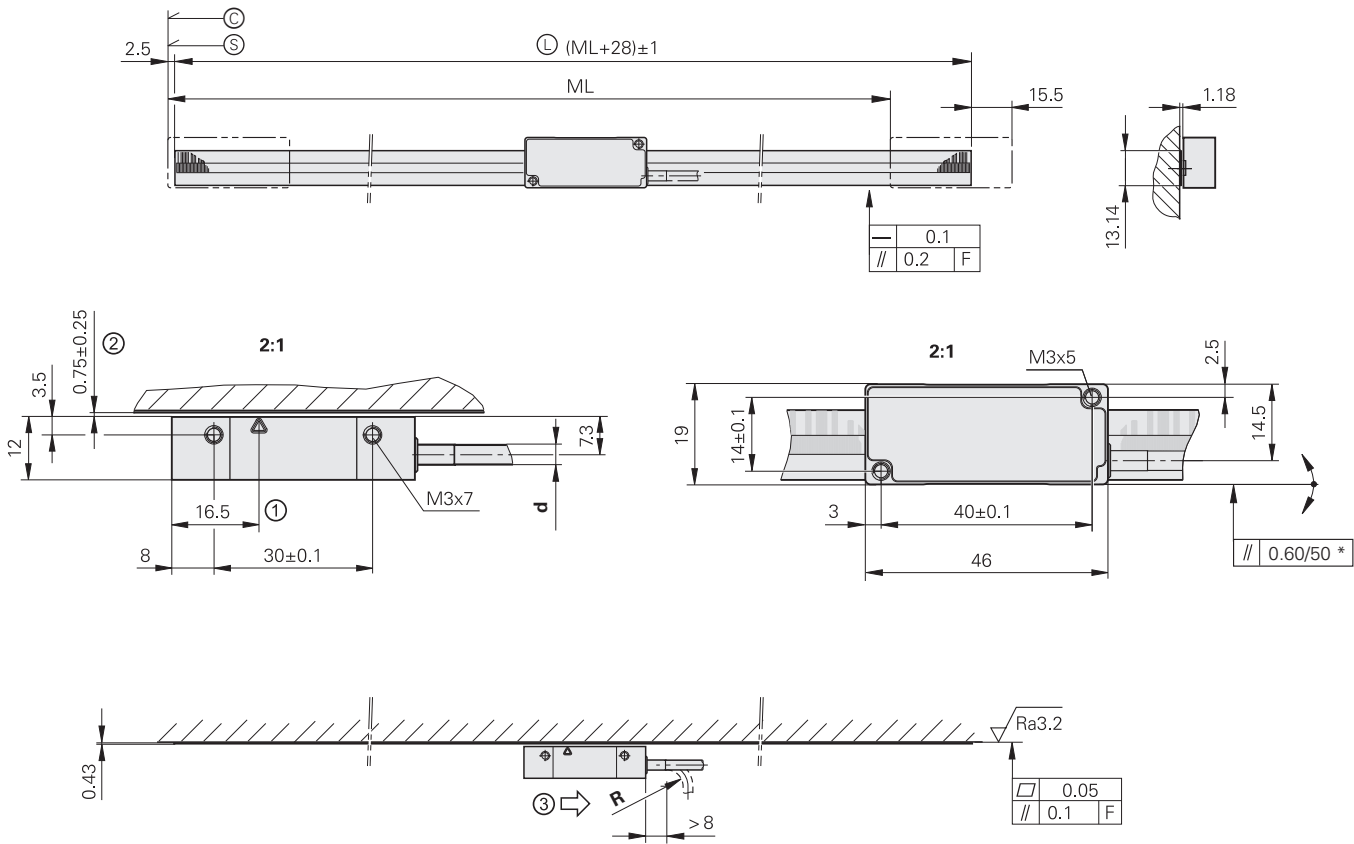
1) $\pm 5 \mu\text{m}$ after linear-error compensation in the downstream electronics

2) *Mitsubishi*: $\text{ML} \leq 2040 \text{ mm}$ / *Yaskawa*: $\text{ML} \leq 1840 \text{ mm}$

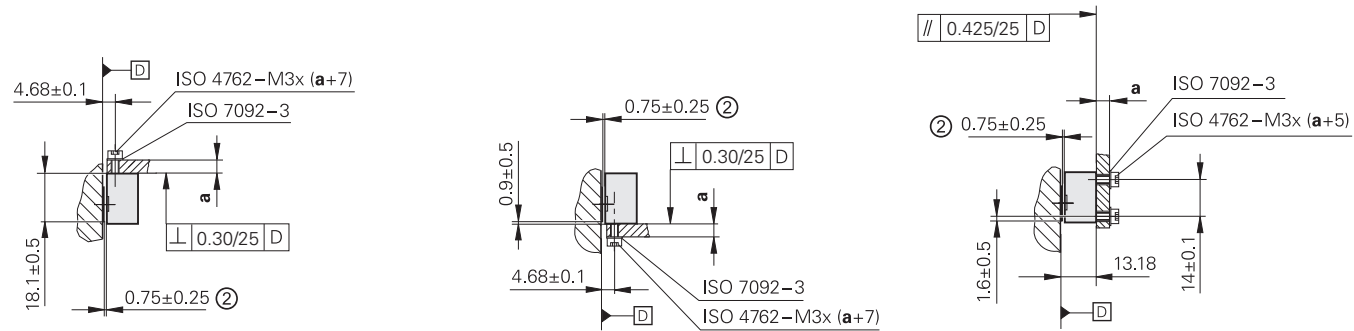
3) See *General electrical information* in the *Interfaces of HEIDENHAIN Encoders* brochure

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)



Mounting options for scanning head



d	R	
Ø 3.7 mm	> 8 mm	≥ 40 mm
Ø 2.9 mm	> 6 mm	≥ 30 mm

mm
Tolerancing ISO 8015
ISO 2768:1989-mH
≤ 6 mm: ±0.2 mm

- F = Machine guideway
* = Mounting error plus dynamic guideway error
⊙ = Code start value: ≥ 100 mm
⊙ = Beginning of measuring length (ML)
⊙ = Scale tape length
1 = Optical centerline
2 = Mounting gap between scanning head and scale
3 = Direction of motion of the scanning unit for ascending position values

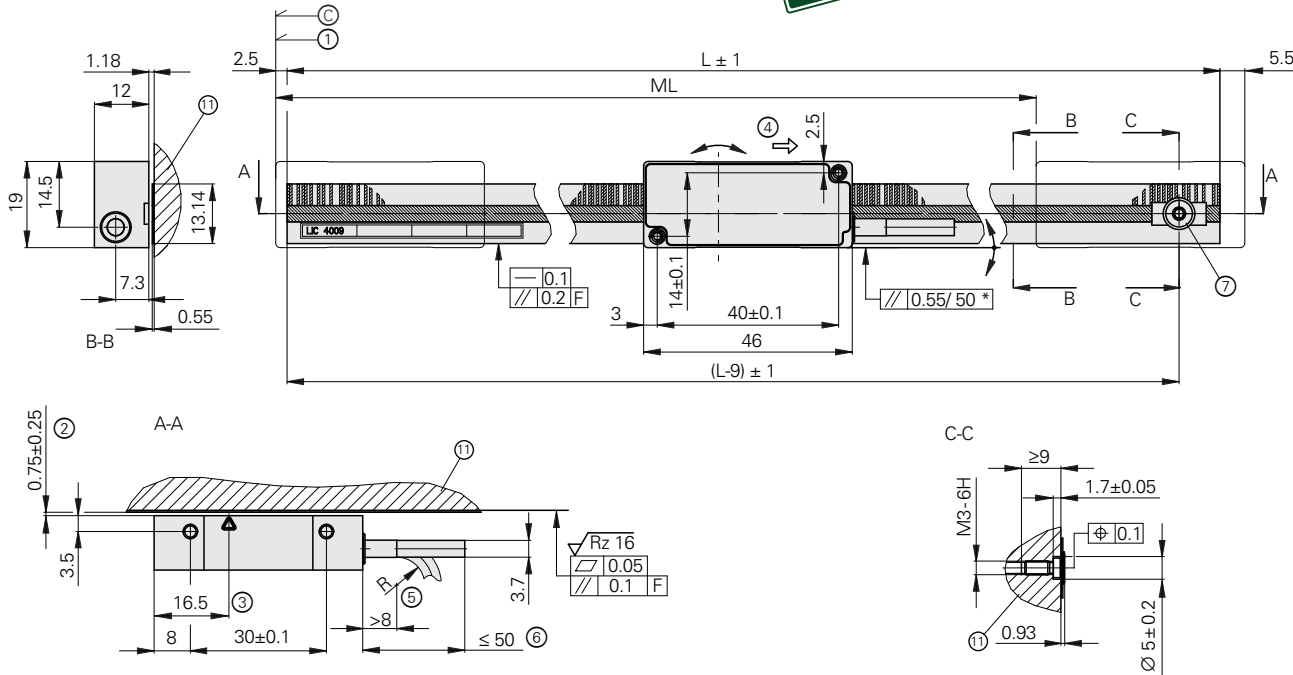
Scale	LIC 4009						
Measuring standard Coefficient of linear expansion*	Steel scale tape with absolute and incremental METALLUR track $\alpha_{\text{therm}} \approx 10 \cdot 10^{-6} \text{ K}^{-1}$						
Accuracy grade*	$\pm 3 \text{ }\mu\text{m}$, $\pm 15 \text{ }\mu\text{m}^{1)}$						
Baseline error	$\leq \pm 0.750 \text{ }\mu\text{m}/50 \text{ mm}$ (typical)						
Measuring length (ML)* in mm	70 520	120 620	170 720	220 820	270 920	320 1020	370 420 Scale tape cut from roll*: 2 m, 4 m, 6 m
Mass	31 g/m						
Scanning head	LIC 411	LIC 413	LIC 419F	LIC 419M		LIC 419P	LIC 419Y
Interface	EnDat 2.2	EnDat 3	Fanuc Serial Interface αi	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 nm, 5 nm, 1 nm	1 nm	10 nm, 5 nm, 1 nm				
Calculation time t_{cal} Clock frequency	$\leq 5 \text{ }\mu\text{s}$ $\leq 16 \text{ MHz}$	–					
Traversing speed ³⁾	$\leq 600 \text{ m/min}$						
Interpolation error	$\pm 20 \text{ nm}$						
Electrical connection*	Cable (1 m or 3 m) with 8-pin M12 coupling (male) (for all interfaces except EnDat 3: E30-R4) or 15-pin D-sub connector (male) (for all interfaces except EnDat 3: E30-R4) or 4-pin MINI-SNAP connector (male) (for EnDat 3: E30-R4)						
Cable length (with HEIDENHAIN cable)	$\leq 100 \text{ m}^{4)}$			$\leq 50 \text{ m}$	$\leq 30 \text{ m}$		$\leq 50 \text{ m}$
Supply voltage	DC 3.6 V to 14 V						
Power consumption ³⁾ (max.)	At 3.6 V: $\leq 700 \text{ mW}$ At 14 V: $\leq 800 \text{ mW}$	At 3.6 V: $\leq 850 \text{ mW}$ At 14 V: $\leq 950 \text{ mW}$					
Current consumption (typical)	At 5 V: 75 mA (without load)	At 12 V: 35 mA (without load)	At 5 V: 95 mA (without load)				
Vibration 55 Hz to 2000 Hz Shock 6 ms	$\leq 500 \text{ m/s}^2$ (EN 60068-2-6) $\leq 1000 \text{ m/s}^2$ (EN 60068-2-27)						
Operating temperature	$-10 \text{ }^{\circ}\text{C}$ to $70 \text{ }^{\circ}\text{C}$						
Mass	Scanning head: $\leq 18 \text{ g}$ (without cable) Cable: <i>M12 coupling and D-sub connector</i> : 20 g/m; <i>MINI-SNAP connector</i> : 15 g/m Connectors: <i>M12 coupling</i> : 15 g; <i>D-sub connector</i> : 32 g; <i>MINI-SNAP</i> : 8 g						

* Please select when ordering
1) ±5 µm after linear-error compensation in the downstream electronics
2) Mitsubishi: ML ≤ 2040 mm / Yaskawa: ML ≤ 1840 mm
3) See General electrical information in the Interfaces of HEIDENHAIN Encoders brochure
4) With LIC 411 FS scanning head: clock frequency: 8 MHz

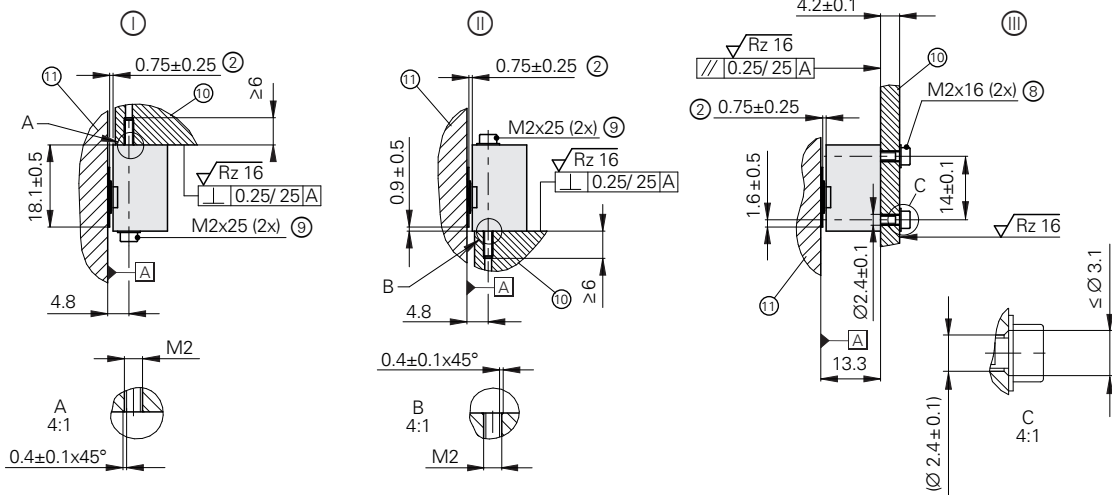
LIC 4119

Absolute linear encoder with high accuracy for safety-related applications

- For measuring steps of down to 1 nm
- Adhesive bonding of steel scale tape to aluminum or steel mounting surface
- Consisting of a linear scale and scanning head
- Fault exclusion for the loosening of the mechanical connection



Mounting options for scanning head



- ①, ⑩,
⊕ = Mounting options
F = Machine guideway
* = Mounting error plus dynamic guideway error
⊙ = Code start value: ≥ 100 mm
ML = Measuring length
L = Scale tape length ($L = ML + 38$)
1 = Beginning of measuring length
2 = Mounting gap between scanning head and scale tape
3 = Optical centerline
4 = Direction of scanning unit motion for output signals in accordance with interface description
5 = Bend radius R of the cable:
– Fixed cable ≥ 8 mm
– Frequent flexing ≥ 40 mm
6 = Cable support
7 = Screw (symmetrical alignment relative to punched hole), hexalobular socket: ISO 10664-10;
materially bonding threadlocker required;
tightening torque = 40 ± 2.4 Ncm
8 = M2x16 ISO 4762-8.8 + ISO 7089-2-200HV
9 = M2x25 ISO 4762-8.8 + ISO 7089-2-200HV
10 = Angle bracket for scanning head
11 = Mounting surface for measuring standard

mm

Tolerancing ISO 8015
ISO 2768:1989-mH
 ≤ 6 mm: ± 0.2 mm



Scale	LIC 4009
Measuring standard Coefficient of linear expansion	Steel scale tape with absolute and incremental METALLUR track $\alpha_{\text{therm}} \approx 10 \cdot 10^{-6} \text{ K}^{-1}$
Accuracy grade* Baseline error	$\pm 3 \mu\text{m}^{(1)}$, $\pm 15 \mu\text{m}^{(2)}$ $\leq \pm 0.750 \mu\text{m}/50 \text{ mm}$ (typical)
Measuring length (ML)* in mm (at operating temperature -10°C to 70°C)	70 120 170 220 270 320 370 420 520 620 720 820 920 1020 1220 1420 1620 1820 2020 2220 ⁽³⁾ 2420 ⁽³⁾ 2620 ⁽³⁾ 2820 ⁽³⁾ 3020 ⁽³⁾ 3220 ⁽³⁾ 3420 ⁽³⁾ 3620 ⁽³⁾ 3820 ⁽³⁾ 4020 ⁽³⁾ 4220 ⁽³⁾ 4420 ⁽³⁾ 4620 ⁽³⁾
Measuring length (ML)* in mm (at operating temperature -10°C to 50°C)	70 120 170 220 270 320 370 420 520 620 720 820 920 1020 1220 1420 1620 1820 2020 2220 2420 2620 2820 3020 3220 3420 ⁽³⁾ 3620 ⁽³⁾ 3820 ⁽³⁾ 4020 ⁽³⁾ 4220 ⁽³⁾ 4420 ⁽³⁾ 4620 ⁽³⁾ 4820 ⁽³⁾ 5020 ⁽³⁾ 5220 ⁽³⁾ 5420 ⁽³⁾ 5620 ⁽³⁾ 5820 ⁽³⁾ 6020 ⁽³⁾
Mass	Scale tape: 31 g/m; screw: < 1 g
Scanning head	LIC 411
Interface	EnDat 2.2 (ordering designation: EnDat22)
Measuring step*	0.01 μm (10 nm); 0.005 μm (5 nm); 0.001 μm (1 nm)
Calc. time t_{cal} /clock freq.	$\leq 5 \mu\text{s}/\leq 16 \text{ MHz}$
Functional safety for applications with up to	• SIL 2, as per EN 61508 (further basis for testing: IEC 61800-5-3) • Category 3, PL “d” as per EN ISO 13849-1:2015
PFH	$\leq 20 \cdot 10^{-9}$ (up to 6000 m above sea level)
Safe position⁽⁴⁾	Encoder: $\pm 550 \mu\text{m}$ (safety-relevant measuring step: SM = 220 μm); mechanical coupling: fault exclusions for the loosening of the scanning head and scale (see “Functional safety”)
Traversing speed⁽⁵⁾	$\leq 600 \text{ m/min}$
Interpolation error	$\pm 20 \text{ nm}$
Electrical connection*	Cable (1 m or 3 m) with 8-pin M12 coupling (male) or 15-pin D-sub connector (male)
Cable length ⁽⁶⁾	$\leq 100 \text{ m}$
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 5 V: 75 mA (without load)
Vibration 55 Hz to 2000 Hz Shock 11 ms	$\leq 200 \text{ m/s}^2$ (EN 60068-2-6) $\leq 200 \text{ m/s}^2$ (EN 60068-2-27)
Operating temperature	-10°C to 70°C
Relative air humidity	$\leq 93 \%$ (at $40^\circ\text{C}/4\text{d}$ as per EN 60068-2-78); condensation excluded
Mass	Scanning head: $\leq 18 \text{ g}$ (without cable) Cable: 20 g/m Connectors: M12 coupling: 15 g; D-sub connector: 32 g

- * Please select when ordering ⁽¹⁾ Up to a measuring length of 1020 mm
⁽²⁾ $\pm 5 \mu\text{m}$ after linear-error compensation in the downstream electronics
⁽³⁾ Additional measuring length only on steel mounting surface
⁽⁴⁾ Further tolerances may arise in the downstream electronics after position value comparison (contact mfr. of downstream electronics)
⁽⁵⁾ See *General electrical information* in the *Interfaces of HEIDENHAIN Encoders* brochure
⁽⁶⁾ With HEIDENHAIN cable; clock frequency $\leq 8 \text{ MHz}$