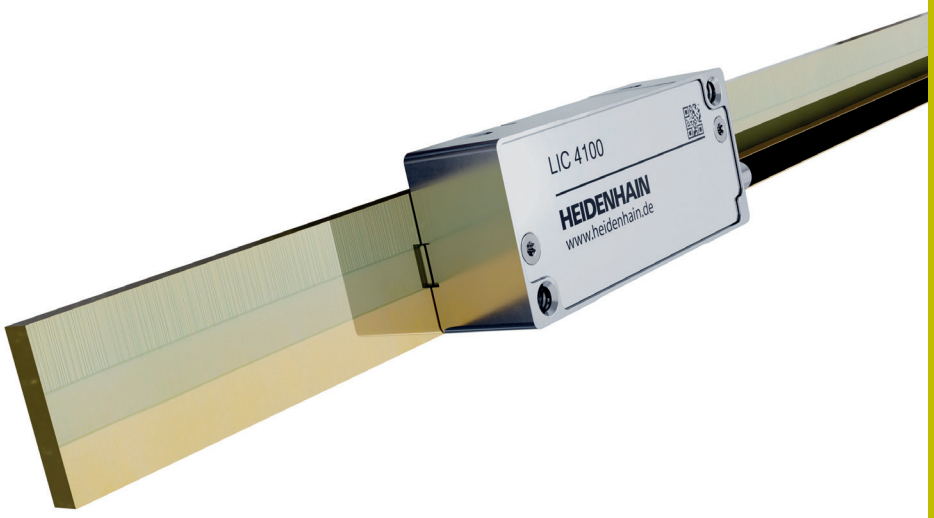
HEIDENHAIN



Product Information

LIC 4100

Absolute Exposed
Linear Encoders

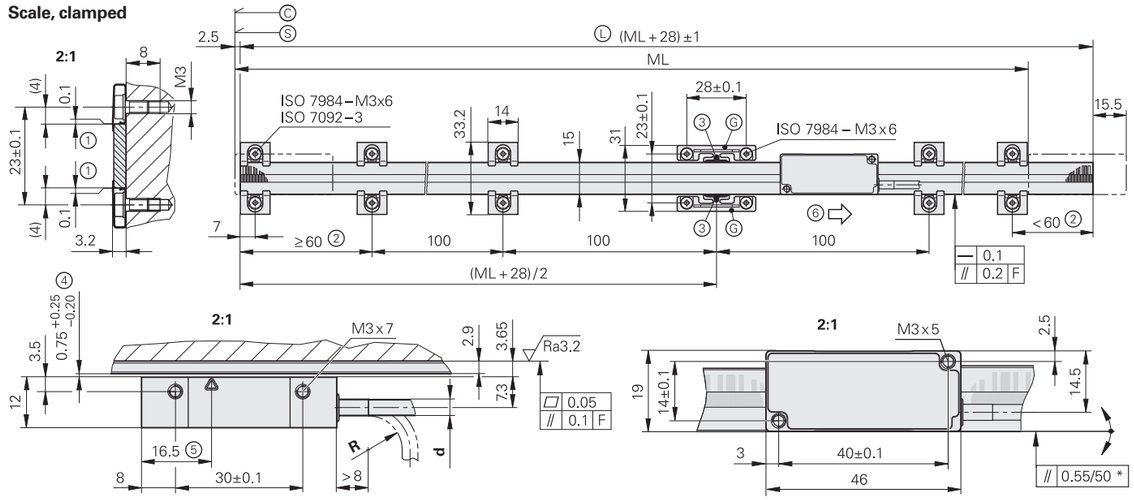
11/2023

LIC 4113, LIC 4133, LIC 4193

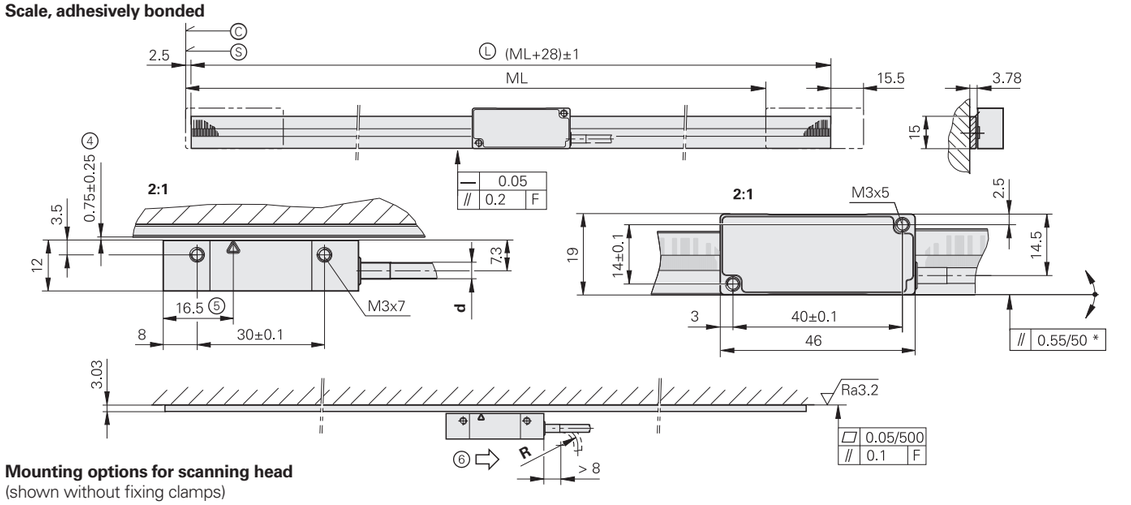
Absolute linear encoders for measuring lengths of up to 3 m

- **For measuring steps of down to 1 nm**
- **Glass or glass ceramic measuring standard**
- **Measuring standard secured with adhesive film or fixing clamps**
- **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)**

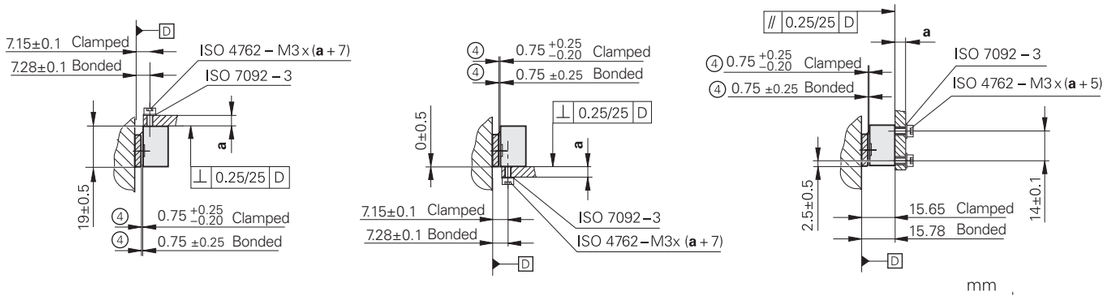
Scale, clamped



Scale, adhesively bonded



Mounting options for scanning head
(shown without fixing clamps)



F = Machine guideway
* = Mounting error plus dynamic guideway error
Ⓢ = Beginning of measuring length (ML)
Ⓒ = Code start value: ≥ 100 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 clearance between scanning head and linear 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	
		Rigid configuration	Frequent flexing
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

Scale	**LIC 4003**
Measuring standard Coefficient of linear expansion*	METALLUR grating on glass or glass ceramic $\alpha_{therm} \approx 8 \cdot 10^{-6}\ K^{-1}$ (glass) $\alpha_{therm} = (0\pm0.5) \cdot 10^{-6}\ K^{-1}$ (Robax glass ceramic)
Accuracy grade*	±1 µm (only for Robax glass ceramic), ±3 µm, ±5 µm
Baseline error	≤ ±0.275 µm/10 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 + 0.11 g/mm 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 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*[1]	10 nm, 5 nm, 1 nm	1 nm	10 nm, 5 nm, 1 nm				
Calculation time t_{cal} Clock frequency	≤ 5 µs ≤ 16 MHz	–					
Traversing speed[2]	≤ 600 m/min						
Interpolation error	±20 nm						
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)	≤ 100 m		≤ 50 m	≤ 30 m		≤ 50 m	
Supply voltage	DC 3.6 V to 14 V						
Power consumption[2] (max.)	*At 3.6 V:* ≤ 700 mW *At 14 V:* ≤ 800 mW	*At 3.6 V:* ≤ 850 mW *At 14 V:* ≤ 950 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	≤ 500 m/s² (EN 60068-2-6) ≤ 1000 m/s² (EN 60068-2-27)						
Operating temperature	–10 °C to 70 °C						
Mass	Scanning head: ≤ 18 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:* 32 g; *MINI-SNAP:* 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

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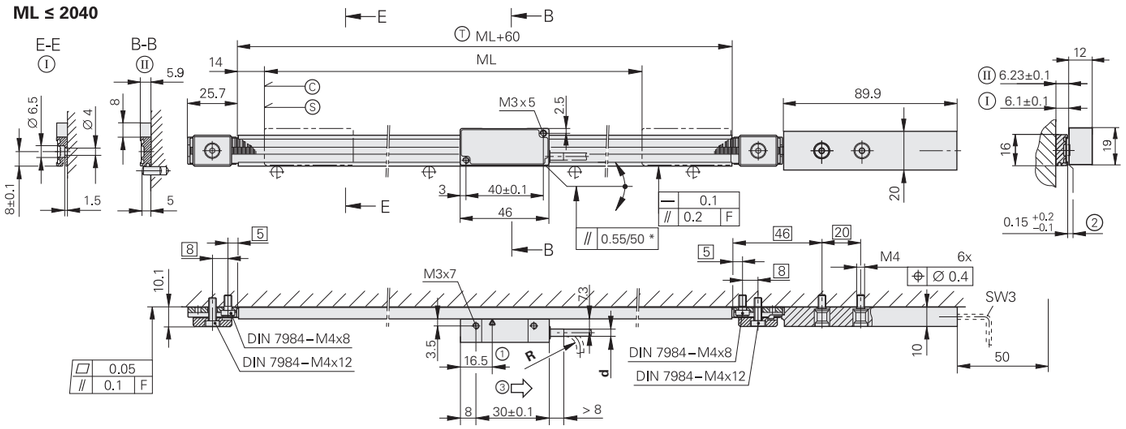
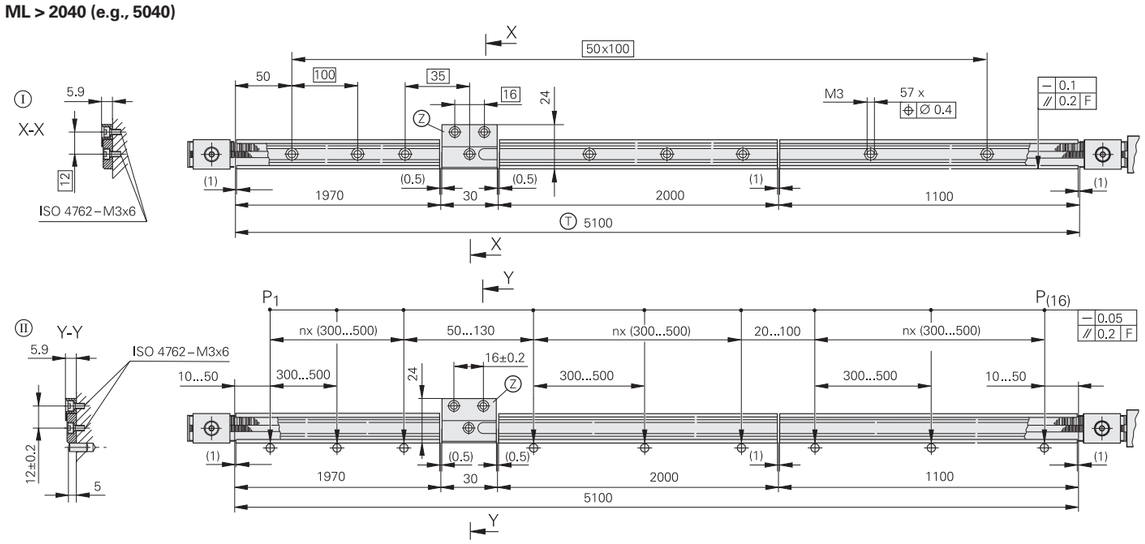
LIC 4115, LIC 4135, LIC 4195

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)**

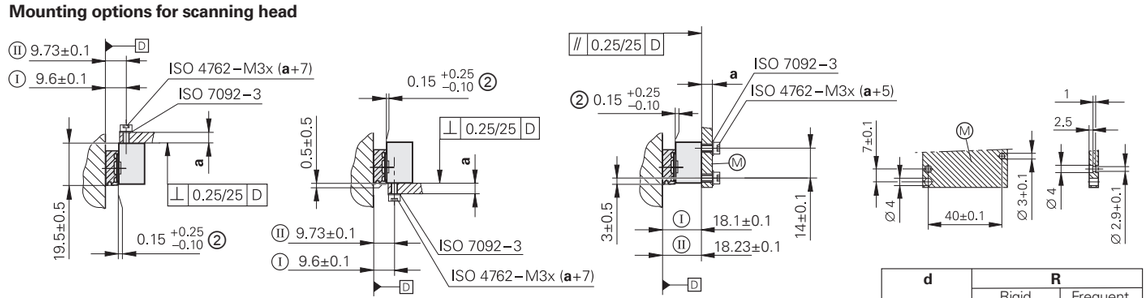
ML ≤ 2040



ML > 2040 (e.g., 5040)



Mounting options for scanning head



d	R	
	Rigid configuration	Frequent flexing
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

Ⓘ = Scale carrier sections secured with screws
Ⓘⓘ = Scale carrier sections secured with PRECIMET
F = Machine guideway
P = Measuring points for alignment
* = Mounting error plus dynamic guideway error
Ⓒ = Code start value: ≥ 100 mm
Ⓢ = Beginning of measuring length (ML)
Ⓩ = Spacer for measuring lengths of 3040 mm or longer
Ⓣ = Carrier length
Ⓜ = Mounting surface for scanning head
1 = Optical centerline
2 = Mounting clearance between scanning head and extrusion
3 = Direction of motion of the scanning unit for ascending position values

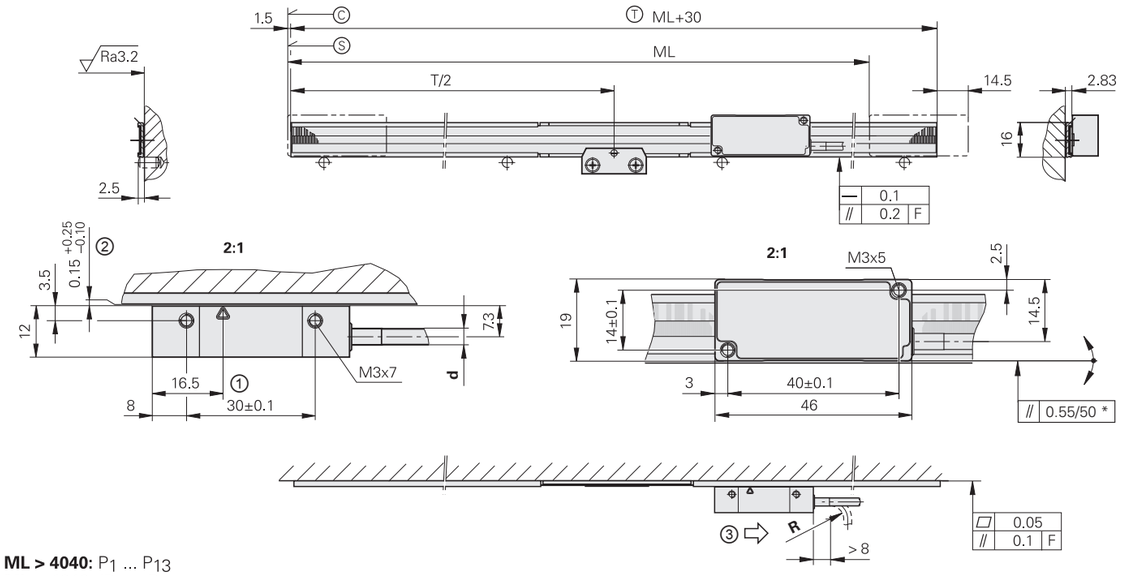
Scale	LIC 4005
Measuring standard Coefficient of linear expansion*	Steel scale tape with absolute and incremental METALLUR track Depends on the mounting surface
Accuracy grade*	±5 µm
Baseline error	≤ ±0.750 µm/50 mm (typical)
Measuring length (ML)* in mm	140 240 340 440 540 640 740 840 940 1040 1140 1240 1340 1440 1540 1640 1740 1840 1940 2040
	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

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	≤ 5 µs ≤ 16 MHz	–					
Traversing speed[3]	≤ 600 m/min						
Interpolation error	±20 nm						
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)	≤ 100 m		≤ 50 m	≤ 30 m		≤ 50 m	
Supply voltage	DC 3.6 V to 14 V						
Power consumption[3] (max.)	*At 3.6 V:* ≤ 700 mW *At 14 V:* ≤ 800 mW	*At 3.6 V:* ≤ 850 mW *At 14 V:* ≤ 950 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	≤ 500 m/s² (EN 60068-2-6) ≤ 1000 m/s² (EN 60068-2-27)						
Operating temperature	–10 °C to 70 °C						
Mass	Scanning head: ≤ 18 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:* 32 g; *MINI-SNAP:* 8 g						

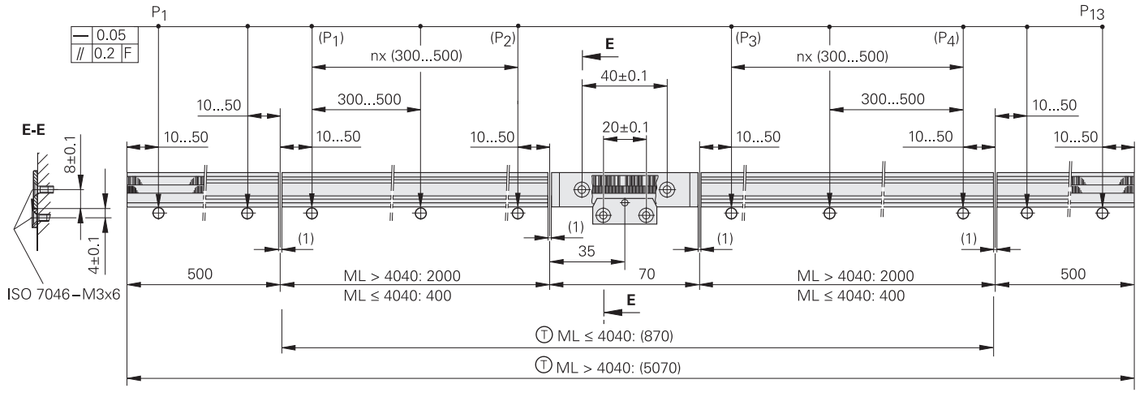
* Please select when ordering
[1] n = 1 for ML 3140 mm to 5040 mm; n = 2 for ML 5140 mm to 7040 mm; etc.*
[2] *Mitsubishi:* 1 nm: ML ≤ 2040 mm; 5 nm: ML ≤ 10040 mm; 10 nm: ML ≤ 20040 mm
Yaskawa: 1 nm: ML ≤ 1840 mm; 5 nm: ML ≤ 9040 mm; 10 nm: ML ≤ 18040 mm
[3] See *General electrical information* in the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

LIC 4117, LIC 4137, LIC 4197

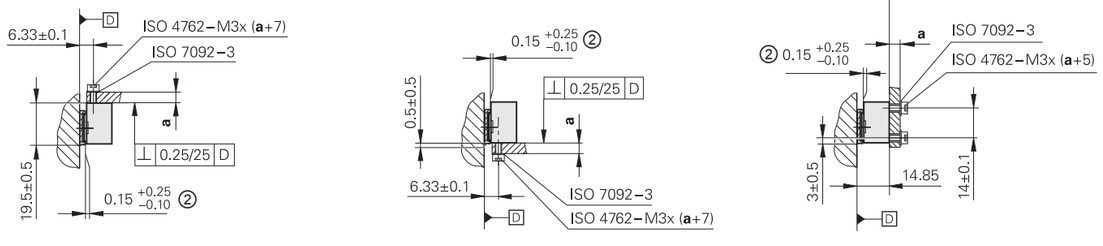
Absolute linear encoders for measuring lengths of up to 6 m
- **For measuring steps of down to 1 nm**
- **Steel scale tape pulled through aluminum extrusions and fastened at center**
- **Consisting of a linear scale and scanning head (with straight or angled cable outlet)**



ML > 4040: P_1 ... P_{13}
ML ≤ 4040: (P_1 ... P_4)



Mounting options for scanning head



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

F = Machine guideway
P = Measuring points for alignment
* = Mounting error plus dynamic guideway error
Ⓒ = Code start value: ≥ 100 mm
Ⓢ = Beginning of measuring length (ML)
Ⓣ = Carrier length
1 = Optical centerline
2 = Mounting clearance between scanning head and extrusion
3 = Direction of motion of the scanning unit for ascending position values

d	R	
	Rigid configuration	Frequent flexing
Ø 3.7 mm	> 8 mm	≥ 40 mm
Ø 2.9 mm	> 6 mm	≥ 30 mm

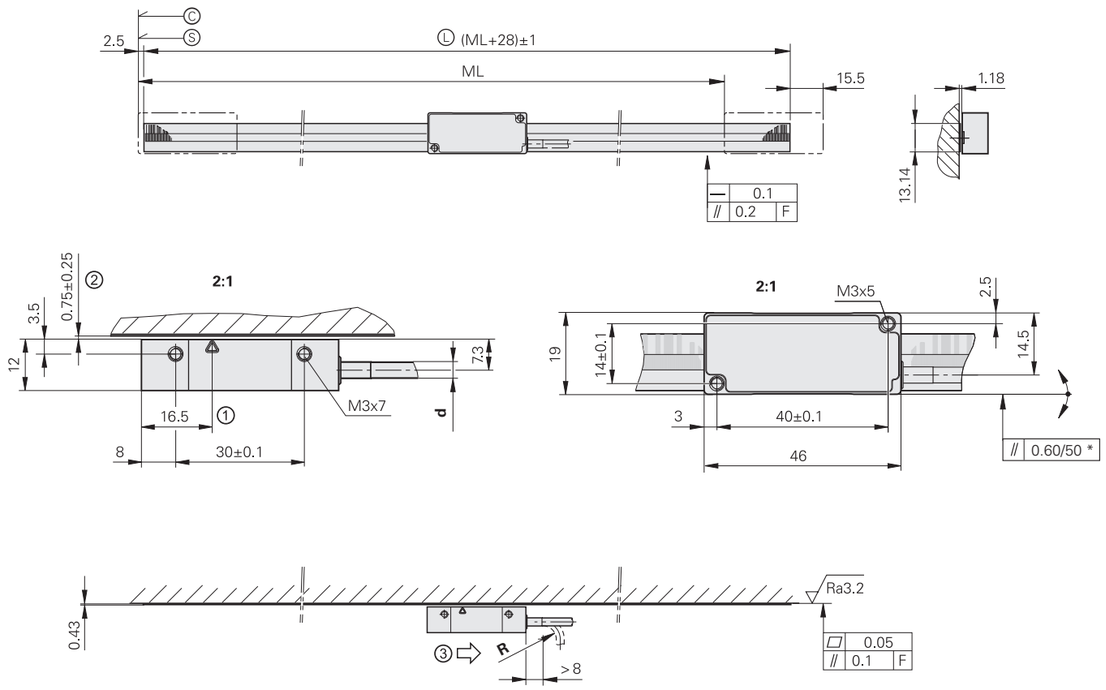
Scale	**LIC 4007**
Measuring standard Coefficient of linear expansion*	Steel scale tape with absolute and incremental METALLUR track $\alpha_{therm} \approx 10 \cdot 10^{-6}\ K^{-1}$
Accuracy grade*	±3 µm (up to ML 1040), ±5 µm (for ML 1240 or greater), ±15 µm[1]
Baseline error	≤ ±0.750 µm/50 mm (typical)
Measuring length (ML)* in mm	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 5840 6040
Mass	Scale tape: 31 g/m; assembly parts: 20 g; scale tape carrier: 68 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	≤ 5 µs ≤ 16 MHz	–					
Traversing speed[3]	≤ 600 m/min						
Interpolation error	±20 nm						
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)	≤ 100 m		≤ 50 m	≤ 30 m		≤ 50 m	
Supply voltage	DC 3.6 V to 14 V						
Power consumption[3] (max.)	*At 3.6 V:* ≤ 700 mW *At 14 V:* ≤ 800 mW	*At 3.6 V:* ≤ 850 mW *At 14 V:* ≤ 950 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	≤ 500 m/s² (EN 60068-2-6) ≤ 1000 m/s² (EN 60068-2-27)						
Operating temperature	–10 °C to 70 °C						
Mass	Scanning head: ≤ 18 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:* 32 g; *MINI-SNAP:* 8 g						

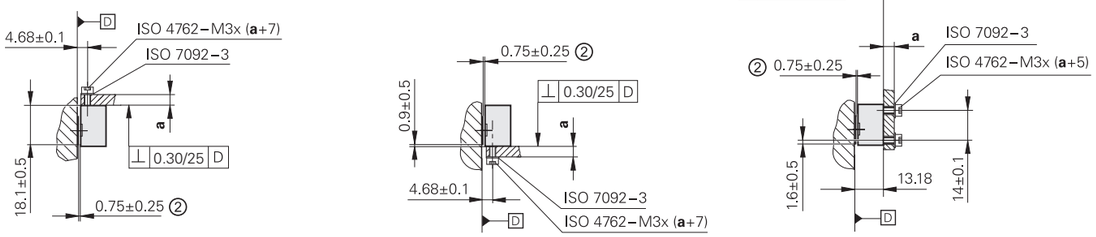
* Please select when ordering
[1] ±5 µm after linear length-error compensation in the downstream electronics
[2] *Mitsubishi:* ML ≤ 2040 mm / *Yaskawa:* ML ≤ 1840 mm
[3] See *General electrical information* in the *Interfaces of HEIDENHAIN Encoders* brochure

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	
	Rigid configuration	Frequent flexing
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 clearance between scanning head and linear 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 $\alpha_{therm} \approx 10 \cdot 10^{-6}\ K^{-1}$
Accuracy grade*	±3 µm, ±15 µm[1)]
Baseline error	≤ ±0.750 µm/50 mm (typical)
Measuring length (ML)* in mm	70 120 170 220 270 320 370 420 520 620 720 820 920 1020
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	≤ 5 µs ≤ 16 MHz	–					
Traversing speed[3)]	≤ 600 m/min						
Interpolation error	±20 nm						
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)	≤ 100 m[4)]		≤ 50 m	≤ 30 m		≤ 50 m	
Supply voltage	DC 3.6 V to 14 V						
Power consumption[3)] (max.)	*At 3.6 V:* ≤ 700 mW *At 14 V:* ≤ 800 mW	*At 3.6 V:* ≤ 850 mW *At 14 V:* ≤ 950 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	≤ 500 m/s² (EN 60068-2-6) ≤ 1000 m/s² (EN 60068-2-27)						
Operating temperature	–10 °C to 70 °C						
Mass	Scanning head: ≤ 18 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:* 32 g; *MINI-SNAP:* 8 g						

* Please select when ordering
1) ±5 µm after linear length-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

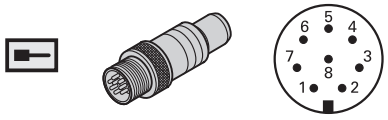
Electrical connection

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

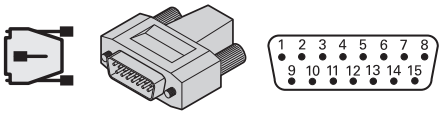
PUR (2 × 0.25 mm²) + (2 × 0.09 mm²) Ø 5.2 mm; A_P= 0.25 mm²		
Adapter cable with 4-pin MINI-SNAP connector (female) and 15-pin D-sub connector (male)		1362192-xx
Connecting cable with 4-pin MINI-SNAP connector (female) and 4-pin MINI-SNAP connector (male)		1363049-xx

EnDat 3 pin layout

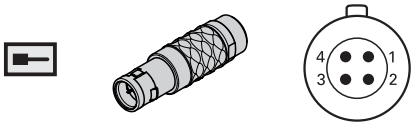
8-pin M12 coupling (E30-RB)



15-pin D-sub connector (E30-RB)



4-pin MINI-SNAP connector (E30-R4)



	Power supply				Serial data transmission			
M12	**8**	**2**	**5**	**1**	**3**	**4**	**7**	**6**
	4	**12**	**2**	**10**	**5**	**13**	**8**	**15**
MINI-SNAP	**1**	**–**	**3**	**–**	**–**	**–**	**2**	**4**
	U_P	**Sensor** U_P	**0 V**	**Sensor** 0 V	**SD+_NEXT**	**SD–_NEXT**	**SD+**	**SD–**
	Brown/Green	Blue	White/Green	White	Gray	Pink	Violet	Yellow

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.

HEIDENHAIN

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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

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