

LIF 481

Incremental Exposed Linear Encoder

Specifications

Dimensions

Output signals

Electrical connection



External dimensions	
Output signals	Incremental signals $\sim 1 V_{pp}$ Position detection \square TTL
Measuring length	70 to 1020 mm (2.7 to 40 in.)
Features	<ul style="list-style-type: none"> • For limited installation space • SUPRADUR grating with relatively high tolerance to contamination • Position detection through limit switches and homing track



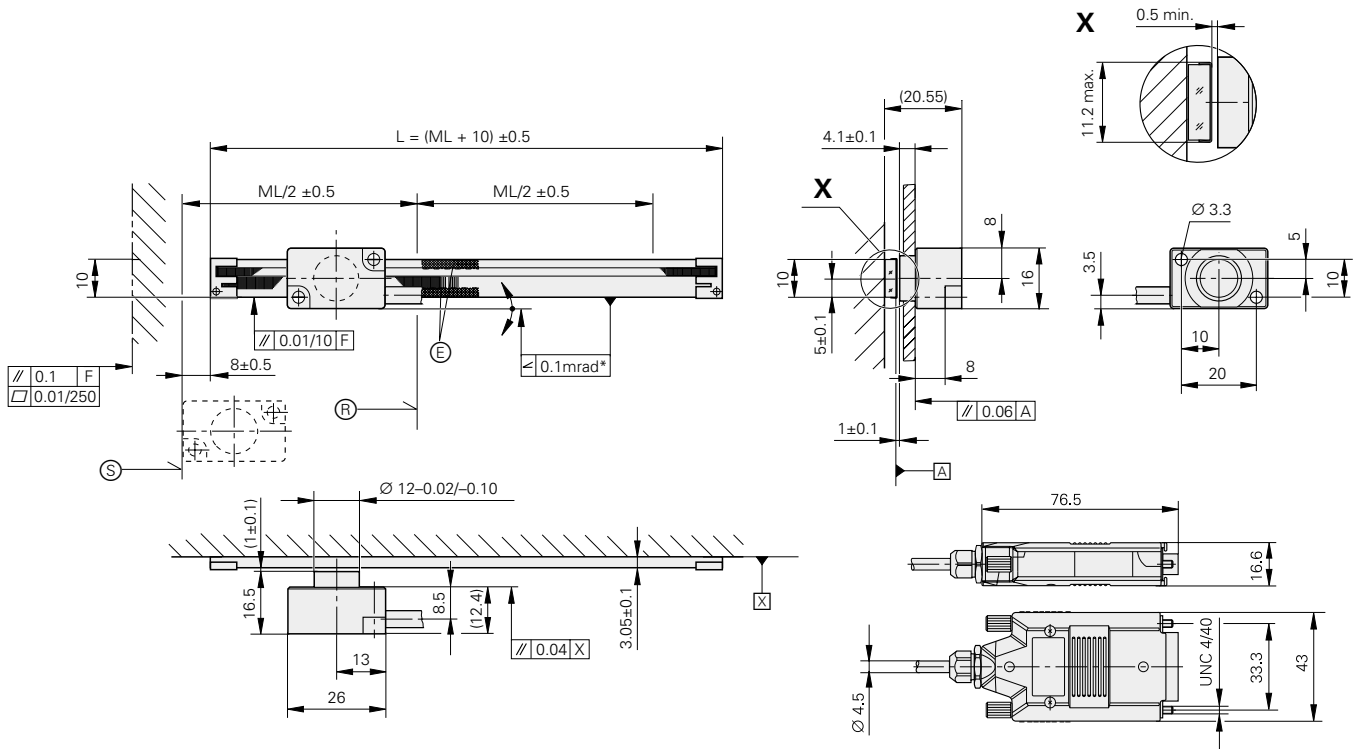
Specifications		LIF 481
Measuring standard Grating period Thermal expansion coefficient		SUPRADUR phase grating on glass 8 µm $\alpha_{\text{therm}} \approx 8 \text{ ppm/K}$
Accuracy grade		$\pm 3 \text{ µm}$ ($\pm 0.00012 \text{ in.}$)
Measuring length ML in mm		70, 120, 170, 220, 270, 320, 370, 420, 470, 520, 570, 620, 670, 720, 770, 820, 870, 920, 970, 1020
Measuring length ML in inches		2.7, 4.7, 6.7, 8.6, 10.6, 12.6, 14.5, 16.5, 18.5, 20.5, 22.4, 24.4, 26, 28, 30, 32, 34, 36, 38, 40
Reference marks		One at midpoint of measuring length
Position detection Output signals		Homing signal Limit signal TTL (without line driver)
Max. traversing speed		Max. 72 m/min (2835 ipm) with -3dB cutoff speed $\geq 300 \text{ kHz}$ Max. 100 m/min (3935 ipm) with -6dB cutoff speed $\geq 420 \text{ kHz}$
Vibration (55 to 2000 Hz) Shock (11 ms)		$\leq 200 \text{ m/s}^2$ (IEC 60068-2-6) $\leq 400 \text{ m/s}^2$ (IEC 60068-2-27)
Operating temperature		0 to 50 °C (32 to 122 °F)
Weight	Scanning head Selector magnet Scale Cable	9 g (without cable) 140 g $0.8 \text{ g} + 0.08 \text{ g/mm}$ measuring length 40 g/m
Power supply		5 V $\pm 5\%$ / < 175 mA (terminating impedance $Z_0 = 120 \text{ }\Omega$)
Output signals/Signal period		$\sim 1 V_{\text{PP}}/4 \text{ µm}$
Electrical connection Cable length to subsequent electronics		Cable 0.5 m/1 m or 3 m with D-sub connector (15-pin); interface electronics integrated in connector Incremental signals: 30 m (98.5 ft) max. Homing, limit: 10 m (32.8 ft) max.

Dimensions

mm

 DIN ISO 8015
 ISO 2768 - m H

- F = Machine guideway
- * = Max. change during operation
- Ⓜ = Reference mark position
- Ⓢ = Epoxy for ML < 170
- Ⓣ = Switch for homing track
- Ⓤ = Beginning of measuring length
- Ⓦ = Limit mark, adjustable
- P = Gauging points for alignment



Output signals

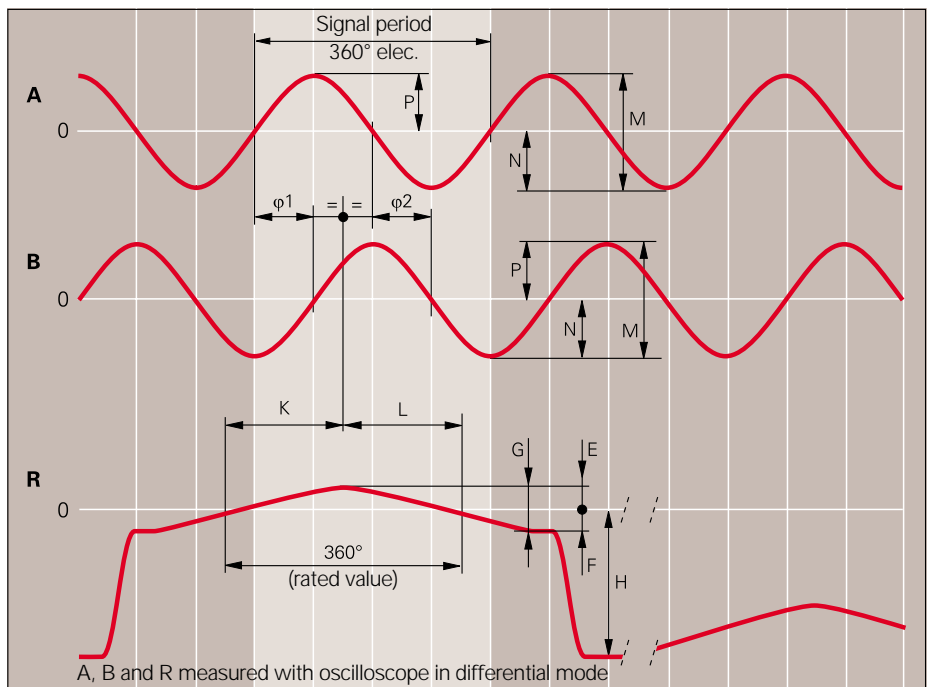
Incremental signals

The sinusoidal incremental signals A and B are phase-shifted by 90° and have signal levels of approximately 1 V_{PP}. The usable component of the reference mark signal R is approximately 0.5 V. The signal levels refer to the difference between the constituent outputs. The data for signal amplitude apply for U_P = 5 V ± 5% at the encoder. The signal amplitude decreases as the scanning frequency increases. The voltage received by the encoder can be measured from the subsequent electronics through sensor lines and corrected, if required, by a control system.

Reference mark signals

Next to the reference mark, whose signal has the usable component G, the idle level can be decreased by approx. 1.5 V. The subsequent electronics must be designed so that this does not cause the input stage to overdrive.

	Measuring signals
Output signals	Sinusoidal voltage signals $\sim 1 V_{PP}$
Incremental signals	<p>Two sinusoidal signals A and B</p> <p>Signal level M: 0.6 to 1.2 V_{PP} Approx. 1 V_{PP}</p> <p>Asymmetry $P - N /2M$: 0.065</p> <p>Signal ratio M_A/M_B: 0.8 to 1.25</p> <p>Phase angle $\varphi_1 + \varphi_2 /2$: 90° ± 10° elec.</p>
Reference mark signal	<p>1 or more signal peaks R</p> <p>Usable component G: 0.2 to 0.85 V</p> <p>Quiescent value H: Max. 1.7 V</p> <p>Signal-to-noise ratio E, F: Min. 40 mV</p> <p>Zero crossovers K, L: 180° ± 90° elec.</p>



~ 1 V_{PP}: Recommended input circuitry of the subsequent electronics
Dimensioning

Dimensioning

Operational amplifier, e.g. RC 4157
 R₁ = 10 kΩ and C₁ = 220 pF
 R₂ = 34.8 kΩ and C₂ = 10 pF
 Z₀ = 120 Ω
 U_B = ± 15 V
 U₁ approx. U₀

-3dB cutoff frequency of circuitry

Approx. 450 kHz
 Approx. 50 kHz with C₁ = 1000 pF and C₂ = 82 pF

Circuit output signals

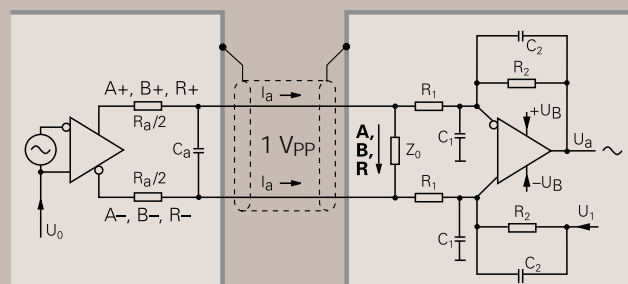
U_a = approx. 3.48 V_{PP}
 Gain 3.48

Signal monitoring

A threshold sensitivity of 250 mV_{PP} is to be provided for monitoring the output signals.

Incremental signals
Reference mark signal

R_a < 100 Ω, approx. 24 Ω
 C_a < 50 pF
 ΣI_a < 1 mA
 U₀ = 2.5 V ± 0.5 V (with respect to 0 V of the power supply)



Output signals

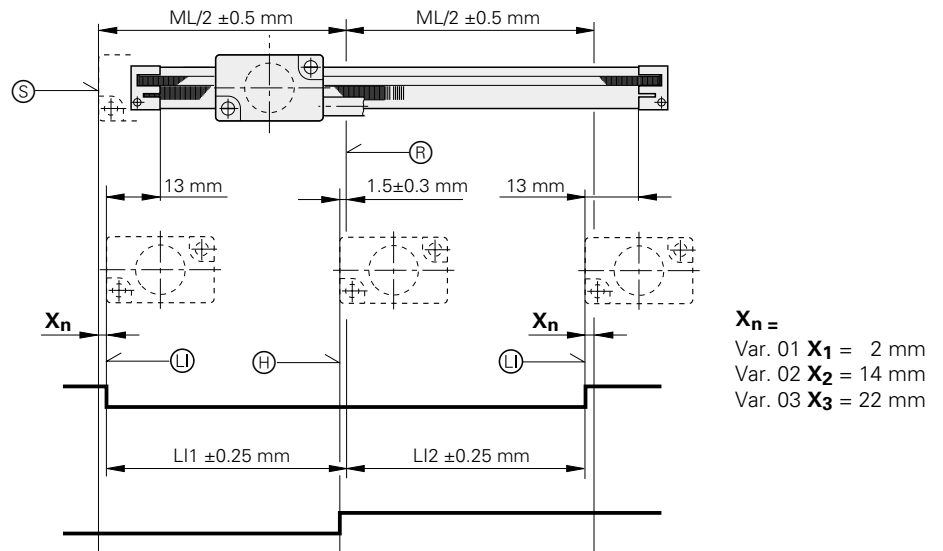
Position detection

Besides its incremental grating, the LIF 481 also features a homing track and limit switches for end position detection.

The signals are transmitted in TTL levels over the separate lines H and L and are therefore directly available. The cable is nevertheless designed quite thin with a diameter of only 4.5 mm to exert minimum force on moving machine elements.

Position detection

Output signals	One TTL pulse each for homing track H and limit switch L
Signal levels	TTL from common-collector circuit $U_H \geq 3.8 \text{ V}$ at $-I_H = 8 \text{ mA}$ $U_L \leq 0.45 \text{ V}$ at $I_L = 8 \text{ mA}$
Permissible load	$R \geq 680 \Omega$ $ I_L \leq 8 \text{ mA}$

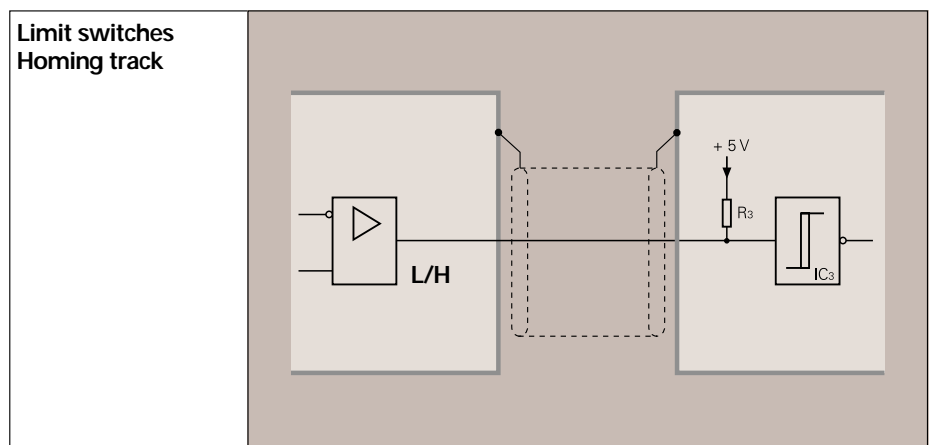


- ⊕ = Reference mark position
- ⊙ = Beginning of measuring length
- ⊖ = Limit mark, adjustable
- ⊕ = Switch for homing track

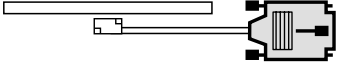

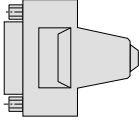
Recommended input circuitry of the subsequent electronics

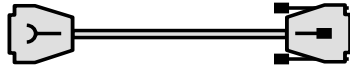
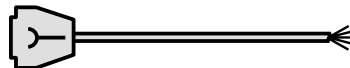
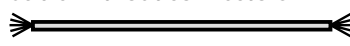
Dimensioning

IC₃ e.g. 74AC14
 R₃ = 4.7 kΩ



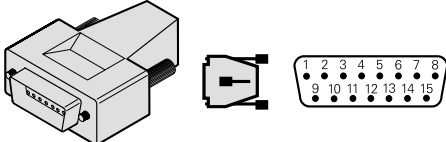
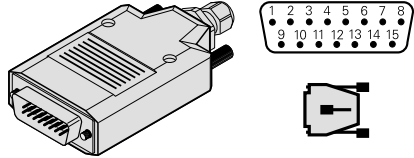

Connecting elements and cables

Connecting element on LIF 481 		
Mating element on connecting cable to encoder connector 		D-sub connector (female), 15-pin 
for connecting cable	Ø 8 mm Ø 6 mm	315 650-14

Connecting cable Ø 8 mm [4(2 x 0.14 mm ²) + (4 x 0.5 mm ²) + 2 x (2 x 0.14 mm ²)] Shield on housing		
Connecting cable Ø 6 mm [6(2 x AWG28) + (4 x 0.14 mm ²)]	Ø 8 mm	Ø 6 mm ¹⁾
Complete with D-sub connector (female) and connector (male) 	354 379-xx	355 397-xx
With one connector, D-sub (female) 	354 411-xx	355 398-xx
Cable without connectors 	354 341-01	355 241-01

¹⁾Cable length for Ø 6 mm max. 9 m (29.6 ft)

Electrical connection

15-pin D-sub connector 							15-pin D-sub connector with integral interface electronics 							
	1	9	3	11	14	7	4	2	12	10	13	8	6	15
~ 1 V _{PP}	A		B		R		5 V _{U_P}	0 V _{U_N}	5 V _{Sensor}	0 V _{Sensor}	Vacant	H ¹⁾	L ¹⁾	Vacant
	+	-	+	-	+	-								
	Brown	Green	Gray	Pink	Red	Black	Brown/ Green	White/ Green	Blue	White	Violet	Green/ Black	Yellow/ Black	Yellow
The sensor line is internally connected to the power line Shield is on housing							EN 50178		¹⁾ Color assignment applies only to connecting cable					

HEIDENHAIN

DR. JOHANNES HEIDENHAIN GmbH
 Dr.-Johannes-Heidenhain-Straße 5
 83301 Traunreut, Germany
 ☎ +49/86 69/31-0
 ✉ +49/86 69/50 61
 E-Mail: info@heidenhain.de

www.heidenhain.de

For more information

- Brochure *Exposed Linear Encoders*