

DIGITAL LINEAR SCALE



Series LS 177 and LS 187

Key-Features:

- Measurement range up to 3040 mm
- Accuracy up to $\pm 3 \mu\text{m}$
- Incremental output: $1 V_{PP}$ or TTL
- Protection class IP53 or IP63
- Operating temperature 0 to $+50 \text{ }^\circ\text{C}$
- High vibration resistance
- Reclining mounting possible

Content:

Technical Data2
Imaging Scanning Principle2
Technical Drawing3
Electrical connection4
Incremental signal TTL, $1 V_{PP}$5

TECHNICAL DATA

		LS 177							LS 187	
Measurement range	[mm]	140 / 240 / 340 / 440 / 540 / 640 / 740 / 840 / 940 / 1040 / 1140 / 1240 / 1340 / 1440 / 1540 / 1640 / 1740 / 1840 / 2040 / 2240 / 2440 / 2640 / 2840 / 3040								
Measuring standard		Glass scale with DIADUR grating, grating period 20 µm								
Coefficient of linear expansion		$\alpha_{\text{therm}} \approx 8 \cdot 10^{-6} \text{ K}^{-1}$								
Accuracy	[µm]	±3 / ±5								
Reference marks		LS 1x7: selectable with magnets every 50 mm, standard setting: 1 reference mark in the centre LS 1x7 C: distance-coded								
Interface		TTL							1 V _{pp}	
Integrated interpolation		5fold		10fold			20fold		-	
Signal period	[µm]	-							20	
Diagnostics interface		-							analog	
Cut-off frequency (-3dB)	[kHz]	-							≥ 160	
Scanning frequency	[kHz]	100	50	100	50	25	50	25	-	
Edge separation a	[µs]	0.5	1	0.25	0.5	1	0.25	0.5	-	
Measuring step	[µm]	1 ¹⁾		0.5 ¹⁾			0.25 ¹⁾		Depends on interpolation	
Electrical connection		separate adapter cable (1 m / 3 m / 6 m / 9 m) connectable on mounting block								
Cable length max.	[m]	≤100							≤150	
Voltage supply without load		5 VDC ±0.25 V / <140 mA							5 VDC ±0.25 V / <120 mA	
Traversing speed	[m/min]	≤120	≤60	≤120	≤60	≤30	≤60	≤30	≤120	
Required moving force	[N]	≤4								
Vibration 55 Hz bis 2000 Hz	[m/s ²]	≤ 200 (EN 60068-2-6)								
Shock 11 ms	[m/s ²]	≤ 400 (EN 60068-2-27)								
Acceleration	[m/s ²]	≤ 60 in measuring direction								
Operating temperature	[°C]	0...+50								
Protection class		IP 53 (when mounted according to the instructions and mounting information) IP 64 (if compressed air is connected via DA 400)								
Mass	[kg]	0.4 + 2.3 for each m range								

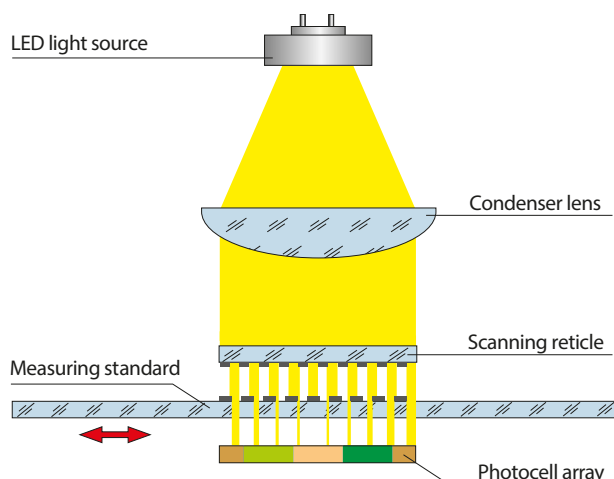
¹⁾ After 4-fold evaluation in the subsequent electronics

IMAGING SCANNING PRINCIPLE

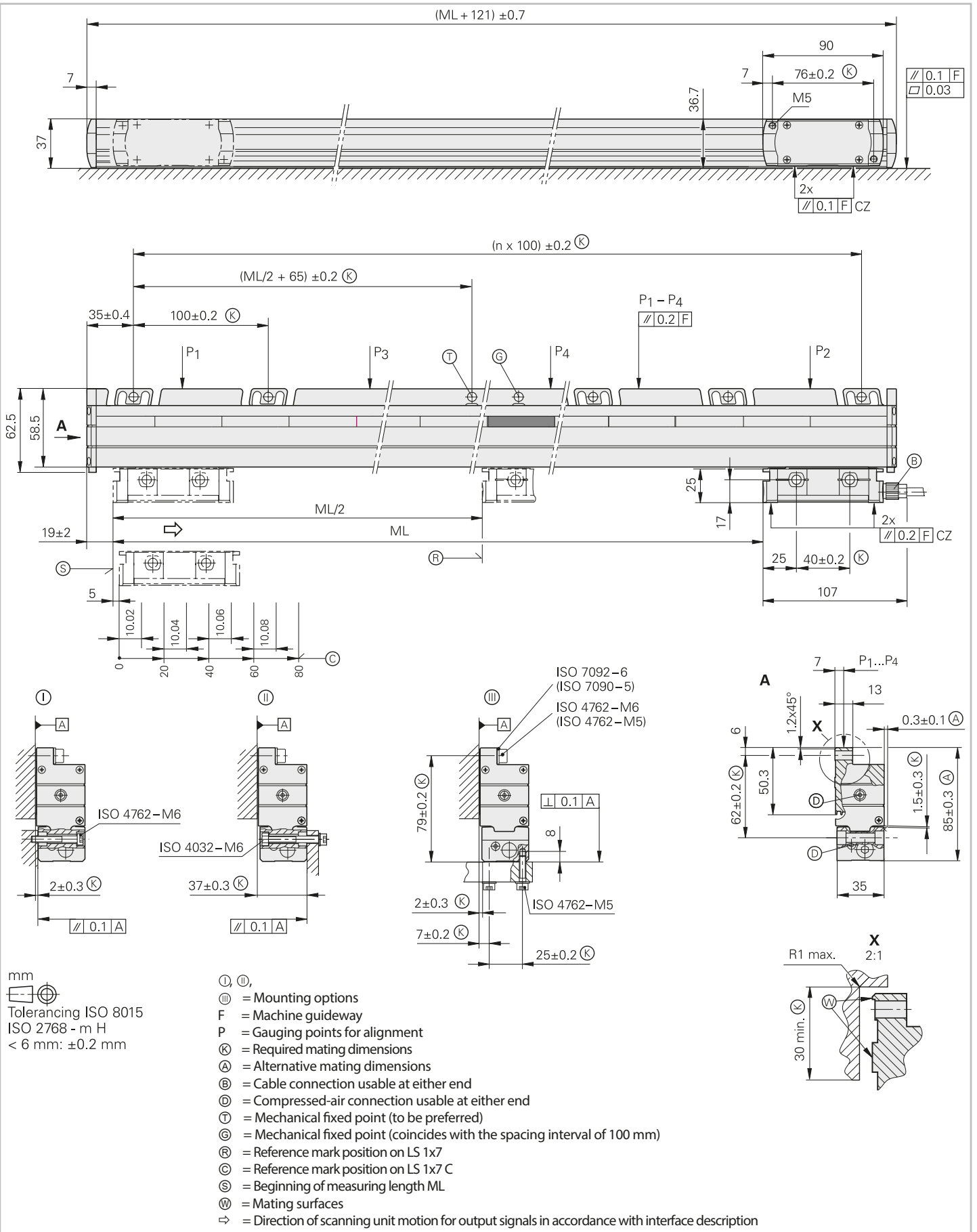
To put it simply, the imaging scanning principle functions by means of projected light signal generation: Two scale gratings with equal or similar grating periods are moved relative to each other - the measuring standard and the scanning reticle. The carrier material of the scanning reticle is transparent, whereas the graduation on the measuring standard may be applied to a transparent or reflective surface.

When parallel light passes through a grating, light and dark surfaces are projected at a certain distance. An index grating is located here. When the two gratings move relative to each other, the incident light is modulated. If the gaps in the gratings are aligned, light passes through. If the lines of one grating coincide with the gaps of the other, no light passes through. An array of photovoltaic cells converts these variations in light intensity into electrical signals. The specially structured grating of the scanning reticle filters the light to generate nearly sinusoidal output signals.

The smaller the period of the grating structure is, the closer and more tightly tolerated the gap must be between the scanning reticle and scale.

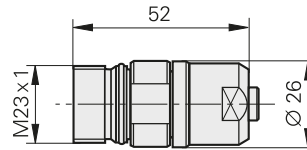
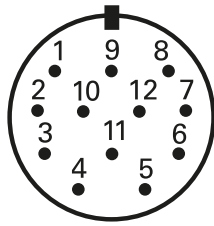
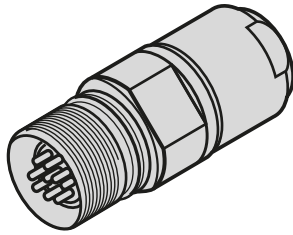


TECHNICAL DRAWING

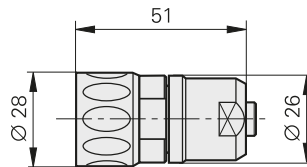
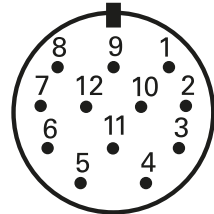
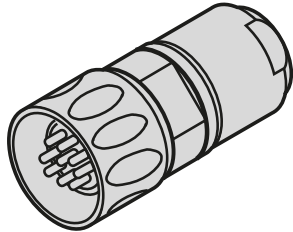


ELECTRICAL CONNECTION

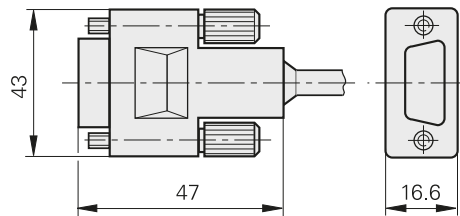
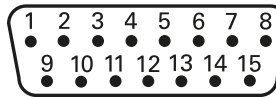
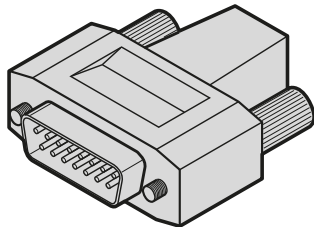
M23 coupling, 12-pin



M23 connector, 12-pin



Sub-D connector, 15-pin



	Voltage supply				Incremental signals						Other signals			
M23 coupling or connector	12	2	10	11	5	6	8	1	3	4	7	9	-	
Sub-D connector	4	12	2	10	1	9	3	11	14	7	13	15	5/6/8	
Cable colour	BN/GN	BU	WH/GN	WH	BN	GN	GY	PK	RD	BK	VT	YE ¹⁾	-	
Signals TTL	U _p	Sensor U _p	0V	Sensor 0V	U _{a1}	/U _{a1}	U _{a2}	/U _{a2}	U _{a0}	/U _{a0}	/U _{a5}	n.c.	n.c.	
Signals 1 Vpp	U _p	Sensor U _p	0V	Sensor 0V	A+	A-	B+	B-	R+	R-	n.c.	n.c.	n.c.	

Cable shield connected to housing; U_p = Power supply voltage

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

¹⁾ with 1 V_{pp} signal not connected to a pin

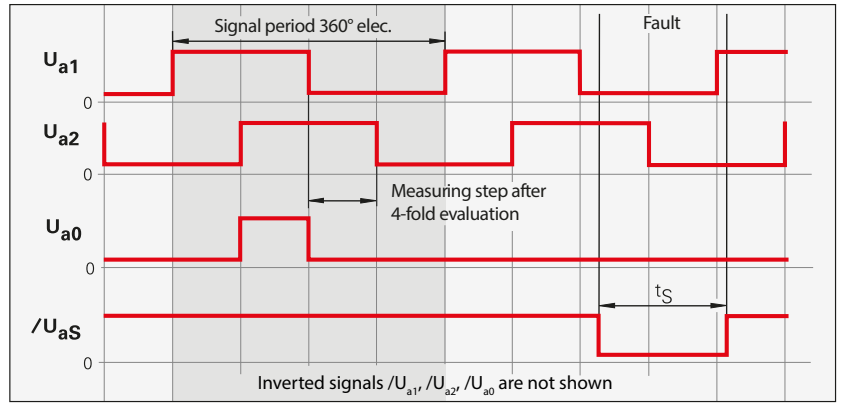
INCREMENTAL SIGNAL TTL

WayCon encoders with TTL interface incorporate electronics that digitize sinusoidal scanning signals with or without interpolation.

The incremental signals are transmitted as the square-wave pulse trains U_{a1} and U_{a2} , phase-shifted by 90° electrical. The reference mark signal consists of one or more reference pulses U_{a0} , which are gated with the incremental signals. In addition, the integrated electronics produce their inverted signals $/U_{a1'}$, $/U_{a2'}$ and $/U_{a0}$ for noise-proof transmission. The illustrated sequence of output signals - with U_{a2} lagging U_{a1} - applies to the direction of motion shown in the dimension drawing.

The fault detection signal $/U_{a5}$ indicates fault conditions such as an interruption in the supply lines, failure of the light source, etc.

The distance between two successive edges of the incremental signals U_{a1} and U_{a2} through 1-fold, 2-fold or 4-fold evaluation is one measuring step.

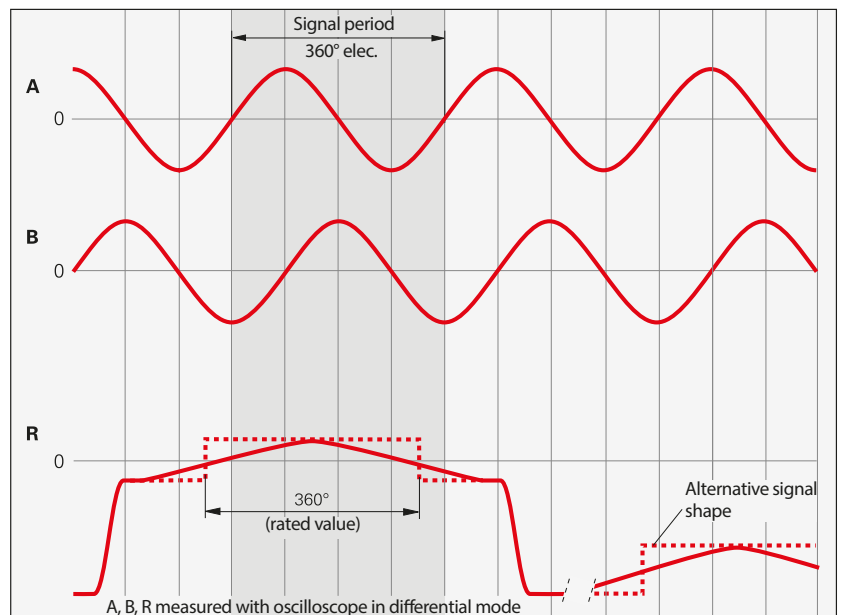


INCREMENTAL SIGNAL 1 V_{PP}

WayCon encoders with 1 V_{pp} interface provide voltage signals that can be highly interpolated.

The sinusoidal incremental signals A and B are phase-shifted by 90° electrical and have amplitudes of typically 1 V_{pp}. The illustrated sequence of output signals - with B lagging A - applies for the direction of motion shown in the dimension drawing.

The reference mark signal R has an unambiguous assignment to the incremental signals. The output signal might be somewhat lower next to the reference mark.



Subject to change without prior notice.

WayCon Positionsmesstechnik GmbH
 email: info@waycon.de
 internet: www.waycon.biz

WayCon

Positionsmesstechnik

Head Office
 Mehlsbeerstr. 4
 82024 Taufkirchen
 Tel. +49 (0)89 67 97 13-0
 Fax +49 (0)89 67 97 13-250

Office Köln
 Auf der Pehle 1
 50321 Brühl
 Tel. +49 (0)2232 56 79 44
 Fax +49 (0)2232 56 79 45