DIGITAL LINEAR SCALE

Series LS 177 and LS 187

Key-Features:

- Measurement range up to 3040 mm
- Accuracy up to ±3 µm
- Output: 1 Vpp or TTL
- IP53 or IP63
- Operating temperature 0 to +50 °C
- High vibration resistance
- Reclining mounting possible

Content:

25.01.18

WayCon Positionsmesstechnik

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		$\alpha_{therm} \approx 8 \cdot 10^{-6}$ K^{-1}							
Accuracy	[µm]	±3, ±5							
Reference marks		**LS 1x7:** selectable with magnets every 50 mm, standard setting: 1 reference mark in the center **LS 1x7 C:** distance-coded							
Interface		TTL							1 Vss
Integrated interpolation		5fold		10fold			20fold		-
Signal period	[µm]	-							20
Diagnostics interface		-							analog
Cutoff frequency (-3dB)	[kHz]	-							≥ 160
Scanning frequency Edge separation a	[kHz] [µs]	100 0.5	50 1	100 0.25	50 0.5	25 1	50 0.25	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)							
Schock 11 ms	[m/s^2]	≤ 400 (EN 60068-2-27)							
Acceleration	[m/s^2]	≤ 60 in measuring direction							
Operating temperature	[°C]	0 to +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 pro m Messlänge							

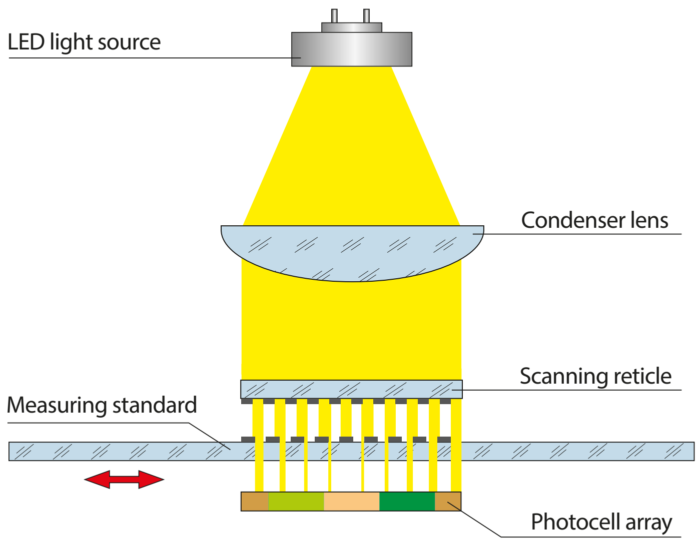
1) After 4-fold evaluation in the subsequent electronics

IMAGING SCANNING PRINCIPLE

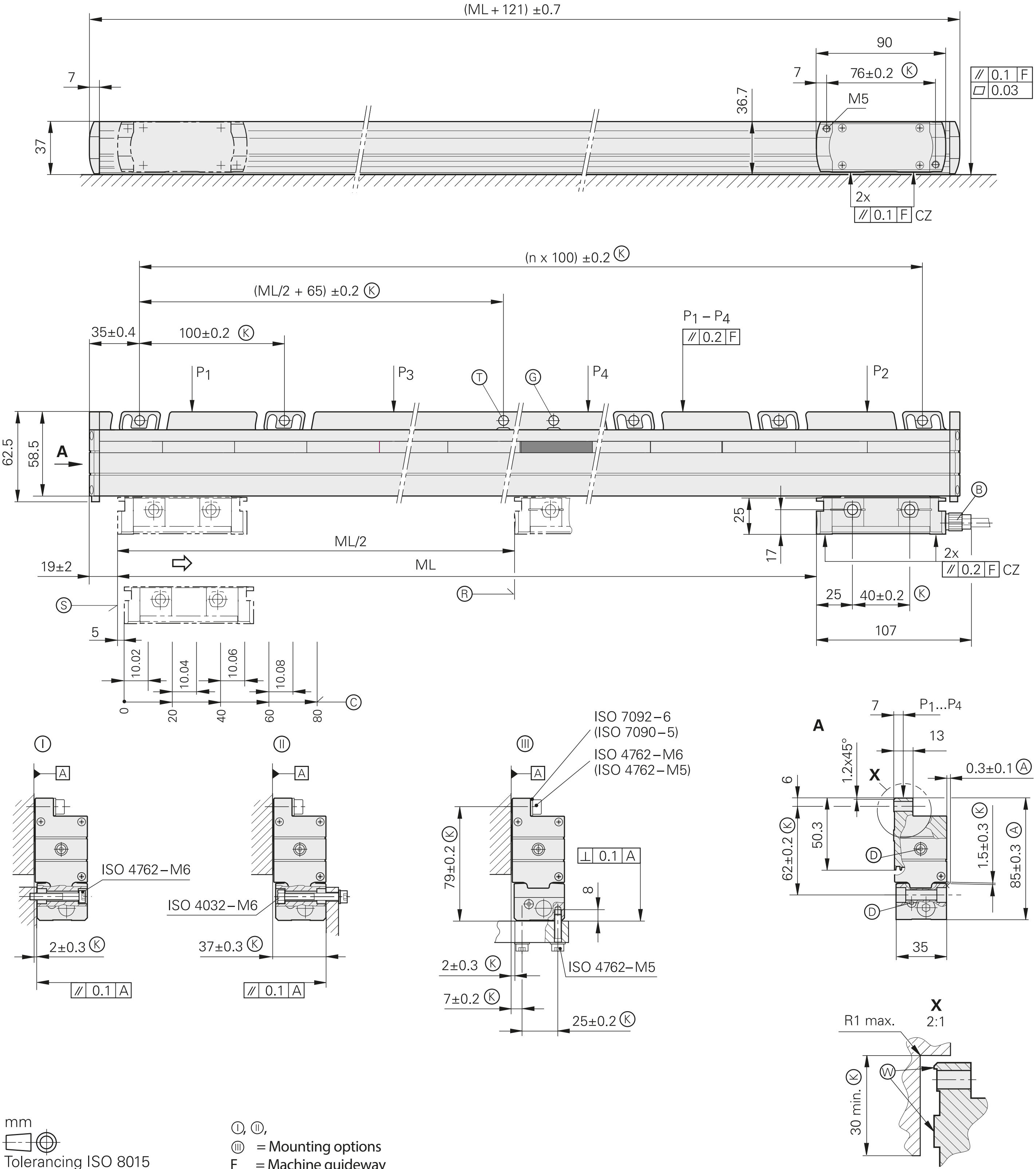
To put it simply, the imaging scanning principle functions by means of projected light signal generation: Two scale gratings with equal or similar grating periods are moved relative to each other - the measuring standard and the scanning reticle. The carrier material of the scanning reticle is transparent, 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 toleranced the gap must be between the scanning reticle and scale.



TECHNICAL DRAWING



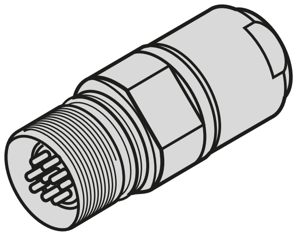
mm

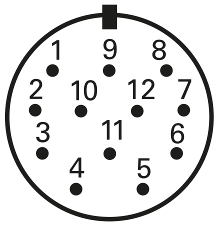
Tolerancing ISO 8015
ISO 2768 - m H
< 6 mm: ±0.2 mm

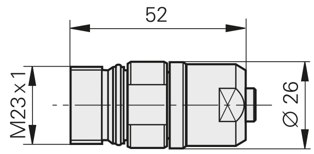
Ⓘ, Ⓘ,
Ⓘ = Mounting options
F = Machine guideway
P = Gauging points for alignment
Ⓚ = Required mating dimensions
Ⓐ = Alternative mating dimensions
Ⓑ = Cable connection usable at either end
Ⓓ = Compressed-air connection usable at either end
Ⓣ = Mechanical fixed point (to be preferred)
Ⓖ = Mechanical fixed point (coincides with the spacing interval of 100 mm)
Ⓡ = Reference mark position on LS 1x7
Ⓒ = Reference mark position on LS 1x7 C
Ⓢ = Beginning of measuring length ML
Ⓦ = Mating surfaces
⇨ = Direction of scanning unit motion for output signals in accordance with interface description

ELECTRICAL CONNECTION

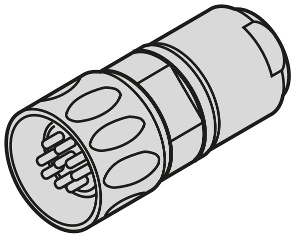
M23 coupling, 12-pin

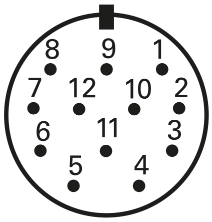


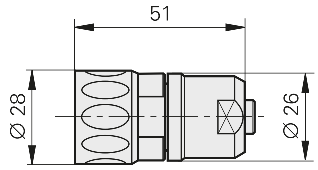




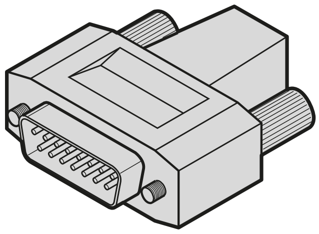
M23 connector, 12-pin

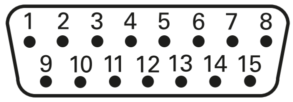


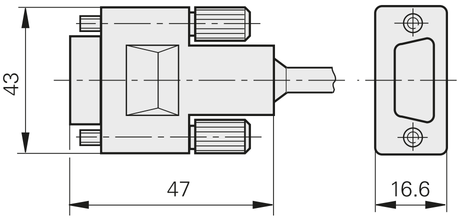




Sub-D connector, 15-pin







	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	0 V	Sensor 0 V	U_{a1}	$\overline{U_{a1}}$	U_{a2}	$\overline{U_{a2}}$	U_{a0}	$\overline{U_{a0}}$	$\overline{U_{aS}}$	n.c.	n.c.
Signals 1 Vpp	U_P	Sensor U_P	0 V	Sensor 0 V	A+	A-	B+	B-	R+	R-	n.c.	n.c.	n.c.

Cable shield connected to housing; $\mathbf{U_P}$ = 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 Vpp signal not connected to a pin

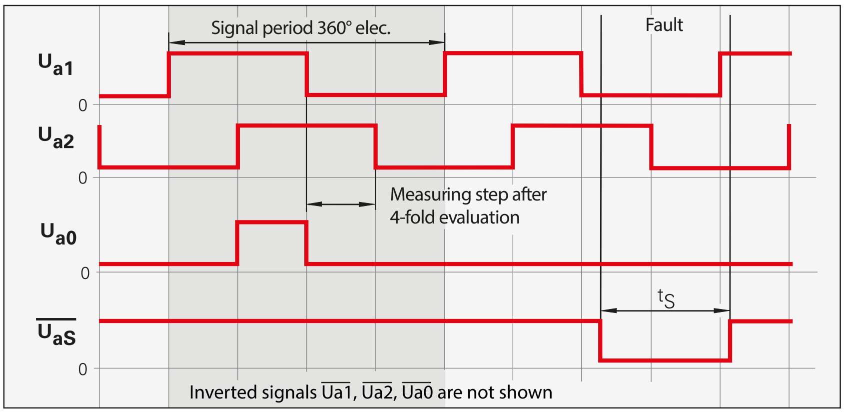
INCREMENTAL SIGNAL TTL

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° elec. The reference mark signal consists of one or more reference pulses Ua0, which are gated with the incremental signals. In addition, the integrated electronics produce their inverted signals $\overline{U_{a1}}$, $\overline{U_{a2}}$ and $\overline{U_{a0}}$ 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 $\overline{U_{aS}}$ 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.

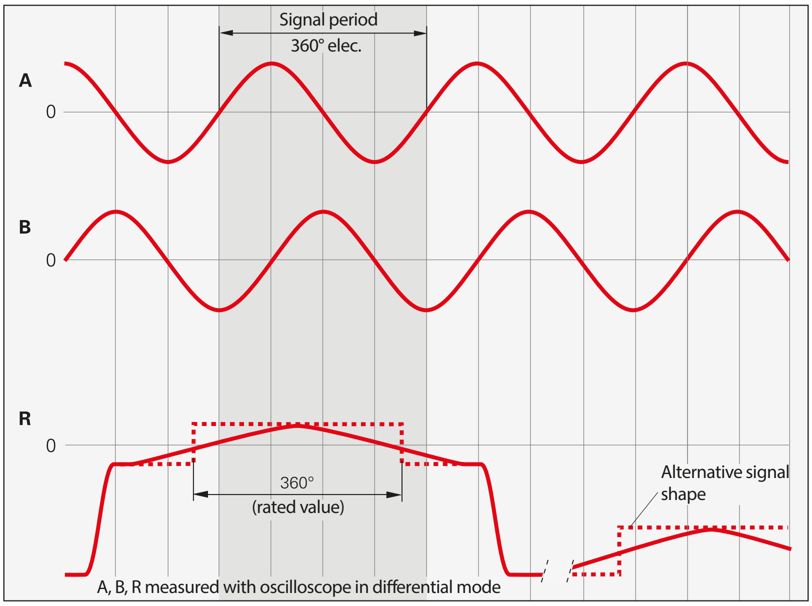


INCREMENTAL SIGNAL 1 Vpp

WayCon encoders with 1 Vpp interface provide voltage signals that can be highly interpolated.

The sinusoidal incremental signals A and B are phase-shifted by 90° elec. and have amplitudes of typically 1 Vpp. 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.



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