HEIDENHAIN

Digital Readouts

Linear Encoders

For Manually Operated Machine Tools

07/2021

ND 5000

Digital readout for milling machines, drilling machines, and lathes with up to three axes

The ND 5000 digital readout is suitable for use on manually operated milling and drilling machines, as well as on lathes with up to three axes. Due to the TTL encoder input, the LS 328 C and LS 628 C linear encoders with a display step of 5 µm are primarily used.

Design
The ND is designed for harsh shop environments. It features a sturdy aluminum housing and a splash-proof membrane keyboard. With their intuitive and user-friendly interface, the ND digital readouts are particularly easy to operate. Everything you need to know for machining your workpiece is displayed on an easy to read 7-inch screen.

The symmetrical design of the ND ensures ergonomic operation. The ND digital readout's keyboard is conveniently accessible, and its screen is easy to read.

Functions
The ND offers many useful functions for machining with manually operated machine tools. The most important functions are readily accessible directly through function keys. Soft keys with language-sensitive information in plain language enable context-sensitive operation.

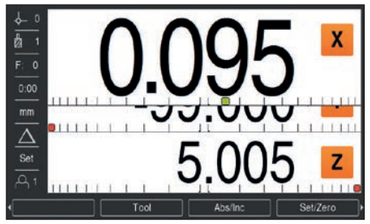
Distance-to-go mode comes to your aid during positioning tasks. With it, you can easily and reliably arrive at the next position by simply moving the axes until the display reads zero.

Of course, the ND also offers special functions for milling and turning operations, such as:
- Hole patterns (linear, circular)
- Radius/diameter switching
- Sum display for the top slide

You can individually configure the display of the ND and save your settings in the user administration.

Data interface
A USB interface permits the import and export of parameters and tables to memory or to a PC.

Dynamic zoom
The axis currently in motion can be graphically highlighted. In "dynamic zoom" mode, the position value is enlarged to its maximum size based on the number of digits. This greatly improves readability—especially from far away.



Installation guide
When you turn on the digital readout for the first time, the ND supports you with its installation guide, which leads you step by step through the most important settings until the device is ready for operation.

Day/night switching
You can also switch the screen of the ND to a light or dark background depending on the amount of ambient light at the machine.

	ND 5023
Axes	Up to 3 axes
Encoder inputs	⊓⊔TTL
Input frequency	≤ 500 kHz
Signal period	2 µm, 4 µm, 10 µm, 20 µm, 40 µm, 100 µm, 10240 µm, 12800 µm
Line count	Any
Display step[1)]	*Linear axis:* 1 mm to 0.0001 mm; 0.005 mm with LS 328C/LS 628C *Rotary axis:* 1° to 0.0001° (00° 00' 01")
Display	7-inch screen (15:9), resolution: 800 x 480 pixels for position values, dialog messages, data entry, and graphical functions
Functions	• User administration and file management • 10 presets, 16 tools • Reference mark evaluation for distance-coded and single reference marks • Distance-to-go mode with nominal position input in absolute or incremental dimensions • Graphical positioning aid • Scaling factor • Integrated help system
For milling and drilling	• Calculation of positions for hole patterns (circular, linear) • Tool radius compensation • Cutting data calculator
For turning	• Freeze tool position during retraction • Sum display of axes in the top slide • Inclined top slide • Taper calculator
Error compensation	Linear (LEC) and segmented linear (SLEC) via up to 200 compensation points
Data interface	USB 2.0 Type C
Accessories	Single-Pos stand, Multi-Pos holder, mounting frame, protective cover, power cable
Power connection	AC 100 V to 240 V (±10 %); 50 Hz to 60 Hz (±5 %); ≤ 33 W
Operating temperature	0 °C to +45 °C (storage temperature: –20 °C to +70 °C)
Protection EN 60529	IP54; back panel: IP40
Mounting	Single Pos stand, Multi-Pos holder; fastening systems compatible with VESA MIS-D 100
Mass	≈ 1.7 kg

[1)] Depends on the signal period or line count of the connected encoder

Linear encoders
for machine tools

For typical applications on manual machine tools such as milling machines or lathes, **display steps of 10 µm or 5 µm** are sufficient. Suitable for these display steps are the LS 300 and LS 600 series linear encoders with an accuracy grade of ±10 µm per meter of traverse.

Jig boring machines, grinding machines, and measuring and inspection tasks normally require **display steps of 1 µm** and finer. Suitable linear encoders for these more stringent requirements typically feature accuracy grades of ±5 µm per meter of traverse. These linear encoders, such as LS 487 or LS 187, are described in the *Linear Encoders for Numerically Controlled Machine Tools* brochure.

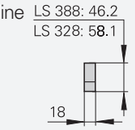
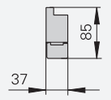
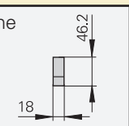
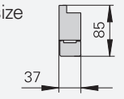
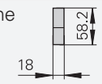
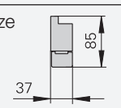
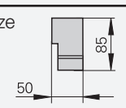
For **limited installation space** (e.g., on the slide of a lathe), the linear encoders with a slimline scale housing are suitable.

The linear encoders with a full-size scale housing are deployed as universal linear encoders under **normal mounting conditions**.

Linear encoders for long traverses
Long traverses of over three meters can be found on large boring mills or milling machines, but also on the long Z axes of lathes. HEIDENHAIN offers suitable linear encoders for specialized applications of this type as well.

LB 382 or **LC 200** encoders with a full-size scale housing enable **measuring lengths of up to 30040 mm** or **28040 mm.** The housing is assembled on the machine in sections, and the single-piece steel scale tape is pulled through. The LB 382 and LC 200 can be found in the *Linear Encoders for Numerically Controlled Machine Tools* brochure.

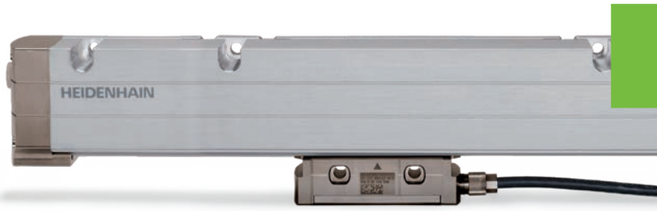
Absolute linear encoders
Encoders for absolute position measurement are used on machines and equipment for which the axis positions must be known upon switch-on. The LC 415, LC 115, and LC 200 absolute linear encoders are described in the *Linear Encoders for Numerically Controlled Machine Tools* brochure. A Product Information document is available for the LC 183 and LC 483.

	Scale housing	Accuracy grade	Measuring lengths	Interface	Signal period	Model	Further information
Linear encoders for manually operated machine tools							
Incremental linear measurement • Glass scale	Slimline 	±10 µm	70 mm to 1240 mm	⊓⊔TTL	20 µm	**LS 328C**	Page 32
	Full-size 	±10 µm	140 mm to 3040 mm	∿ 1 V_{PP}	20 µm	**LS 688C**	Page 36
				⊓⊔TTL	20 µm	**LS 628C**	
Linear encoders for numerically controlled machine tools							
Incremental linear measurement • Glass scale	Slimline 	±5 µm ±3 µm	70 mm to 1240 mm *With mounting spar:* 70 mm to 2040 mm	∿ 1 V_{PP}	20 µm	**LS 487**	Brochure: ***Linear Encoders*** *for Numerically Controlled Machine Tools*
				⊓⊔TTL	Down to 1 µm	**LS 477**	
	Full-size 	±5 µm ±3 µm	140 mm to 3040 mm	∿ 1 V_{PP}	20 µm	**LS 187**	
				⊓⊔TTL	Down to 1 µm	**LS 177**	
Absolute linear measurement • Glass scale	Slimline 	±5 µm ±3 µm	70 mm to 1240 mm *With mounting spar or clamping elements:* 70 mm to 2040 mm	EnDat 2.2	–	**LC 415**	
	Full-size 	±5 µm ±3 µm	140 mm to 3040 mm	EnDat 2.2	–	**LC 115**	
Incremental linear measurement for large measuring lengths • Steel scale tape	Full-size 	±5 µm	440 mm to 30040 mm	∿ 1 V_{PP}	40 µm	**LB 382**	Brochure: ***Linear Encoders*** *for Numerically Controlled Machine Tools*
Absolute linear measurement for large measuring lengths • Steel scale tape			4240 mm to 28040 mm	EnDat 2.2 with ∿ 1 V_{PP}	40 µm	**LC 281**	
				EnDat 2.2	–	**LC 211**	

LS 688C

LS 487/LC 415

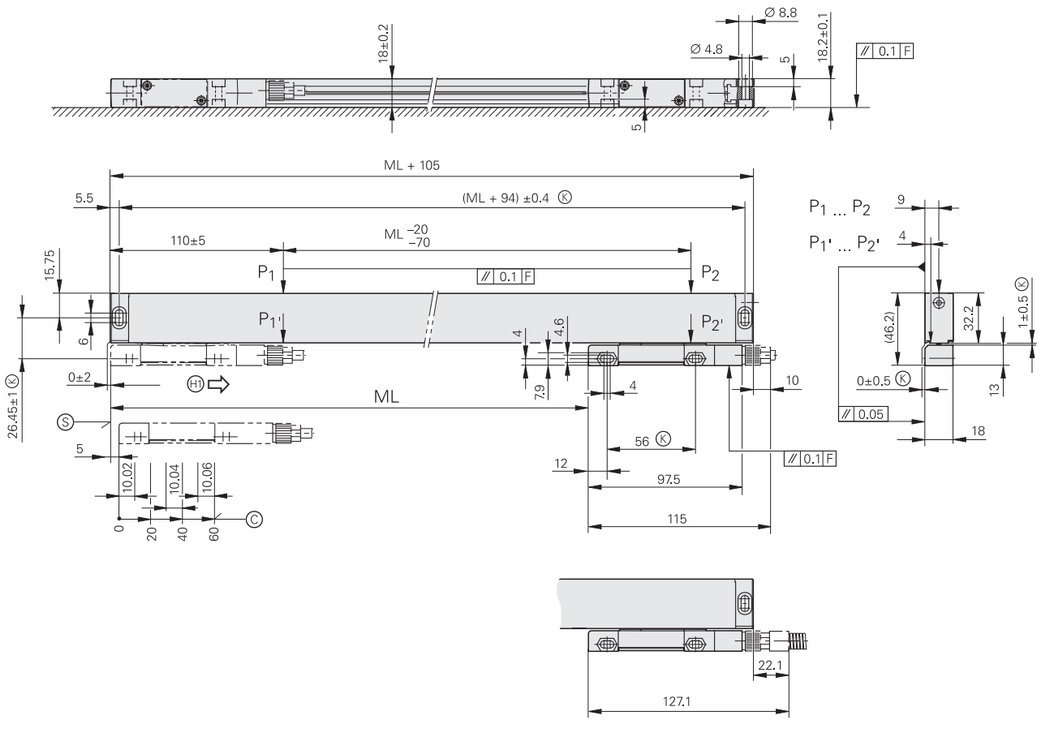
LS 187/LC 115



LC 281/LC 211

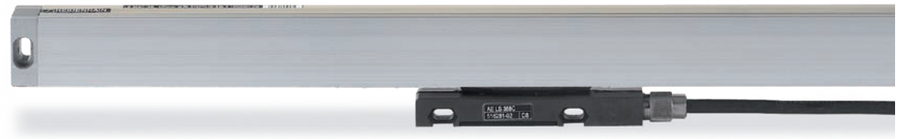
LB 382

LS 300 series



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

Ⓢ = Beginning of measuring length (ML)
Ⓒ = Reference mark position
F = Machine guideway
P = Measuring points for alignment
Ⓚ = Required mating dimensions
1 = Direction of scanning-unit motion for output signals in accordance with the interface description



Specifications	Incremental	
	LS 388C	**LS 328C**
Measuring standard	Glass scale with DIADUR graduation	
Accuracy grade	±10 µm	
Measuring length ML*	70 120 170 220 270 320 370 420 470 520 570 620 670 720 770 820 870 920 970 1020 1140 1240	
Interface	∿ 1 V_{PP}	⊓⊔ TTL
Grating period	20 µm	
Edge separation *a*	–	≥ 5 µs
Reference mark	Distance-coded	
Recommended measuring step[1)]	10 µm, 5 µm	
Supply voltage	DC 5 V ±0.25 V/< 100 mA (without load)	
Electrical connection	Separate adapter cable connectable to mounting block	
Cable length	≤ 30 m (with HEIDENHAIN cable)	
Traversing speed	≤ 60 m/min	
Required moving force	≤ 5 N	
Vibration 55 Hz to 2000 Hz **Shock** 6 ms	≤ 150 m/s^2 (EN 60068-2-6) ≤ 300 m/s^2 (EN 60068-2-27)	
Operating temperature	0 °C to 50 °C	
Protection EN 60529	IP53 when mounted as per the mounting instructions	
Mass	0.27 kg + 0.67 kg/m measuring length	

* Please select when ordering
1) For position measurement

Please refer to the *General electrical information* in the *Interfaces of HEIDENHAIN Encoders* brochure, especially when connecting non-HEIDENHAIN electronics.