



# HEIDENHAIN



## Digital Readouts

for Manually Operated  
Machine Tools

# HEIDENHAIN Digital Readouts

## – for Manually Operated Machine Tools

### Increased productivity with HEIDENHAIN digital readouts

By retrofitting your manually operated machine tools or measuring equipment with digital readouts from HEIDENHAIN, you've made a decision for increased productivity, higher precision and more operating ease.

Regardless of whether you're installing on new equipment or retrofitting machines already in operation, digital readouts can easily be retrofitted to any model of machine or type of equipment, whatever the application or number of displayed axes.

### Save time and reduce cost

Digital readouts from HEIDENHAIN will save you valuable time. The distance-to-go display allows you to move swiftly to the next nominal position, simply by traversing until the display reads "zero". Or, you can use the function for setting multiple reference points to enter position values quickly and without tedious calculation work.

To enable you to machine directly from the dimensions in the drawing, digital readouts offer the following support:

- Switching between absolute/incremental dimensioning
- Radius/diameter switching (for lathes)
- Aids for fast reference-point acquisition

And POSITIP speeds up small-batch production—repetitive machining sequences can be saved as a program.

### HEIDENHAIN linear encoders for accurate positioning

The highly accurate and reliable linear encoders from HEIDENHAIN directly measure the movements of the axis slides and convert them into electrical measuring signals. These signals are evaluated by the readout, which displays traverse paths and accurate positions as numerical values. Play in the machine transfer elements does not affect the accuracy of the displayed position values.

Nearly all HEIDENHAIN linear encoders can be connected to the readouts.

### Made-to-measure solutions

HEIDENHAIN offers digital readouts for every application—even for large traverses of 30 m and longer. Expert advice is provided by the competent staff at all HEIDENHAIN agencies. They are familiar with the wide range of products, and will find the optimal solution for your situation.

## – Proven in the Workshop



HEIDENHAIN digital readouts have universal application: In addition to standard tasks on milling, drilling and boring machines and lathes, they also offer ideal solutions for many applications on machine tools, measuring and testing equipment, and special machines—in fact all machines where axis slides are traversed manually.



# ND 780

## – the Adaptable Readout for up to Three Axes

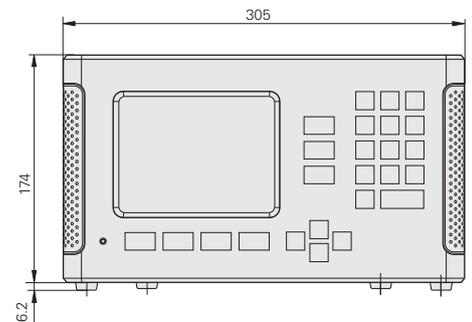
The ND 780 digital readout is especially suited for use on milling, drilling and boring machines and lathes with up to three axes.

The ND 780 readout features conversational programming to assist you with positioning tasks and to explain the display's special functions. It is equipped with a monochrome flat screen for position values, dialog and input displays, graphic functions and graphic positioning support.

The distance-to-go display facilitates positioning. You approach the next position quickly and reliably by simply traversing until the display reads "zero".

The functions for each application are easily activated by parameter input. Special functions are available for producing hole patterns (linear patterns as well as circular patterns). Reference points can be determined quickly and accurately with the KT 130 edge finder. The ND 780 readout supports you with special probing functions.

You can easily switch between radius and diameter display when the position display is configured for turning. The readout also offers support for lathes with separate top slide: The sum display feature allows you to display the saddle and top slides together or separately. To set a reference point, touch the lathe part and freeze the tool position. Then retract and measure the workpiece.



<b>ND 780</b>	Readout with conversational user guidance on a monochrome flat-panel display, HELP functions, graphic functions, splash-protected full-travel keyboard	
<b>Application</b>	Primarily for <b>milling, drilling and boring machines</b>	Primarily for <b>lathes</b>
<b>Axes</b>	Up to 3 axes from A to Z	Up to 3 axes from A to Z and Z <sub>0</sub> , Z <sub>S</sub>
<b>Encoder inputs</b>	3 x $\sim 11 \mu\text{A}_{\text{pp}}$ or $\sim 1 \text{V}_{\text{pp}}$ ; 15-pin D-sub connector	
<b>Display step</b>	10 $\mu\text{m}$ , 5 $\mu\text{m}$ , 1 $\mu\text{m}$ or finer	
<b>Reference points</b>	10	
<b>Tool data</b>	For 16 tools	
<b>Functions</b>	<ul style="list-style-type: none"> <li>• REF reference mark evaluation for distance-coded and single reference marks</li> <li>• Distance-to-go display with nominal position input in absolute or incremental values</li> </ul>	<ul style="list-style-type: none"> <li>• Radius/diameter display</li> <li>• Separate or sum display for Z and Z<sub>0</sub></li> <li>• Freezing the tool position for back-off</li> <li>• Taper calculator</li> </ul>
<b>Interfaces</b>	RS-232-C/V.24, KT edge finder, edge finder with contact triggering, switching functions and control of a constant cutting speed via separate IOB 49 module	

# The POSITIP 880

## – the Programmable Readout for up to Six Axes

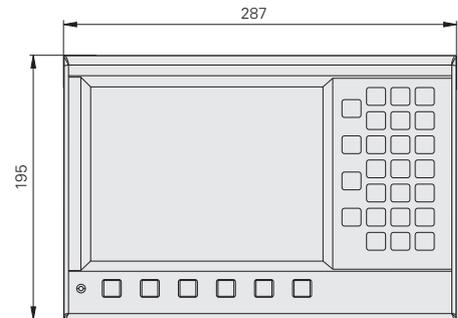
The POSITIP 880 is a versatile display unit designed primarily for milling machines, drilling and boring machines and lathes with up to six axes. The POSITIP provides advanced features beyond those offered by the ND series. It supports all operations with straightforward interactive menus on its large, easy-to-read color flat screen. And it does it on big machines as well: Since the POSITIP 880 permits the connection of a separate display and control unit, you can have all position values and functions available at a remote console.

### Ease of operation

The POSITIP is very easy to use: Soft keys are identified either with words (in your national language) or with easily understood symbols. Each operating mode, work step and screen display has individualized on-screen operating instructions, often with graphic illustrations, which can be called simply by pressing the HELP key. The INFO feature gives you additional on-screen support, such as a pocket calculator, a stopwatch, a cutting data calculator for milling and a taper calculator for settings on the top slide for turning. User parameters are available for setting the radius/diameter switching as well as the separate/sum display of two axes.

### Programs for small-batch production

The programming capabilities of POSITIP make it ideal for small-batch production on conventional machine tools: up to 999 program blocks per program can be stored in its memory. Programs can be created either by keying them in step by step or generating them through actual position capture (teach-in programming). The subprogramming capability lightens your work load: repetitive machining sequences only have to be entered once. Fixed cycles such as Bolt Hole Circle, Linear Hole Pattern or Rectangular Pocket (boring, milling) or Multipass (turning) keep your programs short and save you programming time.



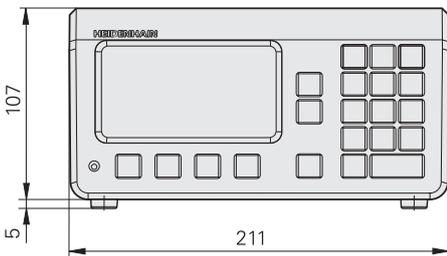
<b>POSITIP 880</b>	Readout with conversational user guidance on a color flat-panel display, HELP functions, graphic functions and program memory, splash-protected full-travel keyboard	
<b>Application</b>	Primarily for <b>milling, drilling and boring machines</b>	Primarily for <b>lathes</b>
<b>Axes</b>	Up to 6 axes from A to Z	Up to 6 axes from A to Z and Z <sub>0</sub> , Z <sub>S</sub>
<b>Encoder inputs</b>	6 x $\sim 11 \mu\text{App}$ , $\sim 1 \text{Vpp}$ or EnDat; 15-pin D-sub connector	
<b>Display step</b>	10 $\mu\text{m}$ , 5 $\mu\text{m}$ , 1 $\mu\text{m}$ or finer	
<b>Reference points</b>	99	1
<b>Tool data</b>	For 99 tools	
<b>Functions</b>	<ul style="list-style-type: none"> <li>• REF reference-mark evaluation for distance-coded or single reference marks</li> <li>• Distance-to-go display with nominal position input in absolute or incremental values</li> <li>• Contour monitoring with magnify function</li> <li>• Programming of up to 999 program blocks per program</li> </ul>	
	<ul style="list-style-type: none"> <li>• Probing function for datum acquisition with the KT edge finder: "Edge", "Centerline" and "Circle center"</li> <li>• Calculation of positions for hole patterns (circular patterns as well as linear patterns)</li> <li>• Positioning aids for milling and roughing of rectangular pockets</li> <li>• Cutting data calculator</li> </ul>	<ul style="list-style-type: none"> <li>• Radius/diameter display</li> <li>• Separate or sum display Z<sub>S</sub> for Z and Z<sub>0</sub></li> <li>• Oversize allowance for positioning</li> <li>• Multipass turning cycle</li> <li>• Freezing the tool position for back-off</li> <li>• Taper calculator</li> </ul>
<b>Interfaces</b>	RS-232-C/V.24, Centronics, KT edge finder, switching functions via separate IOB 89 module	

# ND 200 Series

## – the Digital Readouts for One Axis

The ND 200 series consists of digital readouts for one axis. Due to their performance range they are predestined for measuring and inspection stations, but they are also suited to simple positioning tasks such as infeed for a circular saw, the stroke of press travel, or the position of an additional rotary table on a machine tool. The switching inputs and outputs of the ND 287 permit operation also in simple automated environments. The ND 28x readouts have serial interfaces for measured value transfer.

The standard **ND 280** readout provides the basic functions for simple measuring tasks. The **ND 287** features numerous functions for measuring and statistical evaluation of measured values such as sorting and tolerance check mode, minimum/maximum value storage, and measurement series storage. These data make it possible to calculate mean values and standard deviations and display them in histograms or control charts. With its modular design, the ND 287 permits connection of a second encoder for sum/difference measurement or of an analog sensor, for example for temperature compensation.



<b>ND 200</b>	Universal readout for 1 axis	
<b>Application</b>	Positioning devices, measuring and inspection stations, machines	
<b>Model</b>	<b>ND 280</b>	<b>ND 287</b>
<b>Encoder inputs</b>	1 x $\sim$ 11 $\mu$ App $\sim$ 1 Vpp or EnDat 2.2	
<b>Display step</b>	10 $\mu$ m, 5 $\mu$ m, 1 $\mu$ m and finer	
<b>Reference points</b>	2	
<b>Functions</b>	REF reference mark evaluation	
		<ul style="list-style-type: none"> <li>• Sorting and tolerance checking</li> <li>• Measurement series (max. 10 000 measured values)</li> <li>• Minimum/maximum value storage</li> <li>• Statistics functions</li> <li>• Sum/difference display (option)</li> </ul>
<b>Switching I/O</b>	–	Yes
<b>Interface</b>	V.24/RS-232-C; USB (UART); Ethernet (option for ND 287)	

# Accessories

## – for ND 780 and POSITIP 880

### KT edge finder

The KT is a 3-D triggering edge finder. The stylus is deflected when it contacts the workpiece, and the edge finder sends a triggering signal over the connecting cable to the ND 780 or the POSITIP.

The KT edge finder allows you to set reference points quickly and easily, without leaving marks on the workpiece.



### Tilting base

An optional tilting base is available for the ND 780 and the POSITIP 880. It can be used to tilt the readouts forward and backward up to 20°.



### Handle

The optional handle is attached to the base of the ND 780, and is used to easily tilt the ND 780 connected to a mounting arm.



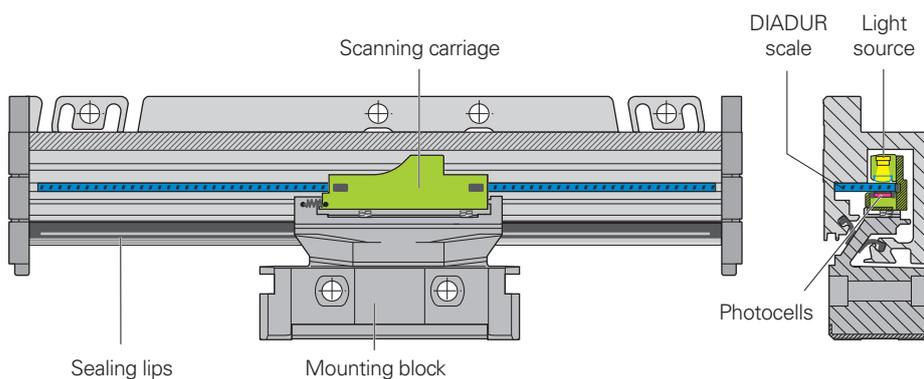
# HEIDENHAIN Linear Encoders

## – They Determine the Accuracy

HEIDENHAIN has a wide range of linear encoders to suit any application—for different display steps, installation spaces and traverse lengths.

The linear encoder measures the exact position directly at the axis slide. The backlash of machine transfer elements (lead screw and gears) as well as screw-pitch error have no influence on the measured position display.

The accuracy of the measurement greatly depends on the scale: LS and LB linear encoders from HEIDENHAIN incorporate high-precision DIADUR scales and AURODUR scale tapes, respectively. The scanning unit travels on a low-friction guide within the scale housing. It is connected to the external mounting block through a coupling that compensates the axial misalignment.



Schematic diagram of LS 187C

### Sturdy design for years of service

HEIDENHAIN linear encoders are robust, vibration-resistant and durable. The scale and scanning unit of the LS and LB linear encoders are protected against chips, swarf, dust and splash fluids by an aluminum housing. Downward-oriented elastic lips seal the housing. The photoelectric scanning of the scales is contact-free and they remain without wear for many years.

### Reference marks

The reference marks on the scale are required so that the display can show the correct position values after any intentional or unintentional interruption in power. Due to the distance-coded reference marks of the LS and LB linear encoders from HEIDENHAIN, only short distances must be traversed to quickly and easily re-establish the reference point: After a maximum traverse of just 20 mm (LS) or 80 mm (LB) in any direction, the value shown on the HEIDENHAIN digital readout is automatically referenced to the last valid reference point. Especially on machines with large traverses, this feature can bring you significant savings in time spent reproducing the reference points.

For typical applications on manual machine tools such as milling machines or lathes, **display steps of 10 µm or 5 µm** are sufficient. Such display steps are provided by the LS 388 C and the LS 688 C with an accuracy grade of better than ± 10 µm per meter traverse.

Jig boring machines, grinding machines, and measuring and inspection tasks normally require **display steps of 1 µm** and better. Linear encoders for these more stringent requirements typically feature accuracy grades of ± 5 µm per meter traverse.

Recommended display step	
10 µm, 5 µm	<b>LS 688 C</b> ~ 1 V <sub>PP</sub> Universal linear encoder  <b>Accuracy</b> Better than ± 10 µm
	<b>LS 388 C</b> ~ 1 V <sub>PP</sub> Slimline linear encoder for limited installation space  <b>Accuracy</b> Better than ± 10 µm
1 µm, 0.5 µm	<b>LS 187 C</b> ~ 1 V <sub>PP</sub> Universal linear encoder  <b>Accuracy</b> Better than ± 5 µm or ± 3 µm
	<b>LS 487 C</b> ~ 1 V <sub>PP</sub> Slimline linear encoder for limited installation space  <b>Accuracy</b> Better than ± 5 µm or ± 3 µm (up to measuring length 1240 mm)
10 µm, 5 µm, 1 µm	<b>LB 382 C</b> ~ 1 V <sub>PP</sub> Linear encoder for <b>traverse path up to 30 m</b>  <b>Accuracy</b> Better than ± 5 µm

The specified accuracy

Measuring lengths						Dimensions	
		170	220	270			
	320	370	420	470	520		
	570	620	670	720	770		
	820	870	920	970	1020		
	1140	1240	1340	1440	1540		
	1640	1740	1840	2040	2240		
	2440	2640	2840	3040			
	70	120	170	220	270		
	320	370	420	470	520		
	570	620	670	720	770		
	820	870	920	970	1020		
	1140	1240					
	140	240	340	440	540		
	640	740	840	940	1040		
	1140	1240	1340	1440	1540		
	1640	1740	1840	2040	2240		
	2440	2640	2840	3040			
	70	120	170	220	270		
	320	370	420	470	520		
	570	620	670	720	770		
	820	870	920	1020	1140		
	1240						
	Only with mounting spar:						
	1340	1440	1540	1640	1740		
	1840	2040					
	From 440 mm to 3040 mm in steps of 200 mm with single-section housing, from 3240 mm to 30040 mm in steps of 200 mm as multiple housing sections.						

applies to any (up to 1 m long) section of the measuring length.



# Incremental Length Gauges from HEIDENHAIN

## – Measuring Equipment for the Workshop

Incremental length gauges from HEIDENHAIN offer high accuracy over long measuring ranges. They are sturdily designed, feature many well-thought-out design attributes, and are available in several field-proven versions.

They have a wide range of applications in production metrology, in multipoint inspection stations, measuring equipment monitoring, and as position measuring devices.

### Quality of the finished workpieces is guaranteed

The HEIDENHAIN METRO MT length gauges are characterized by high accuracy:  $\pm 0.2 \mu\text{m}$  (for traverses of 12 mm and 25 mm),  $\pm 0.5 \mu\text{m}$  (for traverses of 60 mm) or  $\pm 1 \mu\text{m}$  (for traverses of 100 mm). The CT 2500 length gauges (25 mm traverse) and CT 6000 (60 mm traverse) from the HEIDENHAIN CERTO program are available for the increased accuracy of  $\pm 0.1 \mu\text{m}$ . With their small dimensions and measuring ranges of 12 mm or 30 mm and  $\pm 1 \mu\text{m}$  accuracy, the HEIDENHAIN SPECTO length gauges are specifically designed for multipoint inspection devices.

### Fast on-site inspection

Installing an inspection apparatus near your machine means that you will be able to monitor changes on your machine—caused by tool wear or thermal expansion—and react to correct them in time. Because of the large traverse ranges and the simple use of the length gauges as well as the accurate and clear digital displays, HEIDENHAIN length gauges are an optimal choice for universal, fast and accurate measurements at your machining location.

### Further information

For more detailed product information, see our *Length Gauges* brochure.



Our authorized retrofitting distributor

## HEIDENHAIN

**DR. JOHANNES HEIDENHAIN GmbH**

Dr.-Johannes-Heidenhain-Straße 5

**83301 Traunreut, Germany**

☎ +49 8669 31-0

FAX +49 8669 5061

E-mail: [info@heidenhain.de](mailto:info@heidenhain.de)

[www.heidenhain.de](http://www.heidenhain.de)

