Digital Readouts
Linear Encoders
For Manually Operated Machine Tools
Digital readouts from HEIDENHAIN are used in a wide variety of applications. They are deployed on machine tools, infeed axes on saws and presses, measuring and inspection equipment, dividing apparatuses, production inspection measuring stations, and more. To meet such demands, these digital readouts can also be used in combination with numerous encoders from HEIDENHAIN.

Digital readouts with multiple axes are primarily used on manually operated machine tools, where their practical cycles provide optimal support to the operator during milling, drilling, or turning. By instantly displaying the position in an easy-to-read manner, digital readouts enable a significant increase in productivity. This brochure also includes the major HEIDENHAIN linear encoders for position measurement on manually operated machine tools.

Additional connectable encoders can be found online at www.heidenhain.com, or in the Linear Encoders For Machine Tools, Length Gauges, Angle Encoders, and Rotary Encoders brochures.

In addition to digital readouts, HEIDENHAIN offers evaluation units commonly used on SPC inspection stations, profile projectors, measuring microscopes, and manually operated coordinate measuring machines. These evaluation electronics for metrology applications feature either an integrated display or a connection for a PC. You can find more information online at www.heidenhain.com, or in the Evaluation Electronics For Metrology Applications brochure.

For detailed descriptions of all available interfaces, as well as general electrical information, please refer to the Interfaces of HEIDENHAIN Encoders brochure.

This brochure supersedes all previous editions, which thereby become invalid. The basis for ordering from HEIDENHAIN is always the brochure edition valid when the order is placed. Standards (ISO, EN, etc.) apply only where explicitly stated in the brochure.

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Digital readouts from HEIDENHAIN are universally deployable: they can be used in standard milling, drilling, and turning applications, and in many other machine tools and specialized machine applications; in short, on all machines and equipment with manually operated axis slides.

Versatile, ergonomic, and well designed
Digital readouts from HEIDENHAIN are particularly user-friendly.

- Optimally readable display
- Graphical support and help functions
- Conversational user guidance
- Splash-protected front panel (prevents coolant from damaging your digital readout)
- Sturdy housing built for the harshest day-to-day shopfloor conditions

Fast
HEIDENHAIN digital readouts save you time. Their distance-to-go mode, for example, guides you quickly and reliably to the next nominal position. You simply move the axis until the display reads zero. Presets can be set wherever the reference point for the dimensions may lie. This makes positioning easier, especially on workpieces with complex dimensions.

For milling and drilling, entering the geometric data for hole patterns or rectangular pockets is fast and easy. Afterwards, you simply move to the positions shown in distance-to-go mode.

Reliable
The easy-to-read display shows the positions relative to the selected preset, thereby reducing the probability of error and making machining more reliable.

The graphical positioning aid of the POSITIP 8000, ND 5000, and ND 7000 makes distance-to-go mode even faster and more reliable. Graphical illustrations help you correctly enter the geometric data.

For lathes, the sum display for the saddle and top slides helps you with precision positioning. If taper dimensions in the drawing are incomplete, the digital readouts can help you calculate the taper angles.

Small-batch production is particularly easy, because repetitive machining sequences can be stored as programs and then used as often as you require.

Accurate
On older machine tools, precision machining in the hundredths range is often a matter of luck. This is because worn machine elements make exact dial and vernier settings impossible. Linear encoders from HEIDENHAIN, however, measure the motion of the axis slides directly. As a result, any backlash from mechanical transmission elements such as lead screws, racks, or gears has no effect. Being able to directly read the slide position improves your machining accuracy and reduces scrap rates.
## Selection guide

<table>
<thead>
<tr>
<th>Number of axes</th>
<th>Reference points / tool data</th>
<th>Functions</th>
<th>Encoder inputs</th>
<th>Switching inputs and outputs</th>
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<th>Page</th>
</tr>
</thead>
</table>
| **ND 5000**    | Digital readout for milling machines, drilling machines, and lathes with **up to three axes**  
• Membrane keyboard | Up to 3  
10 presets;  
16 tools | General:  
• Distance-to-go mode with graphical positioning aid  
Milling and drilling:  
• Hole patterns (circular and linear)  
• Tool compensation  
Turning:  
• Radius/直径 display  
• Separate/sum display | TTL | — | USB | 14 |

| **ND 7000**    | Digital readout for milling machines, drilling machines, and lathes with **up to three axes**  
• Touchscreen operation  
• Switching inputs/outputs (ND 7013 I/O)  
• Program memory (PGM software option) | Up to 3  
100 presets;  
100 tools | General:  
• Distance-to-go mode with graphical positioning aid  
Milling and drilling:  
• Hole patterns (circular and linear)  
• Tool compensation  
Probing functions for presets  
Turning:  
• Radius/直径 display  
• Separate/sum display  
• Constant cutting speed (ND 7013 I/O) | 1 Vpp  
11 µAPP  
EnDat 2.2 | • For KT edge finder  
• Others via ND 7013 I/O | Ethernet, USB | 16 |

| **POSITIP 8000** | Digital readout for milling machines, drilling machines, and lathes with **up to six axes**  
• Touchscreen operation  
• Program memory  
• Switching inputs/outputs  
Distance control with the **POSITIP 8016 ACTIVE** | Up to 6  
100 presets;  
100 tools | General:  
• Distance-to-go mode with graphical positioning aid  
• Contour monitoring  
• Programming of machining steps  
Milling and drilling:  
• Hole patterns (circular and linear)  
• Tool compensation  
• Probing functions for presets  
• Roughing out of rectangular pockets  
Turning:  
• Radius/直径 display  
• Separate/sum display  
• Constant cutting speed (POSITIP 8016 ACTIVE) | 1 Vpp  
11 µAPP  
EnDat 2.2 | • For KT edge finder  
• Others via POSITIP 8016 ACTIVE | Ethernet, USB | 20 |
Functions
Probing functions for presets

Accessory: KT edge finder
The HEIDENHAIN KT edge finder makes finding presets especially easy: you simply move the edge finder toward the edge of the workpiece until the stylus deflects. The display automatically stores the exact position, taking into account the direction of approach and the radius of the stylus. In milling-machine mode, the ND 7000 and POSITIP 8000 digital readouts offer the following probing functions:
- Workpiece edge as reference line
- Workpiece centerline as reference line
- Circle center as preset

Preset finding with a tool
The probing functions can also be performed using a tool.

Setup made easy with probing functions

Tool compensation for milling machines
The digital readouts of the ND 5000, ND 7000, and POSITIP 8000 series can save tool data, i.e. the diameter and length of the tool in use. Data from already preset tools or tool data collected on the machine can be conveniently stored in a tool table and re-activated at any time.
During positioning in distance-to-go mode, the readouts take into account the tool radius (R+) or (R–) in the machining plane, as well as the tool length (L) in the spindle axis.

Determining and storing tool compensation values on lathes
The data of the tools stored for machining in the revolver or quick-change holder can be stored with the ND 5000, ND 7000, and POSITIP 8000:
- To do so, directly enter the tool position when turning the first diameter, or
- “freeze” the current axis position value, retract the tool, measure the turned diameter, and then enter the value into the readout.

Changing presets
You can define a new preset for a new workpiece or a changed preset. The tool data are automatically referenced to the new preset and do not need to be modified.
Functions
Distance-to-go display

The distance-to-go display greatly simplifies your work: after you have entered the next nominal position, the digital readout shows you the distance remaining to the target position. You simply move the axes until the display reads zero.

In milling, the display can also compensate for the cutter radius. This allows you to work directly with the drawing dimensions without having to calculate conversions. You no longer need to remember any complicated values.

Automatic calculation of hole patterns for milling and drilling

In milling machine mode you can machine bolt hole circles (full circle or circle segments) and linear hole patterns without having to calculate. You simply enter the geometric dimensions and the number of holes shown on the drawing. Based on these data, the readout calculates the coordinates of each hole in the working plane. You then simply move the axis to “zero” and drill. Afterwards, the display shows the next position. The graphical display is a particularly useful feature: it lets you verify all of your entered data for hole patterns prior to machining.
Functions
Aids for working with lathes

Radius/diameter display
In lathe mode, the positions of the cross slide can be displayed either as radius or diameter values. A button allows you to switch between them.

Sum display for longitudinal axes
In lathe mode, you can display the positions of the saddle and top slide either separately or as a sum:
- When displayed separately, the position values are referenced to the datum set for each axis slide. If the saddle alone is moved, the displayed value for the top slide remains unchanged.
- When displayed as a sum, the positions of both slides are added, taking their algebraic signs into account. You can then read the absolute position of the tool relative to the workpiece datum without performing calculations.

Taper turning made easy
If the taper dimensions do not directly provide the taper angle, then the integrated taper calculator helps you calculate it. You simply enter the taper ratio or both diameters and the length of the taper. You then immediately receive the angle that must be configured for the top slide.

Turning
For turning, simply enter the target dimensions, and POSITIP will show you the distance to go in the longitudinal and transverse axes. You determine the best infeed increment.

Constant surface speed
Particularly in taper turning or parting, the surface speed changes based on the diameter. Yet a constant cutting speed is essential for attaining optimal machining results and long tool life. That’s why the ND 7013 I/O and POSITIP 8016 ACTIVE digital readouts enable constant cutting-speed control based on the current workpiece diameter.

Programming of machining steps
The programming functions of the POSITIP 8000 (optionally available for the ND 7000) allow you to save repetitive machining steps as a program. For a small-batch part, for example, all of the operating sequences can be compiled into a single program. In the Program Run mode, the distance-to-go display guides you to the programmed positions in sequence.

You can create programs by manually entering each position or by simply saving the actual position value (teach-in programming).

The POSITIP 8016 ACTIVE also supports the execution of programs with NC-controlled axes, allowing you to machine your workpieces particularly fast and effectively using automation. The program can also control the spindle.
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 ND 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 7000
Digital readout for milling machines, drilling machines, and lathes with up to three axes

The ND 7000 digital readouts are suitable for use on any type of machine with up to three axes:
- Milling machines
- Lathes
- Radial drills (upon request)
- Grinding machines
- Drilling and boring machines

Integrated switching inputs and outputs permit interaction with the machine and enable the implementation of simple automated tasks.

Design
The ND 7000 digital readouts are designed for harsh shop environments. They feature a sturdy aluminum housing with touch-screen operation. 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 low-profile aluminum housing, featuring an integrated power supply unit and fanless passive cooling system, is extremely rugged and durable. Its intuitive touchscreen made of specially hardened glass can even be operated with gloves.

Functions
The ND digital readouts offer many useful functions for machining with manually operated machine tools. Self-explanatory operating elements and language-sensitive information in plain language permit 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 digital readouts also offer special functions for milling and turning operations, such as:
- Hole patterns (linear, circular)
- Radius/diameter switching
- Sum display for the top slide

Preliminary procedures can be found fast and accurately with an edge finder. The ND digital readouts support you with special probing functions.

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

Data interface
A USB port allows you to import and export configuration files.

Software options
Software options allow you to adapt the capabilities of the ND 7000 digital readouts to the given requirements. These software options can be activated by entering a license key. Please contact HEIDENHAIN for more information.

<table>
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<th>Axes</th>
<th>Encoder inputs</th>
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<td>Up to 3 axes</td>
<td>1 Vpp, 11 µAPP, EnDat 2.2</td>
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<table>
<thead>
<tr>
<th>Display step</th>
<th>Display</th>
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</thead>
<tbody>
<tr>
<td>Linear axis: 1 mm to 0.000 01 mm</td>
<td>7-inch screen for touch operation; resolution: 800 x 480 pixels for position values, dialog boxes, data entry, and graphical functions</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>For milling and drilling</th>
<th>For turning</th>
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<tbody>
<tr>
<td>Calculation of positions for hole patterns (circular, linear)</td>
<td>Measurement of tool dimensions</td>
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<tr>
<td>Tool radius compensation</td>
<td>Sum display of axes in the top slide</td>
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<tr>
<td>Cutting data calculator</td>
<td>Taper calculator</td>
</tr>
<tr>
<td>Probing functions for preset finding (edge, centerline, and circle)</td>
<td>Switching functions</td>
</tr>
<tr>
<td>Switching functions</td>
<td>Constant cutting speed</td>
</tr>
<tr>
<td>Display and control the spindle speed</td>
<td>Display and control the spindle speed</td>
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</table>

<table>
<thead>
<tr>
<th>Error compensation</th>
<th>Linear (LEC) and segmented linear (SLEC)</th>
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</thead>
</table>

| Accessories | 1 x Ethernet 100 Mbit / 1 Gbit (RJ45), 1 x USB 2.0 (Type A) |

| Power connection | AC 100 V to 240 V (±10 %), 50 Hz to 60 Hz (±5 %), ≤ 38 W |

| Operating temperature | 0 °C to +45 °C (storage temperature: -20 °C to +70 °C) |

| Protection | EN 60529 IP65, back panel: IP40 |

| Mass | 1.30 kg = 1.50 kg |

<sup>1)</sup> Depends on the signal period or line count of the connected encoder
Connectivity comparison: ND 7013 versus ND 7013 I/O

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<th>Parameter</th>
<th>ND 7013</th>
<th>ND 7013 I/O</th>
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<td>(11 µApp 1 Vpp EnDat 2.2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital inputs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TTL 0 V to 5 V</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>High: DC 31 V to 30 V, 2.1 mA to 6.0 mA</td>
<td>–</td>
<td>24</td>
</tr>
<tr>
<td>Low: DC 3 V to 2.2 V, 0.43 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital outputs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TTL 0 V to +5 V; maximum load = 1 kΩ</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>DC 24 V (20.4 V to 28.8 V); max. 150 mA per channel</td>
<td>–</td>
<td>8</td>
</tr>
<tr>
<td>Relay outputs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. switching voltage: AC/DC 30 V, max.: 0.6 A; max. 15 W; max. continuous current: 0.5 A</td>
<td>–</td>
<td>2</td>
</tr>
<tr>
<td>Analog inputs</td>
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<td></td>
</tr>
<tr>
<td>Voltage range: DC 0 V to 5 V</td>
<td>–</td>
<td>4</td>
</tr>
<tr>
<td>Resistance range: 100 Ω ≤ R ≤ 50 kΩ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analog outputs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage range: DC –10 V to +10 V</td>
<td>–</td>
<td>4</td>
</tr>
<tr>
<td>Maximum load: 1 kΩ</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 V voltage outputs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage tolerance: ±5 %; maximum current: 100 mA</td>
<td>–</td>
<td>1</td>
</tr>
<tr>
<td>Touch probe connection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Voltage supply: DC 5 V or DC 12 V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital inputs: TTL 0 V to +5 V (low active)</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Digital outputs: TTL 0 V to 5 V, maximum load = 1 kΩ</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

User-controlled functions

<table>
<thead>
<tr>
<th>Type</th>
<th>Function</th>
<th>ND 7013</th>
<th>ND 7013 I/O</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logo</td>
<td>Call-up of operating instructions or OEM service information</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Spindle speed</td>
<td>Pre-assignment of spindle speeds (radio buttons)</td>
<td>–</td>
<td>✓</td>
</tr>
<tr>
<td>M function</td>
<td>Freely definable functions</td>
<td>–</td>
<td>✓</td>
</tr>
<tr>
<td>Special functions</td>
<td>Selection between thread cutting, direction of spindle rotation, coolant during spindle operation, or clamping of axes</td>
<td>–</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Zeroing of the tool axis</td>
<td>–</td>
<td>✓</td>
</tr>
<tr>
<td>Document</td>
<td>Display of tables (e.g., thread tables, cutting speeds)</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Further information:
Operating instructions
ND 7000 – Milling ID 1308766-xx
ND 7000 – Turning ID 1308767-xx
Or on the Internet under www.heidenhain.com/service/downloads/documentation
POSITIP 8000
Digital readout for milling machines, drilling machines, and lathes with up to six axes

POSITIP 8000 digital readouts are suitable for manually operated milling machines, drilling machines, and lathes with up to six axes. Integrated switching inputs and outputs permit interaction with the machine and enable the implementation of simple automated tasks.

With the POSITIP 8016 ACTIVE, up to three NC axes plus a spindle can be configured and controlled. The simultaneous movement of multiple axes and functions for machine safety are not supported.

Design
The POSITIP 8000 digital readouts are designed for harsh shop environments. They feature a sturdy aluminum housing with touchscreen operation.

Thanks to the intuitive, user-friendly graphical user interface, the POSITIP digital readouts are particularly easy to operate. Everything you need to know for machining your workpiece is displayed on an easy to read 12-inch screen.

The low-profile aluminum housing, featuring an integrated power supply unit and fanless passive cooling system, is extremely rugged and durable. Its intuitive touchscreen made of specially hardened glass can even be operated with gloves.

Functions
The POSITIP 8000 digital readouts offer many useful functions for machining with manually operated machine tools. Self-explanatory operating elements and language-sensitive information in plain language permit 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. This feature is particularly useful during the execution of programs.

Of course, the POSITIP 8000 digital readouts also offer special functions for milling and turning operations, such as:
- Hole patterns (linear, circular)
- Radius/diameter switching
- Sum display for the top slide

Preset can be found fast and accurately with an edge finder. The POSITIP digital readouts support you with special probing functions.

You can individually configure the POSITIP 8000 digital readouts and save your settings in the user administration.

Data interface
A USB port allows you to import and export configuration files and programs. The Ethernet interface allows programs to be saved or imported over a network.

Software options
Software options allow you to adapt the capabilities of the POSITIP 8000 digital readouts to the given requirements. These software options can be activated by entering a license key. Please contact HEIDENHAIN for more information.

For milling and drilling
- Calculation of positions for hole patterns (circular, linear)
- Tool radius compensation
- Cutting data calculator
- Probing functions for preset finding (edge, centerline, and circle)
- Switching functions

For turning
- Measurement of tool dimensions
- Sum display of axes in the top slide
- Taper calculator
- Switching functions

Error compensation
Linear (LEC) and segmented linear (SLEC)

Data interface
2 x Ethernet 100 Mbit/1 Gbit (RJ45), 4 x USB 2.0 (Type A)

Accessories
Single-Pos/Duo-Pos/Multi-Pos stands, Multi-Pos holder, mounting frame, power cable, and adapter connector

Power connection
AC 100 V to 240 V (±10 %), 50 Hz to 60 Hz (±5 %)
POSTITIP 8016 ACTIVE: ≤ 79 W; POSTITIP 8016: ≤ 38 W

Operating temperature
0 °C to +45 °C (storage temperature: −20 °C to +70 °C)

Protection EN 60529
IP65; back panel: IP40

Mounting
Single-Pos stand, Duo-Pos stand, Multi-Pos stand, Multi-Pos holder, fastening systems compatible with VESA MIS-D 100

Mass
≤ 3.50 kg

1) Depends on the signal period or line count of the connected encoder
Connectivity comparison: POSITIP 8016 versus POSITIP 8016 ACTIVE

<table>
<thead>
<tr>
<th>Encoder interfaces</th>
<th>POSITIP 8016</th>
<th>POSITIP 8016 ACTIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>(11 µA max 1 Vpp EnDat 2.2)</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>2 additional ones as a software option</td>
<td>2 additional ones as a software option</td>
</tr>
</tbody>
</table>

**Digital inputs**
- TTL 0 V to 5 V: 8
- High: DC 11 V to 30 V, 2.1 mA to 6.0 mA, Low: DC 3 V to 2.2 V, 0.43 mA
- 4 additional ones as a software option

**Digital outputs**
- TTL 0 V to +5 V, maximum load: 1 kΩ: 16
- DC 24 V (20.4 V to 28.8 V), max. 150 mA per channel: 8
- 4 additional ones as a software option

**Relay outputs**
- Max. switching voltage: AC/DC 30 V, max. 0.5 A, max. 15 W, max. continuous current: 0.5 A: 2

**Analog inputs**
- Voltage range: DC 0 V to 5 V
- Resistance range: 100 Ω ≤ R ≤ 50 kΩ
- Only with NC software option

**Analog outputs**
- Voltage range: DC –10 V to +10 V
- Maximum load: 1 kΩ
- Only with NC software option

**5 V voltage outputs**
- Voltage tolerance: ±5 %, maximum current: 100 mA
- 1

**User-controlled functions**

<table>
<thead>
<tr>
<th>Type</th>
<th>Function</th>
<th>PT 8016</th>
<th>PT 8016 ACTIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logo</td>
<td>Call-up of operating instructions or OEM service information</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>Programming</td>
<td>–</td>
<td>–</td>
<td>√</td>
</tr>
<tr>
<td>Spindle speed</td>
<td>Pre-assignment of spindle speeds (radio buttons)</td>
<td>–</td>
<td>√</td>
</tr>
<tr>
<td>M function</td>
<td>Freely definable functions</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td></td>
<td>Direction of spindle rotation</td>
<td>–</td>
<td>√</td>
</tr>
<tr>
<td></td>
<td>Coolant during spindle operation</td>
<td>–</td>
<td>√</td>
</tr>
<tr>
<td></td>
<td>Clamping of axes</td>
<td>–</td>
<td>Only with NC software option</td>
</tr>
<tr>
<td></td>
<td>Coolant</td>
<td>–</td>
<td>√</td>
</tr>
<tr>
<td></td>
<td>Zeroing of the tool axis</td>
<td>–</td>
<td>√</td>
</tr>
<tr>
<td>Document</td>
<td>Display of tables (e.g., thread tables, cutting speeds)</td>
<td>√</td>
<td>√</td>
</tr>
</tbody>
</table>

Further information:
- Operating instructions
  - POSITIP 8000 – Milling ID 1317302-xx
  - POSITIP 8000 – Turning ID 1317303-xx
- Or on the Internet under www.heidenhain.com/service/downloads/documentation
Mounting and accessories

Types of mounting

The digital readouts feature setup flexibility thanks to the Single-Pos, Duo-Pos, and Multi-Pos stands. The Multi-Pos holder and the mounting frame are suitable for mounting onto the machine.

**ND 5000 mounting types**
- Single-Pos stand
- Multi-Pos holder on mounting arm
- Mounting frame

**ND 7000 mounting types**
- Single-Pos stand
- Duo-Pos stand
- Multi-Pos stand
- Multi-Pos holder on mounting arm
- Mounting frame

**POSITIP 8000 mounting types**
- Single-Pos stand
- Duo-Pos stand
- Multi-Pos stand
- Multi-Pos holder on mounting arm
- Mounting frame

**ND 5000 dimensions**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>105 mm</td>
</tr>
<tr>
<td>Height</td>
<td>150 mm</td>
</tr>
<tr>
<td>Depth</td>
<td>45 mm</td>
</tr>
</tbody>
</table>

**ND 5000 accessories**

- **Single-Pos stand**
  Included in delivery. For setup on and fastening to a surface (20° tilt).
  ID 1197273-01

- **Mounting arm, straight**
  For mounting onto a machine.
  ID 1088207-01

- **Multi-Pos holder**
  For fastening onto the mounting arm.
  ID 1197273-02

- **Mounting frame**
  For integration into a panel.
  ID 1197274-01
Mounting and accessories

ND 7000 dimensions

ND 7000 accessories

Single-Pos stand
Included in delivery.
For setup on and fastening to a surface (20° tilt).
ID 1089230-05

Multi-Pos stand
For setup on and fastening to a horizontal surface (90° continuous tilt range).
ID 1089230-07

Duo-Pos stand
For setup on and fastening to a horizontal surface (20° or 40° tilt).
ID 1089230-08

Mounting arm, straight
For fastening to a machine.
ID 1089207-01

Multi-Pos holder
For fastening to an arm (90° continuous tilt range).
ID 1089230-08

Mounting frame
For integration into a panel.
ID 1089208-01

Adapter connector
For pin layout conversion after a replacement (e.g., from ND 780 to ND 7000).
ID 1089214-01

PC demo software under
www.heidenhain.com/software
Digital Readouts » ND 7000 » Software DEMO
Mounting and accessories

**POSITIP 8000 dimensions**

**POSITIP 8000 accessories**

*Single-Pos stand*
Included in delivery.
For setup on and fastening to a surface (20° tilt).
ID 1089230-01

*Multi-Pos stand*
For setup on and fastening to a horizontal surface (90° or 45° tilt).
ID 1089230-02

**Duos-Pos stand**
For setup on and fastening to a horizontal surface (90° or 45° tilt).
ID 1089230-02

*Mounting arm, straight*
For fastening to a machine.
ID 1089207-01

*Multi-Pos holder*
For fastening to an arm (90° continuous tilt range).
ID 1089230-04

*Mounting frame*
For integration into a panel.
ID 1089208-02

*Adapter connector*
For pin layout conversion after a replacement (e.g., from PT 880 to POSITIP 8000).
ID 1089214-01

PC demo software under
www.heidenhain.com/software
> Digital Readouts > POSITIP 8000 > Software DEMO
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 30 040 mm or 28 040 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.

### Table: Linear encoders for manually operated machine tools

<table>
<thead>
<tr>
<th>Scale housing</th>
<th>Accuracy grade</th>
<th>Measuring lengths</th>
<th>Interface</th>
<th>Signal period</th>
<th>Model</th>
<th>Further information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slimline</td>
<td>±10 µm</td>
<td>70 mm to 1240 mm</td>
<td>TTL</td>
<td>20 µm</td>
<td>LS 328 C</td>
<td>Page 32</td>
</tr>
<tr>
<td>Full-size</td>
<td>±10 µm</td>
<td>140 mm to 3040 mm</td>
<td>TTL</td>
<td>20 µm</td>
<td>LS 688 C</td>
<td>Page 36</td>
</tr>
</tbody>
</table>

### Table: Linear encoders for numerically controlled machine tools

<table>
<thead>
<tr>
<th>Scale housing</th>
<th>Accuracy grade</th>
<th>Measuring lengths</th>
<th>Interface</th>
<th>Signal period</th>
<th>Model</th>
<th>Further information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slimline</td>
<td>±5 µm ±3 µm</td>
<td>70 mm to 1240 mm</td>
<td>1 Vpp</td>
<td>20 µm</td>
<td>LS 487</td>
<td>Brochure: Linear Encoders for Numerically Controlled Machine Tools</td>
</tr>
<tr>
<td>Full-size</td>
<td>±5 µm ±3 µm</td>
<td>140 mm to 3040 mm</td>
<td>1 Vpp</td>
<td>20 µm</td>
<td>LS 187</td>
<td>LC 115</td>
</tr>
<tr>
<td></td>
<td>±5 µm ±3 µm</td>
<td>140 mm to 3040 mm</td>
<td>1 Vpp</td>
<td>20 µm</td>
<td>LS 177</td>
<td>LC 115</td>
</tr>
<tr>
<td></td>
<td>±5 µm ±3 µm</td>
<td>440 mm to 30040 mm</td>
<td>1 Vpp</td>
<td>40 µm</td>
<td>LB 382</td>
<td>Brochure: Linear Encoders for Numerically Controlled Machine Tools</td>
</tr>
<tr>
<td></td>
<td>±5 µm ±3 µm</td>
<td>4240 mm to 28040 mm</td>
<td>1 Vpp</td>
<td>40 µm</td>
<td>LC 281</td>
<td>LC 211</td>
</tr>
</tbody>
</table>

For additional information, please refer to the Linear Encoders for Numerically Controlled Machine Tools brochure.
LS 300 series

<table>
<thead>
<tr>
<th>Specifications</th>
<th>LS 383&lt;sup&gt;1)&lt;/sup&gt;</th>
<th>LS 373&lt;sup&gt;2)&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring standard</td>
<td>Glass scale</td>
<td></td>
</tr>
<tr>
<td>Coefficient of linear expansion</td>
<td>$a_{Linear} = 8 \cdot 10^{-6} \text{ K}^{-1}$</td>
<td></td>
</tr>
<tr>
<td>Accuracy grade</td>
<td>±5 µm</td>
<td></td>
</tr>
<tr>
<td>Measuring length ML*</td>
<td>in mm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>70 120 170 220 270 320 370 420 470 520 570 620 670 720</td>
<td></td>
</tr>
<tr>
<td>Reference marks</td>
<td>LS 3x3: 1 reference mark in the middle</td>
<td>LS 3x3C: Distance-coded</td>
</tr>
<tr>
<td>Interface</td>
<td>≃ 1 Vpp</td>
<td>≃ 1 Vpp</td>
</tr>
<tr>
<td>Integrated interpolation</td>
<td>–</td>
<td>1-fold 5-fold 10-fold 20-fold</td>
</tr>
<tr>
<td>Measuring step</td>
<td>–</td>
<td>5 µm 1 µm 0.5 µm 0.25 µm</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>5 V ±0.25 V/≤ 150 mA</td>
<td></td>
</tr>
<tr>
<td>Electrical connection</td>
<td>PUR cable and PUR cable with metal armor; cable outlet to the right on the mounting block</td>
<td></td>
</tr>
<tr>
<td>Cable length</td>
<td>3 m, 6 m</td>
<td></td>
</tr>
<tr>
<td>Connecting element</td>
<td>15-pin D-sub connector (male) 15-pin D-sub connector (female) 12-pin M23 connector (male)</td>
<td>15-pin D-sub connector (male) 9-pin D-sub connector (male) 12-pin M23 connector (male)</td>
</tr>
<tr>
<td>Traversing speed</td>
<td>≤ 60 m/min</td>
<td></td>
</tr>
<tr>
<td>Required moving force</td>
<td>≤ 5 N</td>
<td></td>
</tr>
<tr>
<td>Vibration</td>
<td>55 Hz to 2000 Hz</td>
<td>≤ 100 m/s²</td>
</tr>
<tr>
<td>Shock</td>
<td>6 ms</td>
<td>≤ 200 m/s²</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0 °C to 50 °C</td>
<td></td>
</tr>
<tr>
<td>Protection</td>
<td>IEC 60529 IP53</td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>0.3 kg + 0.57 kg/m of measuring length</td>
<td></td>
</tr>
</tbody>
</table>

* Please select when ordering.

<sup>1)</sup> The LS 487 is available as a replacement device through the HEIDENHAIN Service department on short notice.

<sup>2)</sup> The LS 477 is available as a replacement device through the HEIDENHAIN Service department on short notice.
### LS 300 series

#### Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Incremental</th>
<th>LS 388C</th>
<th>LS 328C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring standard</td>
<td>Glass scale with DIADUR graduation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accuracy grade</td>
<td>±10 µm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measuring length ML*</td>
<td>70 120 170 220 270 320 370 420 470 520 570 620 670 720 770 820 870 920 970 1020 1140 1240</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interface</td>
<td>TTL</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grating period</td>
<td>20 µm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Edge separation a</td>
<td>≤5 µs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference mark</td>
<td>Distance-coded</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommended measuring step</td>
<td>10 µm, 5 µm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply voltage</td>
<td>DC 5 V ±0.25 V or 100 mA (without load)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical connection</td>
<td>Separate adapter cable connectable to mounting block</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cable length</td>
<td>≤30 m (with HEIDENHAIN cable)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traversing speed</td>
<td>≤60 m/min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Required moving force</td>
<td>≤5 N</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration 55 Hz to 2000 Hz</td>
<td>≤150 m/s² (EN 60068-2-6)</td>
<td>≤300 m/s² (EN 60068-2-27)</td>
<td></td>
</tr>
<tr>
<td>Shock 5 ms</td>
<td>≤300 m/s² (EN 60068-2-27)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0°C to 50°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection EN 60529</td>
<td>IP53 when mounted as per the mounting instructions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>0.27 kg + 0.07 kg/m measuring length</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Please select when ordering

1 For position measurement

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Please refer to the General electrical information in the Interfaces of HEIDENHAIN Encoders brochure, especially when connecting non-HEIDENHAIN electronics.
LS 600 series

Specifications

<table>
<thead>
<tr>
<th>Incremental</th>
<th>LS 688C</th>
<th>LS 628C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring standard</td>
<td>Glass scale with DIADUR graduation</td>
<td></td>
</tr>
<tr>
<td>Accuracy grade</td>
<td>±10 µm</td>
<td></td>
</tr>
<tr>
<td>Measuring length ML*</td>
<td>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</td>
<td></td>
</tr>
<tr>
<td>Interface</td>
<td>1 Vpp</td>
<td>TTL</td>
</tr>
<tr>
<td>Grating period</td>
<td>20 µm</td>
<td></td>
</tr>
<tr>
<td>Edge separation a</td>
<td>≤ 5 µs</td>
<td></td>
</tr>
<tr>
<td>Reference mark</td>
<td>Distance-coded</td>
<td></td>
</tr>
<tr>
<td>Recommended measuring step 1)</td>
<td>10 µm, 5 µm</td>
<td></td>
</tr>
<tr>
<td>Supply voltage</td>
<td>DC 5 V ±0.25 V/ 100 mA (without load)</td>
<td></td>
</tr>
<tr>
<td>Electrical connection</td>
<td>Separate adapter cable connectable to mounting block</td>
<td></td>
</tr>
<tr>
<td>Cable length</td>
<td>≤ 30 m (with HEIDENHAIN cable)</td>
<td></td>
</tr>
<tr>
<td>Traversing speed</td>
<td>≤ 60 m/min</td>
<td></td>
</tr>
<tr>
<td>Required moving force</td>
<td>≤ 5 N</td>
<td></td>
</tr>
<tr>
<td>Vibration 55 Hz to 2000 Hz</td>
<td>≤ 150 m/s² (EN 60068-2-39)</td>
<td>≤ 300 m/s² (EN 60068-2-27)</td>
</tr>
<tr>
<td>Shock 6 ms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0 °C to 50 °C</td>
<td></td>
</tr>
<tr>
<td>Protection EN 60529</td>
<td>IP53 when mounted as per the mounting instructions</td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>0.7 kg + 2 kg/m ML*</td>
<td></td>
</tr>
</tbody>
</table>

1) For position measurement

* Please select when ordering

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

Digital Readouts
Brochure
Cables and Connectors
Contents:
Technical properties, cable overviews, and cable lists

Brochure
Interfaces of HEIDENHAIN Encoders
Contents:
Information on serial interfaces, sinuoidal signals, square-wave signals, and commutation signals

Further HEIDENHAIN products
Brochure
Touch Probes
Contents:
Tool touch probes TT
Workpiece touch probes TS

Brochure
Encoders for Servo Drives
Contents:
Rotary encoders
Linear encoders

Brochure
Angle Encoder Modules
Contents:
Angle encoder modules MRSP2000, MRSP5000, MRSP8000
Angle encoder modules with integrated torque motor MRSP5000, AccuET

Brochures
TNC 128 Straight-Cut Control
TNC 320 Contouring Control
ITNC 530 Contouring Control
TNC 620 Contouring Control
TNC 640 Contouring Control
Contents:
Information for the user

Brochures
MANUALplus 620 Contouring Control
CNC PILOT 640 Contouring Control
Contents:
Information for the user

OEM brochures
TNC 128 Straight-Cut Control
TNC 320 Contouring Control
ITNC 530 Contouring Control
TNC 620 Contouring Control
TNC 640 Contouring Control
Contents:
Information for the machine tool builder

OEM brochures
MANUALplus 620 Contouring Control
CNC PILOT 640 Contouring Control
Contents:
Information for the machine tool builder

OEM brochures
ITNC 530 Contouring Control
TNC 640 Contouring Control
Contents:
Linear encoders

Brochure
Linear Encoders
For Numerically Controlled Machine Tools
Contents:
Absolute linear encoders LC
Incremental linear encoders LB, LF, LS

Brochure
Angle Encoders with Integral Bearing
Contents:
Absolute angle encoders RON, RPN, ROD

Brochure
Modular Angle Encoders
With Optical Scanning
Contents:
Incremental angle encoders ERR ERO, ERA

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44470 Dortmund, Germany
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HEIDENHAIN Technisches Büro Südwest
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0 711 93 3955-0
HEIDENHAIN Technisches Büro Südost
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0 89 6691-3137

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76711 Leinfelden-Echterdingen, Germany
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