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.

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.

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

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

You can find more information online at www.heidenhain.com, or in the Evaluation Electronics For Metrology Applications 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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Linear encoders for machine tools

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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.
Typical characteristics:
- 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.

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.

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

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<td>Constant cutting speed (POSITIP 8016 ACTIVE)</td>
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</tbody>
</table>
Functions
Probing functions for presets

Setup made easy with probing functions
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 6000 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.

Accessory: KT edge finder
The KT edge finder is a triggering edge finder. Its cylindrical probe contact is attached to the stylus, which is spring-mounted to the housing of the edge finder. Upon contact with the workpiece, the stylus is deflected and a switching signal is output to the digital readout over the cable.

The KT edge finder allows you to find presets with greater speed and convenience without leaving marks on the workpiece.

Tool compensation

Tool compensation for milling machines
The digital readouts of the ND 5000, ND 7000 and POSITIP 6000 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 6000:
- 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.
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.

**Error compensation**
Linear (LEC) and segmented linear (SLEC) via up to 200 compensation points

**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

| 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 | Linear axis: 1 mm to 0.0001 mm; 0.005 mm with LS 328 C/LS 628 C; 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 |

1) Depends on the signal period or line count of the connected encoder
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
- 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 touchscreen 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
- Radius/diameter switching
- Sum display for the top slide
- Presets 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.

**Axes**

Up to 3 axes

**Encoder inputs**

- 1 Vpp, 11 µAPP, EnDat 2.2

**Display step**

Linear axes: 1 mm to 0.000 01 mm

**Display**

7-inch screen for touch operation; resolution: 800 x 480 pixels for position values, dialog boxes, data entry and graphical functions

**Functions**

- User administration and file management
- 100 presets, 100 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
- Program creation and execution with up to 100 machining blocks (PGM software option)

**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
- Display and control the spindle speed

**For turning**

- Measurement of tool dimensions
- Sum display of axes in the top slide
- Taper calculator
- Switching functions
- Constant cutting speed
- Display and control the spindle speed

**Error compensation**

Linear (LEC) and segmented linear (SLEC)

**Data interface**

1 x Ethernet 100 Mbit / 1 Gbit (RJ45), 1 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 %); ≤ 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 with a 50 mm x 50 mm hole pattern

**Mass**

- ND 7013
- 1.0 kg
- ND 7013 I/O
- 1.5 kg

1) 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>Encoder interfaces</th>
<th>ND 7013</th>
<th>ND 7013 I/O</th>
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<td>(11 µAPP, 1 Vpp, EnDat 2.2)</td>
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</tr>
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</table>

**Digital inputs**
- TTL 0 V to 5 V
  - 4
- High: DC 11 V to 30 V, 2.1 mA to 6.0 mA
  - Low: DC 2 V to 2.2 V, 0.43 mA
  - 24

**Digital outputs**
- TTL 0 V to +5 V, maximum load = 1 kΩ
  - 1
- DC 24 V (0.4 V to 28.8 V); max. 150 mA per channel
  - 8

**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
  - 4
- Resistance range: 100 Ω ≤ R ≤ 50 kΩ

**Analog outputs**
- Voltage range: DC –10 V to +10 V
  - 4
- Maximum load: 1 kΩ

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

**Touch probe connection**
- Voltage supply: DC 5 V or DC 12 V
- Digital inputs: TTL 0 V to +5 V (low active)
  - 4
- Digital outputs: TTL 0 V to 5 V, maximum load = 1 kΩ
  - 1

### User-controlled functions

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<tr>
<th>Type</th>
<th>Function</th>
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<th>ND 7013 I/O</th>
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<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>

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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/download/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

Presets 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.

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

Data interface
2 x Ethernet 100 Mbit/s (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 %)

POSITIP 8016 ACTIVE: ≤ 79 W; POSITIP 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>
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<tr>
<th>Encoder interfaces</th>
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<tbody>
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<td>(11 µApp, 1 Vpp, EnDat 2.2)</td>
<td>4 2 additional ones as a software option</td>
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</table>

<table>
<thead>
<tr>
<th>Digital inputs</th>
<th>POSITIP 8016</th>
<th>POSITIP 8016 ACTIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TTL 0 V to 5 V</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>High: DC 3 V to 30 V, 2.1 mA to 6.0 mA; Low: DC 2 V to 2.2 V, 0.43 mA</td>
<td>–</td>
<td>24</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digital outputs</th>
<th>POSITIP 8016</th>
<th>POSITIP 8016 ACTIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>TTL 0 V to +5 V, maximum load = 1 kΩ</td>
<td>16</td>
<td>16</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>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relay outputs</th>
<th>POSITIP 8016</th>
<th>POSITIP 8016 ACTIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. switching voltage: AC/DC 30 V; max.: 0.5 A; max. 15 W; max. continuous current: 0.5 A</td>
<td>–</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analog inputs</th>
<th>POSITIP 8016</th>
<th>POSITIP 8016 ACTIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage range: DC 0 V to 5 V; Resistance range: 100 Ω ≤ R ≤ 50 kΩ</td>
<td>–</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analog outputs</th>
<th>POSITIP 8016</th>
<th>POSITIP 8016 ACTIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage range: DC –10 V to +10 V; Maximum load: 1 kΩ</td>
<td>–</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5 V voltage outputs</th>
<th>POSITIP 8016</th>
<th>POSITIP 8016 ACTIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage tolerance: ±5 %; maximum current: 100 mA</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

### 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](http://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
- 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

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

Tilt/swivel set
Holder for mounting arm
ID 1298187-01

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

**ND 7000 dimensions**

![Diagram of ND 7000 dimensions]

**ND 7000 accessories**

**Single-Pos stand**
Included in delivery. For setup on and fastening to a surface (20° tilt).
ID 1089230-06

**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 45° 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 1089230-09

**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 Dimensions Diagram]

### 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

**Duo-Pos stand**
For setup on and fastening to a horizontal surface (90° or 45° tilt).
ID 1089230-03

**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

#### 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>±5 µm</td>
<td>70 mm to 1240 mm</td>
<td>TTL</td>
<td>20 µm</td>
<td>LS 383C</td>
<td>Page 32</td>
</tr>
<tr>
<td>Full-size</td>
<td>±5 µm</td>
<td>140 mm to 3040 mm</td>
<td>TTL</td>
<td>20 µm</td>
<td>LS 683C</td>
<td>Page 34</td>
</tr>
</tbody>
</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>±3 µm</td>
<td>70 mm to 1240 mm</td>
<td>TTL</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>±3 µm</td>
<td>140 mm to 3040 mm</td>
<td>TTL</td>
<td>Down to 1 µm</td>
<td>LS 477</td>
<td></td>
</tr>
</tbody>
</table>

#### Absolute Linear Encoders

<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>±3 µm</td>
<td>70 mm to 1240 mm</td>
<td>EnDat 2.2</td>
<td>–</td>
<td>LC 415</td>
<td></td>
</tr>
<tr>
<td>Full-size</td>
<td>±3 µm</td>
<td>140 mm to 3040 mm</td>
<td>EnDat 2.2</td>
<td>–</td>
<td>LC 115</td>
<td></td>
</tr>
</tbody>
</table>

#### Linear Encoders for Long Traverses

LB 383 or LC 200 encoders with a full-size scale housing enable measuring lengths of up to 70 040 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 383 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.

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 ±5 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 ±3 µm per meter of traverse.

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 383 or LC 200 encoders with a full-size scale housing enable measuring lengths of up to 70 040 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 383 and LC 200 can be found in the Linear Encoders for Numerically Controlled Machine Tools brochure.
LS 300 series

Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>LS 383(1)</th>
<th>LS 373(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring standard</td>
<td>Glass scale</td>
<td></td>
</tr>
<tr>
<td>Coefficient of linear expansion</td>
<td>$\alpha_{\text{therm}} = 8 \cdot 10^{-6} , \text{K}^{-1}$</td>
<td></td>
</tr>
<tr>
<td>Accuracy grade</td>
<td>±5 µm</td>
<td></td>
</tr>
<tr>
<td>Measuring length ML* in mm</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>
</tr>
<tr>
<td>Reference marks</td>
<td>LS 3x3: One reference mark in the middle LS 3x3C: Distance-coded(3)</td>
<td></td>
</tr>
<tr>
<td>Interface</td>
<td>$\sim$ 1 Vpp F TTL</td>
<td></td>
</tr>
<tr>
<td>Signal period</td>
<td>20 µm</td>
<td></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/ &lt; 150 mA</td>
<td></td>
</tr>
<tr>
<td>Electrical connection</td>
<td>PUR connecting 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>≤ 100 m/s²</td>
<td>≤ 200 m/s²</td>
</tr>
<tr>
<td>Shock</td>
<td>6 ms</td>
<td></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 without cable</td>
<td>0.3 kg ± 0.57 kg/m of measuring length</td>
<td></td>
</tr>
</tbody>
</table>

1) The LS 487 is available as a replacement device through the HEIDENHAIN Service department on short notice
2) The LS 477 is available as a replacement device through the HEIDENHAIN Service department on short notice
3) Starting value for version with distance-coded reference marks between 0 mm and 3200 mm
### Specifications

#### LS 683 C
- Measuring standard: Glass scale
- Coefficient of linear expansion: \( a = 8 \times 10^{-6} \text{ K}^{-1} \)
- Accuracy grade: \( \pm 5 \mu \text{m} \)
- Measuring length (ML)* in mm:
  - 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
- Reference mark: Distance-coded
- Interface: TTL
- Signal period: 20 \( \mu \text{m} \)
- Integrated interpolation: 1-fold
- Measuring step: 5 \( \mu \text{m} \)
- Supply voltage: 5 V \( \pm 0.25 \text{ V} \)
- Electrical connection:
  - PUR cable and PUR cable with metal armor; cable outlet to the right on the mounting block
  - Cable length: 3 m, 6 m
  - Connecting element:
    - 15-pin D-sub connector (male)
    - 15-pin D-sub connector (female)
    - 12-pin M23 connector (male)
    - 9-pin D-sub connector (male)
    - 12-pin M23 connector (male)
- Traversing speed: \( \leq 60 \text{ m/min} \)
- Required moving force: \( \leq 5 \text{ N} \)
- Vibration: 65 Hz to 2000 Hz
- Shock: 6 ms
- Operating temperature: 0 °C to 50 °C
- Protection: IP53 (IP64 with sealing air via DA 400)
- Mass without cable: 0.45 kg to 2.44 kg/m of measuring length

#### LS 673 C
- Measuring length (ML)* in mm:
  - 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
- Reference mark: Distance-coded
- Interface: TTL
- Signal period: 20 \( \mu \text{m} \)
- Integrated interpolation: 1-fold
- Measuring step: 5 \( \mu \text{m} \)
- Supply voltage: 5 V \( \pm 0.25 \text{ V} \)
- Electrical connection:
  - PUR cable and PUR cable with metal armor; cable outlet to the right on the mounting block
  - Cable length: 3 m, 6 m
  - Connecting element:
    - 15-pin D-sub connector (male)
    - 15-pin D-sub connector (female)
    - 12-pin M23 connector (male)
    - 9-pin D-sub connector (male)
    - 12-pin M23 connector (male)
- Traversing speed: \( \leq 60 \text{ m/min} \)
- Required moving force: \( \leq 5 \text{ N} \)
- Vibration: 65 Hz to 2000 Hz
- Shock: 6 ms
- Operating temperature: 0 °C to 50 °C
- Protection: IP53 (IP64 with sealing air via DA 400)
- Mass without cable: 0.45 kg to 2.44 kg/m of measuring length

* Please select when ordering

Starting value for version with distance-coded reference marks between 0 mm and 3200 mm