



Working with the digital readouts

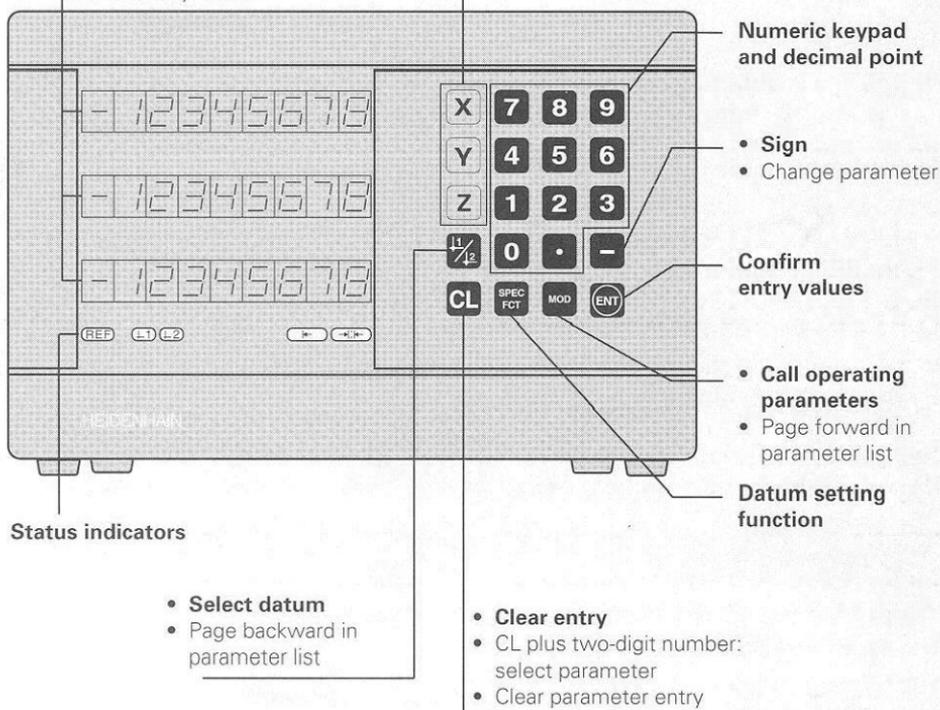
ND 510

ND 550

Actual value and input display

(7-segment LED,
8 decades and sign)
Downwards: X-axis, Y-axis,
ND 550 only: Z-axis

- Select coordinate axis
(Z-axis with ND 550 only)
- Select axis-based operating parameters



- Select datum
- Page backward in parameter list

- Clear entry
- CL plus two-digit number: select parameter
- Clear parameter entry

Indicator	Meaning
REF	Reference mark was crossed over – datum points are now stored in non-volatile memory. Blinking: Waiting for reference mark to be crossed over.
↓1 / ↓2	Datum point 1 / Datum point 2 currently active.
→	Define workpiece edge as datum. Blinking: Waiting for operator to confirm selection.
→ : ←	Define centerline between two workpiece edges as datum. Blinking: Waiting for operator to confirm selection.

The ND 510 and ND 550 digital readouts can be used with HEIDENHAIN linear encoders with sinusoidal output signals.

These linear encoders have one or more reference marks, preferably of the *distance-coded* type. When a reference mark is crossed over, a signal is generated which identifies that position as a reference point.

After switch-on, simply crossing over the reference mark restores the relationship between axis positions and display values last defined by datum setting.

With distance-coded reference marks, a maximum traverse of only 20 mm is sufficient to re-establish the relationship between axis positions and display values after switch-on.

Switch-On

Turn on the power

- ⇒ The power switch is located on the rear panel.
The display shows `ENT. .CL` and **REF blinks**.

Turn on reference mark evaluation

- ⇒ Press the ENT key.
The display shows the value last assigned to the reference mark position, the **REF indicator glows** and the **decimal point blinks**.

Cross over the reference mark in each axis

- ⇒ Move the axes one after the other until the display becomes active and the **decimal point glows**.

The display unit is now ready for operation.

If you do **not** wish reference mark evaluation, press **CL** instead of ENT.

Setting the Datum

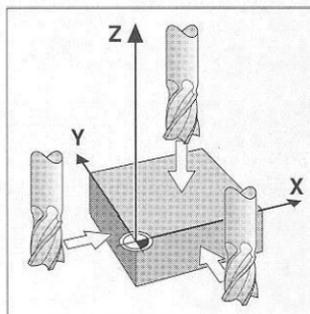
The datum setting procedure assigns a display value to a specific axis position. Two separate datum points can be defined.

You can switch from one datum to the other at the touch of a key.

Use datum 2 if you want to display incremental values.

- ⇒ Select the **datum**.
- ⇒ Select the **coordinate axis** in which the tool moves, for example the X-axis.
- ⇒ **Touch** the workpiece with the tool.
- ⇒ Enter the **position** of the tool center with the numeric keypad, for example $X = -5$ [mm]. The **minus sign** can only be entered when at least one digit is shown in the display.
- ⇒ Press **ENT**.
The display unit stores the value for this tool position.

Follow the above procedure for other axes.



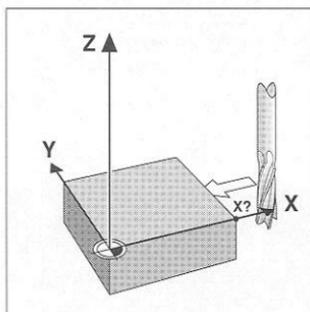
Touching the workpiece

Datum Setting Functions

The special functions which your display unit is capable of allow you to define a workpiece edge or the centerline between two workpiece edges as the datum. With the SPEC FCT feature, the display unit takes into account the **tool diameter** you entered in operating parameter **P25**.

Workpiece edge as datum

- ⇒ Select the **datum**.
- ⇒ Press the **SPEC FCT** key once.
The indicator "Workpiece edge as datum" starts blinking.
- ⇒ Press **ENT**.
The indicator glows.
- ⇒ Select the **coordinate axis** in which the tool moves.
The selected coordinate axis glows more brightly.
- ⇒ **Touch** the workpiece with the tool.
- ⇒ Press **ENT**.
The display shows the current position of the edge.
- ⇒ Enter the new **coordinate value** for the workpiece edge that was touched.
- ⇒ Press **ENT**.
The display unit sets the workpiece edge to the new value and displays the position of the tool center based on the new datum.

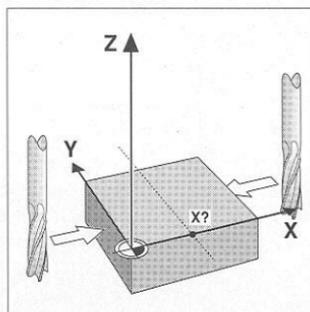


Workpiece edge as datum

This function ends automatically.

Centerline between two workpiece edges as datum

- ⇒ Select the **datum**.
- ⇒ Press the **SPEC FCT** key **twice**.
The indicator "Centerline as datum" starts blinking.
- ⇒ Press **ENT**.
The indicator glows.
- ⇒ Select the **coordinate axis** in which the tool moves.
The selected coordinate axis glows more brightly.
- ⇒ **Touch** the first workpiece edge with the tool.
- ⇒ Press **ENT**.
The decimal point in the display blinks.
- ⇒ **Touch** the second workpiece edge with the tool.
- ⇒ Press **ENT**.
The display shows the current position of the centerline.
- ⇒ Enter the new **coordinate value** for the centerline between the two touched workpiece edges.
- ⇒ Press **ENT**.
The display unit sets the centerline to the new value and displays the position of the tool center based on the new datum.



Centerline as datum

This function ends automatically.

Aborting the datum setting functions

To abort when the indicator for the function is **blinking**:

- ⇒ Press **CL**.

To abort when the indicator for the function is **glowing steadily**:

- ⇒ Press **SPEC FCT**.

Working with Scaling Factors

The ND 510 and the ND 550 can display the axis traverse lengthened or shortened by a **scaling factor**. You enter a scaling factor separately for each axis, then activate the scaling factor function.

Entering scaling factors

- ⇒ Select **operating parameter P12**.
- ⇒ Select the **coordinate axis** to which you want to apply the scaling factor.
 - Scaling factor for the **X-axis**: P12.1
 - Scaling factor for the **Y-axis**: P12.2
 - Scaling factor for the **Z-axis**: P12.3 (ND 550 only)
- ⇒ Enter the desired **scaling factor**.
- ⇒ Select the next **coordinate axis** for which you want a scaling factor, and enter the desired scaling factor.
- ⇒ When you have entered the scaling factor, press **ENT**.
 - The ND stores the values and returns to display mode.

Activating scaling factors

- ⇒ Select **operating parameter P11**.
- ⇒ Set this operating parameter to **ON**.
 - The display unit now divides all dimensions by the scaling factors in P12.

Deactivating scaling factors

- ⇒ Select **operating parameter P11**.
- ⇒ Set this operating parameter to **OFF**.
 - The scaling factors in P12 no longer affect the display.

Error Messages

Message	Cause and effect
<i>ERROR 09</i>	Traverse distance with datum setting function (SPEC FCT) is too short
<i>ERROR 10</i>	Invalid numerical value for parameter
<i>ERROR 12</i>	Value entered cannot be displayed
<i>ERROR 51</i>	Input frequency too high for encoder input (will occur for example when traverse speed too high)
<i>ERROR 53</i>	Internal counter overflow
<i>ERROR 55</i>	Error while crossing over reference marks
<i>ERROR 80</i> <i>ERROR 82</i> <i>ERROR 83</i> <i>ERROR 84</i>	Should any of these errors come up repeatedly, contact your HEIDENHAIN service agency.
<i>ERROR 98</i> <i>ERROR 99</i>	Check the operating parameters. If these errors continue to come up, contact your HEIDENHAIN service agency.

If **all decimal points light up**, the measured value is too large or too small.
Set a new datum.

To clear error message ERROR :

When you have removed the cause of the error,
⇒ press **CL**.

Operating Parameters

Operating parameters allow you to define the operating characteristics of the display unit and how the encoder signals are evaluated.

Operating parameters are designated by the letter P, a two-digit parameter number and an abbreviation. Examples: `P11 SCL` or `P25 TOOL`.

The display unit can show the current setting under the operating parameters.

Axis assignment

Parameters which are entered separately for each axis have **axis codes**:

"1" signifies the X-axis, "2" the Y-axis, and (with the ND 550) "3" the Z-axis.

A point separates the axis code from the parameter number.

In the operating parameter list, these parameters are set off with a superscript "A", the parameter for the X-axis (e.g. `P 12.1 SCL`) is in the list.

You select axis-specific operating parameters with the yellow arrow keys.

To call the operating parameter list:

⇒ Press MOD.

To go directly to a certain operating parameter:

⇒ Press and hold CL, then press the first digit of the parameter number.

⇒ Release both keys and enter the second digit of the parameter number.

To page through the operating parameter list:

⇒ **Page forward**: press MOD.

⇒ **Page backward**: press the $\downarrow 1 / \uparrow 2$ key.

Any changes are automatically activated when you resume paging.

To change a parameter setting:

⇒ Change the value with the minus key, **or**

⇒ Enter the desired value directly, e.g. for P25.

To correct an entry:

⇒ Press CL.

To exit the operating parameters:

⇒ Press ENT.

This activates all changes made.

Operating Parameter List

Parameter	Meaning	Function / Effect	Setting
P01	Unit of measurement	Display in mm	INCH OFF
		Display in inches	INCH ON
P03.1	Radius/diameter display ^A	Radius	RADIUS
		Diameter	DIA.
P11 SCL Scaling	Scaling factor	Scaling factor on	ON
		Scaling factor off	OFF
P12.1 SCL	Scaling ^A	Enter value for each axis separately	
P25 TOOL Tool	Tool diameter	Enter tool diameter	

Operating Parameter List – cont'd.

Parameter	Meaning	Function / Effect	Setting
P30.1	Counting direction A	Normal (<i>Direction: Positive</i>)	dir POS
		Inverse (<i>Direction: Negative</i>)	dir NEG
P31.1	Signal period of encoder A (<i>Period</i>): 2, 4, 10, 20, 40, 100, 200		
P32.1	Subdivision of the encoder signals A (<i>Subdivision</i>): 4, 2, 1, 0.8, 0.5, 0.4, 0.2, 0.1		
P41.1 COMP Compensation	Linear error compensation*) A - 99 999 < P41 < + 99 999 [µm/m]		
P43.1 REF Reference marks A	One reference mark		SINGLE
	Distance-coded with 500 * GP (GP = grating period)		500
	Distance-coded with 1000 * GP (e.g. for LS 303 C / LS 603 C)		1000
	Distance-coded with 2000 * GP		2000
P45.1 ENC Encoder monitoring	Encoder monitoring A		
	Monitoring off (<i>Alarm Off</i>)		ALARM OFF
	Monitoring on (<i>Alarm On</i>)		ALARM ON
P48.1	Axis display A (<i>Axis</i>)		
	Display measured position		AXIS ON
	Do not display measured position / no encoder		AXIS OFF

A These operating parameters must be entered separately for each axis.

*) Determine the entry value for P41

Example: Displayed measuring length $L_a = 620.000$ mm

Actual length (determined with, for example, the VM 101 comparator system from HEIDENHAIN) $L_t = 619.876$ mm

Length difference $\Delta L = L_t - L_a = -124$ µm

Compens. factor k: $k = \Delta L / L_a = -124 \text{ µm} / 0.62 \text{ m} = -200$ [µm/m]

Parameter Settings for HEIDENHAIN Linear Encoders

Model	Signal period [µm]	Reference marks	P43	Display step (unit: P01)		Subdivision P32
				mm	inches	
LS 303	20	one	single	0.005	0.000 2	4
LS 603 C	20	dist.c.	1000	0.01	0.000 5	2
LB 3xx	100	one	single	0.025	0.001	4
				0.05	0.002	2
				0.1	0.005	1

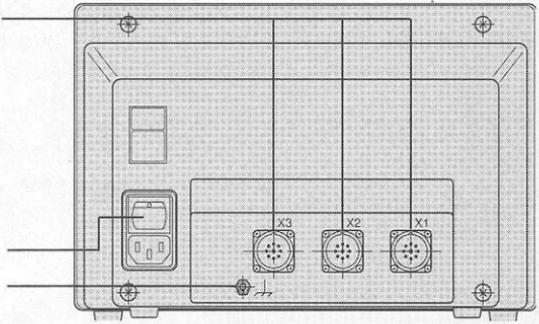
Example: Linear encoder with signal period $s = 20$ µm

Desired display step $a = 0.005$ mm

Subdivision P32 = $0.001 * s / a = 4$

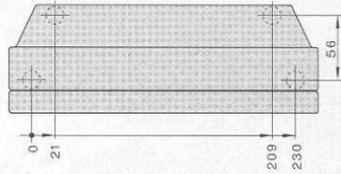
Rear Panel

- Inputs for HEIDENHAIN linear encoders
(ND 510: 2, ND 550: 3)
with sinusoidal output signals
($7\mu A_{pp}$ to $16\mu A_{pp}$),
Connecting cable max. 20 m (66 ft),
Input frequency max. 50 kHz with
6 m/20 ft cable (35 kHz with 10 m/32.8 ft,
20 kHz with 20 m/66 ft)
- Power switch
- Ground terminal



Installation

You can mount the display unit on a surface using M4 screws, or on a tilting base from HEIDENHAIN (Id.-Nr. 281 619 01). (See illustration at right)



Power Connection

Voltage range: 100 V to 240 V (- 15% to + 10%),; **frequency:** 48 Hz to 62 Hz;
power consumption: ND510: 9 W, ND550: 12 W; **line fuse:** F 1 A (in unit).



WARNING – Electric Shock Danger

Grounding conductor required. Voltage may be present on the housing if a grounding conductor is not provided or is interrupted.

Electrical outlets must have a grounding contact.

Connecting cable and extension cable must have a ground wire.

Connections should only be engaged or disengaged when the power is off.

Do not open the housing unless the power cord is unplugged.



To increase electromagnetic compatibility: Connect the ground terminal on the rear panel to the star point of machine ground. Minimum cross-section of the connecting cable: 6 mm²

Ambient Conditions

Temperature range Operation: 0°C to + 45°C (32°F to 113°F)
Storage: - 30°C to + 70°C (- 32°F to 158°F)

Rel. humidity Annual average: < 75 %; maximum: < 90 %

Weight 2.3 kg

DR. JOHANNES HEIDENHAIN GmbH

Dr.-Johannes-Heidenhain-Straße 5
D-83301 Traunreut, Deutschland

☎ (0 86 69) 31-0

FAX (0 86 69) 50 61

☎ Service (0 86 69) 31-12 72

☎ TNC-Service (0 86 69) 31-14 46

FAX (0 86 69) 98 99