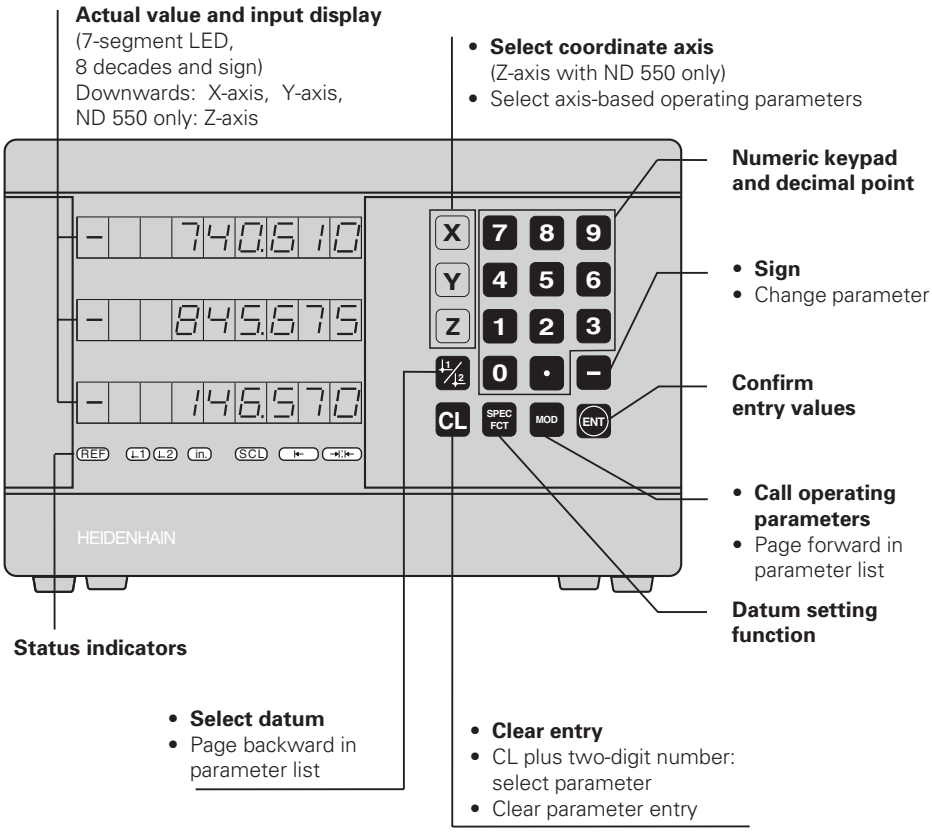
HEIDENHAIN

Working with the digital readouts

ND 510 ND 550



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.
in.	Position values displayed in inches.
⊥1 / ⊥2	Datum point 1 / Datum point 2 currently active.
SCL	Scaling factor 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.

Automation and Metrology
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The ND 510 and ND 550 digital readouts accept 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**.

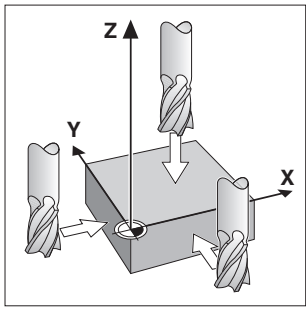
The display unit is now ready for operation.
If you do **not** wish reference mark evaluation, press **CL** instead of ENT.

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.



Touching the workpiece

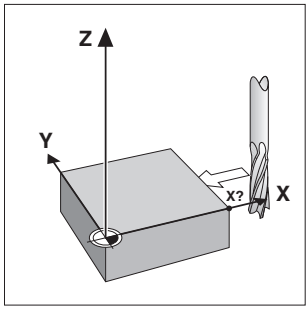
➤ Select the **datum**.
➤ Select the **coordinate axis** in which the tool moves, for example the X-axis.
➤ **Touch** the workpiece with the tool.
➤ Enter the **position** of the tool center with the numeric keypad, for example X = –5 [mm]. The **minus sign** can only be entered when at least one digit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

Follow the above procedure for other axes.

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

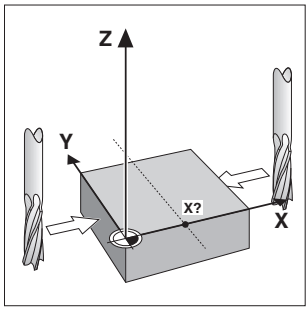


Workpiece edge as datum

- ➤ 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.

This function ends automatically.

Centerline between two workpiece edges as datum



Centerline 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.

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**.

Non-linear Error Compensation

To work with the non-linear error compensation it is necessary to
- activate the function via the operating parameter P40.
- traverse the reference marks after switching on.
- enter the compensation values in the table.

For every axis compensation values can be entered over 16 compensation points. To determine the compensation values with a comparator system from HEIDENHAIN, such as VM 101, you must select the REF display.

Selecting the Compensation Value Table

➤ Select the operating parameter P00 and enter the code number 105 296. Use the following keys for the entries:

Key	Function
MOD	Save input value and select next input parameter.
↓1 / ↓2	Save input value and select preceding input value.
SPEC FCT	Select REF display.
ENT	• Save entry. • Exit compensation value table.
CL	• Delete entry. • Delete all compensation values.

➤ Enter the parameters and compensation values as follows:

Display	Entry
CONTENTS	Enter the axis to be compensated, e.g. X.
1 FUNCT	Enter the axis causing the error, e.g. X, i.e. X = F(X).
BASE 1	Enter the datum on the axis causing the error.
d ISt 1	Enter the distance of the compensation points on the error-causing axis, e.g. 14 (= 2^{14} µm = 16.384 mm). Minimum input value: 10 (= 1.024 mm) Maximum input value: 23 (= 8388.608 mm)
nn 1	Select compensation point No. 1. The compensation point number can be seen while pressing the MOD key. After letting go of the MOD key the coordinates of the selected compensation point can be seen in the upper line. Enter the compensation value in the lower line.
nn 2	Enter all following compensation points.

Delete all compensation values:

Display	Entry
CONTENTS	Press key CL.
DELETE	Press key ENT. Compensation values are deleted.

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 in the user parameter P12, then activate the scaling factor function with the user parameter P11. **SCL** is highlighted.

Error Messages

Message	Cause and effect
error 09	Traverse distance with datum setting function (SPEC FCT) is too short
error 10	Incorrect input value
error 51	Input frequency too high for encoder input (will occur for example when traverse speed too high)
error 53	Internal counter overflow
error 55	Error while crossing over reference marks
error 80 error 82 error 83 error 84	To clear the error message: **Switch of the display unit.** Should any of these error codes recur, contact your HEIDENHAIN service agency.
error 95	Compensation values for nonlinear axis error compensation have been erased
error 97	Datums have been erased
error 99	Erase the operating parameters

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

User Parameters
User parameters are operating parameters that can be changed **without** entering the codes: P00 to P25

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.

Protected Operating Parameters
In order to change protected operating parameters, the code number 95 148 must be entered via P00 Code: They remain accessible until the position display is switched off.

To page through the operating parameter list:
➤ **Page forward**: press MOD.
➤ **Page backward**: press the ⊥1 / ⊥ 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
P00 CODE	**Code Number**	**95148:** protected operating parameter **105296:** select compensation value table	
P01	**Unit of measurement**	Display in mm Display in Zoll	INCH OFF INCH ON
P03.1	**Radius-/diameter display**[A]	**Rad**ius	RADIUS
		Diameter	dIA.
P11 SCL ***Scal**ing*	**Scaling factor**	Scaling factor on	ON
		Scaling factor off	OFF
P12.1 SCL	**Scaling factor** [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 (***Dir**ection: **Pos**itive*)	dir POS
		Inverse (***Dir**ection: **Neg**ative*)	dir NEG
P31.1	**Signal period of encoder** [A] (***Per**iod*:) 2, 4, 10, 20, 40, 100, 200		
P32.1	**Subdivision of the encoder signals** [A] (***Subd**ivision*:) 4, 2, 1, 0.8, 0.5, 0.4, 0.2, 0.1		
P40.1	**Select error compensation**	Error compensation not active	COMP.OFF
		Linear error compensation active	COMP.LIN
		Non-linear error compensation active	COMP.POS
P41.1 COM ***Com**pensation*	**Linear error compensation**[1] [A] – 99 999 < P41 < + 99 999 [µm/m]		
P43.1 REF	**Reference marks** [A]	One reference mark	SINGLE
		Distance-coded with 500 • SP (SP = signal period)	500
		Distance-coded with 1000 • GP (e.g. for LS 303 C / LS 603 C)	1000
		Distance-coded with 2000 • SP	2000
		Distance-coded with 5000 • SP	5000
P45.1 ENC ***Enc**oder*	**Encoder monitoring** [A]	Monitoring off (***Alarm Off**)	ALAR. OFF
		Monitoring on (***Alarm On**)	ALAR. ON
P48.1	**Axis display** [A] (***Axis**)	Display measured position	AXIS ON
		Do not display measured position / no encoder	AXIS OFF
P80 SEt	**Function of CL key**	Resets display to zero	ZERO
		Does not reset display to zero	OFF

1) Calculate 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 µm / 0.62 m = **–200** [µm/m]

Parameter Settings for HEIDENHAIN Linear Encoders

Model	Signal period [µm]	Reference marks	P43	Display step (unit: P01) mm	Display step (unit: P01) inches	Subdivision P32
LS 303	20	one	single	0.005	0.000 2	4
LS 603		dist.c.	1 000	0.01	0.000 5	2
LB 302 LIDA 10x	40	one dist.c.	single 2 000	0.01	0.000 5	4
LB 3xx	100	one	single	0.025	0.001	4
		dist.c.	1 000	0.05	0.002	2
				0.1	0.005	1

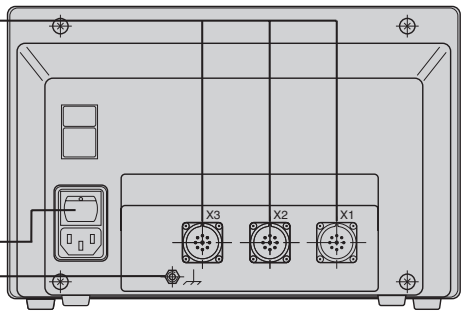
Example: Linear encoder with signal period s = 20 µm
Desired display step a = 0.005 mm
Subdivision P32 **= 0.001 • s / a** = 4

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

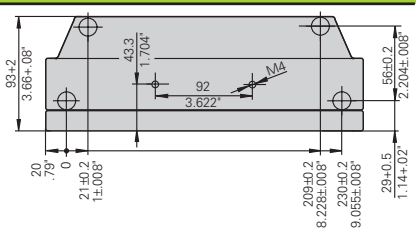
Ground terminal



Interfaces X1, X2 and X3 comply with the recommendations in EN 50 178 for separation from line power.

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).



Power Supply and Connection

Danger of electrical shock!
Unplug the power cable before opening the housing.
Connect a protective ground. This connection should never be interrupted.

Danger to internal components!
Do not engage or disengage any connections while the unit is under power.
Use only original replacement fuses.

Primary-clocked power supply.
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)
Minimum cross-section of power cable: 0.75 mm^2

To increase the noise immunity, connect the ground terminal on the rear panel to the central ground point of the machine. (Minimum cross-section 6 mm^2)

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

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