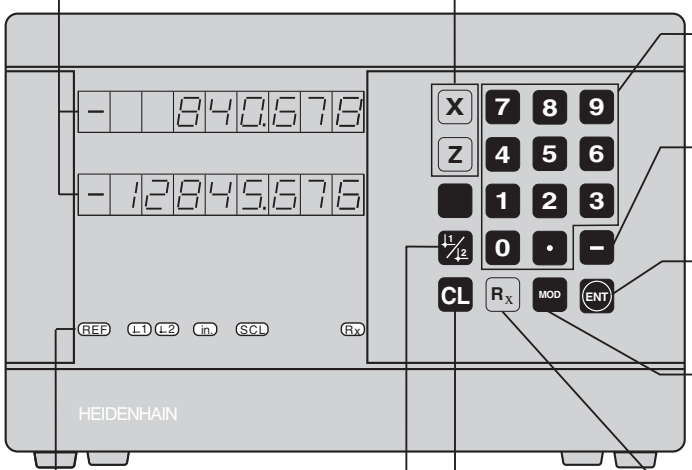
HEIDENHAIN

Working with the position display unit

ND 530



Actual value and input display
(7-segment LED, 8 decades and sign); upper display: X axis; lower display: Z axis

- **Select coordinate axis**
- Select axis-specific operating parameters

Numeric keypad and decimal point

- **Sign**
- Change parameter

Confirm entry

- **Call operating parameters**
- Page forward in parameter list

Select radius display for X axis

Status indicators

- **Select datum**
- Page backward in parameter list

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

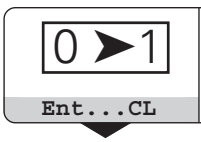
Indicator	Meaning
REF	Reference mark crossed over – datum points are now stored in nonvolatile memory. **Blinking:** Waiting for confirmation from operator.
⊥1 / ⊥2	Datum point 1 / Datum point 2 currently active.
in.	Position values displayed in inches
SCL	Scaling factor active
R_X	Radius display for X axis active

The ND 530 display unit for lathes is designed for use with two HEIDENHAIN linear encoders with sinusoidal output signals.

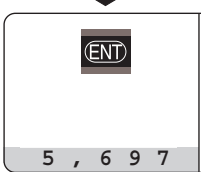
The linear encoders have one reference mark or several (preferably distance-coded) reference marks. When a reference mark is crossed over, a signal is generated which identifies that position as a reference point.

After switch-on, crossing over the reference marks restores the relationship between axis slide positions and display values last established by datum setting. With encoders that have distance-coded reference marks, this requires a traverse of no more than 20 mm.

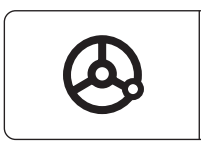
Switch-On



Turn on the display unit (switch located on rear panel).
- Display shows Ent. . .CL.
- REF blinks.



Switch on reference mark evaluation.
- The display shows the value last assigned to the reference mark position.
- REF glows.
- The decimal point blinks.



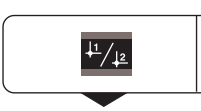
Cross over the reference mark.
Move the axis until the display becomes active and the decimal point stops blinking.
The display unit is now ready for operation.

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

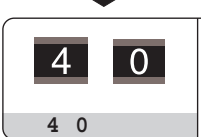
Datum Setting

The datum setting procedure assigns a specific axis position to the associated display value. For example, you can set the workpiece face to Z = 0 mm and a shoulder on the workpiece to its associated X coordinate.

You can set two separate datum points.



Select datum point 1 or 2.



Enter a numerical value, such as 40.

Confirm your entry.

You can switch from one datum point to the other at any time.
Use datum point 2 if you want to display incremental dimensions.

Radius Display for the X Axis

There are two ways to switch the X axis from diameter to radius display:

- Operating parameter P03.1 **or**
- The R_X key.

When R_X lights up the radius display is active.

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 10	Incorrect input value
ERROR 50	Encoder signal too weak (encoder may be contaminated)
ERROR 51	Input frequency too high for encoder input (will occur for example when traverse speed too high)
ERROR 52	Encoder signal to strong
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 off the display unit.** Should any of these error codes recur, contact your HEIDENHAIN service agency.
ERROR 94	Offset compensation values for encoder signals have been erased: contact your 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**.

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.
R+	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
CONT.EAS	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)
PNT 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.
PNT 2	Enter all following compensation points.

Delete all compensation values:

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

Operating Parameters

User Parameters
User parameters are operating parameters that can be changed **without** entering the codes: P00 to P12

Axis assignment
Parameters which are entered separately for each axis have **axis codes**:
"1" signifies the X-axis, "2" 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. P12.1 SCL) is in the list. You select axis-specific operating parameters with the orange 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 P12.

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	INCH OFF
		Display in inches	INCH ON
P03.1	**Radius/diameter display**[A]	**Rad**ius	rAd WS
		Diameter	dIA
P11 SCL ***Scaling***	**Scaling factor**	Scaling factor on	ON
		Scaling factor off	OFF
P12.1 SCL	**Scaling factor** [A]	Enter value for each axis separately 0.1 ≤ P12 ≤ 9.999 999	

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 [µm]** [A] (***Per****iod*:) 2, 4, 10, 20, 40, 100, 200, 12 800		
P32.1	**Subdivision of the encoder signals** [A] (***Subd****ivision*:) 128, 100, 80, 64, 50, 40, 20, 10, 5, 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.PAS
P41.1 COM ***Com****pensation*	**Linear error compensation**[1] [A] Input range: –99 999 to +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 • SP (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 (***Alar****m* ***Off***)	ALAR. OFF
		Monitoring on (***Alar****m* ***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 the CL key**	Reset to zero with CL	ZERO
		No reset to zero with CL	OFF

[1] Entry value for P41

Example: Displayed measuring length L_d: 620.000 mm
Actual length L_a (as determined with a comparator system such as the VM 101 from HEIDENHAIN): 619.876 mm
Length difference ΔL: $L_a - L_d = -124$ µm
Compensation factor: $k = \Delta L / L_d = -124$ µm / 0.62 m = **–200** [µm/m]

Display step, signal period and subdivision for linear encoders

Display step		P31: Signal period [µm]							
		2	4	10	20	40	100	200	12 800
[mm]	[inches]	P32: Subdivision							
0.000 02	0.000 001	100	–	–	–	–	–	–	–
0.000 05	0.000 002	40	80	–	–	–	–	–	–
0.000 1	0.000 005	20	40	100	–	–	–	–	–
0.000 2	0.000 01	10	20	50	100	–	–	–	–
0.000 5	0.000 02	4	8	20	40	80	–	–	–
0.001	0.000 05	2	4	10	20	40	100	–	–
0.002	0.000 1	1	2	5	10	20	50	100	–
0.005	0.000 2	0.4	0.8	2	4	8	20	40	–
0.01	0.000 5	0.2	0.4	1	2	4	10	20	–
0.02	0.001	–	–	0.5	1	2	5	10	–
0.05	0.002	–	–	0.2	0.4	0.8	2	4	–
0.1	0.005	–	–	0.1	0.2	0.4	1	2	128
0.2	0.01	–	–	–	–	–	–	–	64

Parameter Settings for HEIDENHAIN Linear Encoders

Model and signal period [µm]		Reference marks	P43	Display step (unit: P01) mm	inches	Subdivision, P32
LIP 40x	2	one	single	0.001	0.000 05	2
				0.000 5	0.000 02	4
				0.000 2	0.000 01	10
				0.000 1	0.000 005	20
				0.000 05	0.000 002	40
				0.000 02	0.000 001	100
LIP 101 A LIP 101 R	4	one	single	0.001	0.000 05	4
				0.000 5	0.000 02	8
				0.000 2	0.000 01	20
				0.000 1	0.000 005	40
				0.000 05	0.000 002	80
LIF 101 R	4	one	single	0.001	0.000 05	4
LIF 101 C		dist.cod.	5000	0.000 5	0.000 02	8
LF 401		one	single	0.000 2	0.000 01	20
LF 401 C		dist.cod.	5000	0.000 1	0.000 005	40
LID xxx/LID xxx C	10	one/dist.cod.	single/2000	0.001	0.000 05	10
LS 103 / LS 103 C	10	one/dist.cod.	single/1000	0.000 5	0.000 02	20
LS 405 / LS 405 C				0.000 2	0.000 01	50
ULS/10				0.000 1	0.000 005	100
LS 303 / LS 303 C	20	one/dist.cod.	single/1000	0.01	0.000 5	2
LS 603 / LS 603 C				0.005	0.000 2	4
LS 106 / LS 106 C	20	one/dist.cod.	single/1000	0.01	0.000 5	2
LS 406 / LS 406 C				0.005	0.000 2	4
LS 706 / LS 706 C				0.002	0.000 1	10
ULS/20				0.001	0.000 05	20
				0.000 5	0.000 02	40
LIDA 10x	40	one/dist.cod.	single/2000	0.002	0.000 1	20
LB 302				0.001	0.000 05	40
				0.000 5	0.000 02	80
LIDA 2xx	100	one	single	0.01	0.000 5	10
LB 3xx				0.005	0.000 2	20
LB 3xx C		dist.cod.	1000	0.002	0.000 1	50
				0.001	0.000 05	100
LIM 102	12800	one	single	0.1	0.005	128

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

Linear measurement with ballscrew and rotary encoder

If you are measuring linear distance with a ballscrew and rotary encoder, calculate the signal period s as follows:

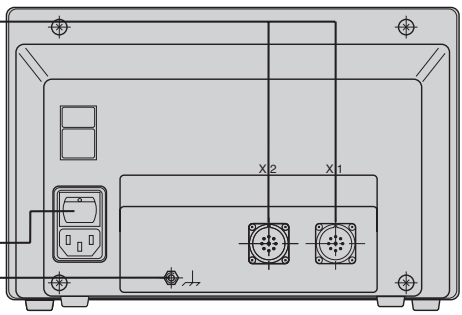
$$\text{Signal period } s = \frac{\text{Screw pitch [mm]} \bullet 1000}{\text{Line count}} \quad [\mu m]$$

Rear Panel

Inputs for two HEIDENHAIN linear encoders with sinusoidal output signals ($7\mu A_{PP}$ to $16\ \mu A_{PP}$), Connecting cable max. 30 m (98.5 ft), Input frequency max. 100 kHz

Power switch

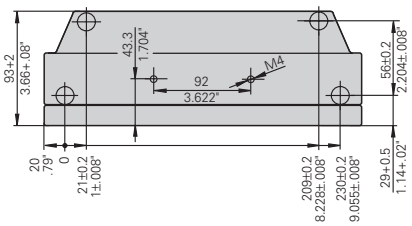
Ground terminal



Interfaces X1 and X2 conform to the recommendations in EN 50 178 for separation from line power.

Installation

The display unit can be mounted on a flat surface or on the tilting base from HEIDENHAIN (Id.-Nr. 281 619 01) with M4 screws.



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** 9 W. **Line fuse:** F 1 A (in unit). Minimum cross-section of power cable: 0.75 mm².

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 mm²)

Ambient Conditions

Temperature range	Operation: 0°C to +45°C (32°F to 113°F) Storage: –30°C to +70°C (–22°F to 158°F)
Rel. humidity	Annual average: < 75%; maximum: < 90%
Weight	2.3 kg

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