



**HEIDENHAIN**



## User's Manual

# ND 282 B

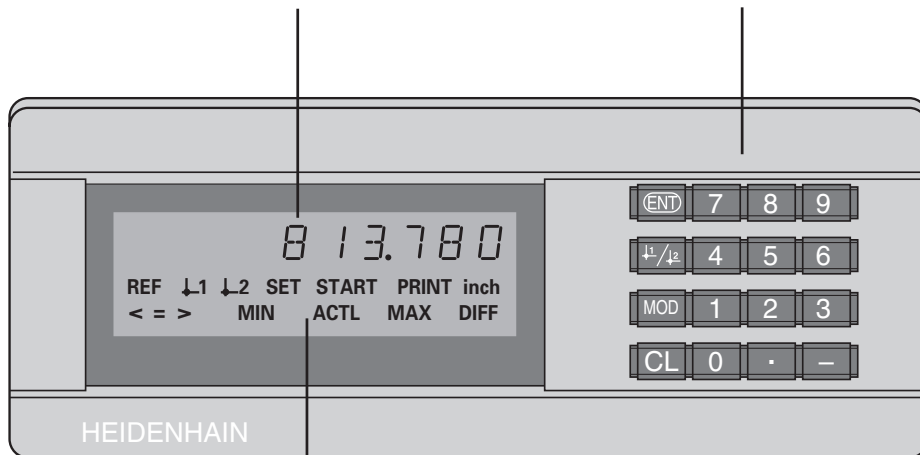
## Measured Value Displays

11/2000







**Display of actual value and input**

(8 decades with algebraic sign)

**Numeric keypad  
with decimal point**



**Status display with indicators**

Key	Function
	<ul style="list-style-type: none"> <li>• Set datum</li> <li>• Transfer input value</li> <li>• Set display to value from P79 (P80!)</li> <li>• Leave parameter list</li> </ul>
	<ul style="list-style-type: none"> <li>• Select datum</li> <li>• Page backwards in parameter list</li> </ul>
	<ul style="list-style-type: none"> <li>• Start series of measurements</li> <li>• Switch display for measurement series</li> <li>• Start measured value output "PRINT"</li> <li>• Select parameter after switch-on</li> <li>• Page forward in parameter list</li> </ul>
	<ul style="list-style-type: none"> <li>• Delete entry</li> <li>• Set display to zero (P80!)</li> <li>• CL plus MOD: select parameter list</li> <li>• CL plus number: select parameter</li> </ul>
	<ul style="list-style-type: none"> <li>• Algebraic sign</li> <li>• Reduce parameter value</li> </ul>
	<ul style="list-style-type: none"> <li>• Decimal point</li> <li>• Increase parameter value</li> </ul>

Indicator	Meaning
<b>REF</b>	<p>If the decimal points are also blinking: Display is waiting for reference mark traversing. If decimal points are not blinking: Reference mark has been traversed—display stores datum points in nonvolatile memory</p> <p><b>Blinking:</b> display is waiting for ENT or CL to be depressed</p>
<b>inch</b>	Position values in inches
<b><u>1</u> / <u>2</u></b>	Selected datum point
<b>PRINT</b>	<b>Blinking:</b> Display is waiting for ENT to be pressed for data output
<b>SET</b>	<b>Blinking:</b> Display is waiting for input values
<b>&lt; / = / &gt;</b>	<b>Sorting and tolerance checking:</b> measured value smaller than lower limit / within the limits / greater than upper limit
<b>MIN / MAX / DIFF / ACTL</b>	<p><b>Series of measurements:</b> Minimum / maximum / greatest difference (MAX–MIN) / current measured value</p> <p><b>Blinking:</b> Confirm selection or deselect function</p>
<b>START</b>	<p>Series of measurements is running</p> <p><b>Blinking:</b> Display is waiting for signal to start series of measurements</p>

**Items supplied with ND 282 B**

<b>ND 282 B</b>	Measured value display unit, benchtop model
Encoder input 11 $\mu\text{A}_{\text{PP}}$	Id. Nr. 344 998-xx
<b>Power cord</b>	3 m (9.9 ft)
<b>User's Manual</b>	ND 282 B
<b>Adhesive plug-in feet</b>	For stacking ND 282 B units



This manual is for the ND 282 B measured value display with the following software number or higher:

**354 394-01**

The software number is indicated on a label on the rear panel.

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## Position Encoders and Reference Marks

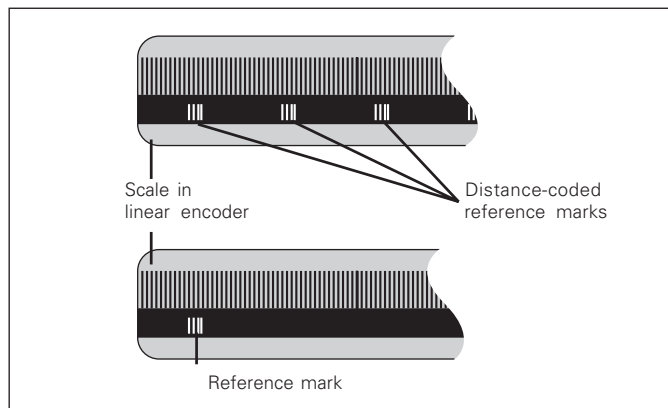
The ND 282 B display unit is designed for use with photo-electrical linear encoders with 11  $\mu\text{A}_{\text{PP}}$  sinusoidal signals: primarily for HEIDENHAIN **MT length gauges** with 11  $\mu\text{A}_{\text{PP}}$ .

The MT length gauges have **one** reference mark. The scales of other photoelectric linear encoders (see "Linear Encoders") can contain one reference mark or many *distance-coded* reference marks.

If there is an interruption of power, the relationship between the position of the length gauge and the displayed position value is lost. The reference marks on the position encoders and the REF reference mark evaluation feature enable the display unit to quickly reestablish this relationship again when the power is restored.



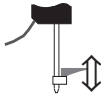
When a reference mark is crossed over, a signal is generated which identifies that position as a reference point. At the same time, the display unit restores the relationship between length gauge position and display values which you last defined by setting the datum.

To restore the datum on scales with **distance-coded** reference marks, you only need to traverse a maximum of 20 mm for linear encoders.



Reference marks on linear encoders

## Switch-On, Traversing the Reference Marks

 <b>ENT . . . CL</b>	<p><b>Turn on the power.</b> (Switch located on rear panel.)</p> <ul style="list-style-type: none"><li>• <b>ND 282 B</b> appears for two seconds.</li><li>• ENT . . . CL <sup>1)</sup> appears.</li><li>• REF indicator is blinking.</li><li>• Data interface shows error 7.</li></ul>
 <b>5 , 6 9 7</b>	<p><b>Switch-on the reference mark evaluation function.</b></p> <ul style="list-style-type: none"><li>• The position value that was last assigned to the reference mark position is displayed.</li><li>• REF indicator lights up.</li><li>• Decimal point is blinking.</li></ul>
	<p><b>Cross over the reference mark.</b> Move the plunger until the display starts counting and the decimal point stops blinking. The display is now ready for operation.</p>

For automation purposes, crossing over the reference marks and the display ENT ... CL can be disabled with parameter P82.

## REF Mode

Crossing over the reference marks automatically switches the display to REF mode: The last assignment of display values to length gauge positions is stored in nonvolatile memory.

<sup>1)</sup> Press the CL key if you choose **not** to traverse the reference marks. Note that, in this case, the relationship between length gauge position and display value will be lost if the power is interrupted or if the unit is switched off.

## Datum Setting

The datum setting procedure assigns a display value to a known position. With the ND 200 series, you can set two separate datum points.

There are several ways to set the datum:

- Enter a numerical value, or
- Transfer a value from an operating parameter (see P79, P80), or
- By external signal



**Select datum 1 or 2.**

**5**

5

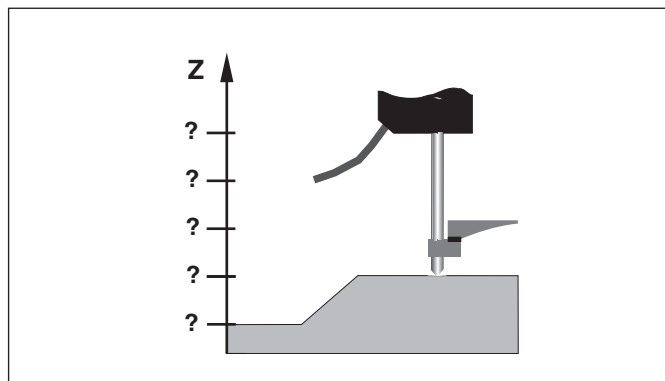
**Enter numerical value** (here 5),  
SET blinks.



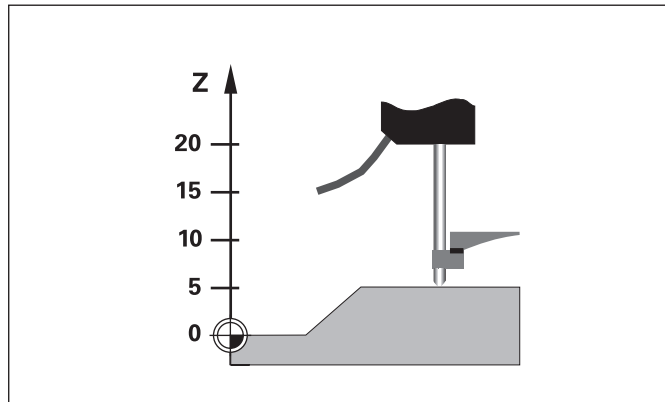
**Confirm** the entered numerical value.

You can switch between datums 1 and 2 as desired. Datum 2 can be used, for example, for working with incremental dimensions.

When you switch back to datum 1, the display unit resumes display of the actual position of the MT.



Without datum setting: unknown assignment of measured values to positions



After datum setting: Assignment of measured values to positions



## Finding Minimum and Maximum Values from a Series of Measurements

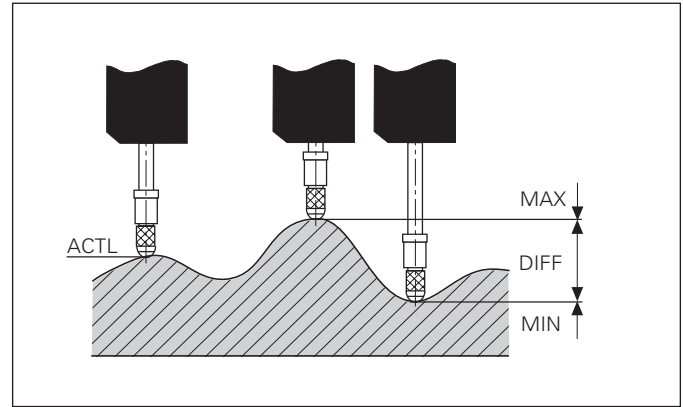
After a series of measurements has been started, the display transfers the first measured value to the memory for minimum and maximum values. Every 0.55 ms, the display compares the current measured value with the memory contents: A new value is stored if it is greater than the stored maximum value or smaller than the stored minimum value. At the same time, the display calculates and stores the difference DIFF between the current MIN and MAX values.

Display	Meaning
MIN	Minimum value from the series of measurements
MAX	Maximum value from the series of measurements
DIFF	Difference MAX – MIN
ACTL	Current measured value

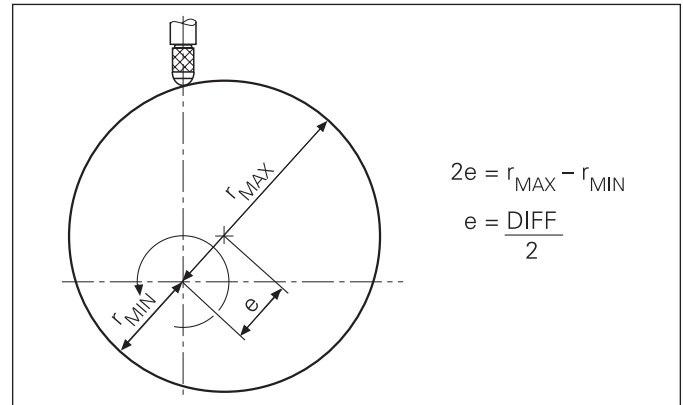
### Starting the measurement series and selecting the display

You can start the series of measurements either by pressing MOD and selecting the desired display—as described on the following pages—or by external signal over the **switching inputs at the D-sub connection EXT** (see section on X41).

When a series of measurements is started, the internal MIN/MAX/DIFF memory is reset.

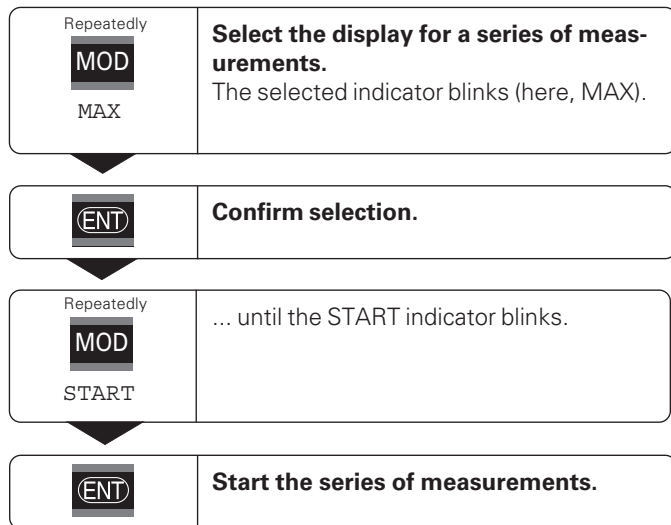


Series of measurements: The MIN, MAX and DIFF values of an uneven surface



Example: Measurement series for determining eccentricity  $e$

## Starting a series of measurements



### Indicator preselection

Press MOD to start the series of measurements and select the display with the indicators.

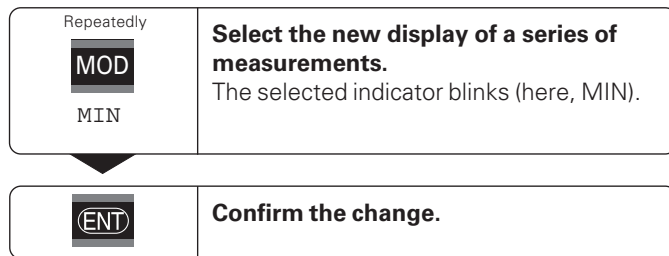
Operating parameter **P86** allows you to define which indicator is displayed first when MOD is pressed.

## Switching between MIN, MAX, DIFF and ACTL displays



It is **not** possible to switch between the displays as described below if the switching input for external control of the series of measurements (pin 6 on D-sub connection EXT) is active.

As an alternative, you can select the display with operating parameter P21 (see "Operating Parameters").



The display now shows the smallest value measured during the current series of measurements.

## Starting a new series of measurements

Repeatedly <b>MOD</b> START	<b>Select the indicator START.</b> The indicator START blinks.
-----------------------------------	---

<b>ENT</b>	<b>Start a new series of measurements.</b>
------------	--

## Ending a series of measurements

Repeatedly <b>MOD</b>	<b>Select the active indicator (MIN, ACTL, MAX, DIFF).</b> The indicator that lit up last blinks.
--------------------------	--

<b>ENT</b>	<b>End the series of measurements.</b>
------------	--

or

Repeatedly <b>MOD</b> START	<b>Select the indicator START.</b> The START indicator blinks.
-----------------------------------	---

<b>CL</b>	<b>End the series of measurements.</b>
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## Sorting and Tolerance Checking

In the sorting and tolerance checking mode, the display unit compares the displayed value with the programmed upper and lower sorting limits. The sorting and tolerance checking mode is enabled and disabled with operating parameter **P17**.

### Entering sorting limits

Sorting limits are entered in operating parameters **P18** and **P19** (see "Operating Parameters").

### Sorting signals

The indicators and switching outputs at D-sub connection EXT (see section on X41) sort the display value into one of three classes.

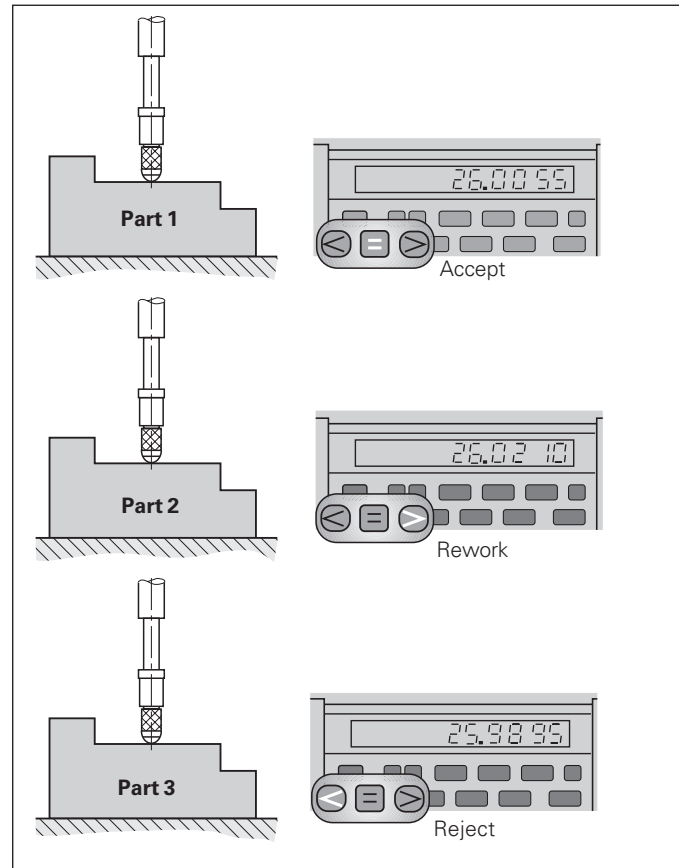
Display	Meaning
=	Measured value is within sorting limits
<	Measured value is smaller than lower sorting limit
>	Measured value is greater than upper sorting limit

### Operating parameters for sorting and tolerance checking

P17 CLASS.    Sorting ON/OFF

P18 L.CLASS.    Lower sorting limit

P19 U.CLASS.    Upper sorting limit



Example: Upper sorting limit = 26.02 mm  
Lower sorting limit = 26.00 mm

## Measured Value Output



For technical information on the BCD data interface (X33), information on the data format, etc., see the chapter “BCD Interface (X33).”

Measured values can be output over the BCD interface (X33).

There are several ways to start measured value output:

- Press MOD repeatedly until the PRINT indicator blinks (only for “slow” data output), then start data output with ENT;  
**or**
- Let the measured values periodically be sent to the data output;  
**or**
- Input a latch command at the D-sub connection EXT;  
**or**
- Input a latch command at the BCD connection.

### Interface Operating Mode (see Operating Parameter P53)

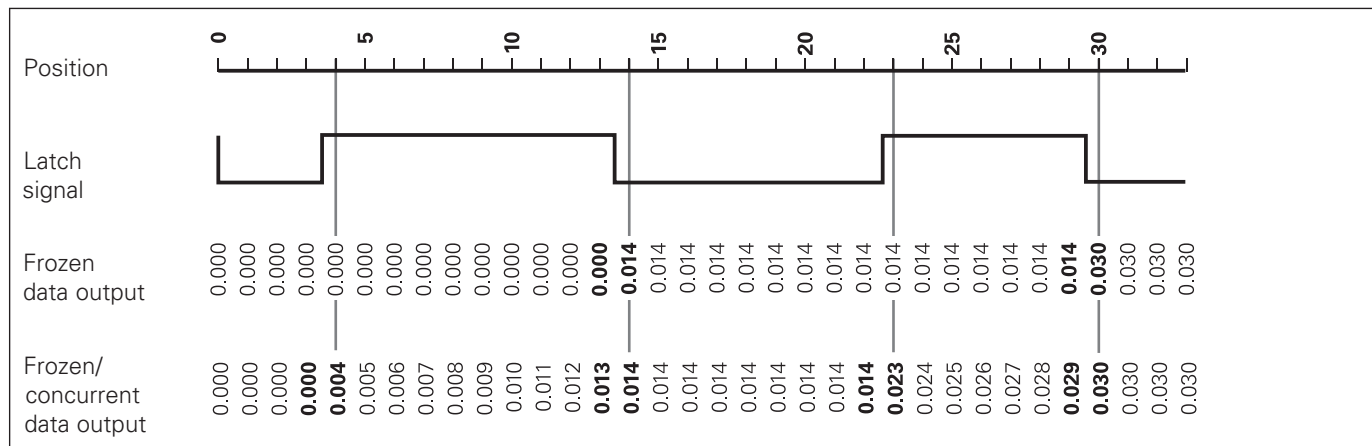
slow–            Display value  
fast –            Display value referenced to datum 1  
(MIN/MAX/DIFF display values are not shown)

## Data Output and Display Freeze with Measured Value Output

The effect of the measured value output signal on the data output is determined with operating parameter P55.

- **Concurrent**, no display freeze: The data output ignores latch commands and always displays the current measured value (BCD ACTL.).
- **Frozen / hold**: Data output is stopped and the measured value is retained until the next signal for measured value output arrives (BCD HOLD).
- **Frozen/concurrent**: Data output remains frozen as long as the latch signal is present; with the signal off, the display again shows the current measured values (BCD STOP).

Parameter P23 determines if the display value is equal to the measured value (DISPL. ACTL.) **or** equal to the data output value (DISPL. BCD).



## Error Messages

Display	Effect/Cause	Display BCD Output <sup>2)</sup>
BCD SPEED	Last measured value not yet called (with external data requesting). <sup>1)</sup>	01
NO RES .PRES	Illegal attempt to set or zero reset. The display will not be set or zero reset. <sup>1)</sup>	04
OVERFLOW	Input value not displayable (input through keys or external setting). <sup>1)</sup>	12
	Internal counteroverflow (BCD counter). <sup>1)</sup>	53
SIGNAL	Encoder signal is too weak. The scale may be contaminated. <sup>1)</sup>	50
FREQUENCY	Input frequency too high for encoder input. Traversing speed may be too fast. <sup>1)</sup>	51
ERR. REF.	The spacing of the reference marks as defined in P43 is not the actual spacing. <sup>1)</sup>	55

Display	Effect/Cause	Display BCD Output <sup>2)</sup>
ERR. MEMORY	Checksum error: Check the datum, operating parameters and compensation values for non-linear axis error compensation. If this error recurs, contact your service agency!	80

<sup>1)</sup> These errors are important for the attached device. The error signal (pin 19) at the D-sub connection EXT is active.

<sup>2)</sup> Active with P84: ERROR ON

The ND sends the error message to the BCD output on the first and second decades. All other decades receive the ASCII character "A" (1010).

### Other Error Displays

If "OVERFLOW" appears, the measured value is too large or too small:

- Set a new datum.
- or**
- Traverse back.

If **all sorting signals light up**, the upper sorting limit is smaller than the lower limit:

- Change operating parameters P18 and/or P19.

### To clear error messages:

Once you have removed the cause of the error:

- Clear the error message with the CL key.

## Rear Panel



Ports X1, X33 and X41 comply with the recommendations in EN 50 178 for separation from line power.

### Encoder input X1

HEIDENHAIN flange socket	9-pin
Input signals	~ 11 $\mu$ A <sub>PP</sub>
Maximum encoder cable length	30 m (98.5 ft)
Maximum input frequency	50 kHz

### BCD data interface (X33)

"AMP-CHAMP" connection (36-pin, female)

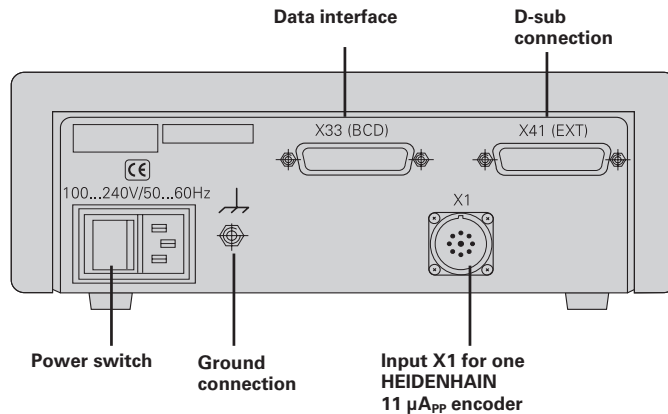
### Switching inputs and outputs EXT (X41)

25-pin D-sub connection (male)

## Accessories

### Connecting elements

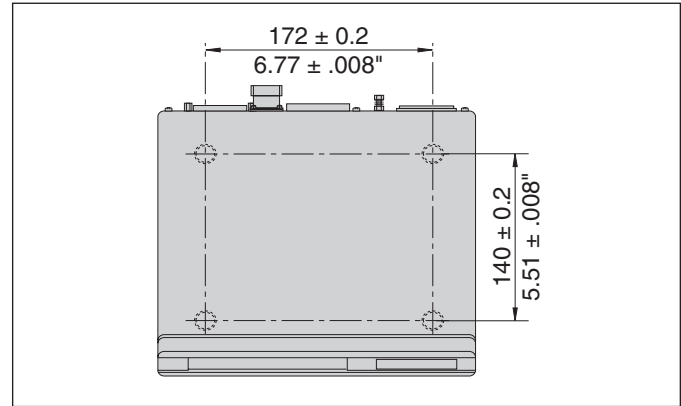
<b>Connector</b> (female)	25-pin for D-sub connection X41 Id. Nr. 249 154-ZY
<b>Data interface cable, complete</b>	36-pin for "AMP-CHAMP" connection X33 Id. Nr. 202 420-xx Cable length up to 10 m (32.8 ft)





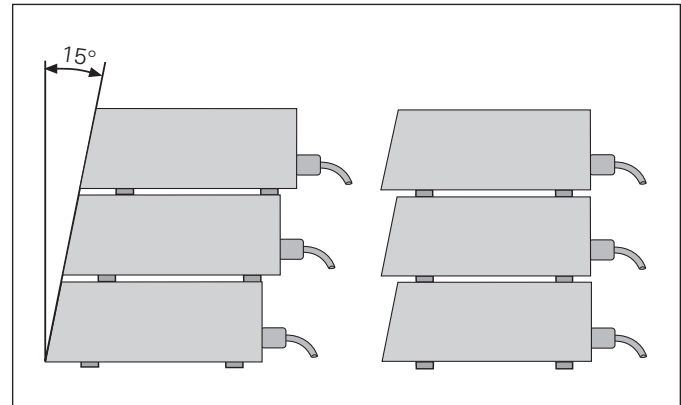
## Mounting

You can fasten the **ND 282 B** from below by using M4 screws (see illustration at right).



Hole positions for mounting the ND display unit

ND 282 B display units are stackable. Adhesive plug-in feet (supplied with your unit) prevent the stacked units from being moved out of place.



Alternatives of stacking the display units

## Power Connection

### ND 282 B

The rear panel of the ND 282 B contains a connecting jack for a power cord with Euro connector (power cord supplied with the delivery).

**Minimum cross section of the power cord:** 0.75 mm<sup>2</sup>

**Power supply:** 100 Vac to 240 Vac (–15% to +10%)  
50 Hz to 60 Hz (± 2 Hz)

A voltage selector is therefore not necessary.



#### **Danger of electrical shock!**

Unplug the power cord before opening the housing. Connect the grounding conductor. Do not interrupt the grounding conductor.



#### **Danger to internal components!**

Do not engage or disengage any connections while the unit is under power. Use only original replacement fuses.



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

## Operating Parameters

Operating parameters allow you to modify the operating characteristics of your ND display unit and define the evaluation of the encoder signals.

Operating parameters are designated by:

- the letter P,
- a two-digit parameter number, and
- an abbreviation.

**Example:** P01 INCH

The **factory settings of the operating parameters** are indicated in the parameter list (see “List of Operating Parameters”) in boldface type.

Parameters consist of “user parameters” and “protected operating parameters,” which can only be accessed by entering a code number.

### User parameters


User parameters are operating parameters that can be changed **without** entering the code number:

P00 to P30, P79, P86, P98



The functions of the individual user parameters are detailed in the list of operating parameters (see “List of Operating Parameters”).

**To access a user parameter ...**



**... after switching on the display:**


While ENT ... CL is displayed: 	Display first user parameter.
---	-------------------------------

**... during operation:**

Together:  	Display first user parameter.
--	-------------------------------

**To go directly to a user parameter:**

Together:  	Press and hold CL while entering the first digit of the parameter number (here, 1).
--	---

	Enter the second digit of the parameter number (here, 9). The display shows the selected user parameter.
---	---

## Code number for changing protected operating parameters

If you wish to change protected operating parameters, you must first enter the **code number 9 51 48**:

- Select the user parameter P00 CODE.
- Enter the code number 9 51 48.
- Confirm entry with ENT.

Parameter P30 appears on the display. By paging through the list of operating parameters you can display—and, if necessary, change—each protected operating parameter and, of course, each user parameter.



Once you have entered the code number, the protected operating parameters remain accessible until the display unit is switched off.

## Functions for changing the operating parameters

Function	Key
Page forward in the list of operating parameters	
Page backward in the list of operating parameters	
Reduce parameter value	
Increase parameter value	
Correct entry and display parameter designations	
Confirm change or numerical entry, leave list of operating parameters	

A changed parameter is stored as soon as you

- leave the list of operating parameters
- or**
- page forward or backward after the change.

## List of Operating Parameters

Parameter	Settings / Function
P00 CODE 9 51 48:	Enter a <b>code number</b> : To change the protected operating parameters
24 65 84:	To lock the keyboard
66 55 44:	To show the software version
24 65 82:	Distance-to-go display
P01	<b>Units of measurement</b> Display in millimeters <b>MM</b> Display in inches <b>INCH</b>
P17 CLASS.	<b>Sorting and tolerance checking</b> Sorting and tol. checking ON <b>CLASS. ON</b> Sorting and tol. checking OFF <b>CLASS. OFF</b>
P18 L.CLASS.	<b>Lower limit</b> for sorting
P19 U.CLASS.	<b>Upper limit</b> for sorting
P21 M.SERIE	<b>Display for series of measurements</b> <b>OFF</b> DIFF MAX ACTL MIN
P23 DISPL.	<b>Display stop for measured value output</b> Display equal to actual value <b>DISPL. ACTL.</b> Display equal to output <b>DISPL. BCD</b>

Parameter	Settings / Function
P30 DIR	<b>Counting direction</b> Positive counting direction with positive direction of traverse <b>DIRECT. POS</b> Negative counting direction with positive direction of traverse <b>DIRECT. NEG</b>
P32 SUBD.	<b>Encoder signal subdivisions</b> 200 / 100 / 50 / 40 / <b>20</b> / 10 / 8 / 5 / 4 / 2 / 1 / 0.8 / 0.5 / 0.4 / 0.2 / 0.1
P33 COUNT	<b>Counting mode</b> 0-1-2-3-4-5-6-7-8-9 <b>COUNT 0-1</b> 0-2-4-6-8 <b>COUNT 0-2</b> 0-5 <b>COUNT 0-5</b>
P38 DEC.	<b>Decimal places</b> 1 / 2 / 3 / <b>4</b> / 5 / 6 (up to 7 for inch display)
P43 REF	<b>Reference marks</b> One reference mark <b>SINGLE REF.</b> Distance-coded with 500 • SP <b>500 SP</b> (SP: signal period) Distance-coded with 1000 • SP <b>1000 SP</b> (e.g. for HEIDENHAIN LS ...C) Distance-coded with 2000 • SP <b>2000 SP</b> Distance-coded with 5000 • SP <b>5000 SP</b>

Parameter	Settings / Function
P44 REF	<b>Reference mark evaluation</b> Evaluate the reference mark <b>REF. ON</b> <hr/> Do not evaluate the reference mark <b>REF. OFF</b>
P45 ALARM	<b>Encoder monitoring</b> No monitoring <b>ALARM OFF</b> <hr/> Monitor the frequency <b>FREQUENCY</b> <hr/> Monitor contamination <b>CONTAMINAT.</b> <hr/> Contamination + frequency <b>FRQ. + CONT.</b>
P53 BCD	<b>Data output speed</b> Fast <b>BCD FAST</b> <hr/> Slow <b>BCD SLOW</b>
P54 BCD	<b>Latch rate</b> LATCH 0.2 / 0.4 / 0.8 / 1.6 / 3.2 / 6.4 / 12.8 / <b>25.6</b> [µs]
P55 BCD	<b>Data output during value display</b> Concurrent <b>BCD ACTL.</b> <hr/> Frozen / hold <b>BCD HOLD</b> <hr/> Frozen / concurrent <b>BCD STOP</b>
P56 BCD	<b>Algebraic sign level</b> Low = Minus <b>MINUS LOW</b> <hr/> High = Minus <b>MINUS HIGH</b>

Parameter	Settings / Function
P57 BCD	<b>Behavior without latch signal</b> Data output always active <b>TRIST. ON</b> <hr/> High-impedance output (3-state) <b>TRIST. OFF</b>
P62 A1	<b>Trigger limit 1</b>
P63 A2	<b>Trigger limit 2</b>
P79 PRESET	<b>Value for datum point</b> Enter numerical value for datum setting over switching input or with ENT key
P80 ENT-CL	<b>Set display</b> No set/Set with CL/ENT <b>CL-ENT OFF</b> <hr/> Zero reset with CL setting disabled with ENT <b>CL . . . . . ON</b> <hr/> Zero reset with CL and set with ENT to value selected in P79 <b>CL-ENT ON</b>
P82 DISPL.ON	<b>Message after switch-on</b> ENT . . . CL message <b>MESSAGE ON</b> <hr/> No message <b>MESSG. OFF</b>
P84 BCD	<b>Display errors</b> Error display on <b>ERROR ON</b> <hr/> Error display off <b>ERROR OFF</b>

Parameter	Settings / Function
P85 EXT.REF	<b>External REF</b> REF over D-sub port EXT      EXT.REF ON No REF over D-sub port EXT <b>EXT.REF OFF</b>
P86 MOD	<b>First indicator after pressing MOD</b> <b>START</b> PRINT MIN      ACTL      MAX      DIFF
P87 S-SET	<b>Quickly repeat external zero resetting / setting</b> Fast external zero resetting / setting (P53 setting: Fast) <b>REF</b> mode, datum 2 and series measurement not usable <b>FAST.SET ON</b> No fast setting <b>FAST.SET OFF</b>

Parameter	Settings / Function
P98 LANGUA.	<b>Conversational language</b> German <b>LANGUAGE D</b> English      LANGUAGE GB French      LANGUAGE F Italian      LANGUAGE I Dutch      LANGUAGE NL Spanish      LANGUAGE E Danish      LANGUAGE DK Swedish      LANGUAGE S Finnish      LANGUAGE FI Czech      LANGUAGE CZ Polish      LANGUAGE PL Hungarian      LANGUAGE H Portuguese      LANGUAGE P

## Linear Encoders

The ND 282 B display unit is designed for use together with photoelectrical encoders with  $11 \mu\text{A}_{PP}$  sinusoidal signals.

### Display step with linear encoders

You can select a specific display step by adapting the following operating parameters:

- Subdivision (P31)
- Counting mode (P33)
- Decimal places (P38)

### Example

Linear encoder with a signal period of  $10 \mu\text{m}$

Desired display step ..... 0.000 5 mm

Subdivision (P31) ..... 10

Counting mode (P33) ..... 5

Decimal places (P38) ..... 4

The tables on the following pages will help you to select the appropriate parameter settings.



## Recommended parameter settings for HEIDENHAIN linear encoders with 11 $\mu\text{A}_{pp}$ signals

Model	Signal period in $\mu\text{m}$	Reference marks	Millimeters			Inches		
			Display step in mm	Count mode	Decimal places	Display step in inches	Count mode	Decimal places
CT MT xx01	2	Single	0.0005	5	4	0.00002	2	5
LIP 401A/401R		Single	0.0002	2	4	0.00001	1	5
			0.0001	1	4	0.000005	5	6
			0.00005	5	5	0.000002	2	6
			<i>Recommnd. only for LIP 401</i>			0.00002	2	5
0.00001	1	5	0.0000005	5	7			
0.000005	5	6	0.0000002	2	7			
LF 103/103C LF 401/401C LIF 101/101C LIP 501/501C	4	Single/5000	0.001	1	3	0.00005	5	5
LIP 101		Single	0.0005	5	4	0.00002	2	5
			0.0002	2	4	0.00001	1	5
			0.0001	1	4	0.000005	5	6
			0.00005	5	5	0.000002	2	6
<i>Recommnd. only for LIP 101</i>			0.00002	2	5	0.000001	1	6
0.00001	1	5	0.0000005	5	7			
MT xx	10	Single	0.0005	5	4	0.00002	2	5
			0.0002	2	4	0.00001	1	5
			0.0001	1	4	0.000005	5	6
LS 303/303C LS 603/603C	20	Single/1000	0.01	1	2	0.0005	5	4
			0.005	5	3	0.0002	2	4

**Recommd. parameter settings for HEIDENHAIN linear encoders with 11  $\mu\text{A}_{\text{pp}}$  signals (continued)**

Model	Signal period in $\mu\text{m}$	Reference marks	Millimeters			Inches		
			Display step in mm	Count mode	Decimal places	Display step in inches	Count mode	Decimal places
LS 106/106C LS 406/406C LS 706/706C	20	Single/1000	0.001	1	3	0.00005	5	5
ST 1201			0.0005	5	4	0.00002	2	5
LB 302/302C LIDA 10x/10xC	40	Single/2000	0.005	5	3	0.0002	2	4
			0.002	2	3	0.0001	1	4
			0.001	1	3	0.00005	5	5
			0.0005	5	4	0.00002	2	5
			<i>Recommd. only for LB 302</i>					
			0.0002	2	4	0.000001	1	5
			0.0001	1	4	0.0000005	5	6
LB 301/301C	100	Single/1000	0.005	5	3	0.0002	2	4
			0.002	2	3	0.0001	1	4
			0.001	1	3	0.00005	5	5

**Example**

Your encoder:

MT 101

Desired display step:

 0.0005 mm (0,5  $\mu\text{m}$ )

Parameter settings:

P01 = mm, P43 = single, P32 = 20, P33 = 5, P38 = 4

## BCD Data Interface (X33)

There are several ways to start measured value output:

- ▶ Press MOD repeatedly until the PRINT indicator blinks (only for “slow” data output), then start data output with ENT;  
**or**
- ▶ Let the measured values periodically be sent to the data output;  
**or**
- ▶ nput a latch command at the D-sub connection EXT;  
**or**
- ▶ nput a latch command at the BCD connection.

### Interface Operating Mode (see Operating Parameter P53)

slow – Display value  
fast – Display value referenced to datum 1  
(MIN/MAX/DIFF display values are not shown)

You can order a **connecting cable** (to a PC, for example) from HEIDENHAIN (Id. Nr. 206 420-..); maximum cable length 10 m.

**Operating parameters** for display output: P23, P53 to P57, P84.

## “AMP-Champ” Connector (36-pin, female)

Pins				Assignment
2 <sup>0</sup>	2 <sup>1</sup>	2 <sup>2</sup>	2 <sup>3</sup>	
1	2	3	4	Decade 1
5	6	7	8	Decade 2
9	10	11	12	Decade 3
13	14	15	16	Decade 4
17	18	19	20	Decade 5
21	22	23	24	Decade 6
25	26	27	28	Decade 7
29	30	31	32	Decade 8

Pins	Assignment
33	Algebraic sign
34	Ready message
35	Display value
36	0V

### Output Level

**Low:**  $U \leq 0,4 \text{ V}$  at  $I \leq 6 \text{ mA}$

**High:**  $U \geq 3,8 \text{ V}$  at  $I \leq 2,6 \text{ mA}$

The output signals are TTL compatible.

### Latch level

**Low:**  $U \leq 0,9 \text{ V}$  at  $I_{\text{max}} \leq 6 \text{ mA}$

**High:**  $U \geq 3,9 \text{ V}$ ; **or**

TTL level (internal pull-up resistor 10 k $\Omega$ ).

## Signal run times

The times in the following table are **guide lines**.

If you are working with slow data output and are using display functions at the same time (e.g. measurement series or inch display), the actual signal run times can be twice as long as given here.

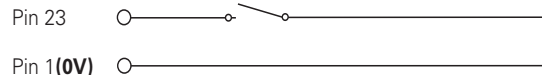
### Concurrent Data Output (P55 ACTL)

Operating mode	P53	Latch rate	Data output after
fast	FAST	P54	Value from P54 / 2
slow	SLOW	$t \leq 30 \text{ ms}$	$t \leq 8 \text{ ms}$

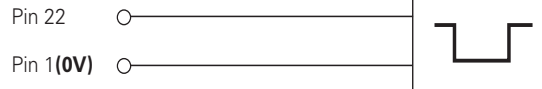
### Data output after external latching (P55 STOP or HOLD)

Operating mode	P53	Minimum impulse length		Measured value latched after		
		Pulse/ BCD	Contact	BCD	Pulse	Contact
fast	FAST	3 $\mu\text{s}$	7 ms	0.3 $\mu\text{s}$	1.1 $\mu\text{s}$	4.8 ms
slow	SLOW	$t \geq 8 \text{ ms}$	$t \geq 13 \text{ ms}$	0.3 $\mu\text{s}$	1.1 $\mu\text{s}$	4.8 ms
		Data output		Relatch after		
				Pulse/ BCD	Contact	
fast	FAST	$\leq 0.3 \mu\text{s}$ after internal latching		3 $\mu\text{s}$	7 ms	
slow	SLOW	$\leq 7.5 \text{ ms}$ after internal latching		3 $\mu\text{s}$	7 ms	

### EXT(X41)



### EXT(X41)



Triggering the "Contact" and "Pulse" inputs at D-sub connection EXT (X41)

## Switching Inputs and Outputs EXT (X41)



### Danger to internal components!

Voltage sources for external circuitry must conform to the recommendations in EN 50 178 for low-voltage electrical separation. Connect inductive loads only with a quenching diode parallel to the inductance.



### Only use shielded cable!

Connect the shield to the connector housing.

## Outputs at D-sub connection EXT (X41)

Pin	Function
14	Display value is zero
15	Measured value $\geq$ trigger limit A1 (P62)
16	Measured value $\geq$ trigger limit A2 (P63)
17	Measured value $<$ lower sorting limit (P18)
18	Measured value $>$ upper sorting limit (P19)
19	Error (see "Error Messages")

## Inputs at D-sub connection EXT (X41)

Pin	Function
1, 10	0 V
2	Reset display to zero, clear error message
3	Set display to the value selected in P79
4	Ignore reference mark signals
5	Start series of measurements
6	Externally select display value for series of measurements
7	Display MIN value of series of measurements
8	Display MAX value of series of measurements
9	Display difference MAX – MIN
22	Pulse: Output measured value
23	Contact: Output measured value
24	Deactivate BCD data output
25	Enable or disable REF mode (current REF status is changed)
12, 13	Do not assign
11, 20, 21	Vacant

### Special case: Display current measured value ACTL

If you wish to display the current measured value ACTL of a series of measurements, note for inputs **7, 8 and 9**: Either none or more than one of these inputs must be active.

## Inputs

### Input signals

Internal pull-up resistor 1 kΩ, active with low level

Trigger by making contact against 0 V **or** by low level signal over TTL logic device

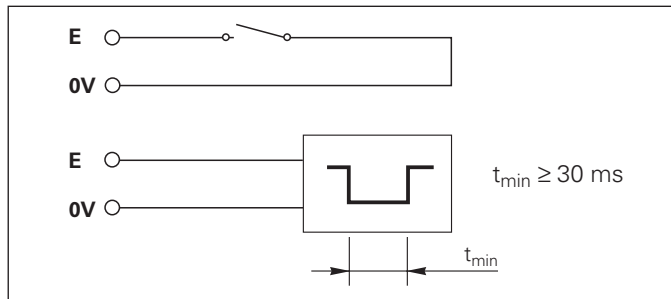
Minimum pulse duration:  $t \geq 30$  ms,  
with fast set/zero reset:  $t \geq 30$  μs

Minimum pulse duration:  $t \geq 30$  ms, with set/zero reset:  
 $t \geq 1.5$  ms, with fast set/zero reset:  $t \geq 30$  ms

Delay for set/zero reset: fast data output  $t_d \leq 25$  μs;  
slow data output  $t_d \leq 2$  ms

### Signal level of inputs

Status	Level
High	$+ 3.9 \text{ V} \leq U \leq + 15 \text{ V}$
Low	$- 0.5 \text{ V} \leq U \leq + 0.9 \text{ V}; I \leq 6 \text{ mA}$



## Outputs

### Output signals

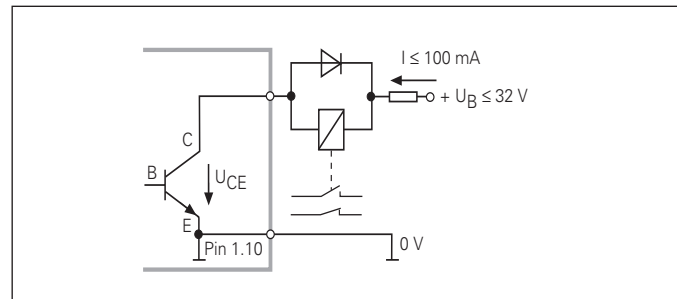
Open collector outputs, active with low level

Delay until signal output:  $t_d \leq 30$  ms

Signal duration of zero signal, trigger limit A1, A2:  $t_0 \geq 180$  ms

### Signal level of outputs

Status	Level
High	$U \leq + 32 \text{ V}; I \leq 10 \text{ μA}$
Low	$U \leq + 0.4 \text{ V}; I \leq 100 \text{ mA}$



## Setting and zero resetting the display

With an external signal, you can set the display to the value selected in parameter P79 (pin 3) or reset each axis to zero (pin 2).

## Enabling and disabling REF mode

Operating parameter P85 allows you to activate the input (pin 25) which will be used for setting the display externally to REF mode when the unit is switched on or when the power is restored after an interruption. The next signal deactivates REF mode again (switchover function).

## Ignoring reference mark signals

If this input (pin 4) is active, the display will ignore all reference mark signals. A typical application of this function is for measuring lengths with a rotary encoder and spindle; in this case, a cam switch releases the reference mark signal at a preset position.

## Externally selecting MIN/MAX

### Starting a series of measurements

### Switching the display between MIN/MAX/DIFF/ACTL

You can activate the operating mode for finding minimum and maximum values from a series of measurements with an external signal (pin 6, low-level signal must continuously be present). The setting selected with MOD or operating parameter P21 is disabled. You can switch to MIN/MAX/DIFF/ACTL display (pins 7, 8, 9, low-level signal must be present continuously) and START (pin 5, Pulse) a new series of measurements only by external signal over the switching inputs.

## Switching signals

As soon as the trigger points defined in parameters are reached, the corresponding outputs (pins 15, 16) are activated. You can set up to two trigger points. The switching point "zero" has a separate output (see "Zero crossover").

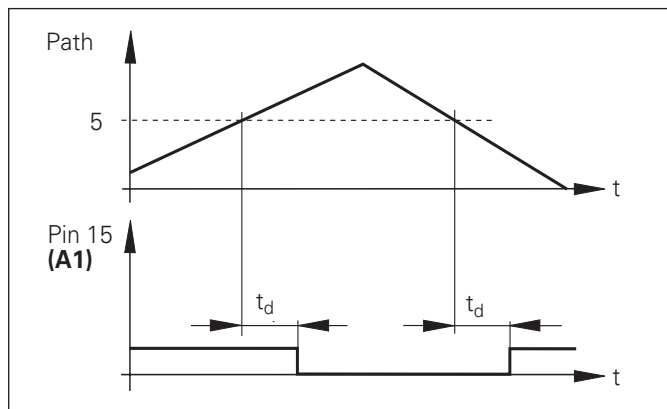
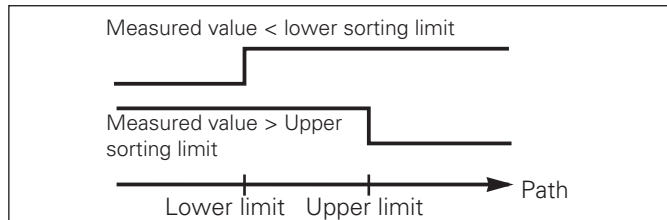
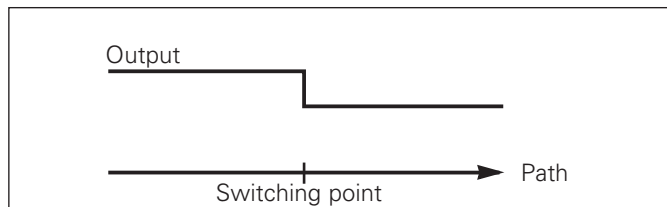
## Signals for sorting and tolerance checking

If the sorting limits defined in parameters are exceeded, the corresponding outputs (pins 17, 18) are activated.

Signals	Operating parameters	Pin
Switching signals	P62, switching limit 1	15
	P63, switching limit 2	16
Sorting signals	P18, lower sorting limit	17
	P19, upper sorting limit	18

## Zero crossover

The display value "zero" activates the corresponding output (pin 14). Minimum signal duration is 180 ms.



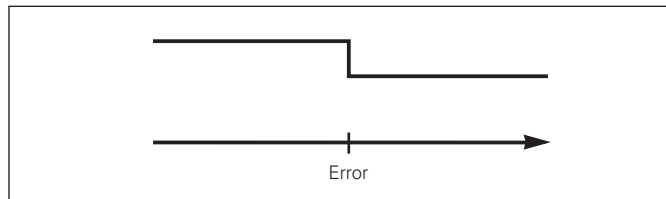
Time curve of signal at pin 15 for trigger limit (A1) = 5 mm ,  $t_d \leq 30$  ms



## Switching signal for errors

The display unit permanently monitors functions such as measuring signal, input frequency, and data output, and displays an error message if it detects an error.

If errors occur that seriously influence measurement or data output, the display unit activates a switching output. This feature allows monitoring of automated processes.



## Distance-to-Go Display Mode

Normally, the display shows the actual position of the encoder. However, it is often more helpful to display the remaining distance to an entered nominal position—especially when you are using the display unit for machine tools and automation purposes. You can then position simply by traversing to display value zero.

You can access the distance-to-go display by entering the **code number 24 65 82**.

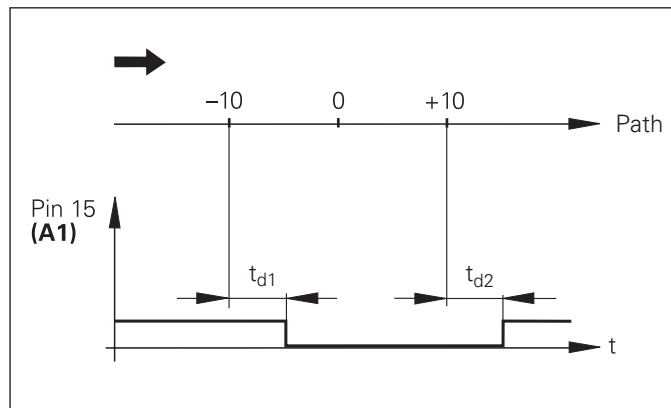
Display	Meaning
DELTA ON	Distance-to-go display active
DELTA OFF	Distance-to-go display not active

### “Traversing to zero” with distance-to-go display

- Select datum point 2.
- Enter the nominal position.
- Move the axis until the display value is zero.

## Function of switching outputs A1 and A2

In the distance-to-go mode, switching outputs A1 (pin 15) and A2 (pin 16) have a different function: they are symmetrical to the display value zero. For example, if a switching point of 10 mm is entered in P62, output A1 switches at both +10 mm and -10 mm. The figure below shows output signal A1 when approaching zero from the negative direction.



Time curve of a signal for switching limit (A1) = 10 mm,  
 $t_{d1} \leq 30$  ms,  $t_{d2} \leq 180$  ms

## Displaying the Software Version

To display the software version of the display unit, enter the code number 66 55 44:

- Select the user parameter P00 CODE.
- Enter the code number 66 55 44.
- Confirm your entry with ENT.
- The display unit shows the software number.
- With the “-” key you can switch the display to the date of issue.
- To exit the software version display mode, press ENT.

## Locking the Keypad

You can disable or re-enable the keypad by entering the code number 24 65 84:

- Select the user parameter `P00 CODE` (see “Operating Parameters”).
- Enter the code number 24 65 84.
- Confirm the entry with ENT.
- With the “•” or “-” key, select `KEYS ON` or `KEYS OFF`.
- Confirm your selection with ENT.

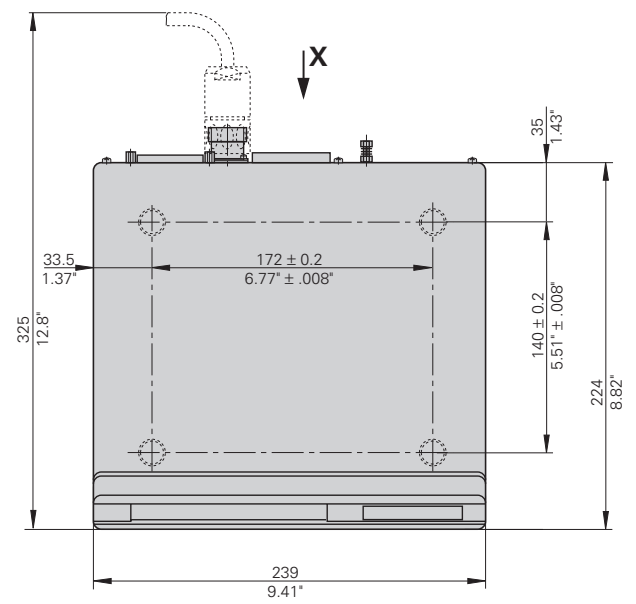
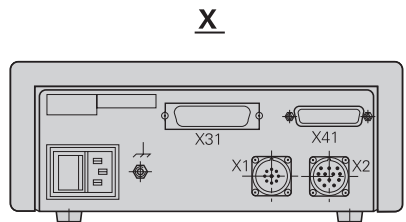
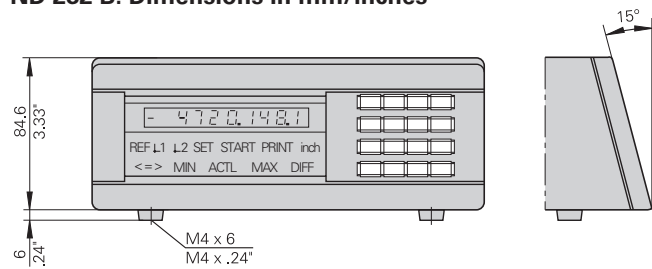
If the keypad is locked, you can only select the datum or select `P00 CODE` over the MOD key.

## Specifications

<b>Housing</b>	<b>ND 282 B</b> Benchtop design, cast-metal housing (W · H · D) 239 mm · 84.6 mm · 224 mm
<b>Operating temperature</b>	0° to 45° C (32° to 113° F)
<b>Storage temperature</b>	-20 °C to 70 °C (-4 °F to 158 °F)
<b>Weight</b>	Approx. 1.5 kg (3.3 lb)
<b>Relative humidity</b>	< 75% annual average < 90% in rare cases
<b>Power supply</b>	Primary-clocked power supply 100 Vac to 240 Vac (-15% to +10%) 50 Hz to 60 Hz (± 2 Hz)
<b>Line fuse</b>	F 1 A inside the housing
<b>Power consumption</b>	8 W (typically)
<b>Electromagnetic compatibility</b>	Class B according to EN 55022

<b>Noise immunity</b>	As per VDE 0843 Parts 2 and 4, severity 4
<b>Protection</b>	IP40 according to IEC 529
<b>Encoder inputs</b>	For linear encoders with sinusoidal output signals (11 $\mu$ A <sub>PP</sub> ); Reference mark evaluation for distance- coded and single reference marks
<b>Input frequency</b>	Max. 50 kHz for 30 m cable length
<b>Display step</b>	Adjustable (see "Linear Encoders")
<b>Datum points</b>	Two
<b>Functions</b>	<ul style="list-style-type: none"> <li>• Series of measurements</li> <li>• Sorting and tolerance checking</li> <li>• Switching and sorting signals</li> <li>• Set display and reset display to zero with external signal</li> <li>• Measured value output</li> </ul>
<b>BCD Interface</b>	Output measured values

ND 282 B: Dimensions in mm/inches




# HEIDENHAIN


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