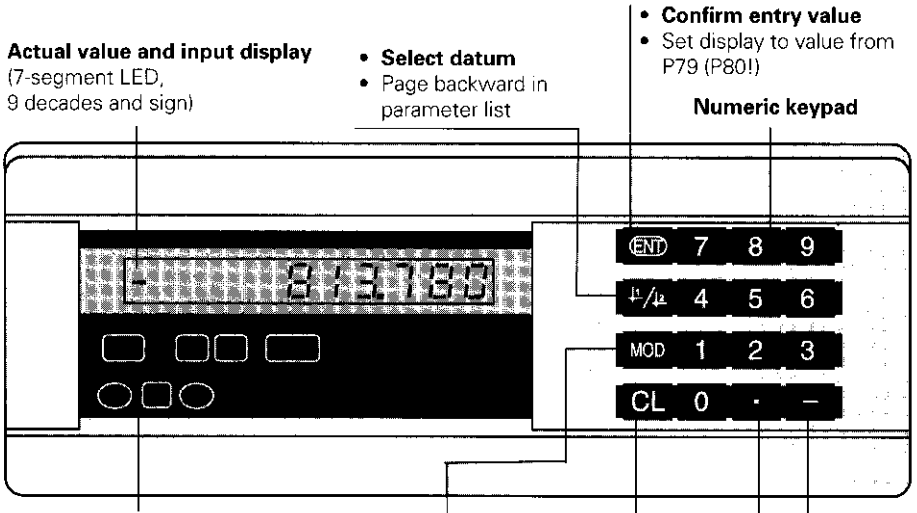
HEIDENHAIN

Working with the measured value display unit

ND 261



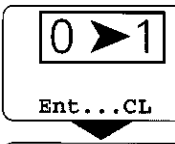
Indicator	Meaning
REF	If decimal points are blinking: Display is waiting for the reference mark to be crossed over. If decimal points are not blinking: Reference mark was crossed over — datum points are now stored in nonvolatile memory. **Blinking:** Waiting for operator to press ENT or CL.
⊥1 / ⊥2	Datum 1 / Datum 2 currently active.
SET	**Blinking:** Waiting for operator to confirm entry values.
< / = / >	**Sorting mode:** Measured value less than lower limit / within tolerance / greater than upper limit.

The ND 261 is designed for use with HEIDENHAIN **angle encoders** with sinusoidal output signals. These angle encoders have one reference mark or several *distance-coded* reference marks.

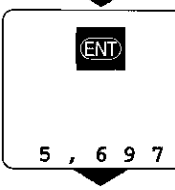
When a reference mark is crossed over, it generates a signal identifying that position as a reference point. After switch-on, simply crossing over a reference mark restores the relationship between axis positions and display values as it was last defined by datum setting.

With distance-coded reference marks, a maximum traverse of only 10° or 20° suffices to restore the datum.

Switch-On



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



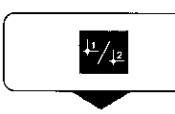
Switch on reference mark evaluation
- Display shows the value last assigned to the reference mark position.
- REF indicator glows.
- Decimal point blinks.

Cross over reference mark
Move the axis until the display becomes active and the decimal point no longer blinks.

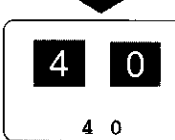
If you do **not** wish reference mark evaluation, press **CL** instead of ENT.

Setting the Datum

The datum setting procedure assigns a display value to a specific axis position. The ND 261 allows you to set two separate datum points.



Select datum 1 or 2.



Enter a value, such as 40.

Confirm entered value.

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

Sorting and Tolerance Check Mode

In this mode, the display value is compared with an upper and a lower limit value. Status indicators and the trigger signal outputs at the D-sub EXT connection (see that section) indicate whether the display value is less than the lower limit, greater than the upper limit, or between the two limit values.

Indicator	Meaning
=	Measured value is between the limit values
<	Measured value is less than the lower limit value
>	Measured value is greater than the upper limit value

Operating parameters for the sorting mode:

- P17: Sorting on/off
- P18, P19: Limit values

Data Output

There are three ways to output data:

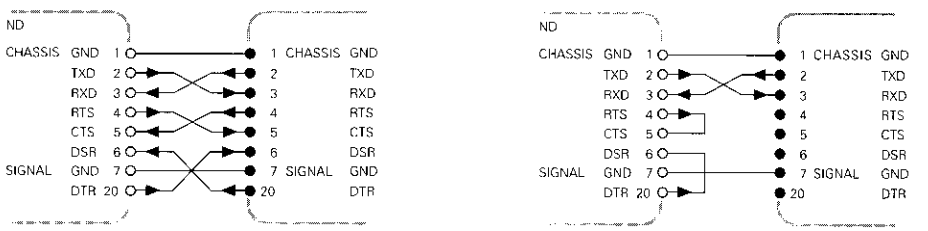
- ➤ PRINT function: Press the MOD key (this method can be inhibited with operating parameter P86); **or**
- ➤ Input the command STX (CTRL B) over the RXD input; **or**
- ➤ Input a latch command over the D-sub connection EXT.

A **connecting cable** (to a PC, for example) is available from HEIDENHAIN (Id.-Nr. 274 545 ..); cable length up to 20 m (66 ft).

Operating parameters for data output: P50, P51

Wiring and pin layout

Connecting cable is either **completely** wired (left) or only **partially** wired (right).



CHASSIS GND: Chassis Ground; **TXD:** Transmitted Data, **RXD:** Received Data, **RTS:** Request To Send, **CTS:** Clear To Send; **DSR:** Data Set Ready; **SIGNAL GND:** Signal Ground; **DTR:** Data Terminal Ready

Signals	Signal level "active"	Signal level "not active"
TXD, RXD	–3 V to –15 V	+3 V to +15 V
RTS, CTS, DSR, DTR	+3 V to +15 V	-3 V to -15 V

Data transfer format and control characters

Format	ASCII code
Data word	1 start bit, 7 data bits, parity bit (even parity), 2 stop bits
Control characters	Call measured value: STX (CTRL B), interrupt DC3 (CTRL S), resume DC1 (CTRL Q) Enquire error message: ENQ (CTRL E)
Sequence	• Sign • Numerical value with up to 2 decimal points • Blank space (or ? for error) • Comparison result (<, >, =; ? if P18 > P19) **or** blank space • 1 blank space • Carriage return • Line feed

Storage and transfer times

The duration of data transfer depends on the selected baud rate and the number of additional line feeds. Display of degrees, minutes and seconds increases the storage and transfer times.

Latch signal	STX (CTRL B)	EXT (pulse)	EXT (contact)	PRINT
Storage time	≤ 1 ms	≤ 1 µs	≤ 5 ms	≤ 42 ms
Transfer time	≤ 44 ms	≤ 44 ms	≤ 48 ms	≤ 85 ms

D-Sub Connection EXT

Danger to internal components!
Voltage sources from external circuitry must conform to the recommendations in VDE 0160, 5.88 for low-voltage electrical separation. Connect inductive loads only with a quenching diode parallel to the inductance.

Use only shielded cable!
Connect the shield to the connector housing.

	Pin	Function	Pin	Function
Outputs	15	Meas. value ≥ trigger limit A1 (P62)	1	0 V
	16	Meas. value ≥ trigger limit A2 (P63)	10	0 V
	17	Meas. value < lower sorting limit (P18)	5	Do not use
	18	Meas. value > upper sorting limit (P19)	6	Do not use
	19	Error (see "Error Messages")	7	Do not use
	14	Display value is zero	8	Do not use
Inputs	2	Reset display to zero, clear error message	9	Do not use
	3	Preset display to value from P79	12	Do not use
	25	Cross over reference marks	13	Do not use
	4	Ignore reference mark signal	24	Do not use
	22	Pulse: output the measured value	11	Vacant
	23	Contact: output the measured value	20	Vacant
			21	Vacant

Signal levels	LOW		HIGH	
Inputs	–0.5 V ≤ U ≤ 0.9 V	I ≤ 6 mA	3.9 V ≤ U ≤ 15 V	
Outputs	U ≤ 0.4 V	I ≤ 100 mA	U ≤ 32 V	I ≤ 10 µA

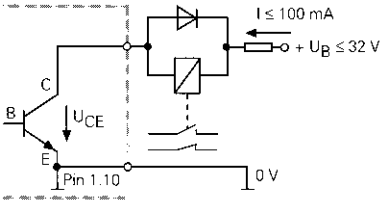
Description of input and output signals

Input signals

- Internal pull-up resistor 1 kΩ
- Triggering by make contact against 0 V **or** LOW level over TTL component
- Delay for Zero reset/Preset: $t_d \leq 2$ ms
- Minimum pulse duration for all signals: $t_{min} \geq 42$ ms

Output signals

- Open collector outputs, active LOW
- Signal output delay: $t_d \leq 42$ ms
- Zero crossover signal minimum duration, trigger outputs A1, A2: $t_0 \geq 180$ ms



Note that these times will increase if features are active (such as the sorting mode) or if the measured values are being displayed in degrees/minutes/seconds.

Display Freeze by Measured Value Output Signal

The effect of the signal for measured value output on the display is defined in user parameter P23.

- ➤ **Concurrent display:** No display freeze. The unit shows the current measured value (ACTL).
- ➤ **Frozen display:** The display is frozen and is updated with each signal for measured value output (HOLd).
- ➤ **Frozen/concurrent display:** The display freezes only as long as the signal is present (StOP).

Error Messages

To clear error message ERROR

When you have removed the cause of the error,

- ➤ press CL.

Message	Cause and effect
ERROR 01	Last measured value not yet latched*
ERROR 02	External device not ready for data transfer* (ERROR 02 only appears once)
ERROR 03	Data interface: Parity error or wrong format*
ERROR 10	Incorrect input value
ERROR 11	Overflow caused by external preset
ERROR 13	Overflow, trigger limit 1
ERROR 14	Overflow, trigger limit 2
ERROR 15	Overflow, lower sorting limit
ERROR 16	Overflow, upper sorting limit
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 53	Internal counter overflow
ERROR 55	Error while crossing over reference marks*
ERROR 80 ERROR 83 ERROR 84 ERROR 86	To erase these error messages: **Switch off the unit.** Should any of these errors recur, contact your HEIDENHAIN service agency
ERROR 99	Check the operating parameters. Should this error code continue to come up, contact your HEIDENHAIN service agency.

If **all decimal points light up**, the measured value is too large or too small. In this case, set a new datum **or** retract.

If **all sorting indicators light up**, this means that the upper sorting limit is less than the lower limit.

* These errors are significant for a connected device. The error signal (pin 19) at the EXT D-sub connection is active.

Operating Parameters

The parameters are divided into "user parameters" and "protected operating parameters," which can only be accessed by entering a code number.

User parameters
User parameters are operating parameters that you can change **without** entering the code number: They are designated P00 to P30, P50, P51, P79, P86

Calling user parameters
To call user parameters **immediately after switch-on**:
➤ Press the MOD key as long as [ENT. . CL] is visible in the display.

To call user parameters **during operation**:
➤ Press and hold the CL key, then press MOD.
To go **directly** to a specific user parameter:
➤ Press and hold the CL key, then press the first digit of the parameter number.
➤ Release both keys and press the second digit.

Protected operating parameters
Before you can change protected operating parameters you must enter the **code number 95 148** through [P00 CODE]: They **remain** accessible until you switch off the position display.

To page through the parameter list
➤ **Forward** paging: Press the MOD key.
➤ **Backward** paging: Press the ⊥1 / ⊥2 key.
By paging on, you automatically enter any change you've made in a parameter.

To change operating parameters
➤ Increase the parameter value with the decimal point key, **or**
➤ Decrease the parameter value with the minus key, **or**
➤ Enter the numerical value for the operating parameter, e.g. for P41 ([SET] blinks).

To correct your entries and show the parameter designation
➤ Press the CL key.

To exit the operating parameters
➤ Press ENT. All changes made become effective.

Operating Parameter List

Parameter	Meaning	Function / Effect	Setting
P00 CODE	Enter **code number 95 148** to change a protected operating parameter.		
P08 DISP ***Display***	**Display mode**	Decimal degrees	DECIMAL
		Degrees, minutes, seconds	DEGMINSEC
P09 DISP	**Angle display**	+/– 180°	180
		360°	360
		+/– ∞	ENDLESS
P17 CLSS ***Classification***	**Sorting mode**	Sorting on	CLSS ON
		Sorting off	CLSS OFF
P18 CLSS	**Lower sorting limit** (ensure that P18 < P19)		
P19 CLSS	**Upper sorting limit** (ensure that P19 > P18)		

Operating Parameter List – *continued*

Parameter	Meaning	Function / Effect	Setting
P23 d ISP ***Disp**lay*	**Display value with measured value output**	Concurrent display, no freeze	ACtL
		Frozen display / update with signal	HOLd
		Frozen/concurrent display	StOP
P30 d IR ***Dir**ection*	**Counting direction**	Normal (***Pos**itive*)	POS
		Inverse (***Neg**ative*)	nEG
P36 SubD ***Subd**ivision*	**Angle subdivision** 400, 250, 200, 100, 50, 40, 25, 20, 10, 8, 4, 2.5, 2, 1, 0.4, 0.2		
P37 StEP	**Counting mode**	0 - 1 - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 0	1
		0 - 2 - 4 - 6 - 8 - 0	2
		0 - 5 - 0	5
P38 dEC ***Dec**imal point*	**Places after decimal** 1 / 2 / 3 / 4 / 5 / 6		
P43 rEF	**Reference marks**	One reference mark	S InGLE
		Distance-coded with 500 • GP (GP = grating period)	500
		Distance-coded with 1000 • GP (e.g. for ROD 250 C / ROD 700 C)	1000
		Distance-coded with 2000 • GP	2000
P44 rEF	**Reference mark evaluation**	Evaluation	rEF On
		No evaluation	rEF OFF
P45 EnCd ***Enc**oder*	**Encoder monitoring**	No monitoring (***Alarm Off***)	ALAr. OFF
		Contamination	ALAr. C
		Frequency	ALAr. F
		Contamination and frequency	ALAr. CF
P50 U24	**Baud rate** bAUd	110, 150, 300, 600, 1200, 2400, 4800, 9600	
P51 U24	**Additional line feeds** L InEFd. (***Linefeed***) 0 to 99		
P62 A1	**Trigger limit 1**	Enter numerical value	
P63 A2	**Trigger limit 2**	Enter numerical value	
P79 PrSt ***Pres**et*	**Value for datum**	Enter numerical value for datum setting over switching input or with ENT key	
P80 SEt	**Reset/Preset**	No zero resert/Preset with CL/ENT	SEt OFF
		Zero reset with CL (***Set Zero***), no preset with ENT	SEt ZEro
		Zero reset with CL and preset with ENT to value in P79	PrESEt
P82 MESG ***Mess**age*	**Display after switch-on**	[ENt. .CL] message displayed	MESG On
		[ENt. .CL] message not displayed	MESG OFF
P85 rEF	**External REF**	REF over D-sub connection EXT	EHt. On
		No REF over EXT connection	EHt. OFF
P86 Mod ***Mod**e*	**Inhibit PRINT**	PRINT inhibited	Pr InH OFF
		PRINT not inhibited	Pr InH On

Parameter Settings for HEIDENHAIN Angle Encoders

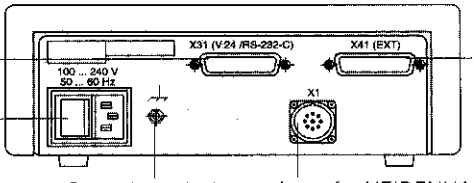
Model	Line count	Reference marks	P43	Display step	Sub-division P36	Count. mode P37	Decimal places P38
ROD 450	1 800	one	single	0.05°	4	5	2
ROD 456				0.01°	20	1	2
ROD 450	3 600	one	single	0.01°	10	1	2
ROD 456				0.005°	20	5	3
ROD 450M				0.001°	100	1	3
RON 455							
ROD 250	9 000	one	single	0.005°	8	5	3
ROD 255				0.001°	40	1	3
ROD 250C	9 000	dist.c.	500	0.005°	8	5	3
ROD 255C				0.001°	40	1	3
ROD 250	18 000	one	single	0.001°	20	1	3
ROD 255				0.000 5°	40	5	4
ROD 700				0.000 1°	200	1	4
ROD 705							
RON 706							
ROD 250C	18 000	dist.c	1 000	0.001°	20	1	3
ROD 255C				0.000 5°	40	5	4
ROD 700C				0.000 1°	200	1	4
ROD 705C							
RON 706C							
ROD 700	36 000	one	single	0.000 1°	100	1	4
ROD 800							
ROD 806							
ROD 905							
ROD 700C	36 000	dist.c	1 000	0.000 1°	100	1	4
ROD 800C							
ROP 801	180 000	one	single	0.000 01°	200	1	5

Example: Set parameters for any encoder
Angle encoder with line count s = 18 000
Desired display step a = 0.001°
Subdivision P36 = **360° / *s* / *a*** = 20
Counting mode P37 = 1 (display counts 1, 2, 3, ...)
Decimal places of a: P38 = 3

Convert decimal degrees to degrees, minutes, seconds

1 degree (1°) = 60 minutes (60'); 1 minute (1') = 60 seconds (60'')
1 second (1'') ≈ 0.000278°

Rear View

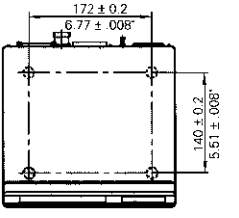


Interfaces X1, X31 and X41 interfaces comply with the recommendations in VDE 0160, 5.88 for separation from line power.

Installation

You can fix the display unit to a flat surface with M4 bolts (see illustration at right).

The units can also be stacked. Adhesive inserts (included in delivery) prevent them from sliding.



Power Supply and Connection

Danger of electrical shock!
Unplug the power cord before opening the housing.
Connect a protective ground. This connection must 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, class 2 overvoltage tolerance in accordance with VDE 0160, 5.88.
Voltage range: 100 V to 240 V (– 15% to + 10%) **Frequency:** 48 Hz to 62 Hz
Power consumption typ. 8 W **Line fuse:** F 1 A (in unit)
Minimum cross-section of the power line: 0.75 mm²

To increase noise immunity, connect the ground terminal on the rear panel to the central ground point of the machine. (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 (– 22°F to 158°F)
Rel. humidity	Annual average: < 75%; maximum: < 90%
Weight	1.5 kg

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