STABILA®

How true pro's measure

TECH 1000 DP

Operating instructions

Contents

1. Intended use

Congratulations on the purchase of your STABILA measuring tool. The STABILA TECH 1000 DP is a digital measuring tool for measuring inclinations.

? If you still have questions after reading through the operating instructions, you can obtain advice by telephone:

☎ +49 63 46 3 09 0

Equipment and functions:

- Tough, independent 360° digital protractor for quick and accurate measurements

- Integrated rare-earth magnet for attachment

- Integrated V-groove for aligning on round surfaces

- Integrated T-groove for attachment

- Integrated Li-ion rechargeable battery

- Digital protractor with fast, direct transfer of measurement data via a RS485 interface

- Digital protractor for measuring / monitoring via MODBUS-compatible data traffic

- Carrying case

- Mains adapter

- RS 485 data cable ‹– › open

- RS 485 data cable ‹– › USB (optional)

- STABILA Analytics evaluation software (optional)

TECH 1000 DP
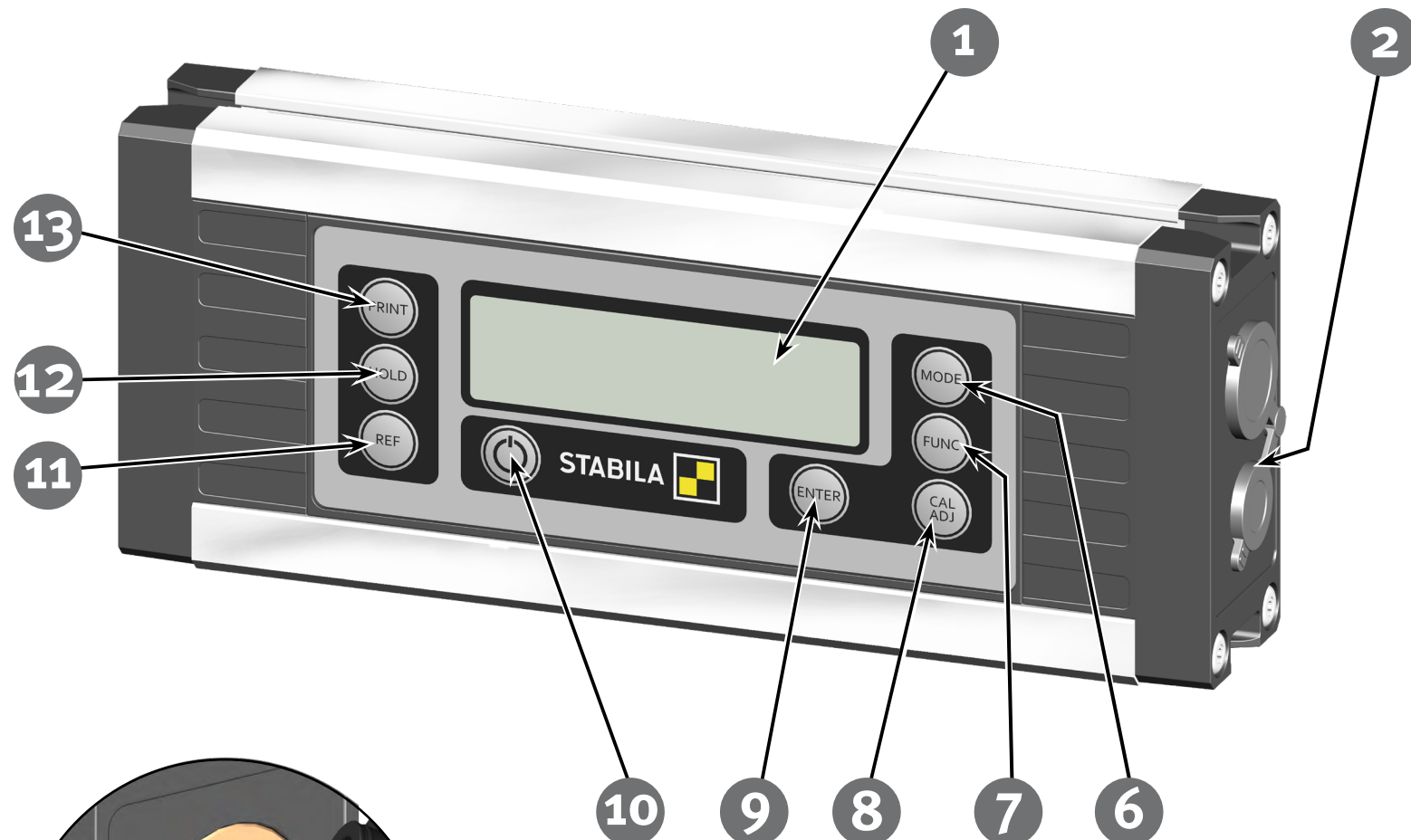
2. Components of the unit

(1) Display

(2) Mains adapter connection, M12 socket

(3) Rare-earth magnet

(4) T-groove profile for securing with M4 groove stones, e.g. Bosch Rexroth® or square nut in accordance with DIN 557

(5) V-shape for aligning on round surfaces

Buttons:

(6) MODE — Units of measurement: °, %, mm/m, in/ft

(7) FUNC — Function selection
Lighting, acoustic guidance, keylock, unit settings, Auto OFF, baud rate, battery status

(8) CAL ADJ — Calibration, sensor adjustment

(9) ENTER — Confirm entry

(10) On/Off

(11) REF — Reference – freely selectable zero position

(12) HOLD — HOLD – lock measurements

(13) PRINT — Print mode – manual transmission of measurements

3.5 mm

TECH 1000 DP
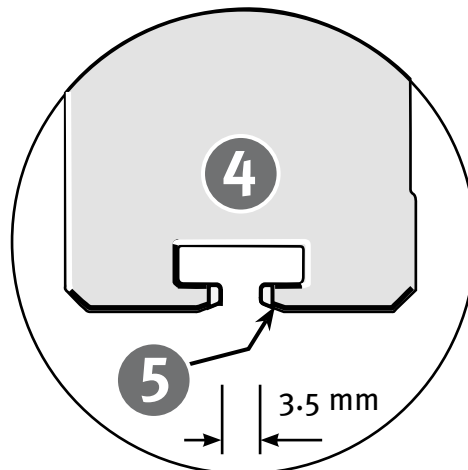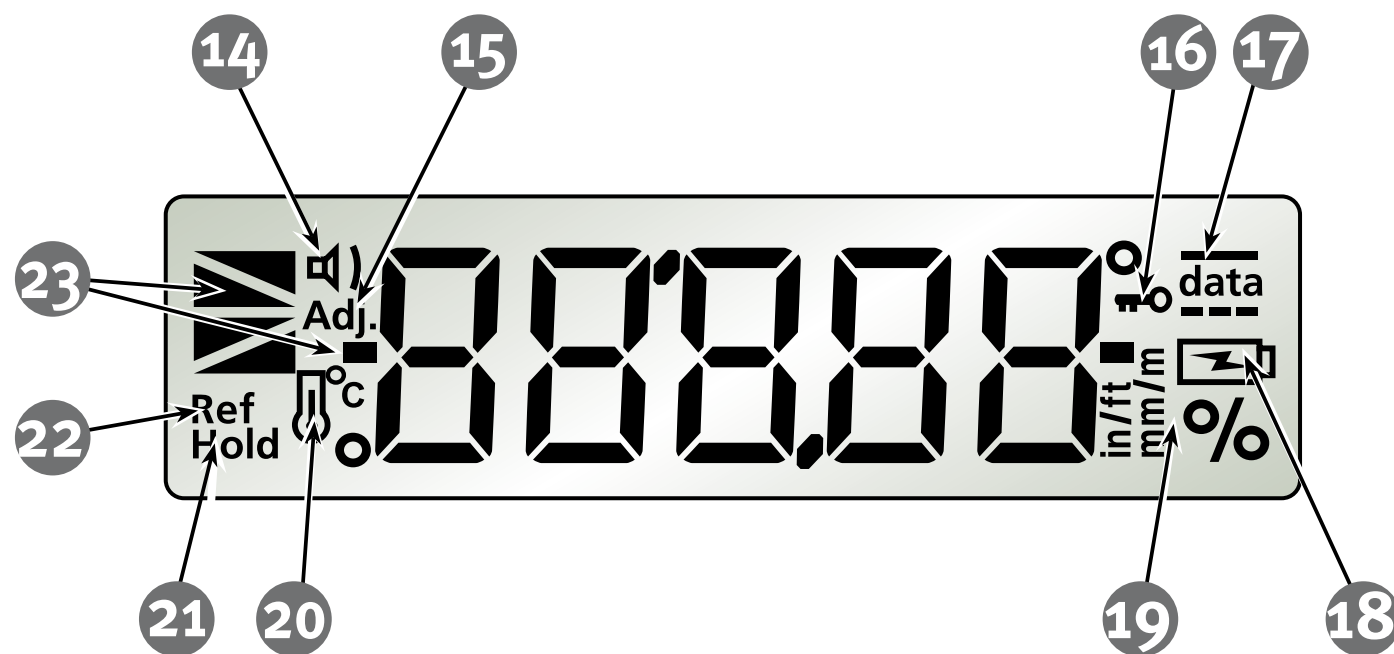
3. Display elements

(14)   Acoustic guidance: activated

(15)   See chapter 7.4

(16)   Keylock: activated

(17)   Data traffic

(18)   See chapter 4.1

(19)   Units of measurement: °, %, mm/m, in/ft

(20)   See chapter 7.4

(21)   Hold: activated

(22)   Reference: activated

(23)   Position indicator

4. Commissioning

4.1 Power supply
- Charging the Li-ion rechargeable battery

+ 5 V DC

GND

The Li-ion rechargeable battery is charged using the mains adapter provided. Alternatively, the battery can be charged using the USB connection cable provided, as well as the M12 RS485 connection. The charging time depends on the maximum charging current of the source. Remaining connected to the mains adapter for a long period of time will not damage the Li-ion rechargeable battery.

⚠ Other power sources can damage the measuring tool!

Before using the unit for the first time, ensure that the rechargeable battery is fully charged!

Charging time: approx. 3 hours.
- After 1 hour, the Li-ion rechargeable battery will be charged to approx. 80%.
- Charging temperature range: 0 °C – 40 °C
- Do not allow the Li-ion rechargeable battery to become fully discharged.
- The performance of the Li-ion rechargeable battery is dependant on temperature.

LCD indicator:
Symbol not displayed – rechargeable battery is charged

Low battery level

If connected to the mains – rechargeable battery is being charged

If connected to the mains – rechargeable battery is fully charged
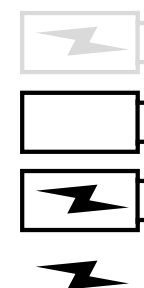
4.2 M12 socket pin assignment

+ 5v DC   RS485-A-line

RS485-B-line   GND

When charging via the M12 socket, observe the following:

- Correct polarity
- Voltage: + 4.75 V (DC) ... +5.25 V (DC)
- Charging current: › 100 mA ... 2000 mA

TECH 1000 DP

4.3 Connection cable

1	+ 5v DC
2	RS485-A-line
3	GND
4	RS485-B-line

Pin assignment for the enclosed connection cable to the M12 socket

4.4 Switching the unit on

Test

After switching on with the "ON/OFF" button, an automatic test is carried out. All the display's segments are shown.
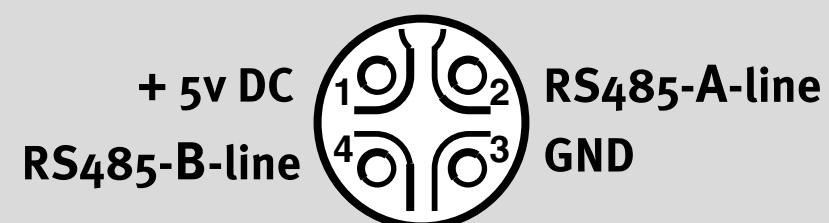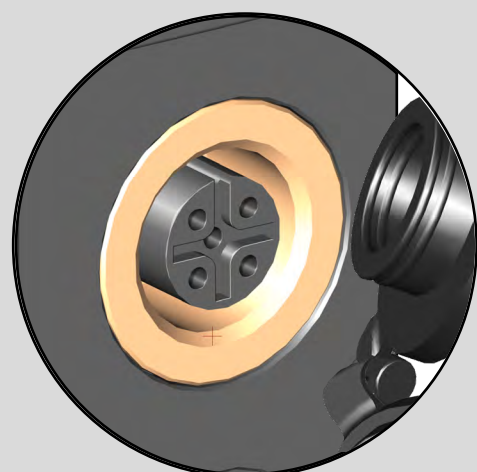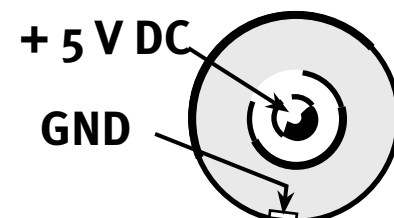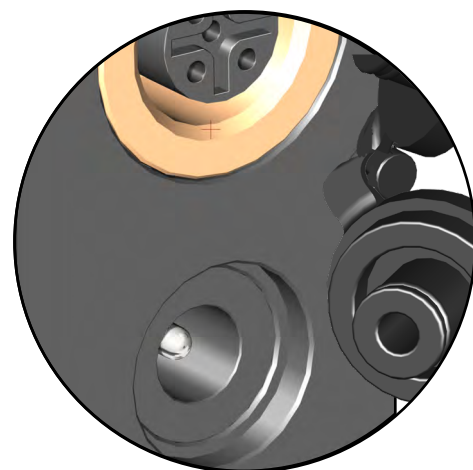
S 1.00 — Software Version

After the end of the test, the version number S x.xx of the software is briefly displayed and the automatic switch-off time (Auto OFF) is shown.

A-OFF — Auto OFF

0.2h

boud4 — BAUD

9600 — [Bd]

9600 Bd = standard

- 0.00° — ◁))) = OK ✓

An acoustic signal indicates that the unit is ready for operation.
The display shows the angle measured in the set unit of measurement.

5.1 Visual guidance

Triangles representing the inclination indicate the position of the digital protractor in relation to the horizontal or vertical axis.

The 2 "centre display" bars indicate the precise position at which the vertical or horizontal axis is reached.

Display showing direction of inclination

$$- 90.00 -$$

$$90.01°$$

$$89.99°$$

90°

$$0.01°$$

0.00°

0°

$$359.99°$$

0.01° - 45.00°	270.01° - 315.00°
45.00° - 89.99°	135.00° - 179.99°
225.00° - 269.99°	315.00° - 359.99°
90.01° - 135.00°	180.01° - 225.00°
0.00°	90.00°
180.00°	270.00°

PRINT HOLD REF MODE FUNC ENTER CAL ADJ STABILA
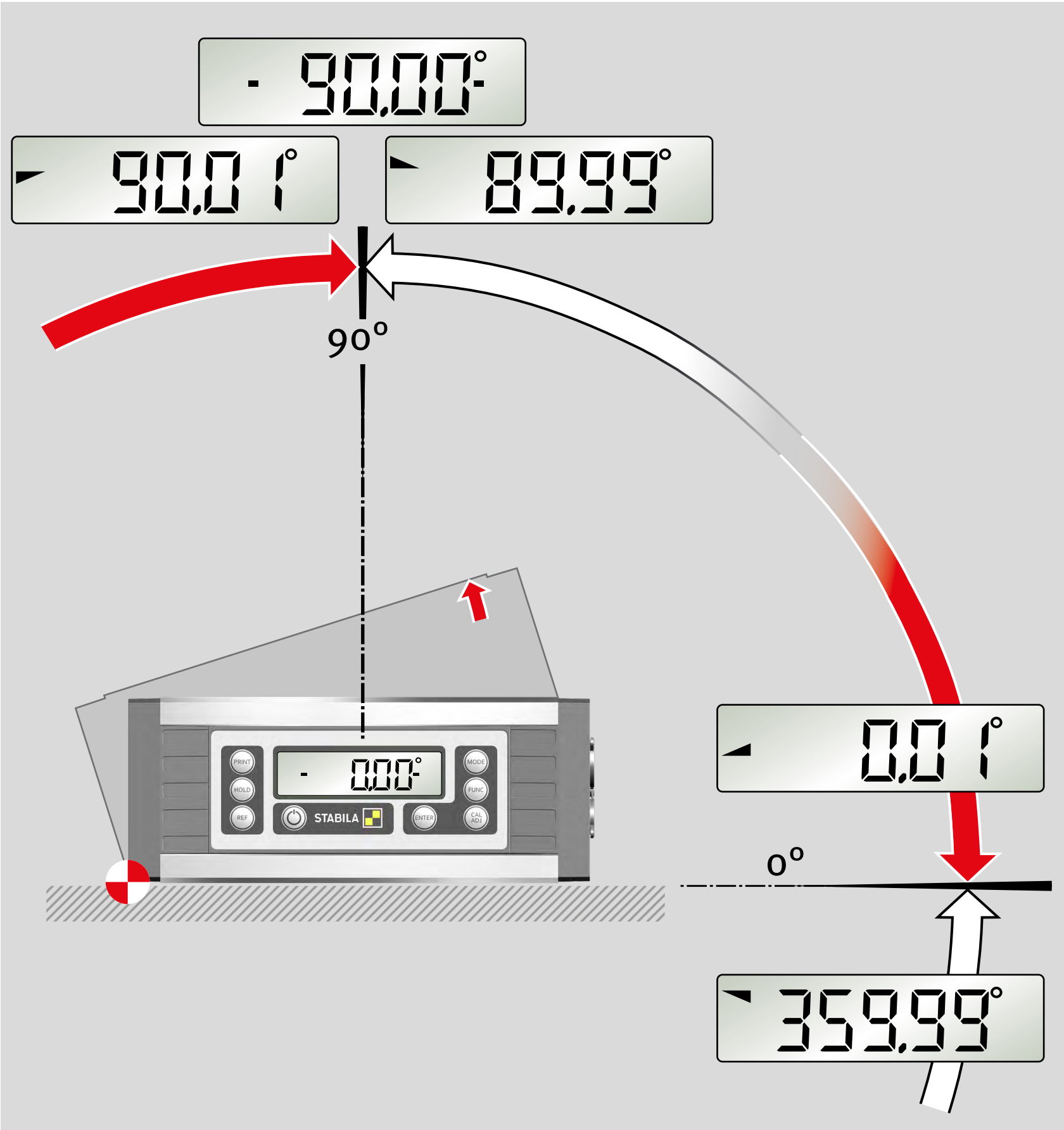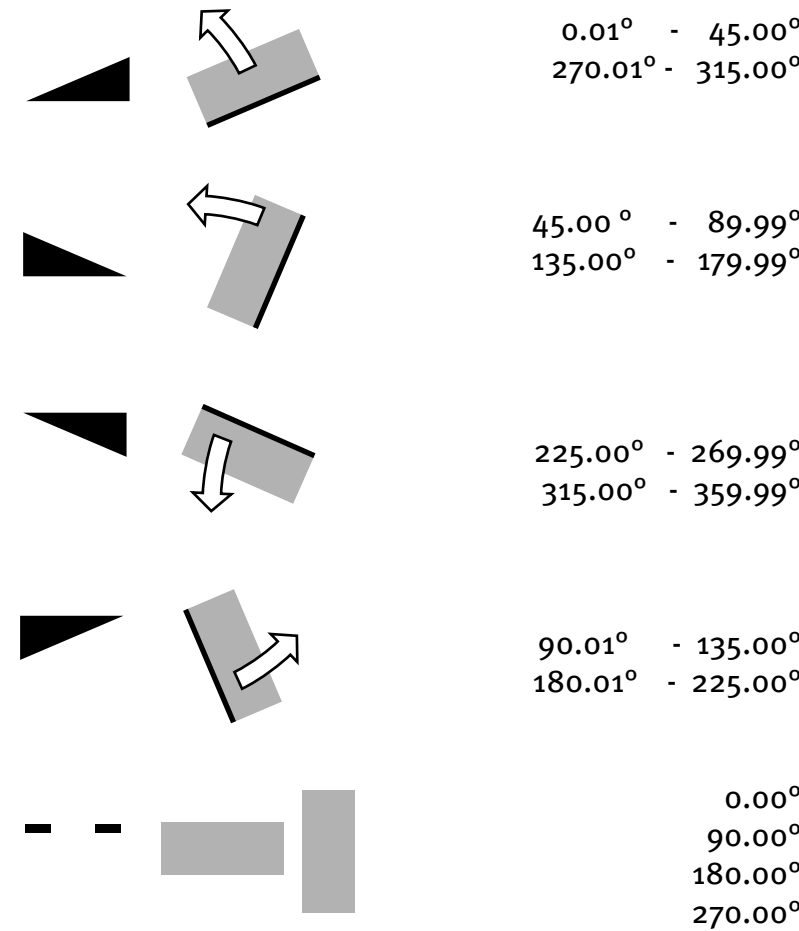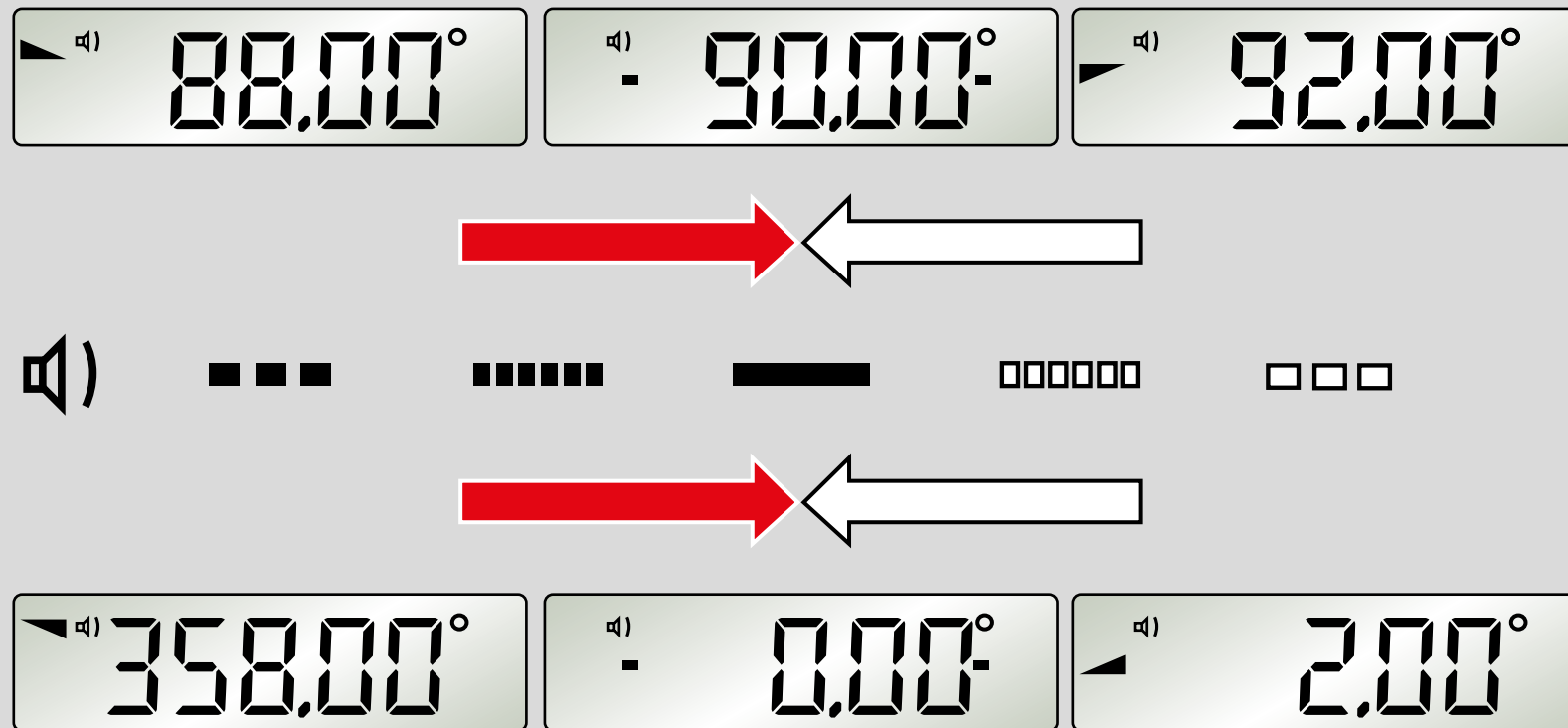
5.2 Acoustic guidance

The acoustic guidance is selected via the "FUNC" button.
The tone sequence speeds up as the 0°, 90°, 180° and 270° positions are approached in a range of +/- 2°.
A change in the pitch indicates that these positions have been exceeded.

A continuous signal tone confirms the precise point at which 0°, 90°,180° and 270° are reached.

This function is not active in interface mode.

88.00°   90.00°   92.00°

358.00°   0.00°   2.00°

5.3 Automatic display inversion

The display is inverted for overhead measurements so that it is always legible.

7.00°

187.00°

TECH 1000 DP

0°
359.99°

10.18°

o

(MODE)

0°
359.9°

10.2°

o

0%
100%
0%

17.7 %

%

0 mm/m
1000 mm/m
0 mm/m

177 mm/m

mm/m

0 in/ft
12 in/ft
0 in/ft

2.12 in/ft
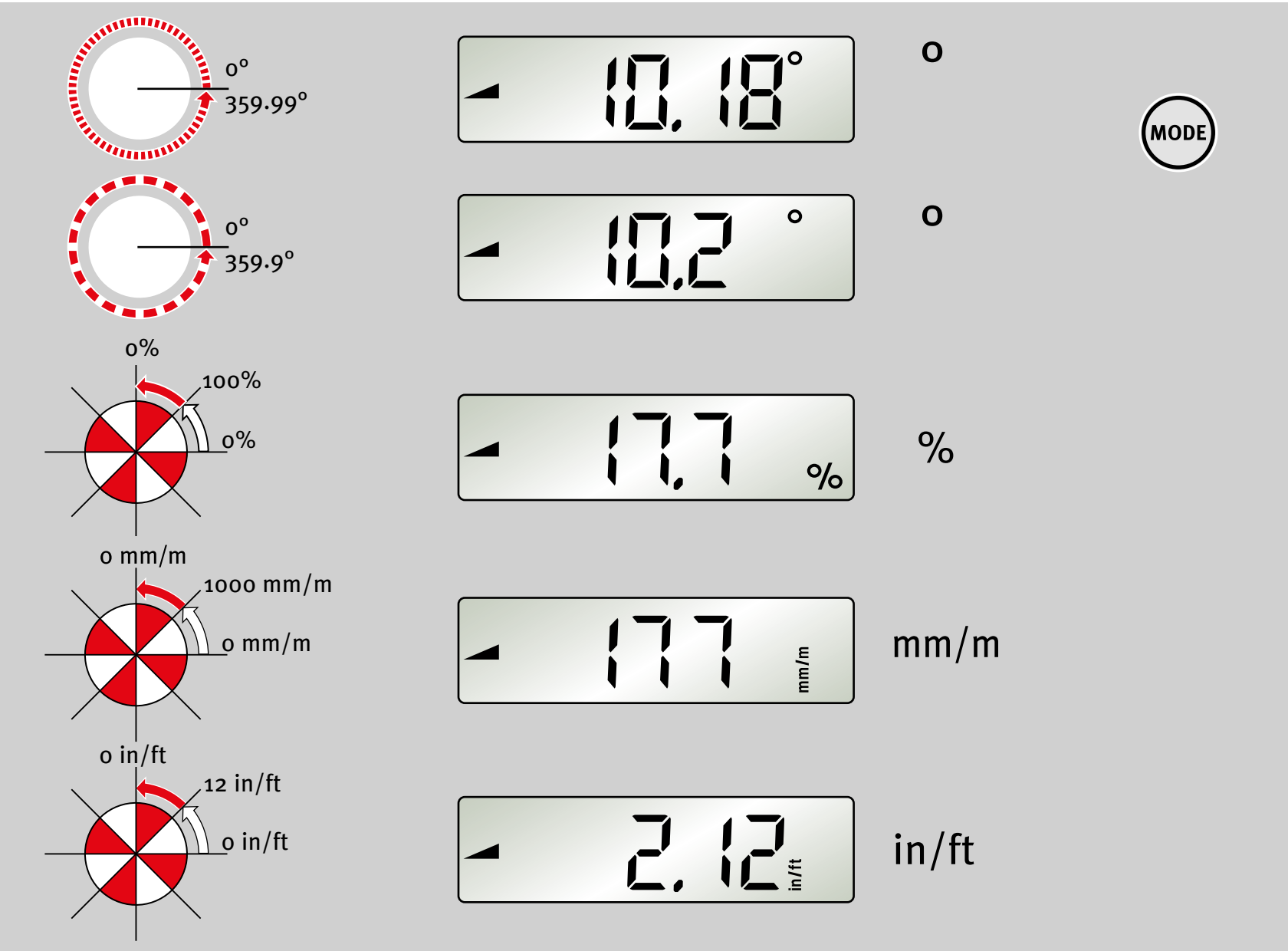
in/ft

5.4 Setting the "MODE" unit of measurement

The unit of measurement is set by pressing the "MODE" button several times.

	° Precise	Display in	0.01° increments
	° Rough	Display in	0.1° increments
	%	Display in	0.1% increments
	mm/m	Display in	1 mm/m increments
	in/ft	Display in	0.01 in/ft increments

The set unit of measurement is retained after the unit is switched off.
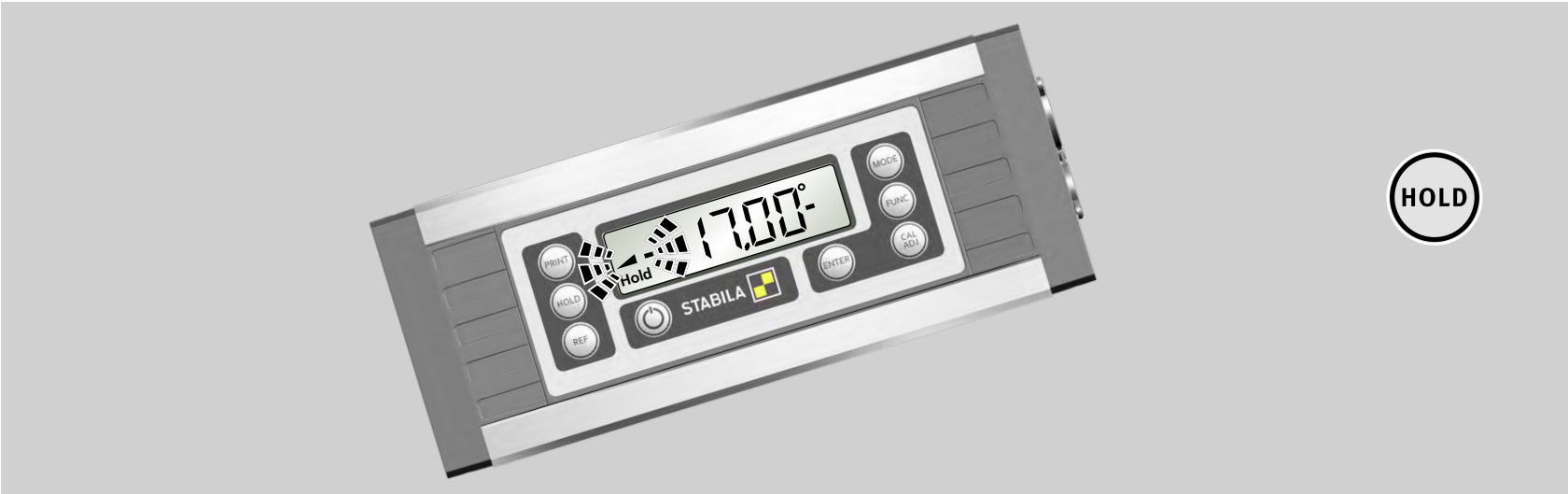
5.5 Locking the measurement with "HOLD"

(HOLD)

The current measurement can be locked by pressing the "HOLD" button. The relevant inclination triangle and the bars flash. The "Hold" symbol is displayed continuously. The measurement is displayed continuously.
The locked measurement is deleted by pressing the "HOLD" button again or switching the unit off.

5.6 Freely selectable zero position "REF"

The "REF" button can be used to select any set angle as 0° reference. The angle details now displayed relate to this reference angle. The displayed valueflashes with this setting.

REFERENCE
20,05°

REF

$\stackrel{\wedge}{=}$20.05°
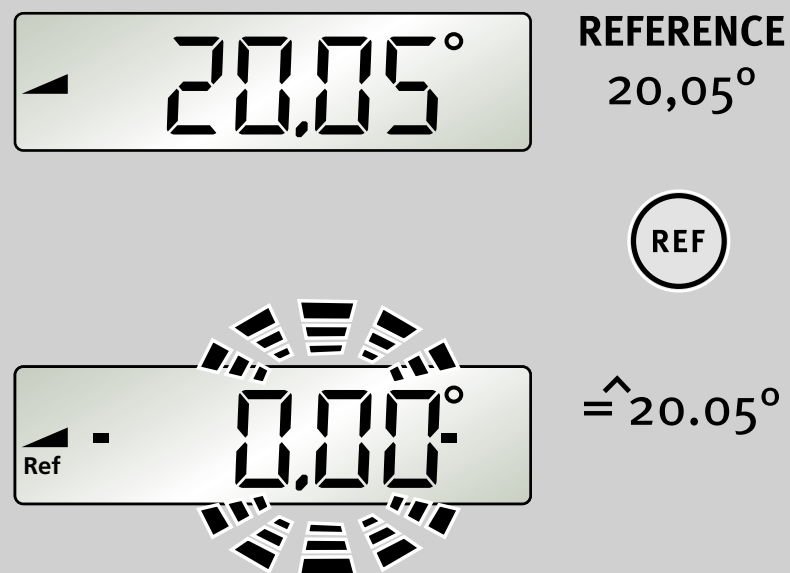
A:
The reference angle value is displayed for 3 seconds by briefly pressing the "REF" button.

A

$\stackrel{\wedge}{=}$25.05°

B:
The reference angle is deleted by:

- Pressing and holding (≥ 3 sec) the "REF" button
  If the keylock is active, this must be disabled first.
- Switching off
- The automatic switch-off function

REF

+ 5°

3 sec

The zero position then refers back to the original setting.

The alignment selected for the digital protractor must not be changed during the reference function, as this could lead to a display error.

B

REF

› 3 sec

RESET
REFERENCE

TECH 1000 DP

6. "FUNC" button settings

FUNC **ENTER**
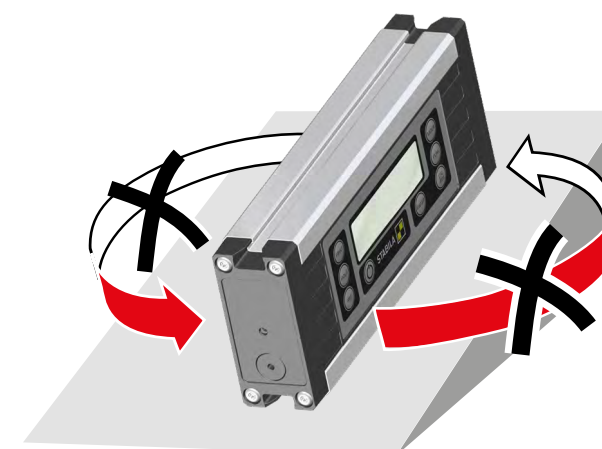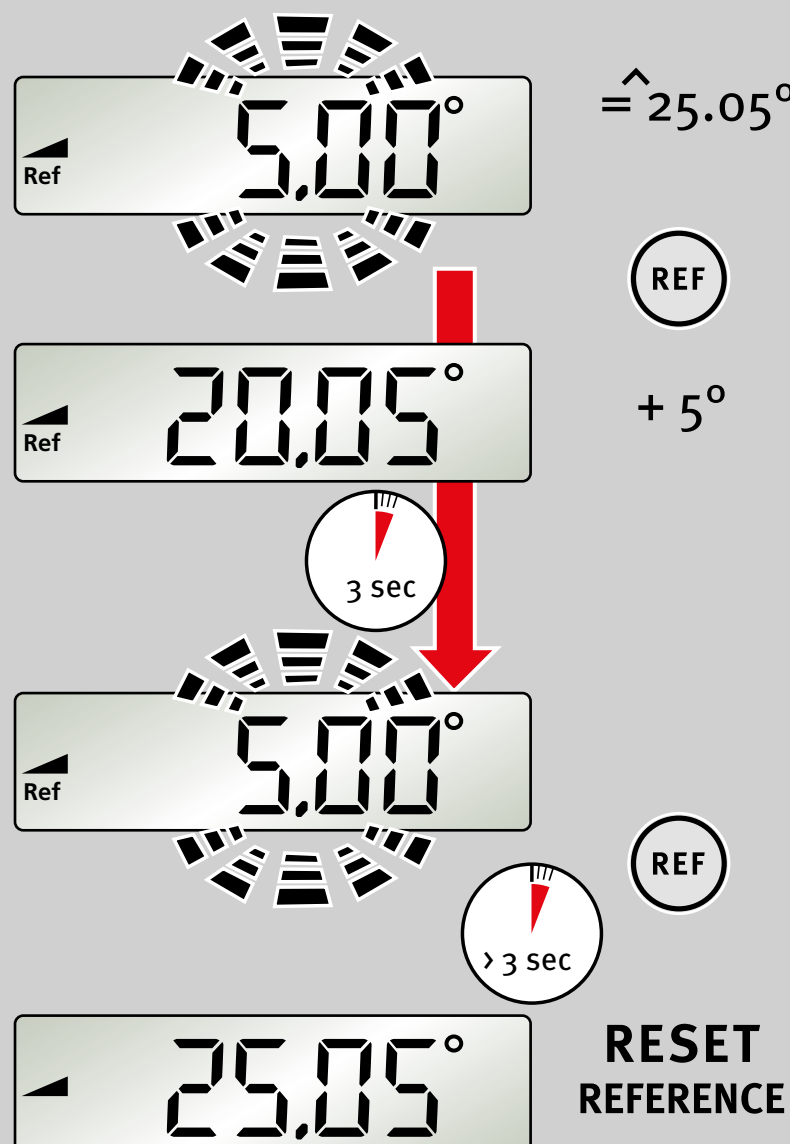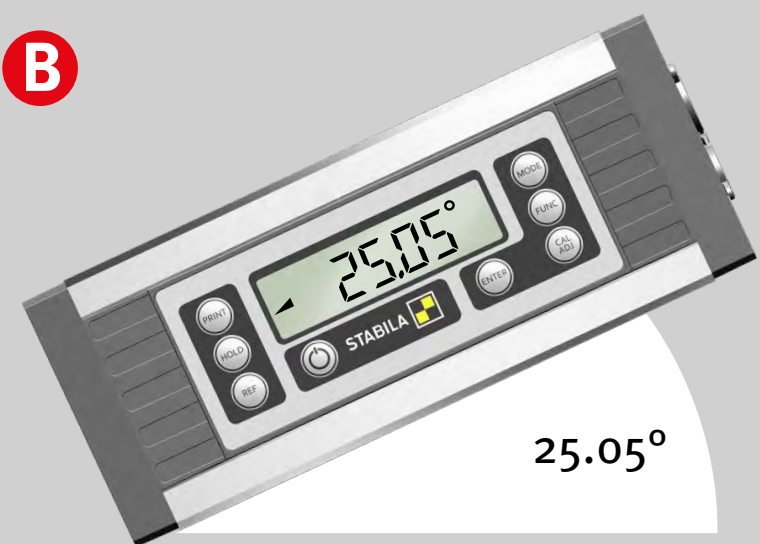
The user can switch between the different setting options by repeatedly pressing the "FUNC" button. While the display is flashing, the selected function can be confirmed with the "ENTER" button. If no button is pressed, the "FUNC" menu closes after a short time.

6.1. Lighting

6.2 Acoustic guidance

6.3 Keylock
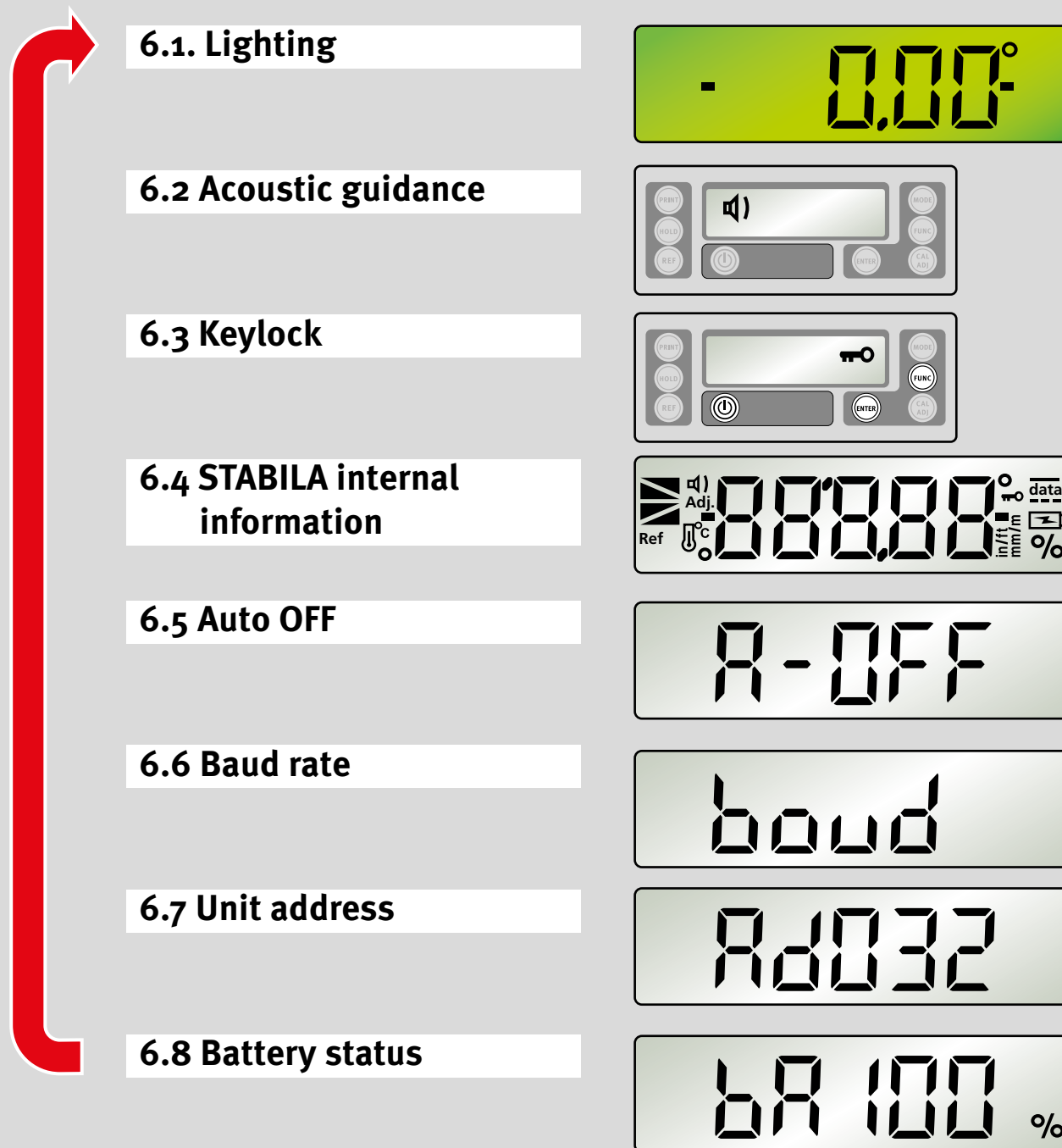
The "ON/OFF", "FUNC" and "ENTER" buttons are always active.

6.4 STABILA internal information

6.5 Auto OFF

With battery operation: switch between 0.2 and 2 hours. The unit is permanently on when connected to an external power supply.

6.6 Baud rate

The baud rate can be set from 1200 – 19,200 Bd.

The Analytics evaluation software can only be connected with a baud rate of 9600 Bd.

6.7 Unit address

6.8 Battery status

7. Checking the measuring tool

7.1 Accuracy check

⚠ To prevent measuring errors, the accuracy of the measuring tool must be checked at regular intervals; for example, each time before beginning work, or after a heavy impact or extreme fluctuations in temperature.

1

`0,05°`

`0,05°`

Step 1:
Place the unit with the lower measuring sole on as horizontal a surface as possible (e.g. a table) with the display side facing the user. Determine the measurement.

2

`359,95°`

STABILA ⬜ ENTER

Step 2:
Turn the unit by 180° in the same position.

3

+ 5V DC   RS 485-A-line
RS 485-B-line   GND

Li Ion 3.7V   2400 mAh

Tolerance	
± 0,05°	± 0,1°
0°	1°... 89°
90°	91°... 179°
180°	181°... 269°
270°	271°... 359°

STABILA® ⬜
TECH 1000 DP

STABILA
Landauer Str 45
D-76855 Annweiler
Germany

Made in Germany

Service Manual
download ⬆
www.stabila.com
CE ♻

1 `0,05°`

3 `359,95°`

Step 3:
The rear of the unit is now facing the user. Calculating the error:

$0.00° -$ display **1** $= A$

$360.00° -$ display **3** $= B$

If A+B is greater than ± 0.05°, the tool must be recalibrated.

7.2 Calibration ‑— Adjustment

By pressing the "CAL/ADJ" button repeatedly, the user can switch between CAL2P = calibration in relation to the measuring sole and ADJ4P = sensor adjustment. The selected function is confirmed by pressing the "ENTER" button.

`CAL2P`   `RdJ4P`   (CAL ADJ)   (ENTER)

7.3 Calibration

1
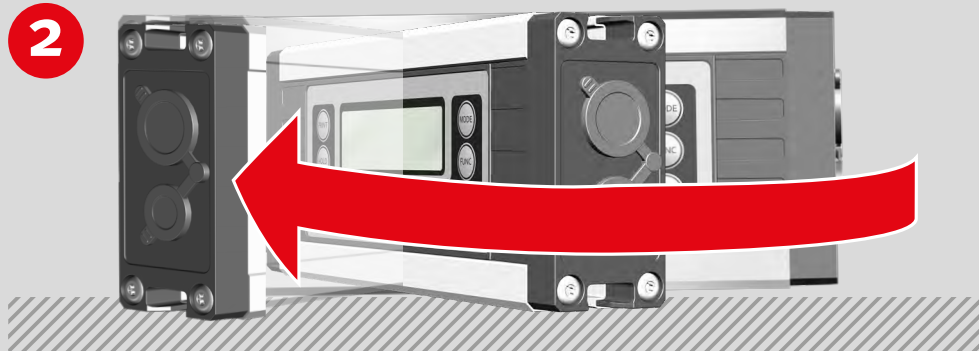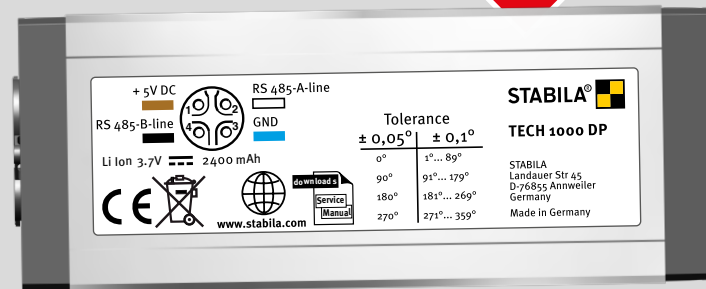
CAL2P

CAL ADJ   ENTER

Step 1: Once "Calibration" has been selected with the "CAL/ADJ" button, confirm by pressing "Enter".
Display: CAL2P

2

-CAL 1-

CAL ADJ

Step 2:
Place the unit with the lower measuring sole on as horizontal a surface as possible (e.g. a table) with the display side facing the user. Calibration is started by pressing the "CAL/ADJ" button. "CAL" flashes in the display.

CAL -

Display: CAL2
Calibration step 2 successfully completed

-CAL 2-

3

Step 3:
Turn the unit by 180° in the same position.

4

CAL -

Step 4:
The rear of the unit is now facing the user. The second calibration is started by pressing the "CAL/ADJ" button. "CAL" flashes in the display.

CAL ADJ

- rdY -

"rdy" display: Calibration completed successfully!
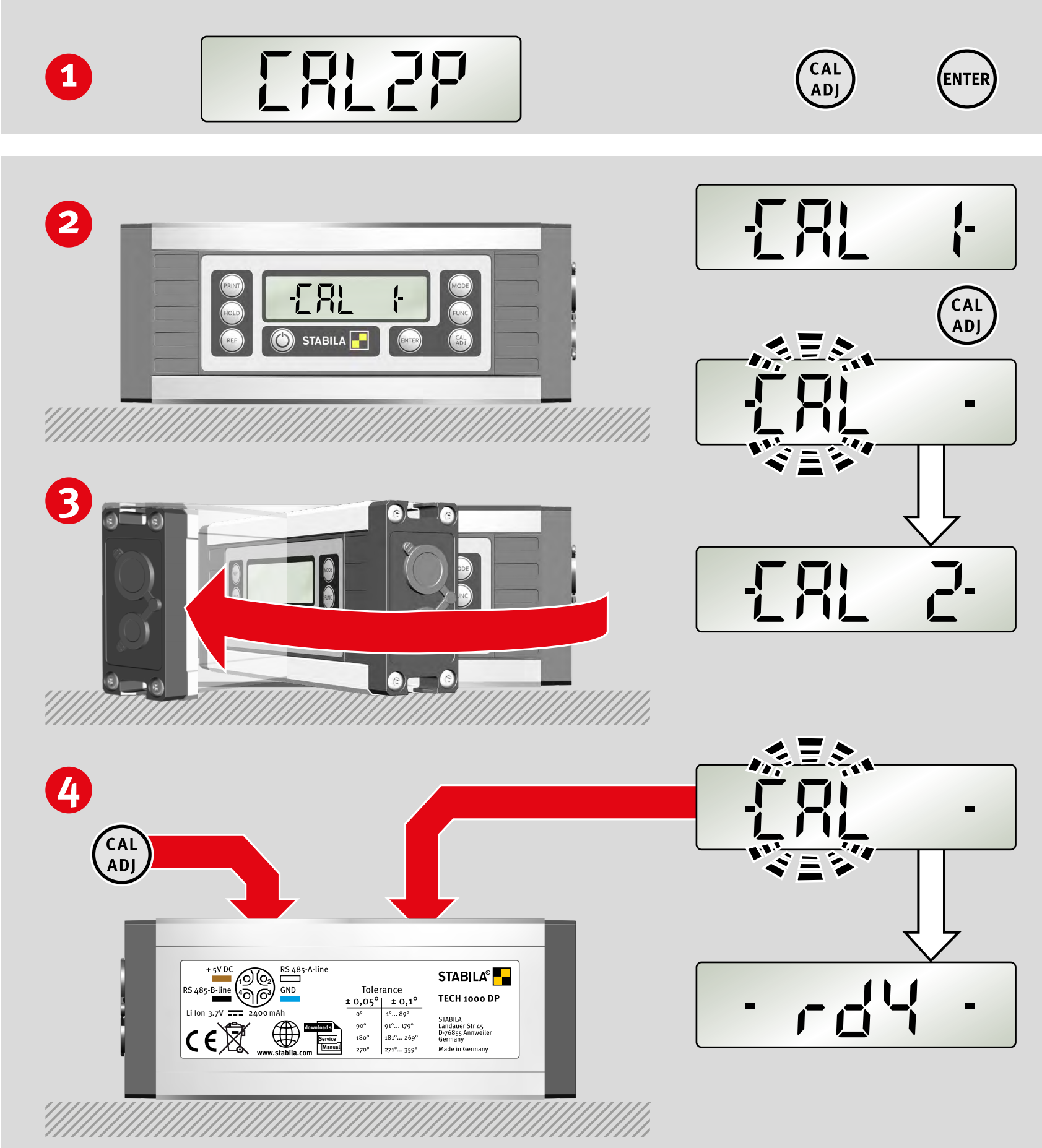
7.4 Adjusting the sensor

The sensor must be adjusted if the "temperature" or "Adj." symbols are shown in the display.

⚠️

📟°C

Adj.

A
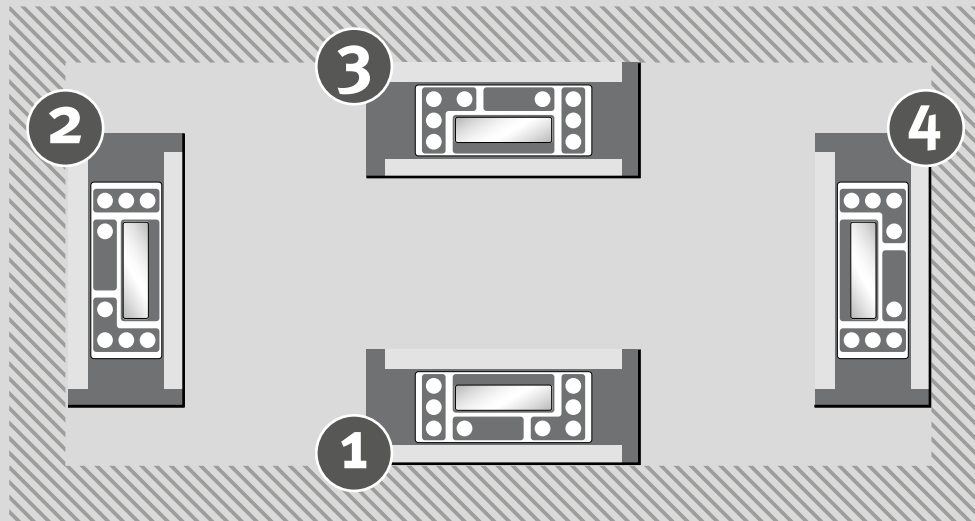
A:
All 4 planes are adjusted during the sensor adjustment.

B

- 1P -

B:
The sensor can only be adjusted if the two black bars appear on the display (in the range of 0°, 90°, 180° and 270°).

C

-AdJ-

C:
"ADJ" flashes during sensor adjustment of the respective plane.

D

D:
Planes that have not been adjusted are not displayed. Successfully adjusted planes are permanently indicated in the display.

7.4 Adjusting the sensor

1

`AdJ4P`

CAL ADJ   ENTER

Step 1:
Once "Sensor adjustment" has been selected with the "CAL/ADJ" button, confirm by pressing "Enter".
Display: ADJ4P

2

- 1P -

Step 2:
Hold the unit in plane 1.

1

CAL ADJ

Press the "CAL/ADJ" buttons.

`-AdJ_ -`

If the plane has been adjusted successfully, it is displayed permanently.

`2P_`

2

3

Step 3:
Turn the unit by 90° to plane 2.

CAL ADJ

Press the "CAL/ADJ" button.

`-AdJ_ -`

If the plane has been adjusted successfully, it is displayed permanently.

`3P_`

7.4 Adjusting the sensor

Step 4:
Turn the unit by 90° to plane 3.

Press the "CAL/ADJ" button.

If the plane has been adjusted successfully, it is displayed permanently.

Step 5:
Turn the unit by 90° to plane 4.

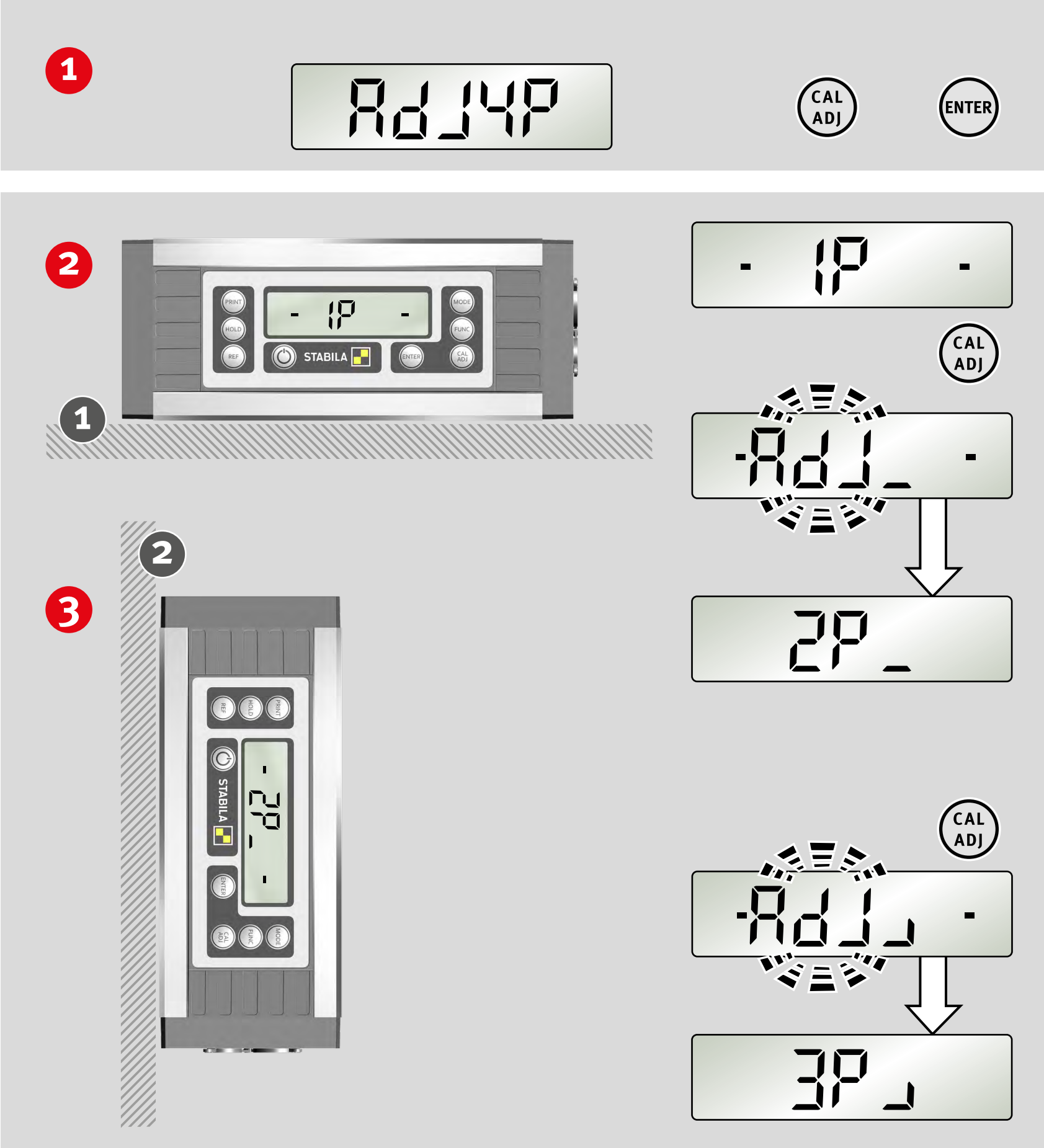Press the "CAL/ADJ" button.

"rdy" display: Sensor adjustment completed successfully!
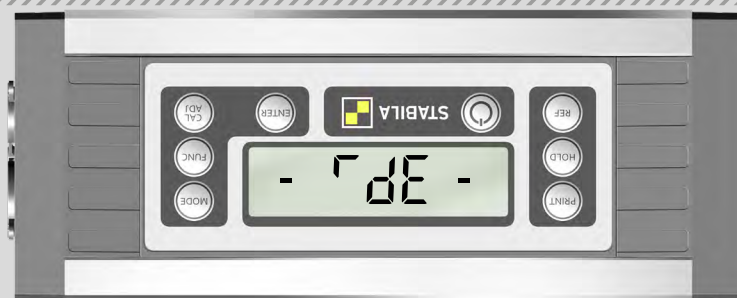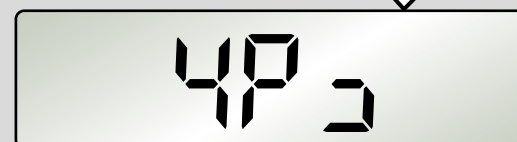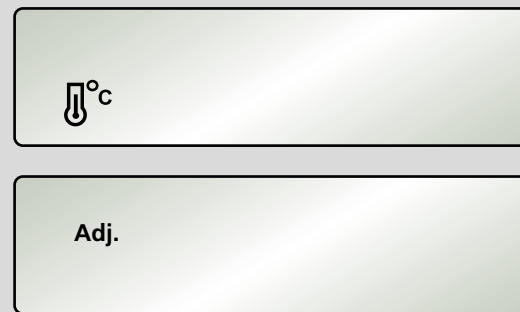
7.5 Error messages

The sensor must be adjusted if the "temperature" or "ADJ" symbols are shown in the display.
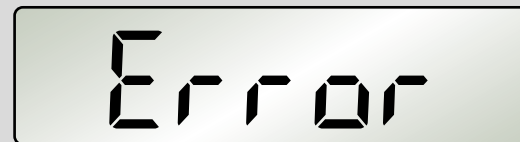
Display: Error
The measuring unit must not be moved or subjected to vibrations during the calibration/sensor adjustment. This can lead to measurement errors.
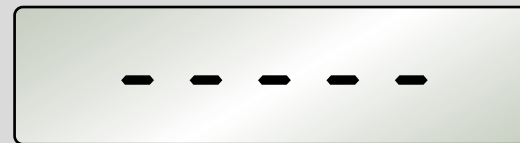
Display: - - - -
Measuring unit inclination around longitudinal axis › 10°
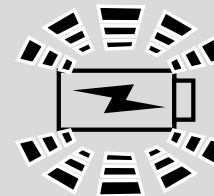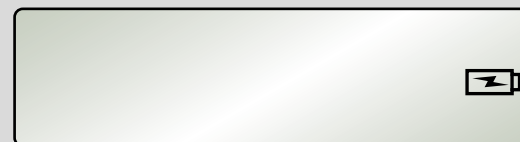
Display: mains connection/battery symbol flashes
Temperature too high or too low to operate the rechargeable battery

Display: mains connection/battery symbol flashes quickly
Charging voltage too high or too low
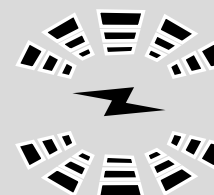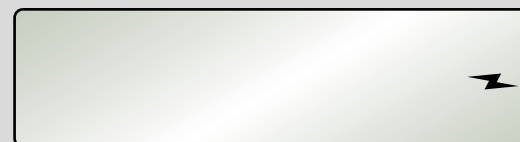
Display: only the lightning symbol flashes quickly
Rechargeable battery is faulty

MODBUS/ RTU protocol

The transmission protocol is configured in accordance with the MODBUS standard.

Characterformat:	1 start bit, 8 data bits, 2 stop bits, no parity
Baud rate:	Default setting: 9600 Bd Possible: 1200 Bd ... 19,200 Bd
Idle period:	at least 3.5 characters between two messages
Unit address:	Default setting: 032 $_d$ Possible: 001 $_d$ ..... 247 $_d$

Please note: The data connection is interrupted if there is no query for › 2 seconds.
To prevent errors when analysing measurements, the angle is only transmitted in degrees.
The REF and HOLD settings are deleted.

Multiple-participant mode:

This mode enables multiple participants with different unit addresses but the same baud rate to connect to the MODBUS.

Function	MODBUS function	Start Address	Description
03 $_h$	Read Holding Register	4051 $_d$	Query current angle in 1/100°
		4052 $_d$	Query print angle in 1/100°
		4053 $_d$	Software version
		4054 $_d$	Serial number 1
		4055 $_d$	Serial number 2
06 $_h$	Write Single Register	4100 $_d$	Change bus address
		4250 $_d$	Switch off measuring unit
08 $_h$	Diagnostics	XXX $_d$	Analysis of data connection

8.1 Querying the measurement

Structure of the read command function 03 $_h$

1st Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
Addr	Function	Start Address		No. of Points		CRC16	

Example: querying the current angle (register 4051 $_d$ [0FD 3 $_h$])

20_h	03_h	$0F_h$	$D3_h$	00_h	01_h	70_h	56_h

Structure of the response function 03 $_h$

1st Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte
Addr	Function	No. of Data	Data		CRC16	

Example: response at **45.00°** (= 4500 $_d$ [1194 $_h$])

20_h	03_h	02_h	**11_h**	**94_h**	01_h	70_h

8.2 Changing the bus address

Structure of the write command function 06 $_h$

1st Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
Addr	Function	Start Address		No. of Points		CRC16	

Example: changing address to 16 $_d$

20 $_h$	06 $_h$	10 $_h$	04 $_h$	00 $_h$	10 $_h$	CB $_h$	86 $_h$

Structure of the response function 06 $_h$

1st Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
Addr	Function	Start Address		No. of Points		CRC16	

Example: changing address to 16 $_d$

20 $_h$	06 $_h$	10 $_h$	04 $_h$	00 $_h$	10 $_h$	CB $_h$	86 $_h$

8.3 Error codes

An incorrect query is acknowledged with **8X** $_h$ in the function code (second byte).

Error codes

1st Byte	2nd Byte	3rd Byte	4th Byte	5th Byte	6th Byte	7th Byte	8th Byte
Addr	Function	Start address		Number of registers		CRC16	
	8X $_h$						

8.4 Auto mode

Example:

```
unsigned short angle;

        angle = ModbusReadPrintAngle();      //read angle via modbus
```


AUTO MODE:

A measurement is transmitted immediately after each query.

If the inclination of the measuring unit in the longitudinal axis is greater than 10° during the measurement, the TECH 1000 DP supplies the value $FFFF_h$ (65535_d).

8.5 Print mode

Example:

```
#define WAIT_FOR_PRINT_KEY  0xCCCC

unsigned short angle;

do

{

        angle = ModbusReadPrintAngle();      //read angle via modbus

        Wait(1000);                          //wait 1sec

} while (angle == WAIT_FOR_PRINT_KEY);       //redo until key was pressed
```


PRINT MODE:

A query is sent from the PC to the measuring unit. If the "PRINT" button has not yet been pressed, the TECH 1000 DP supplies the value $CCCC_h$ (52428_d).
Otherwise, the TECH 1000 DP supplies the angle at the time the button was pressed.

If the inclination of the measuring unit in the longitudinal axis is greater than 10° during the measurement, the TECH 1000 DP supplies the value $FFFF_h$ (65535_d).

9. STABILA Analytics evaluation software (optional)

STABILA Analytics provides communication between a Windows PC and the TECH 1000 DP digital protractor made by the company STABILA Messgeräte GmbH. The TECH 1000 DP is connected to the computer via the data cable provided.

The Analytics evaluation software can only be connected with a baud rate of 9600 Bd.

Installation requirements:

- TECH 1000 DP with the data cable provided (RS485 to USB)
- PC with operating system Microsoft Windows XP SP3, Windows 7, Windows 8 or Windows 10
- At least Windows installer version 4.5.6001.22159
- .NetFramework 4

10. Technical data

Accuracy:	
0° / 90° / 180° / 270°:	± 0.05°
In intermediate areas:	± 0.1°
Data output standard:	RS485
Power supply:	Li-ion polymer rechargeable battery 2400 mAh
Battery life:	≥ 150 hours
External mains adapter:	Input 110V-240V ~50/60Hz
	Output 5V DC / 2A
Charging temperature range:	0 °C to +40 °C
Operating temperature range:	-10 °C to +50 °C
Storage temperature range:	-20 °C to +65 °C
Housingmaterial:	Aluminium / PC-ABS
Dimensions:	approx. 70 x 32 x 175 mm
Weight:	450 g
Protection class:	IP 65 with closed connection sockets

Subject to technical modifications.