Nedo®

TUBUS2

EN Operating Instruction

Version:
TUBUS 2
063049_EN_14.01.2020

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1 About these operating instructions

These operating instructions contain all important information for handling the TUBUS 2 pipe laser. Operation, maintenance and care of the laser as well as the warnings and error messages are also described.

- Do not use the TUBUS 2 pipe laser until you have completely read and understood these operating instructions.
- Keep these operating instructions together with the TUBUS 2 pipe laser at all times.
- In these operating instructions the TUBUS 2 pipe laser is also referred to as the “Laser”.

1.1 Symbols used in these operating instructions

Compliance with the safety instructions and warnings is the basic requirement for safe use of the TUBUS 2 pipe laser. The various instructions and warnings are labelled with corresponding symbols.

WARNING!

This pictogram with the word "WARNING!" indicates an imminent danger, which could result in severe physical injuries if it is not avoided.
▶ This arrow indicates the appropriate measure to prevent the imminent danger.

CAUTION!

This pictogram with the word „CAUTION!“ indicates an imminent danger, which could result in slight or moderate physical injuries or property damage if it is not avoided.
▶ This arrow indicates the appropriate measure to prevent the imminent danger.

NOTE

This „Note“ pictogram provides tips, recommendations and important information on use and handling of the laser.

In addition, the standard symbols are used in the appropriate places in these operating instructions.

2 Safety information

2.1 Documentation

Compliance with the following safety instructions and the specific national safety regulations and health ↄ safety provisions is a basic requirement for trouble-free and safe use of the laser. Therefore, please read carefully through these operating instructions and all notes and follow them while working with the laser.

2.2 Laser radiation

The Primus 2 H rotating laser is, depending on the version, a Class 2 or Class 3R laser product in accordance with EN 60825-1:2014.

LASER RADIATION
DO NOT STARE INTO BEAM
LASER CLASS 2

EN 60825-1:2014
P ≤ 1mW
λ: 630-680 nm
φ ≤ 1,5 mrad

LASER RADIATION
AVOID DIRECT
EYE EXPOSURE!
LASER CLASS 3R

EN 60825-1:2014
P ≤ 5 mW
λ: 630-680 nm
φ ≤ 1.5 mrad

General safety instructions for handling laser radiation

WARNING!

- ▶ *Laser radiation can damage the eyes.*
- ▶ *Prevent direct eye exposure to the beam.*
- ▶ *Do not direct the beam at other people/animals or into public areas.*
- ▶ *To prevent reflections, do not point the laser at reflective surfaces.*
- ▶ *If possible, do not operate the laser at eye level.*
- ▶ *The housing of the laser may be opened by trained service technicians only.*

The emitted laser radiation has the following properties:

- Class 2 Power P ≤ 1mW / Class 3R Power P ≤ 5mW
- Wavelength λ: 515 nm
- Beam divergence φ ≤ 0,3 mrad

NOTE

For users in Germany:
Please note and follow the regulations of the body responsible for industrial safety and insurance (Berufsgenossenschaft) BGI 832 on the operation of laser equipment and BGV B2 on accident prevention. We recommend registering operation of a class 3R laser with the relevant Berufsgenossenschaft. Information can be found in §5 of BGV B2 and section 2 - Annex 5 of BGI 832.

Signage

WARNING!

- ▶ *Warning signs on the laser are for your safety.*
- ▶ *Never remove the warning signs!*

Laser warning

Laser exit openings

Type label

2.3 Power supply safety instructions

WARNING!

Destruction! Explosion risk!

- ▶ *Use charger included in the scope of delivery only.*
- ▶ *Use the charger in dry rooms only.*
- ▶ *Never expose the units to heat or fire.*
- ▶ *Check live components regularly and stop using them if they are damaged.*

CAUTION!

Damage!

- ▶ *In case of lengthy storage, it may be necessary to charge and discharge the units several times to reach the maximum output.*
- ▶ *In case of storage for longer than 3 months, the units must be charged every 3 months.*

NOTE

- ▶ *Operation at ambient temperatures below 0° C leads to lower battery capacity.*

2.4 General safety instructions

CAUTION!

Damage!

- ▶ *Do not open the units.*
- ▶ *Do not modify or change the units.*
- ▶ *Do not use the units in case of obvious damage or defects.*
- ▶ *Do not charge the units in a wet environment.*
- ▶ *Only use accessories that have been explicitly approved by Nedo.*
- ▶ *Do not use the units as a climbing aid for people or machines.*

2.5 Intended use

The TUBUS 2 pipe laser is suitable for measuring tilts and alignments in pipes and sewers. The unit is submersible (IP68). The unit can be operated with a radio remote control or alternatively via infrared.

2.6 Transport and storage

The laser is a sensitive, high-precision instrument and must be handled with appropriate care. Always transport and store the laser and the accessories in the transportation case. Note the storage temperature given in the technical data.

NOTE

- ▶ *Never store the units in the case if the units are wet.*

2.7 Repair and service

Repairs may only be carried out by NEDO or an authorised customer service agent. Never open the units yourself, doing so cancels the warranty. Send the units to NEDO for repair or checking. Always send the laser together with the complete accessories in the original case and with completed repair form. The repair form can be downloaded from www.nedo.com.

2.8 The environment

Product-specific information on disposal of the laser can be downloaded from www.nedo.com. Batteries and rechargeable batteries are hazardous waste and may not be placed in the domestic waste. They must be properly disposed of according to the respective national guidelines

2.9 Conformity assessments

CE declaration of conformity

Wir, die Unterzeichner: We, the subscriber	Nedo GmbH & Co. KG
Adresse: Address:	Hochgerichtstr. 39-43 72280 Dornstetten, Germany
Bevollmächtigter Delegate	Dr. Thomas Fischer
Telefon phone	+49 7443 2401 0
eMail Fax	info@nedo.com +49 7443 2401 45

bestätigen in alleiniger Verantwortung, dass das Gerät:
confirm under our sole responsibility that the device:

Type: Type:	TUBUS 2 – 472210 / 472210-632
Beschreibung : description:	Kanalbaulaser mit Fernbedienung Pipe laser with remote control
Hersteller: manufacturer:	Nedo GmbH & Co. KG
Marke: Brand name:	Nedo

die grundlegenden Anforderungen der Richtlinie 2014/53/EU (RED) erfüllt und den Bestimmungen der Richtlinie 2011/65/EU (RoHS) entspricht, basierend auf der Anwendung der folgenden Normen:
Complies with the principal requirements of Directive 2014/53/EU (RED) and meets the requirements of Directive 2011/65/EU (RoHS), based on the application of the following standards:

EN 61326-1: 2013
EN 301489-17: V3.2.0
EN 61010-1: 2011
EN 60825-1: 2014

Dornstetten, 14.11.2019

Bernd Ling
Qualitätsmanagement-Beauftragter
Quality Management Representative

FCC note

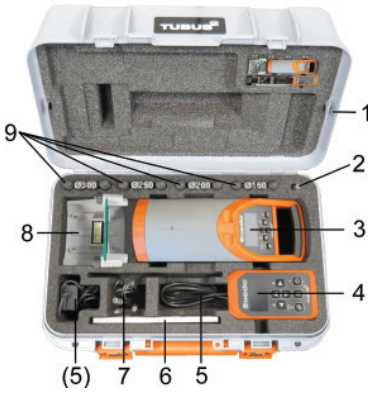
This unit has been tested and conforms with the limits for a Class A digital device in accordance with Part 15 of the FCC Rules. These limits should provide appropriate protection against harmful interference, if the device is operated in a commercial, industrial or business environment. This device generates, uses and radiates potentially high-frequency energy, and if it is not installed and used in accordance with the operating instructions, it can cause radio disturbance. Operation of this device in residential areas can cause harmful disturbance and faults. In this case the user must correct the disturbance and faults at their own cost.

3 Description of the TUBUS 2

3.1 General product description

The TUBUS 2 is a fully automatic laser, which has been developed for use in pipe and sewer constructions. The TUBUS 2 can be used to survey or measure and lay pipe systems quickly and easily. The innovative shock protection system and the robust, water and dust protected housing protect the laser. The laser can also be monitored and controlled from a distance using the remote control with integrated display. A Li-ion rechargeable battery in the laser and the remote control ensures a long operating time.

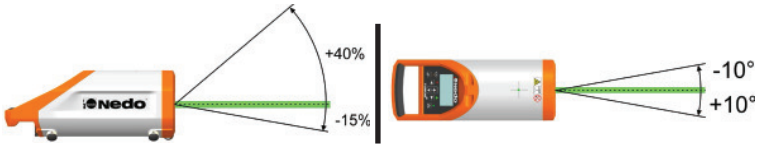
3.3 Specifications



1 Transportation case
2 Tool
3 TUBUS 2 pipe laser
4 Remote control
5 Charger
6 Operating Instructions
7 Adapter cable
8 Target board with disc
9 Adjustable feet, different lengths

3.2 How it works TUBUS 2

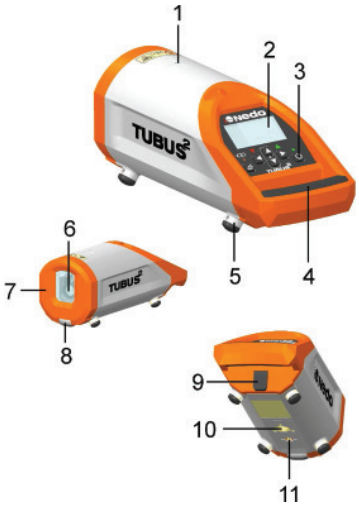
The TUBUS 2 pipe laser emits a laser beam, which can be tilted within a range from -15% to +40%. It can also be swung to the side by +/-10° for precise alignment of the beam onto a target board. The TUBUS 2 pipe laser is equipped with a self-levelling feature and levels out tilted positioning of the unit within a range of -15% to +40%.



3.4 Device components

TUBUS 2 pipe laser

1 LED for signalling the laser axis of rotation
2 OLED display
3 Control panel with rubber keypad
4 Handle, rubberised
5 Adjustable feet for pipe (Ø 150mm, 200mm, 250mm, 300mm)
6 Laser
7 Rubber protector
8 Sliding roller (pipe slider)
9 Charging socket with cover
10 5/8" connection thread
11 M8 thread for adjustable foot (three-point support)



TUBUS 2 remote control

1 IR-LED outlet window
2 OLED-Display
3 Control panel with rubber keypad
4 Charging socket with cover
5 Hand loop

3.5 Technical spezification Pipe laser

Pipe laser	TUBUS 2
Ref-No.	472210 / 472210-632
Self-levelling range:	-15% ... +40%
Transverse tilt compensation	±5°
Vertical adjustment range	-15% ... +40%
Horizontal adjustment range	±10°
Display resolution	0,001%
Levelling accuracy [1, 2]	± 5mm over 100m
Laser type	≤ 1 mW, Laser class 2, 515 nm ≤ 5 mW, Laser class 3R, 515 nm
Power supply	Li-Ion rechargeable battery: Capacity approx. 6700 mAh / 7.2V. Varying voltage charger: 110V ... 230V, Charging voltage 12V (2A)
Operation duration	up to 40 h
Weight	3,5 kg
Dimensions (diameter/length):	D=120mm / L=300mm
Working temperature range	–20 °C to +50 °C
Charging temperature	+5 °C to +40 °C (empfohlen +10 °C bis +30 °C)
Storage temperature	-20 °C to +60 °C
Class of protection:	IP 68

[1] at 22°C ambient temperature,
[2] without transverse tilt of the unit

3.6 Technical spezification Remote control

Remote control	TUBUS 2
Power supply	Li-Ion rechargeable battery: Capacity approx. 2900 mAh / 3.6V. Varying voltage charger: 110V ... 230V, Charging voltage: 12V (0.7A)
Range	Funk: bis zu 100m IR: bis zu 150 m
Operation duration	bis zu 50 h
Weight	0,250 kg
Dimensions (width/length/height):	B=80mm / L=145mm / H=38mm
Working temperature range	–20 °C bis +50 °C
Charging temperature	+5 °C bis +40 °C (empfohlen +10 °C bis +30 °C)
Storage temperature	-20 °C bis +60°C
Class of protection	IP 67

NOTE

▶ *Use of the units is only intended up to 2000 m a.s.l.*

4 Initial start up TUBUS 2

4.1 Charging the battery

1 Remove the rubber cover from the charging socket.
2 Connect the adapter cable supplied to connect both units to the charger at the same time.
3 Connect the cable in the charging socket of the unit.
4 Connect the charger to the mains supply.

Note voltage! (110-230 V)
Charging time if battery empty and for complete charging: 3-4 h.

After charging, always use the rubber cover (1) to close off the charging socket.

- During charging, the red charging LED lights up on the control panel.
- The red LED goes out if the battery is fully charged.
- The laser can be operated during charging

NOTE

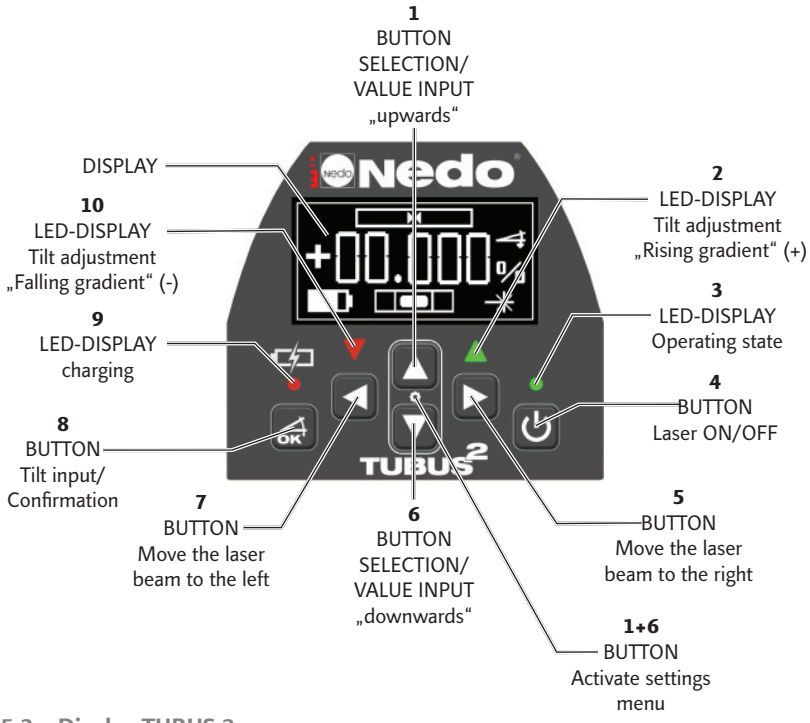
▶ *The units do not charge at temperatures below 5 °C and above 45 °C.*

CAUTION!

▶ *The typical design life of Li-ion cells and thus the EOL is 5 years at 20 °C ambient temperature or in case of a storage capacity of only 70% or less of the initial capacity.*
▶ *We recommend having the battery replaced by a service technician after 5 years or if the residual capacity is 70%.*

5 TUBUS 2 Controls

5.1 Buttons of the TUBUS 2 control panel



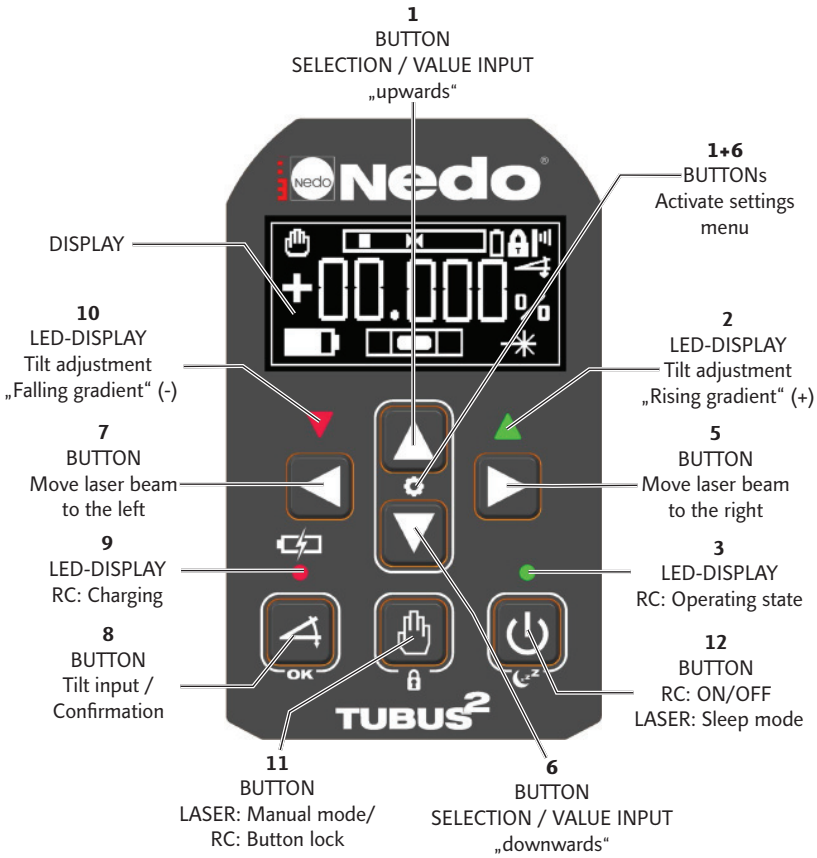
5.2 Display TUBUS 2

Symbol	Description					
	HORIZONTAL LASER POSITION: Indicates the current position of the laser beam in relation to the unit's longitudinal axis.					
	VERTICAL TILT INPUT (symbol flashes during input)					
± 00.000 %	**TILT INDICATOR (%):** Displays the entered tilt in %. The green arrow LED display (2) also lights up in case of rising gradient (+), the red arrow LED display (10) also lights up in case of falling gradient (-)..					
	LASER BEAM: Flashing = laser is being aligned. Flashing = laser is being aligned.					
	TILTI LEVEL: The spirit level symbol indicates the current transverse tilt of the laser.					
	Battery level	100 %	75%	50%	25%	5%
	remaining operating time in hours	~40 h	~30 h	~20 h	~10 h	~ 2 h

5.3 Display and button functions TUBUS 2 and Remote control

No.	Button/Display	Description
1		**Up arrow** Number selection upwards for tilt input or tilt adjustment upwards in manual mode
2		**Tilt indicator** Lights up green if a rising gradient (+) is set
3		**LED display, operating state** **Lights up continuously,** if the laser is in operation **Flashes,** if the laser has been switched to sleep mode via the remote control.
4		**ON/OFF** Switches the unit on and off.
5		**Right arrow** Swing the laser beam to the RIGHT or for directly selecting a decimal place when entering the tilt.
6		**Down arrow** Number selection downwards for tilt input or tilt adjustment downwards in manual mode.
7		**Left arrow** Swing the laser beam to the left or for directly selecting a decimal place when entering the tilt.
8		**Tilt input / OK button** Select tilt menu, confirm entered tilt and exit tilt menu or OK button to confirm other settings.
9		**LED display, battery charging** Lights up during charging and goes out if the battery is fully charged.
10		**Tilt indicator** Lights up red if a falling gradient (-) is set.
1 + 6		**Settings** Press the two buttons at the same time to switch the laser to the “Unit settings” menu.

5.4 Buttons of th TUBUS 2 remote control panel



5.5 Additinal displays of the TUBUS 2 remote control

Symbol	Description					
	MANUAL: Laser is in manual mode.					
	RADIO CONNECTION active					
	Button lock of the remote control activated					
	Battery level, remote control					
	remaining operating time in hours	~ 50 h	~ 38 h	~ 25 h	~ 13 h	~ 2 h
IR	**INFRARED CONNECTION active**: Radio connection not possible. Setting of the horizontal, or in manual mode the horizontal and vertical, laser position only is possible.					

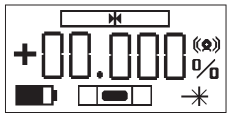
5.6 Additional button functions of the TUBUS 2 remote control

No.	Button	Description
8		**BUTTON Tilt input / OK** The same function as for TUBUS 2 (for functions, see table on page 15)
11		**Manual mode** Activate / deactivate manual mode. Laser beam can be set and adjusted using the UP/DOWN/RIGHT/LEFT arrow buttons.
11		**Keypad lock** Press the button for approx. 3 sec. to activate / deactivate the keypad lock.
12		**Sleep mode** Press the button for approx. 3 sec. to activate / deactivate laser sleep mode.

6 Startup

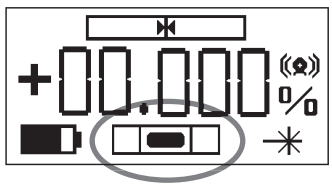
6.1 Switching on the TUBUS 2 Pipe laser

Press the ON/OFF button (4) to switch on the laser.
The following displays appear consecutively:

	->		->	
Company logo		Sand timer, unit references itself		Display ready

6.2 Aligning the TUBUS 2 Pipe laser

The laser shows a tilt level in the bottom area of the display.
Position the laser so that the tilt level is aligned with the middle.

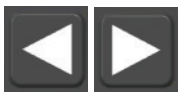


NOTE

The laser's display indicates possible problems, which result due to setting up of the unit → see Error Messages / Displays chapter!

7 Adjusting the Tilt

7.1 Adjusting the tilt in automatic mode

Button	Description
	Press the TILT/OK button to change the tilt. The angle symbol and the sign flash.
	Use the UP/DOWN arrow buttons to change the sign or to set the required numerical value within the range from 1 to 9. The numerical value selected can be reset to “0” by pressing the two buttons at the same time.
	Use the RIGHT/LEFT arrow buttons to switch between the individual decimal places. The tilt value can be reset to „00.000” by pressing the two buttons at the same time.
	To confirm the set value, press the TILT/OK button.

7.2 Plumb function

The TUBUS 2 remote control can be used to manually adjust the laser beam vertically. This function can be used to align the laser beam with a target mark above the pipe. After exiting the plumb function the laser beam returns to the previously set tilt!

Button	Description
	To change the tilt manually, press the MANUAL button. A hand symbol appears in the display and the tilt value flashes.
	The UP/DOWN arrow buttons can now be used to set or adjust the tilt value. To do this, either press the respective button briefly or keep it pressed.
	Press the MANUAL button again to return to the previously set tilt value. The laser resets the previous value, manual mode is ended.

7.3 Measuring and accepting the tilt

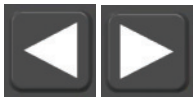
The TUBUS 2 remote control can be used to manually align the laser beam vertically with the target plate and the tilt value can be accepted.

Button	Description
	To change the tilt manually, press the MANUAL button. A hand symbol appears in the display and the tilt value flashes.
	The UP/DOWN arrow buttons can now be used to set or adjust the tilt value. To do this, either press the respective button briefly or keep it pressed.
	To save the set value, press the TILT/OK button and keep it pressed for approx. 3 sec. The value is saved, if the tilt value in the display no longer flashes or an acoustic signal sounds in IR mode and the laser beam stops flashing. Manual mode is ended.

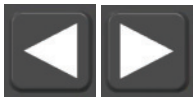
7.4 Adjusting the laser direction

The laser beam of the TUBUS 2 can be aligned horizontally with the unit's longitudinal axis within a range of +/- 10°.

Adjust the laser beam

Button/ Symbol	Description
	Use the RIGHT/LEFT arrow buttons to swing the laser beam to the side. To do so, press the button briefly or keep it pressed.
	The top part of the display shows the laser beam's current position.

Reset the laser beam

Button / Symbol	Description
	The laser beam can be reset to the middle by pressing the RIGHT/LEFT arrow buttons at the same time.
	The display shows two arrows pointed towards each other in the top area, if the laser beam is aligned with the middle.

NOTE

The display on the remote control is laterally reversed! A setting via the remote control is usually made on the opposite side of the laser, with the view of the target plate and the outlet of the laser beam.

8 Unit settings

The TUBUS 2 pipe laser provides a unit setting mode with which the laser can be adjusted individually to the needs of the user. The settings can either be selected directly at the laser or using the remote control.

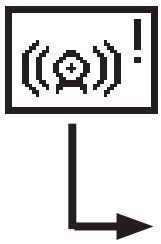
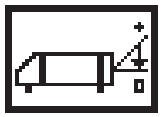
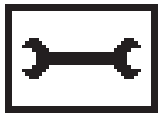
CAUTION!

Incorrect entries in this area can result in malfunctioning of the unit and incorrect measurements!

8.1 Button function in the unit menu

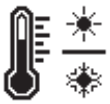
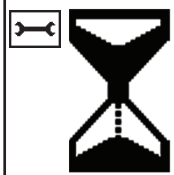
Button	Description
	Press the UP and DOWN buttons at the same time to switch to the unit settings mode.
	Use the RIGHT/LEFT arrow buttons to switch between the individual menu items.
	Use the DOWN arrow button to select the required menu.
	Use the UP arrow button to exit the selected menu.
	Press the OK button to activate a function or to save a setting.
	Press the UP and DOWN buttons at the same time to exit the settings mode. Alternatively, the mode can also be ended by pressing the ON/OFF button

8.2 Unit menu

<table>
<tr><th>Symbol</th><th colspan="3">Description</th></tr>
<tr><td rowspan="3">  </td><td colspan="3">Vibration sensitivity
The threshold of the vibration sensitivity can be switched between OFF, COARSE and FINE. By default, the COARSE threshold is set.
The function is active 60 seconds after the laser has levelled itself horizontally. Depending on the setting, a movement of the laser then triggers a warning.</td></tr>
<tr><td>  </td><td>  </td><td>  </td></tr>
<tr><td>OFF
The laser readjusts automatically during a vibration. A vibration does not trigger a warning.</td><td>COARSE
The Laser switches off in case of strong vibrations. The warning then appears on the display:
  </td><td>FINE
The laser switches off with even if the vibration is light. The warning then appears on the display:
  </td></tr>
<tr><td>  </td><td colspan="3">Referencing
In case of particularly high accuracy requirements, additional referencing can be started manually. Additional referencing can also improve the accuracy in case of large temperature changes (e.g. after acclimatising the unit). The unit checks the precise 0% reference.</td></tr>
<tr><td>  </td><td colspan="3">Info
The software version, the serial number, the service date, remaining time until the next service and the remaining battery capacity can be called up via the info menu.</td></tr>
<tr><td>  </td><td colspan="3">Service
This menu is only accessible to
authorised service technicians.</td></tr>
</table>

9 Info displays and warnings

9.1 Displays in the control panel display

Symbol	Description
 bzw. 	The horizontal levelling range or tilt range has been exceeded, the unit can no longer level itself or move to the set tilt. **Remedy:** Change the inclined position of the unit in the direction of the arrow, press the OK button. The laser re-aligns itself as soon as the inclined position is removed.
 bzw. 	
	**Vibration** Laser has been moved. **Remedy:** Press the OK button, the laser re-aligns itself and the function is active once more after 60 seconds.
	**Time out** Laser is unable to reference itself. **Remedy:** Remove cause, restart the laser. The cause can be, for example, strong vibrations below ground.
	**Temperature warning** Unit temperature too hot or too cold. **Remedy:** Adjust the unit temperature to the allowable working temperature (–20 °C to +50 °C).
	**Service indicator** During start referencing, the laser shows a service symbol at the top left next to the hourglass in the form of a wrench. **Remedy:** Service is due! Send device for service at NEDO or to an authorized customer service.

Displays in the control panel display

Symbol	Description
	**Sleep-mode display on the remote control:** Laser is in standby mode. **Remedy:** Use the remote control to disable the laser's standby mode
	**Infrared display on the remote control** If the radio connection is disrupted the unit switches to infrared communication automatically. **Note:** Setting of the horizontal, or in manual mode the horizontal and vertical, laser position only is possible.
	**Error 01 - Error 05** Noncorrectable unit error! **Remedy:** Send in the laser for a service.

9.2 Acoustic warning signal

End position reached

An acoustic warning signal is emitted if the horizontal adjustment range, or in manual mode the horizontal and vertical adjustment range, is ended. The end position has been reached.

Remedy:

Move the laser beam in the opposite direction. If necessary, change the position of the unit to reach the target point and then re-align the laser beam. The warning signal goes out as soon as the limit switch is no longer touched.

9.3 Warnings of the laser beam

Laser beam	Description
Continuously on	Referencing finished, target tilt is set
Uniform flashing	Laser is referencing itself or moving to the target tilt. Please wait..
Irregular flashing	Laser is in manual mode.

Precise surveying and measuring

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72280 Dornstetten
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