Translation of the original manual

english

Measuring unit

Elmasense Cavicheck

Item No. 1146608

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Subject to technical and visual modifications.

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1 About this manual

NOTE Please read the manual before using the product. This manual forms part of the contents supplied with the unit. Keep the manual in an accessible place close to the product, and keep it with the product if it is sold on.

Meaning of the symbols used:

- ● This symbol denotes lists.
- ✓ This symbol denotes requirements.
- 1. Numbers with a dot denote actions.
- ○ This symbol denotes individual actions.
- ⇨ This symbol denotes interim results.
- ➔ This symbol denotes the result of an action.
- 1 Numbers without a dot denote image labels.

1.1 User

In the manual, users are defined as all persons who can transport and operate the unit. The manual is aimed at persons with appropriate technical knowledge and experience with measuring units.

The user is at least 16 years old. They must have read and understood the manual and be capable of following all notes and instructions.

All tasks that go beyond the pure operation of the unit within the scope described here must be performed by qualified and authorised specialists.

1.2 CE mark

This unit fulfils CE marking requirements in line with EU directives. Details are stated in the EU declaration of conformity that can be obtained from the manufacturer.

Technical changes to the unit must be approved by the manufacturer.

2 Safety

2.1 The structure of warnings

SIGNALWORD

Type and source of the danger

Possible consequences of the danger if disregarded.

➢ Measures to prevent the danger.

Signal word	Meaning	Consequences if disregarded
DANGER	Immediate danger	Death or serious injury
WARNING	Possible dangerous situation	Death or serious injury
CAUTION	Possible dangerous situation	Slight injuries, damage to components or units
NOTICE	Useful advice or tip	No risk of personal injury, but possible damage to components or units

Table 1: Meaning of the signal words

2.2 Meaning of the symbols and labelling on the product

	Attention
	Serial number
	CE mark
	NFC (Near Field Communication)
	Disposal information

2.3 Product labelling (on the packaging)

	Attention

	Read the manual
	Manufacturer
	Date of production
	Order number
	Serial number
	Temperature limit
	CE mark
	Disposal information

2.4 Safety information on specific types of hazard

Hot liquids and surfaces

Danger of burns and scalds due to contact with hot fluids or surfaces caused by high operating temperatures or continuous ultrasonic operation.

- Do not touch the surfaces, accessories or objects being cleaned.
- Danger of splashes caused by high temperatures, by switching on ultrasonic operation or by careless insertion of the basket or objects. If necessary, wear suitable protective equipment.
- If work must be performed on hot components, switch off the unit and allow to cool. If necessary, wear suitable protective equipment.

Cleaning agents

Volatile, corrosive or abrasive cleaning agents can cause chemical burns to the skin and respiratory tract.

- Observe the safety data sheet when using cleaning agents.
- Wear the protective equipment stipulated in the safety data sheet.
- Where necessary, provide adequate extraction for the emitted vapours and regularly check that the extraction system is working correctly.
- Observe the information stipulated in the ‘Cleaning agents’ chapter. In case of doubt, ask the manufacturer or supplier.

Ultrasound-conductive liquids and materials

Ultrasound damages the cell membranes and bone structure.

- Do not reach into the liquid during ultrasonic operation.

- During ultrasonic operation, do not touch any parts that conduct ultrasound, such as the tank, basket or any accessories used.

Ultrasound noise emissions

Working with ultrasonic cleaning units for longer periods of time can damage your hearing!

- Use the lid or wear personal ear protection when working on ultrasonic units.
- Pregnant women must not be subjected to the noise emissions for longer periods of time.
- Keep animals away from the vicinity of ultrasonic units.

3 Proper use

The Cavicheck measures the cavitation noise level in ultrasonic cleaning baths in the frequency range from 25 kHz to 50 kHz. It enables the qualification of ultrasonic cleaning baths on the basis of the cavitation noise level determined in accordance with IEC TS 63001 (Annex A; B).

Continuous operation does not correspond to the intended use of the Cavicheck.

- To achieve comparable measurement results, the measuring unit is positioned in the ultrasonic unit using the Cavicheck fixator (accessory). The measurement is carried out during ultrasonic operation, where the measuring unit floats on the bath surface.
- An LED display visually indicates the various operating states of the measuring unit.
- The measuring unit is qualified for a liquid temperature of +20 °C to +65 °C.
- Observe the information on resistance to suitable cleaning chemicals and refer to the technical data.
- The measurement results can be transmitted in encrypted form via an NFC interface to the Elma Hub portal, where they can be displayed, evaluated and documented.
- Only authorised, qualified personnel who are familiar with the manual may operate this product.
- The product is only suitable for use in rooms, e.g. laboratories and industrial rooms. Only use original accessories made for this product.

3.1 Misuse

Misuse refers to any use of the unit that deviates from proper use. Any misuse takes place at the user's own risk and incurs the following consequences:

- Misuse, e.g. opening the measuring unit, will invalidate all warranty claims.
- All liability for personal injuries and damage to property caused by misuse is excluded.

Therefore, it is vital to prevent misuse. This particularly applies to foreseeable misuse that can, for instance, arise in the following circumstances:

- Operation by persons who are incapable of operating the unit safely due to their physical, sensory or mental abilities or due to inexperience or a lack of knowledge. In particular, the unit must be kept out of reach of children at all times.
- Failure to observe safety and warning notifications and maintenance and repair regulations.
- Failure to observe the conditions and liquids defined in the manual during setup and operation.
- Operation using unapproved cleaning agents.
- Operation in areas with explosive atmospheres.

4 Use of cleaning agents

To accelerate cavitation activity, a cleaning agent can be added to the liquid in the tank. We recommend the addition of cleaning agents containing surfactants (e.g. Elma lab clean N10), as they reduce the surface tension of liquids.

If using cleaning agents, observe and apply the instructions stated in the safety data sheet and product information.

Also observe the following information.

4.1 Permissible cleaning agents

- Only use aqueous cleaning agents for ultrasonic cleaning.
- Only use cleaning agents that are suitable for ultrasonic cleaning.
- Cleaning agents with a pH value of more than 1.5, but less than 13.5, according to the manufacturer's specifications must be used for cavitation measurement.

Elma provides a wide range of aqueous cleaning agents developed in-house that are optimised for ultrasonic cleaning.

You can find a list of Elma cleaning agents on our homepage:

Elma Schmidbauer GmbH

https://www.elma-ultrasonic.com – cleaning chemicals

4.2 Cleaning agents

Use of aggressive, corrosive cleaning agents:

Aggressive, corrosive cleaning agents can cause severe chemical burns if they come into contact with eyes or skin. Insufficient ventilation can result in severe chemical burns to the respiratory tract.

- Before using any cleaning agents, read the safety data sheet and product information and observe and apply the instructions.
- Where necessary, install an effective extractor system for the emitted vapours (e.g. at higher temperatures) and regularly check that the extractor system is working correctly.
- Never reach into the tank when filled with cleaning agent.
- Wear suitable protective equipment in line with the safety data sheet.

Danger of fire or explosion when using combustible cleaning agents

Ultrasound and heat increase the evaporation of liquids and form extremely fine mists that readily ignite on contact with sources of ignition. This can result in severe burns or death.

- Do not use cleaning agents that are labelled with the pictograms GHS01 (explosive), GHS02 (flammable) or GHS03 (oxidising) in line with the CLP regulation (EC no. 1272/2008). Do not use cleaning agents that have a flashpoint.
- If necessary, clarify the cleaning agents that can be used by consulting the manufacturer or supplier.

GHS01	GHS02	GHS03

Table 2: GHS pictograms for explosive, flammable or oxidising substances

Damage to the measuring unit due to unsuitable cleaning agents

Unsuitable cleaning agents such as ammonia and mineral oils can cause the measuring unit to leak.

- Consult the unit and cleaning agent manufacturers to clarify whether the cleaning agent is suitable.
- Do not use any cleaning agents in the acidic pH range at the same time as halides, such as fluoride, chloride, bromide or iodide.
- Do **not** use solvents, strong oxidising agents or concentrated acids/alkalis.
- Only use cleaning agents that are suitable for use with ultrasound.

5 Technical data

Cavicheck	Unit	
Mechanical data		
Max. external dimensions Ø/H	mm	72/71
Material (media contacted)	-	PEEK, EPDM, PPSU
Weight	g	175
Performance data		
Ultrasonic frequency measuring range	kHz	25–50
Measurement uncertainty	dB	±1.5
Permissible operating temperature	°C	+20 to +65
Measuring mode	Pcs	2 (Cavi log/Cavi check)
Memory for measurements	Pcs	20 (ring buffer)
Service life	h	500 operating hours
Electrical data		
Degree of protection	-	IP 68
Real-time clock*	Years	Approx. 10
Communication data		
Interface	-	NFC (Near Field Communication)
Ambient conditions		
Temperature (transport)	°C	–15 to +60
Temperature (storage)	°C	+5 to +40
Reliability/quality assurance		
Calibration cycle recommendation	h	100 operating hours or 1 year

***Real-time clock**: battery-operated (button cell, type CR 2032); used exclusively for time stamping the certificates. The time displayed depends on the time zone of the server location. **Battery replacement**: as part of recalibration by the manufacturer.

6 Product contents

IMPORTANT	Check delivery for damage to the packaging. Document any damage immediately (e.g. take a photo), and report it to the manufacturer or dealer. Check that all parts of the delivery are complete and undamaged. Never put a damaged product into operation. Keep the packaging for servicing purposes. The unit must be sent in the original box. Improper packaging can lead to product damage and loss of warranty claims. Dispose of packaging materials that are no longer required in an environmentally friendly manner.

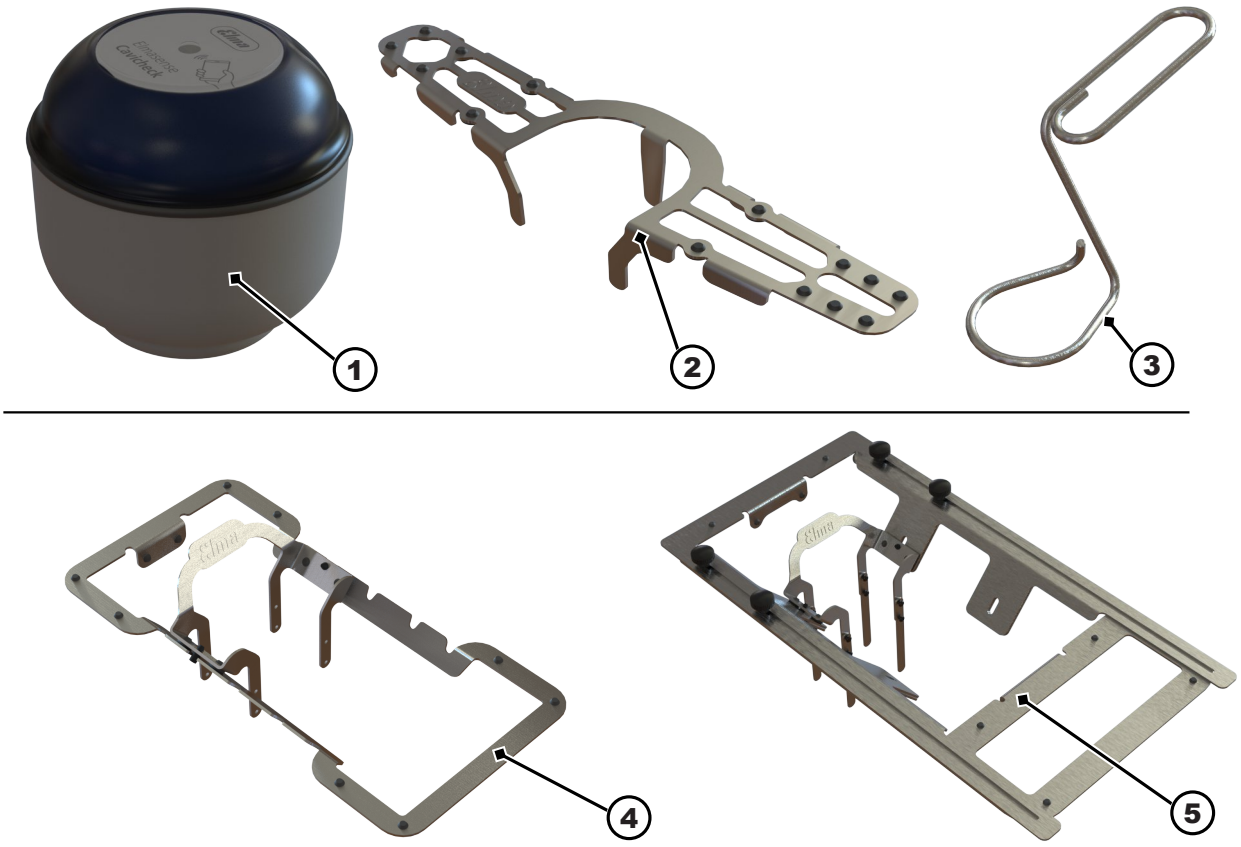


Illustration 1: Scope of supply of Elmasense Cavicheck set items 1–3*

1 Elmasense Cavicheck (measure cavitation noise level L_{CN})

2 Cavicheck Fixator Single 30-300 (variable positioning)

3 Cavicheck lifter (for insertion and removal)

Microfibre cloth (not shown)

Quick Start Guide (not shown)

Optional accessories (for measurements at different measuring positions):

4 Cavicheck Fixator Multi 30-300, 2-piece (variable positioning)

5 Cavicheck Fixator Multi 300-2500, 3-piece (variable positioning)

*Scope of supply according to ordered configuration!

7 Preparing the ultrasonic cleaning unit

✓ The operator is familiar with the functions of the ultrasonic cleaning unit and has read and understood the manual.

✓ The power cord is connected to the power supply.

✓ The drain may be connected.

✓ We recommend using the standard set-up as described below.

1. Fill the tank of the ultrasonic cleaning unit with liquid, e.g. softened water.
2. If necessary, add cleaning agent, e.g. 1% ELC N10.
   ⚠ **WARNING! Use of cleaning agents!** Observe the safety data sheet and use suitable protective equipment.
3. Heat up the temperature of the liquid, e.g. to 40 °C.
   Wear suitable protective gloves ⚠ **CAUTION! at cleaning temperatures over 40 °C.**
4. While heating up, degas the liquid for at least 10 minutes in the ‘degas’ ultrasonic mode. Degassing of the liquid can also be carried out using the ultrasonic modes, e.g. pulse and dyn (dynamic), if the unit does not have a degas mode.
   ⚠ **WARNING! Hearing damage!** When working with the unit in ultrasonic operation, cover it with the lid or wear hearing protection.

➔ The unit is filled, degassed and heated up.

Using the Elma Hub:

Prepare the ultrasonic cleaning unit according to the defined set-up in the Elma Hub.

- This requires login/registration in the Elma Hub.
- The liquid, cleaning agent, ultrasonic mode and temperature are specified in the Elma Hub Free unit-specific set-up. Customised set-ups are possible in Elma Hub Plus (optional) and may need to be taken into account when preparing the ultrasonic cleaning unit.
- Ultrasonic cleaning units and Cavichecks are managed in the Elma Hub.
- The measurement data stored in the Cavicheck are transferred to the Elma Hub.
- Measurement data are assigned to the ultrasonic cleaning units.
- Certificates with measurement data can be issued for specific units.

8 Measuring with Cavicheck

The manual describes the intended and safe use of the measuring unit. For more in-depth information on the physical principles of ultrasonic cleaning – especially cavitation – see the company website for further content. You can order the book **'Fascination Cavitation'** there.

Elma Schmidbauer GmbH
https://elma-ultrasonic.com

WARNING

Damage caused by noise emissions

Hearing damage!

- When working with the unit in ultrasound mode, cover it with the lid or wear hearing protection.
- Pregnant women must not spend long periods of time near an ultrasonic unit in operation.
- Keep animals away from the ultrasonic unit.

CAUTION

Hot liquid, vapours and unit parts!

Burns or scalds.

- Do not reach into the tank.
- When working at high cleaning temperatures (> 50 °C), only touch the elements and the covers wearing suitable gloves.

Only use **NOTE! the Cavicheck** if there is no visible damage to it. Handle the measuring unit with care. If the unit is dropped or otherwise damaged, send it to the manufacturer for inspection.

- ✓ Ultrasonic operation is ready to go.
- ✓ The liquid of the ultrasonic unit is heated up and degassed.

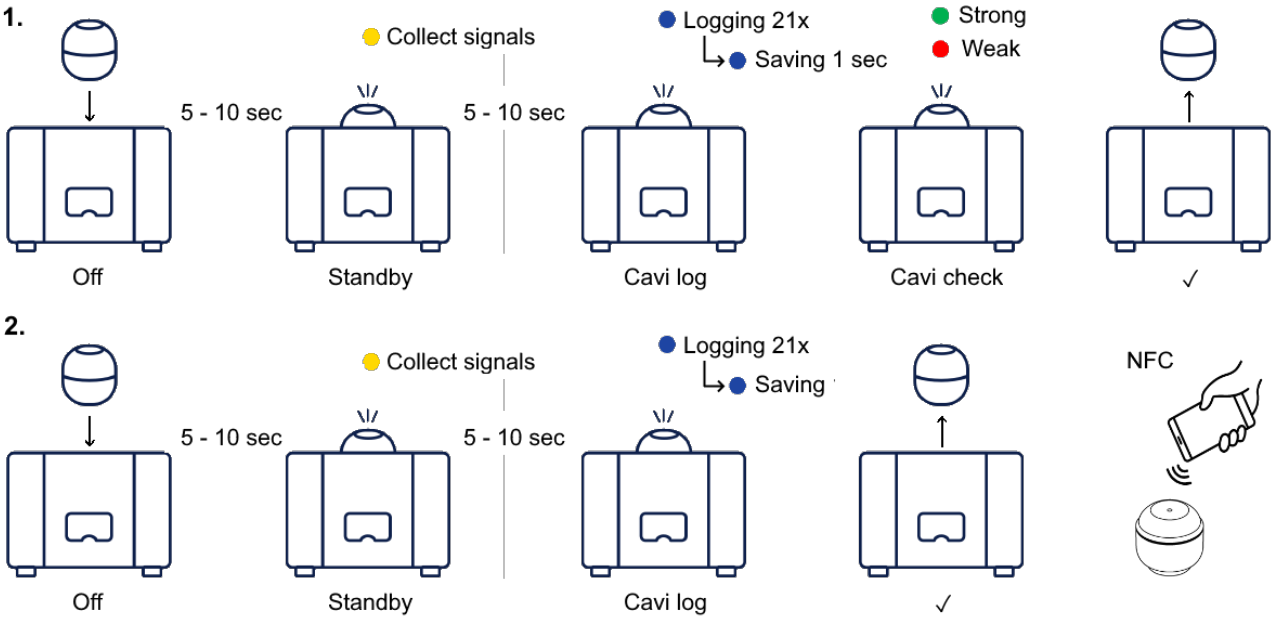
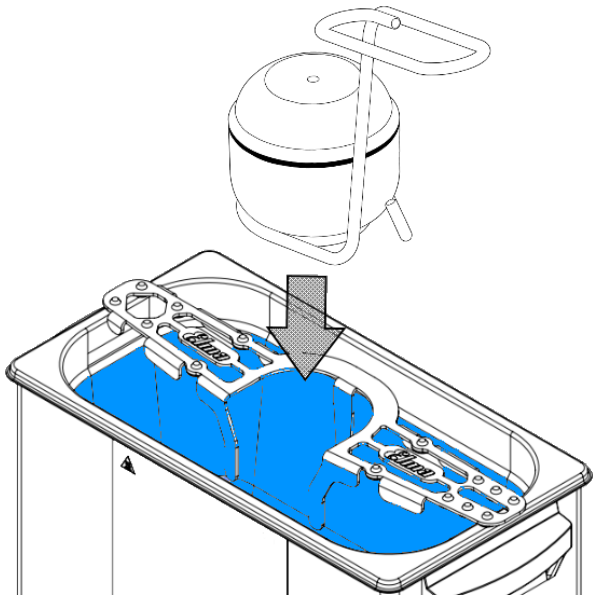
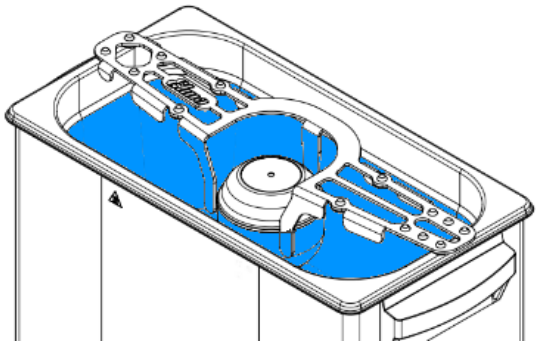


Illustration 2: Measure approx. 2 min – **1**. Without the Elma Hub/**2**. With the Elma Hub

1. Place the Cavicheck fixator on the edge of the tank. Additional fixators are available depending on the unit size and for multi-measurements. See the ‘Optional accessories’ section in the scope of supply. Product contents [▸ 11]
2. Insert the Cavicheck into the fixator using the Cavicheck lifter until it is immersed in the liquid.





3. Set an ultrasonic mode on the ultrasonic cleaning unit, e.g. sweep or dyn (dynamic).
   NOTE! The set ultrasonic mode must not be paused during the measurement.
4. Start ultrasonic operation.
5. The LED display of the Cavicheck will be off briefly.
6. The Cavicheck automatically starts operation after approx. 5–10 seconds. ***Yellow*** flashing of the LED display (standby) indicates operation (collecting signals).
7. It takes approximately 1 minute – 21 ***blue*** flashes of the LED display (Cavi log) – to record the measurement data.
   ⇨The Cavicheck saves the measurement data when the LED display lights up ***blue*** for 1 second (Cavi log).
   ⇨Subsequent ***green*** or ***red*** flashing of the LED display (Cavi check) indicates the current cavitation activity.
8. The LED display flashes ***green*** (Cavi check) – Strong (L_{CN}): ≥ 206 dB for strong cavitation. Displays the current cavitation activity for operation without the Elma Hub.
9. The LED display flashes ***red*** (Cavi check) – Weak (L_{CN}): < 206 dB for weak cavitation. Displays the current cavitation activity for operation without the Elma Hub.
10. Remove the Cavicheck from the ultrasonic bath using the Cavicheck lifter.
11. Switch off ultrasonic operation.

➔ The measurement data are saved in the Cavicheck (Cavi log – Saving).

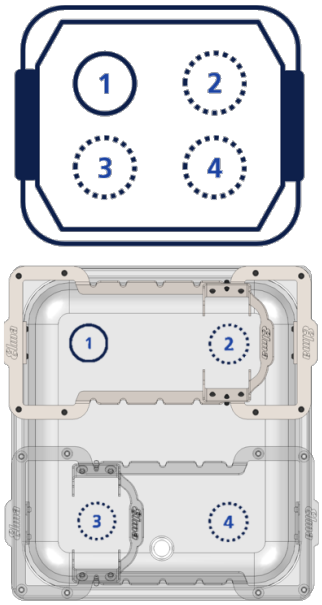
➔ The measurement data can be read out using an NFC reader (smartphone).

➔ Login/registration in the Elma Hub is required in order to issue certificates.
https://go.elma.gmbh/hub

NOTE! The Cavicheck stores up to 20 measurement results. Starting with the 21st measurement (ring buffer), the oldest measurement result is overwritten.

8.1 Multi-measurement example

The example shows an ultrasonic cleaning unit of size 180 with a Cavicheck Fixator 30-300 (optional accessory). Measurements are taken at measuring positions 1 to 4 in succession using the Cavicheck.



Further multi-measurements for larger ultrasonic cleaning units are possible with the Cavicheck Fixator 300-2500 (optional accessory).

9 Reading out Cavicheck measurement data via NFC

The measurement data from the Cavicheck are managed in the Elma Hub. All new measurement data from the Cavicheck are transferred individually or collectively – up to 20 measurement data – to the Elma Hub. The measured data frequency, time stamp, L_{CN} and DL_{CN} are displayed. If a measured value is outside the previously set tolerance range, it is highlighted in colour.

Set up ultrasonic cleaning units in the Elma Hub:

Log in to the Elma Hub. To manage ultrasonic cleaning units and Cavichecks in the Elma Hub, you need to register with or log in to the Elma Hub.

Prepare a defined set-up for ultrasonic cleaning units. The parameters liquid, cleaning agent, ultrasonic mode and temperature can be stored in the set-up for the specific unit.

Manage Cavichecks. To manage a Cavicheck in the Elma Hub, read out the Cavicheck using an NFC reader (e.g. smartphone). Enter the serial number and name of the Cavicheck.

Transfer measurement data. The measurement data stored in the Cavicheck (up to 20 memory locations) are read out using an NFC reader (e.g. smartphone) and can be assigned to a corresponding ultrasonic cleaning unit.

Output certificates and measurement data. Unit-specific certificates can be generated and output on the basis of the read-out measurement data.

Procedure:

- ✓ The measurement was successful – the LED display flashes blue for 1 second and then changes to green or red.
- ✓ A user account for the Elma Hub exists.
- ✓ The serial number of the Cavicheck is registered in the Elma Hub.
- ✓ The serial number of the ultrasonic cleaning unit to be used is registered in the Elma Hub.
- ✓ An NFC-enabled device such as a smartphone or NFC reader is available.

1. For older smartphone models, switch on the NFC function under settings and connections (connected devices). NFC is switched on by default on newer smartphone models.
2. Hold the smartphone or NFC reader at a distance of 0–2 cm from the NFC symbol on the Cavicheck to read out the measured data.
   NOTE! The position of the NFC chip differs depending on the smartphone model.

   ⇨**Apple (iOS**): a push message appears on the smartphone screen.
   Android: the read-out measurement data appear directly on the smartphone screen.
3. **Apple (iOS):** touch the push message to display the read-out measurement data in the Elma Hub.

➔ The read-out measurement data are automatically saved and displayed in the Elma Hub, and then they are displayed after the measurement has been assigned to an ultrasonic cleaning unit.

➔ A unit-specific certificate for this measurement can be generated and issued on the basis of the measurement data read out and analysed.

10 Cavicheck LED operating indicators

Operating status LED	Designation	Function	Action
LED is off	Operation off	The Cavicheck is started by being inserted into the liquid during ultrasonic operation.	Insert the Cavicheck into the ultrasonic cleaning unit in operation. The position of the Cavicheck in the ultrasonic cleaning unit is important for an accurate measurement result!
Flashes yellow (collecting signals)	Standby	Collecting measurement signals – LED flashes every 5 seconds.	Wait until the Cavicheck starts measuring.
Flashes blue (logging)	Cavi log	Record measurement data – LED flashes 21 times.	The Cavicheck carries out measurement.
Lights up blue once for 1 second	Cavi log	Recording of measurement data completed.	Measurement data are saved. The measurement data can be read out via NFC. This requires registration in the Elma Hub. https://go.elma.gmbh/hub
Flashes green (strong)	Cavi check	Monitoring the current cavitation activity.	The cavitation of ultrasonic operation is above the cavitation threshold (strong).
Flashes red (weak)	Cavi check	Monitoring the current cavitation activity.	The cavitation of ultrasonic operation is below the cavitation threshold (weak).
Flashes red (every 5 seconds, three times in quick succession)	Error	Error state	Remove the Cavicheck from the ultrasonic bath; wait until the LED is off or flashes yellow once. Start the measurement again.* In the event of an error, the Cavicheck can be read out via NFC. The Elma Hub will display a detailed error message.
Flashes yellow (continuously)	Error	Error state	Remove the Cavicheck from the ultrasonic bath; wait until the LED is off or flashes yellow once. Start the measurement again.*

NOTE! *Check the ultrasonic unit; if necessary, extend degassing of the ultrasonic bath or add surfactants to the liquid. If necessary, set an alternative ultrasonic mode or use a different ultrasonic unit. If the error persists, send the Cavicheck to the manufacturer for testing. Use the original box for this.

10.1 Important LED indicators for operation

The Cavicheck measurement data are recorded once during operation. When the measurement data have been fully recorded, the LED lights up blue for one second.

For a new measurement, it is necessary for the Cavicheck to be off – the LED is not lit or flashes yellow once. To do this, remove the Cavicheck from the unit or switch off ultrasonic operation and wait until the Cavicheck LED goes out or flashes yellow once.

A new measurement can only be carried out once the Cavicheck LED is off or has flashed yellow once. The Cavicheck can record and store up to 20 measurement data. Starting with the 21st measurement, the oldest measurement result is overwritten.

11 Cleaning and care

We recommend rinsing the measuring unit thoroughly with warm tap water after each use in the ultrasonic cleaning bath with cleaning agent. Then dry the measuring unit, e.g. with a clean microfibre cloth.

Store the measuring unit in a safe place after use. To avoid damage due to falling or impact, we recommend storing it in the box supplied.

11.1 Visible damage

Underside of the measuring unit

During normal operation, material is removed from the underside of the measuring unit. This is a typical side effect during ultrasonic cleaning which takes place through cavitation erosion. Minor material removal generally has no influence on the function of the measuring unit. As part of the recommended calibration, whether or not there is any critical material removal that could impair function is also checked. In this case, the customer will be informed by the manufacturer.

Seal ring

In the course of use, the seal ring may swell or become porous if it comes into contact with unsuitable liquids or is exposed to excessive heat.

In this case, the measuring unit must be sent to the manufacturer for inspection.

11.2 Calibration

Regular calibration is required to ensure the long-term accuracy of the measuring unit. We recommend sending the measuring unit to the manufacturer for calibration once a year or after 100 operating hours.

- The measuring unit may only be opened by the manufacturer**.**
  Opening the enclosure can cause leaks and will invalidate the warranty.
- The battery is replaced by the manufacturer as part of the calibration process. There is no provision for separate battery replacement.
- Clean the measuring unit thoroughly before sending it and remove any dirt and residue.
- Only send the measuring unit to the manufacturer in the original shipping box to avoid transport damage.
- The measuring unit can be further operated without calibration, but it should be noted that measuring accuracy may decrease without regular calibration.

12 Disposal

CAUTION

Once the unit has reached the end of its service life, ensure that the unit and accessories are disposed of safely and correctly:

- Clean and disinfect the old device and accessories before disposal.
- Do not dispose of old devices with household waste, but instead at the local collection and disposal points.
- Secure the old device against unauthorised access until removal; if necessary, dispose of the power cable separately.
- Observe regionally applicable disposal directives.
- Data protection notice: The end user is responsible for deleting personal and confidential data from the unit being discarded.