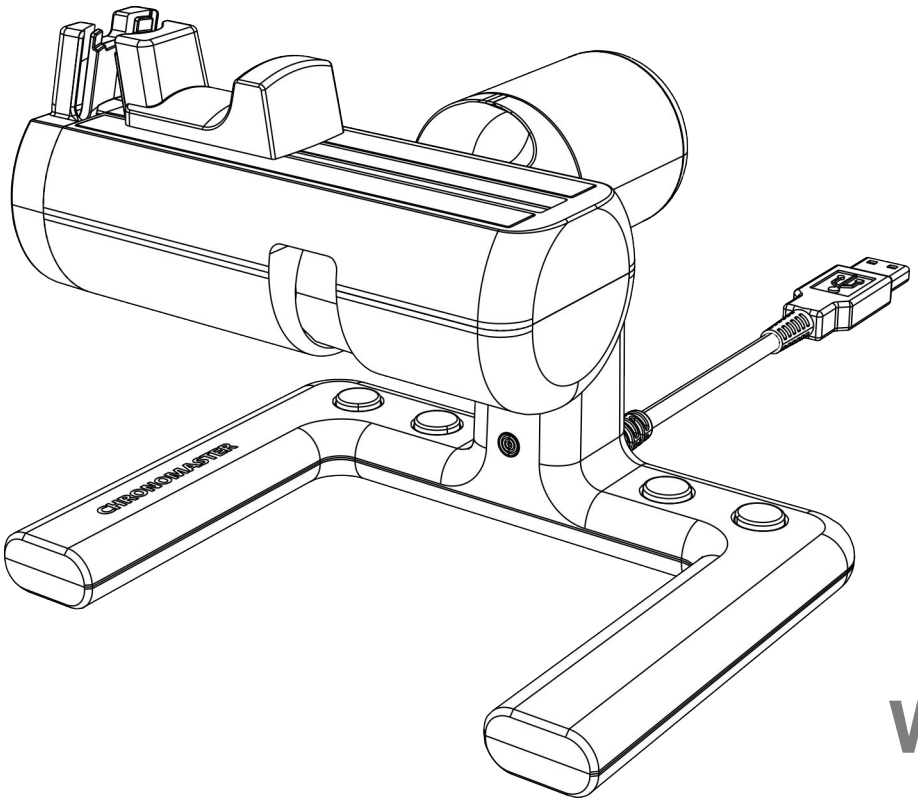
Precision measuring device
ChronoMaster / ChronoMaster Air



witschi

Read the instructions prior to performing any task!

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About this document

This document enables safe and efficient use of the ChronoMaster/ChronoMaster Air precision measuring device (hereafter referred to as the "device" (applies to both models) or "ChronoMaster Air"). The document is a component of the device and must be kept near the device where it can be accessed by personnel at all times.

This document is valid for ChronoMaster und ChronoMaster Air. If the content is only valid for ChronoMaster Air, this is indicated accordingly.

Personnel must have carefully read through and understood this document before commencing work. The basic prerequisite for safe work is compliance with all the safety, warning and process instructions specified in this document.

In addition, the local health and safety regulations and general safety rules for the area in which the device is used apply.

Illustrations in this document help provide a basic understanding and may deviate from the actual design.

Copyright

Customer Service

Your point of sale can provide you with technical information.

You can find your nearest point of sale on our website at http://www.witschi.com/de/firma/vertretungen

We are also always interested in hearing from you about your experiences in using the device and any information that could help us improve our products.

Customer Service information

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1 Product description

1.1 Overview

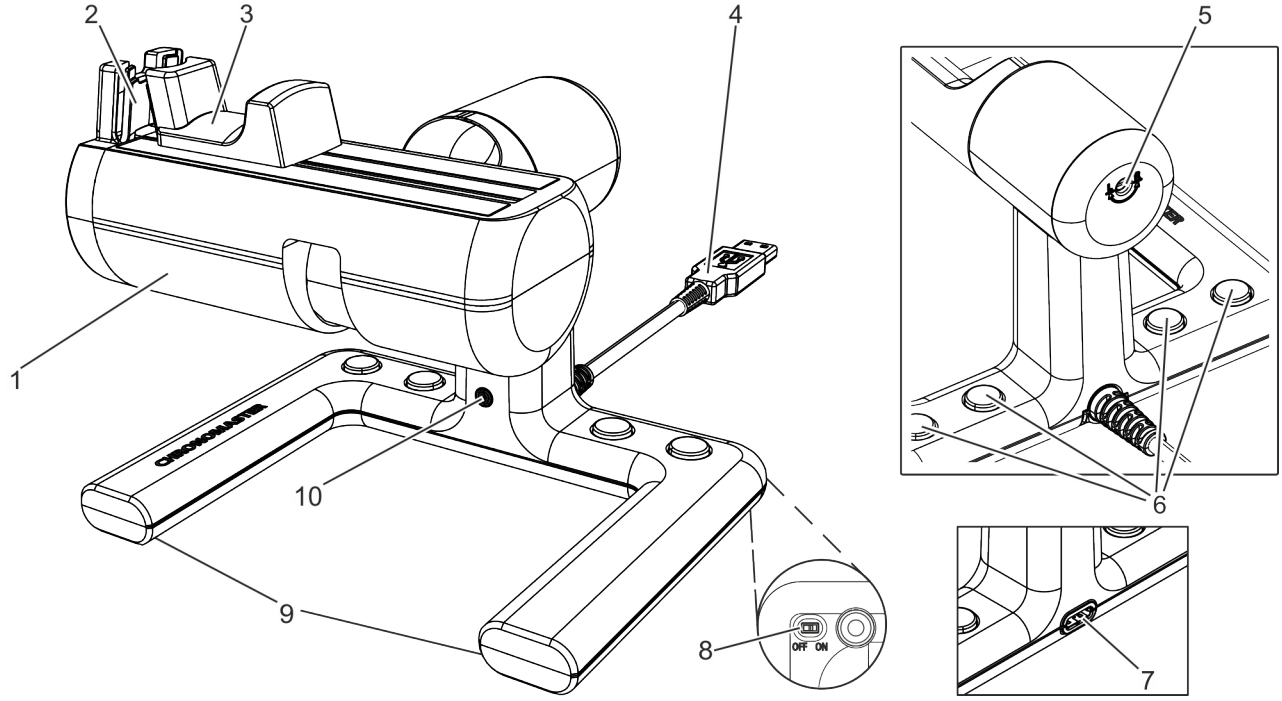

Fig. 1: ChronoMaster Air

No.	Description
1	Pivoting microphone for measurement of the watch noises
2	Signal sensor for recording and transmission of the watch noises • *Chapter 4.2 'Positioning the watch and starting a measurement automatically' on page 29*
3	Clamping jaw made of neoprene for clamping the watch or the watch movement • *Chapter 4.2 'Positioning the watch and starting a measurement automatically' on page 29*
4	USB cable for connecting the device to the PC or tablet computer • *Chapter 3.4 'Connecting the device' on page 24*
5	Switching screw for setting the device for right-handers or left-handers
6	Control keys for frequently used functions: selecting the previous program or the next program, restart and start/stop • *Chapter 4.3 'Controlling the measurement using control keys' on page 33*
7	USB-C port (ChronoMaster Air only)
8	ON/OFF slide switch (on bottom) (ChronoMaster Air only) • *Chapter 1.5 'Slide switch (ChronoMaster Air only)' on page 11*

No.	Description
9	2 × 2 AAA rechargeable batteries (on bottom) (ChronoMaster Air only) • ↳ *Chapter 1.7 'Technical data' on page 12*
10	LED signal lamp for visual indication of the device status and watch signal • ↳ *Chapter 4.2 'Positioning the watch and starting a measurement automatically' on page 29* • ↳ *Chapter 1.8 'Signal LED' on page 14*

Measuring options

The ChronoMaster/ChronoMaster Air is a precision measuring device that allows measurement of the rate deviation, the amplitude and the beat error of mechanical watches. The compact microphone features integrated measurement electronics.

All standard beat numbers can be determined automatically. Manual adjustment for any beat numbers in a range from 3,600 to 72,000 A/h is possible as an alternative.

Watches can be tested in the 6 main testing positions, in 4 vertical intermediate positions and in 2 special positions. The position is identified automatically.

Using different measuring modes, watches can be tested with the following escapements:

- Swiss lever escapement
- Cylinder escapement
- Duplex escapement
- Chronometer escapement
- Co-axial escapement
- AP escapement

Information on the measuring options

Further information on the measuring options can be found under ↳ *'Measuring modes' on page 9* *and in the corresponding software manual.*

Versions

Two versions of the ChronoMaster software are available:

- ChronoMaster
- ChronoMaster PRO

All functions are available at all time when ChronoMaster Air is used.

Witschi Token Installer (for ChronoMaster only)

The *'Witschi Token Installer'* software can be used to install what is known as a token on the ChronoMaster to upgrade the ChronoMaster to the PRO version.

> ***Ordering a token***
>
> *The token is created specifically for the ChronoMaster to be upgraded. The token contains the item number and the serial number of the ChronoMaster.*
>
> *More information can be found in the software manual.*

Using what is known as a demo token, you can test the PRO version for a limited time. The demo token features a timestamp, and can only be installed once on the ChronoMaster. If new functions are provided by the manufacturer, a new demo token can be created, which can be installed again once.

Controlling the measurements

A USB cable is used to connect the device to the PC or tablet computer. The measurements are controlled using the corresponding *'Chronoscope Service'* display software.

The *'Chronoscope Service'* display software allows you to choose between the *'Diagram'* and *'Vario'* display modes for both versions. In addition, the *'Trace'*, *'Sequence'*, *'Polar'*, *'Scope 1'* and *'Scope 2'* display modes are included with the ChronoMaster PRO version.

The ChronoMaster Air can either use a USB-C cable or a Bluetooth connection to communicate with the PC or tablet computer.

> ***Information on controlling the measurements***
>
> *Further information on controlling the measurements is to be found under ↳ 'Display modes' on page 10, in ↳ Chapter 4 'Performing a measurement' on page 29 and in the corresponding software manual.*

1.2 Scope of delivery

The scope of delivery includes the ChronoMaster and a USB flash drive with the following contents:

- *'Chronoscope Service'* display software
- Software manual in German, French, English, Spanish and Italian as PDF files

> ***Information on the display software***
> *Further information on the display software can be found in ↳ Chapter 1.3 'Software' on page 9 and ↳ Chapter 3.3 'Installing the software' on page 22, and in the corresponding software manual.*

The scope of delivery also includes:

- This document
- Calibration certificate
- Warranty information
- Dust cover
- 4 × Eneloop AAA rechargeable batteries with charger (ChronoMaster Air only)
- USB-C cable (1 m) and charger (ChronoMaster Air only)

1.3 Software

The measurements are controlled using the *'Chronoscope Service'* display software. It is provided on the supplied USB flash drive.

> ***Information on the display software***
> *Information on installation and operation of the display software is to be found in ↳ Chapter 3.3 'Installing the software' on page 22 and in the corresponding software manual.*

1.4 Modes

Measuring modes

The device provides various measuring modes that can be set in accordance with the escapement type of the watch to be tested.

Measuring mode	Information
Standard	Standard measuring mode for watches with Swiss lever escapement.
Rate	Measuring mode for the rate measurement only of watches with cylinder, duplex or chronometer escapement, in addition to watches with unusual beat noises.
Special 1 co-axial	Measuring mode for watches with co-axial escapement.
Special 2 AP	Measuring mode for watches with AP escapement.
Special 3 – 9	Not active (reserved)

Determining the escapement type

You can find out the escapement type of the watch for testing by consulting the watch manufacturer.

Information in the software manual

Further information on the measuring modes can be found in the corresponding software manual.

Display modes

The *'Chronoscope Service'* display software provides two possible display modes for the ChronoMaster and ChronoMaster PRO versions:

- Continuous diagram recording
- Vario

The following display modes are also available for the ChronoMaster PRO version:

- Trace
- Sequence
- Polar
- Scope 1, Scope 2

All display modes are available when ChronoMaster Air is used.

Information in the software manual

Further information on the display modes can be found in the corresponding software manual.

1.5 Slide switch (ChronoMaster Air only)

There is a slide switch on the bottom of the device. Before a measurement can be performed, the slide switch must be moved to the "ON" position. When the ChronoMaster Air is connected to a USB power adapter or to a PC, the integrated rechargeable batteries are charged, regardless of which position the slide switch is set to.

Device downtime

Moving the slide switch to the "OFF" position, thereby switching off the device, is recommended in the event of an extended period of downtime.

1.6 Bluetooth connection (ChronoMaster Air only)

Bluetooth® is a registered trademark of Bluetooth SIG, Inc.

Range and display of signal strength

The Bluetooth connection generally has a range of several metres. The range is affected by many different factors. To ensure that a measurement can be performed without interruptions, placing the ChronoMaster Air as close as possible to the receiver is recommended. The signal strength of the Bluetooth communication is displayed as an icon both in the header of the measurement window, and in the channel overview.

Meaning of the signal strength display:

Symbol	Meaning
	Strong signal strength
	Sufficient signal strength
	Weak signal strength, insufficient

Faults affecting the Bluetooth connection

If more than one ChronoMaster Air is connected to the PC or tablet computer by Bluetooth, or faults or interruptions occur, using the external Bluetooth dongle "Laird" (item no. JB15-BT851) is recommended. It can be ordered from the company Witschi Electronic AG as an accessory.

1.7 Technical data

Configuration

Device	Type no.
ChronoMaster	13.3210
ChronoMaster Air	13.3310

Time base

- TCXO quartz, high-frequency quartz time base

Stability	± 0.025 s/d

Measuring capacity

Function	Measuring range	Resolution	Precision	Notes
Rate deviation	± 999 s/d	1.0 s/d, 0.1 s/d or 0.01 s/d can be selected	± 0.1 s/d	Numerical display in s/d
Amplitude	70° to 360°	1° or 0.1° can be selected	± 0.4°	Numerical display in degrees
				Lift angle adjustable from 10° to 90°, resolution 0.1°
Beat error	9.9 ms	0.1 ms	± 0.1 ms	Numerical display in milliseconds

Communication interfaces

Designation	Purpose
USB	Connect the device to a PC or tablet computer for the following functions: • Power supply • Data transmission • Controlling measurements
Bluetooth connection (ChronoMaster Air only)	Connect the device to a PC or tablet computer using Bluetooth for the following functions: • Data transmission • Controlling measurements

Bluetooth connection (ChronoMaster Air only)

Data	Value	Unit
Technology	Bluetooth Low Energy 4.2	
Bluetooth module	CYBLE-222005-00	
Output	–18 to +3	dBm
Range, depending on placement	2 – 3	m
Module ID	FCC ID: WAP2005, IC ID: 7922A-2005	
Frequency	2.4	GHz

Rechargeable batteries (ChronoMaster Air only)

Data	Value	Unit
Brand	Panasonic	
Type	Eneloop AAA	
Technology	Nickel metal hybrid (NiMh)	
Capacity	750	mAh
Charging time	4 – 5	hours
Device autonomy	> 20	hours

ChronoMaster

Data	Value	Unit
Power consumption in operation	0.31	W

ChronoMaster Air

Data	Value	Unit
Power consumption in operation	typically 0.08 – 0.15	W
Power consumption when charging	typically 1.04	W

Dimensions and weight

Data	Value	Unit
Width	130	mm
Height	110	mm
Depth	110	mm
Weight	180	g

Recommended requirements for PC or tablet computer

Processor	Quadcore processor i5 or i7
Operating system	Windows 10, build number 14393 or higher
Working memory (RAM)	at least 4 GB
USB interface	2.0, type A
Screen	Minimum resolution: 1366 × 768 pixels

Operating conditions

Data	Value	Unit
Temperature range	5 – 40	°C
Relative humidity, maximum	10 – 80	%, non-condensing

1.8 Signal LED

An LED is installed on the base of the device that uses several different colours to indicate the device status:

Device status	LED display	Meaning
The slide switch is in the "ON" position (ChronoMaster Air only).	Lights up in green approx. 3 seconds after switching on	Rechargeable battery charge sufficient.
	Lights up in red approx. 3 seconds after switching on	Rechargeable battery charge not sufficient.

Device status	LED display	Meaning
ChronoMaster Air is not connected by Bluetooth.	Flashes in blue	Bluetooth is in ‘advertising mode’, ChronoMaster Air can be found and paired by the PC.
	Lights up in blue for approx. 4 seconds	Connecting Bluetooth.
ChronoMaster Air is operational.	Flashes in red	Charge voltage of the rechargeable batteries is low (< 10%). From this moment on, only approx. 1 hour of ChronoMaster Air operation remains.
Device is performing measurement.	Flashes in yellow	Display of the beat noises of the watch placed on the device.

2 Safety

This section provides an overview of all the important safety aspects that ensure personal protection and safe and trouble-free operation of the device. There are additional, task-specific warnings in the sections on the individual life cycle phases.

2.1 Symbols in this document

Safety indications and warnings

Safety information and warnings are identified by symbols in this document. The safety information and warnings are introduced by signal words that indicate the extent of the hazard.

NOTICE!
This combination of symbol and signal word indicates a potentially hazardous situation that can entail material damage if not avoided.

ENVIRONMENT!
This combination of symbol and signal word indicates possible hazards to the environment.

Tips and recommendations

This symbol draws your attention to useful tips and recommendations and to information that helps ensure efficient and trouble-free operation.

Additional labels

The following labels are used in this document to draw attention to instructions, results, lists, references and other elements:

Label	Explanation
1., 2., 3. ...	Step-by-step instructions
⇨	Results of actions
↳	References to sections of this document and other applicable documents
■	Lists without a fixed order

2.2 Risk of material damage

Damage to the USB cable or to the electronics

NOTICE!

Damage to the USB cable or to the electronics

Damage to the USB cable or to the electronics can damage the device.

- Only allow Customer Service to perform work on the device's electronics (*'Customer Service' on page 3*).
- In the event of damage to the USB cable or the plug, disconnect the USB plug and arrange for a repair by Customer Service (*'Customer Service' on page 3*).
- Keep moisture away from live parts. It can result in a short-circuit.
- Do not kink or jam USB cables, damage them on sharp edges or bring them into contact with heat sources.
- Check the USB cable and plug for damage every time before using the device.

Material damage due to opening the housing

NOTICE!

Material damage due to opening the housing!

Opening the housing causes a risk of damaging components inside the device or damaging the housing itself.

- Never open the housing of your own accord.
- In the event of malfunctions or problems that cannot be solved using the operation manual, contact Customer Service (*'Customer Service' on page 3*).

Material damage due to use of non-rechargeable batteries (ChronoMaster Air only)

NOTICE!

Material damage due to use of non-rechargeable batteries!

If non-rechargeable batteries are used in the ChronoMaster Air, it could be damaged or destroyed.

- Only use rechargeable NiMh batteries in size AAA.

2.3 Rechargeable batteries

For ChronoMaster Air only

WARNING!

Risk of injury in the event of improper use of rechargeable batteries!

In the event of improper use of rechargeable batteries, there is a risk that they will explode, or that substances harmful to health could escape that can cause burns in the event of contact with skin, acute toxicity in the event of ingestion, or blinding in the event of contact with the eyes.

- To recharge the rechargeable batteries, connect the ChronoMaster Air to the charger provided, or to a PC.
- The rechargeable batteries can remain in the ChronoMaster Air when being recharged from a PC or laptop.
- Never short circuit the contacts (positive or negative terminal) of the rechargeable batteries.

2.4 Intended use

The ChronoMaster/ChronoMaster Air precision measuring device is intended solely for measuring mechanical watches to determine the rate deviation, amplitude and beat errors.

The device can test watches of any size due to the clamping jaw.

The intended use includes compliance with all the information in this document.

Misuse

Any use beyond or other than the intended use shall be considered misuse.

NOTICE!

Material damage due to misuse!

Misuse of the device can result in material damage.

- Never immerse the device in water or other liquids. Keep the device away from rain and wet conditions at all times.
- Never clamp any objects other than watches or watch movements on the device.

2.5 Owner's responsibilities

Owner's obligations

The device is intended for commercial use. The owner of the device is subject to the statutory obligations of occupational health and safety.

In addition to the safety indications and warnings in this document, you must comply with the safety, occupational health and safety and environmental protection requirements that apply to the device's area of application.

The following applies in particular:

- Throughout the entire period that the device is in operation, the owner shall check that the operating instructions compiled by the owner comply with the current versions of regulations and must adapt the instructions as necessary.
- The owner shall ensure that all persons who handle the device have read and understood this document. In addition, the owner shall train personnel at regular intervals.
- The owner shall ensure that the service intervals described in this document are complied with.
- The owner shall ensure that the service intervals for the components are complied with.

2.6 Personnel qualifications

This document stipulates the following qualifications for the operator:

Customer Service
Certain work may only be performed by Customer Service. Customer Service personnel have been trained extensively for all work performed on measuring devices.

Work that is the specified task of Customer Service personnel may not be performed by unauthorised personnel. Contact Customer Service when this work is due.

Operator
The operator of the device has all the necessary knowledge and training to handle watches. In addition, the operator has been instructed by the owner about the tasks entrusted to him or her and about possible hazards in the event of improper behaviour. The operator may only perform tasks that go beyond normal operation where this is provided for in the operating instructions and the owner has specifically entrusted the operator with such tasks.

3 Commissioning the device

3.1 Unpacking the device

Delivery

The device is delivered by a local logistics company. All the components included in the scope of delivery are delivered together in a single package.

Transport inspection

Upon receipt of the delivery, check it immediately to ensure that it is complete and undamaged.

If there is any visible external transport damage, proceed as follows:

1. Do not accept the delivery.
2. Make a note of the scope of damage on the carrier's delivery note.
3. Lodge a complaint.

> ***Claims for damages can only be made within the applicable claim periods.***
> *Lodge a complaint for any damage as soon as it is identified. Claims for damages can only be made within the applicable claim periods.*

Unpacking the device

1. Take the device out of its packaging.
2. Keep the original packaging for any later transport or storage (*Chapter 5 'Device transport and storage' on page 35*).

3.2 Requirements for the location

Distortion of measurement results

NOTICE!

Distortion of measurement results due to unsuitable location!

There is a risk of the distortion of measurement results if the following requirements for the location are not complied with.

- Do not position the device and the test object in the vicinity of heaters or open windows.
- Do not expose the device and the test object to direct sunlight.
- Operate the device on a level, horizontal surface.
- Set up the device in a low-noise environment.
- Do no set up the device in the direct proximity of electromagnetic radiation (e.g. as caused by mobile telephones).

Short-circuit or damage to the electronics

NOTICE!

Risk of material damage due to unsuitable location!

There is a risk of a short-circuit or of damage to the device electronics if the following requirements for the location are not complied with.

- Install the USB cable so that it cannot be damaged by external influences.
- Never operate the device in an environment with a high level of humidity.

3.3 Installing the software

The *'Chronoscope Service'* display software can be found on the USB flash drive included (*Chapter 1.2 'Scope of delivery' on page 9*).

> ***Notes on installation***
> – *The 'Chronoscope Service' display software must be installed on the PC or tablet computer before the device is connected.*
> – *To install the 'Chronoscope Service' display software, administrator rights are required for the PC or tablet computer.*
> – *Further information on the software is to be found in the corresponding software manual.*

Personnel: ■ Operator

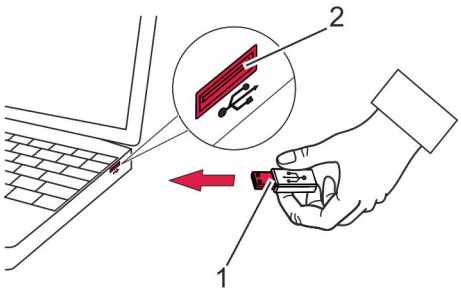

Fig. 2: Connecting the USB flash drive

1. Connect the USB flash drive to the USB port of the PC or tablet computer.
2. Open the directory of the USB flash drive on the PC or tablet computer.
3. Run the installation file **cs_setup.exe** as the administrator.

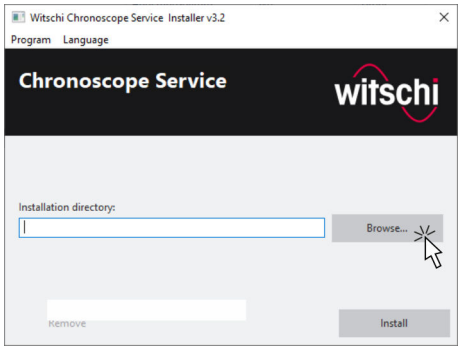

Fig. 3: Selecting the file location

4. Select the installation directory for the software on the PC or tablet computer (Fig. 3).

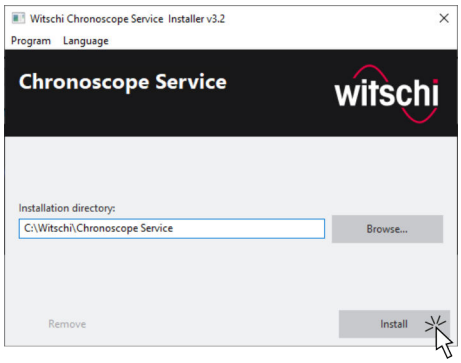

Fig. 4: Installing the software

5. Start the installation (Fig. 4).
   ⇨ After successful installation, the software can be started:

Software updates

Information on potential software updates is provided on the manufacturer's website.

3.4 Connecting the device

Fig. 5: Starting 'Chronoscope Service'

Personnel: ■ Operator

Prerequisite:

- The *'Chronoscope Service'* display software is installed on the PC or tablet computer.

1. Start the *'Chronoscope Service'* display software on the PC or tablet computer.
2. Plug the USB plug of the USB cable (Fig. 6/1) into the USB port of the PC or tablet computer (Fig. 6/2).

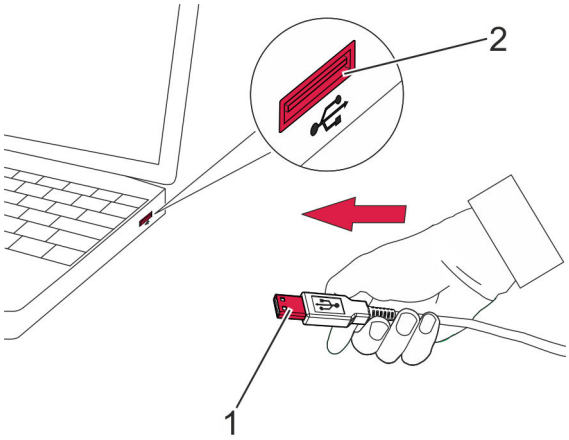

Fig. 6: Connecting the device to the PC or laptop

⇨
- The device is connected to the PC or tablet computer.
- The device is identified by the display software and executed there (Fig. 7).

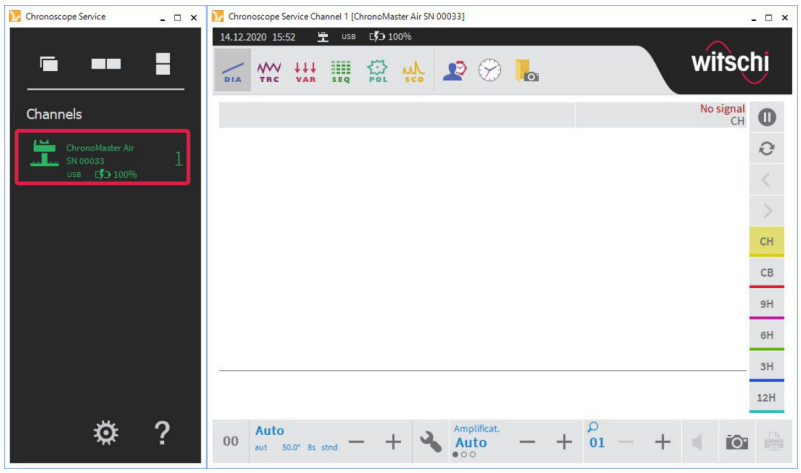

Fig. 7: Identification of the device by the display software

3.5 Assigning the device to a channel

There is the option of using the USB cable for communication between the device and a PC or tablet computer, or of using Bluetooth for wireless communication (ChronoMaster Air only).

> ***Choosing between 'manual' and 'automatic'***
>
> *There is the option of choosing between 'automatic' and 'manual'.*
>
> *'Automatic' mode is recommended if only one device is connected to the PC or tablet computer by USB cable. In 'automatic' mode, only devices are identified that are connected to the PC or tablet computer by a USB connection. If several devices are connected, the assignment of the devices on channel 1 and 2 may change under certain circumstances.*
>
> *'Manual' mode is recommended if two channels are being used, or if at least one device is to be connected to the PC or tablet computer using the Bluetooth interface.*

Configuring the device in *'automatic'* mode (by USB only)

Personnel: ■ Operator

Prerequisites:

- The *'Chronoscope Service'* display software is installed on the PC or tablet computer.
- The device is connected to the PC or tablet computer by a USB cable.

1. Click the configuration symbol ⚙.
2. Click the *[Yes]* button in the *'Configuration'* dialog window.

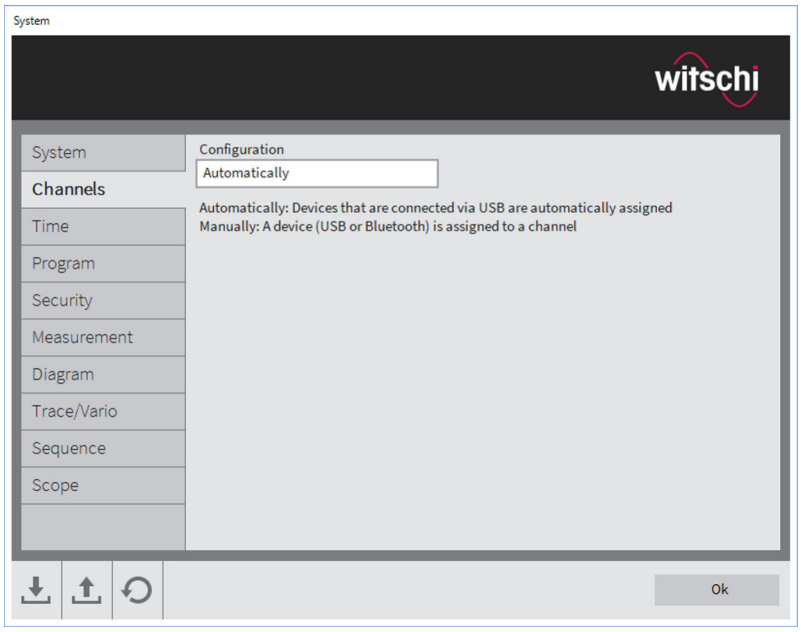

Fig. 8: Automatic channel assignment

3. Click on the *'Channels'* tab and select *'Automatic'*.
   ⇨ Die Software identifies the device connected by USB.

Configuring the device in *'manual'* mode

Personnel: ■ Operator

Prerequisite:

- The *'Chronoscope Service'* display software is installed on the PC or tablet computer.

1. Click the configuration symbol .
2. Click the *[Yes]* button in the *'Configuration'* dialog window.

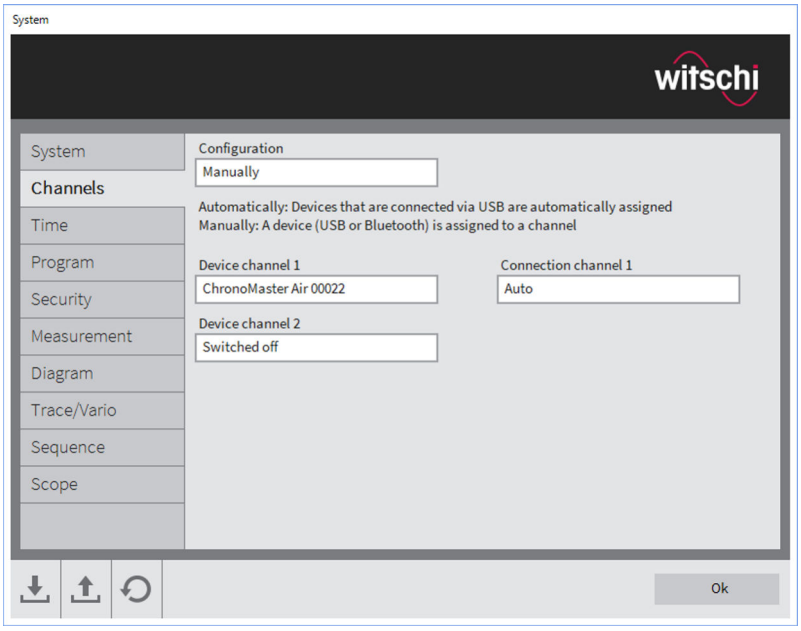

Fig. 9: Manual channel assignment

3. Click on the *'Channels'* tab and select *'Manual'*.
4. Select a device from the list in the selection window for *'Device channel 1'* or *'Device channel 2'* respectively.

   ⇨ It is now possible to define which connection is used for communication between the device and the PC or tablet computer.
5. Select *'Automatic'*, *'USB'* or *'Bluetooth'*.

   ⇨ USB:

   - The channel is only assigned to the device selected if it is connected to the PC or tablet computer by a USB cable.

   Bluetooth:

   - The channel is only assigned to the device selected using a Bluetooth connection, regardless of whether there is a USB connection.
   - The USB connection is then only used to charge the rechargeable batteries.

   Auto:

   - The device selected is assigned either by using a USB or a Bluetooth connection. The USB connection is given priority when this is done.

A device that is connected by means of Bluetooth will not automatically switch to a USB connection when the USB cable is plugged in. Only after the software restarts will the USB connection be active.

All channel assignments are saved, and are opened automatically the next time the device is switched on with the corresponding connection.

3.6 Charging the rechargeable batteries (ChronoMaster Air only)

The rechargeable batteries are partly charged upon delivery, and are already installed in the device.

→ Use the USB cable or the battery charger provided to connect the ChronoMaster Air to a power supply for approx. 4 hours.

Depending on the application, the runtime of the rechargeable batteries totals between 20 and 45 hours.

4 Performing a measurement

4.1 Configuring measurement settings

Overview

The measurement settings are configured using the *'Chronoscope Service'* display software.

The measurement settings are:

- Beat number
- Lift angle
- Measuring mode
- Integration time
- Display mode

Information in the software manual

Information on the measurement settings is to be found in the corresponding software manual.

Programs

Various programs are available with pre-defined measurement settings.

It is also possible for you to create your own programs with frequently used measurement settings.

Information in the software manual

Information on selecting and setting the programs is to be found in the corresponding software manual.

4.2 Positioning the watch and starting a measurement automatically

Distortion of measurement results

NOTICE!

Distortion of measurement results!

There is a risk of the distortion of measurement results if the watch or the clockwork is not clamped correctly.

– Make sure that the watch or the clockwork is clamped correctly.

Long-term measurements (ChronoMaster Air only)

Long-term measurements

When performing long-term measurements, connecting the ChronoMaster Air to a power supply using the USB cable is recommended.

Clamping the complete watch or watch movement with cup

Personnel: ■ Operator

Prerequisites:

- The slide switch is in the "ON" position (ChronoMaster Air only).
- The device is connected to the PC or tablet computer.
- The *'Chronoscope Service'* display software has been started.

1. Pull the clamping jaw (Fig. 10/1) outwards and hold it.

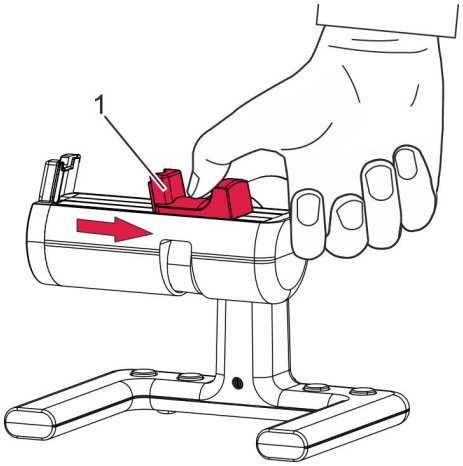

Fig. 10: Tightening the clamping jaws

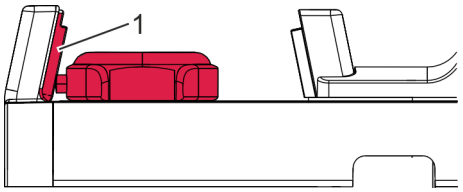

Fig. 11: Clamping the complete watch

2. Place the crown of the watch or cup on the clamping area so that it is positioned up against the signal sensor (Fig. 11/1, Fig. 12/1).

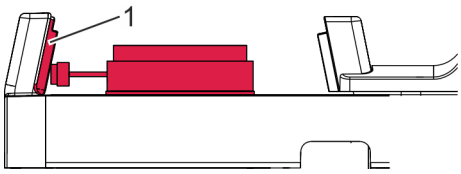

Fig. 12: Clamping the watch movement with cup

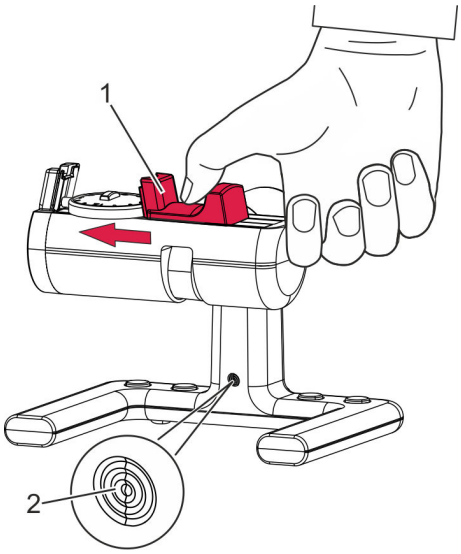

Fig. 13: Releasing the clamping jaw

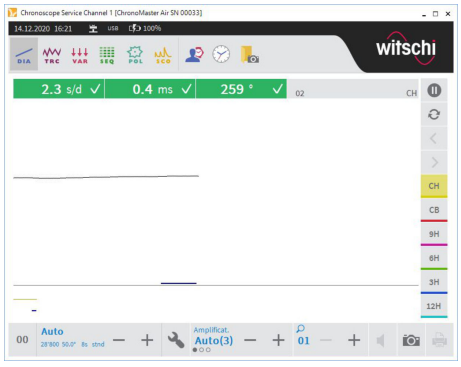

Fig. 14: The measuring process starts automatically

3. Carefully guide the clamping jaw (Fig. 13/1) to the watch or the watch movement.

⇨
- The complete watch or the watch movement with cup is clamped.
- The LED on the device (Fig. 13/2) flashes at the same frequency as the watch beats.
- The measuring process starts automatically (Fig. 14).

Alternatively, the measurement can be started using the ‘**Restart**’ button in the display software.

Information in the software manual

Information on the measuring process and on controlling the measurement is to be found in the corresponding software manual.

Clamping the watch movement without housing

Personnel: ■ Operator

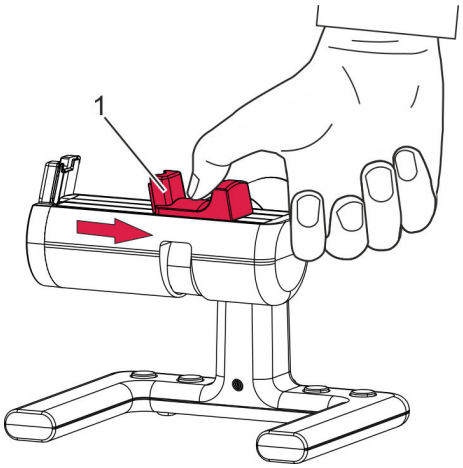

Fig. 15: Tightening the clamping jaws

Prerequisites:

- The slide switch is in the "ON" position (ChronoMaster Air only).
- The device is connected to the PC or tablet computer.
- The *'Chronoscope Service'* display software has been started.

1. Pull the clamping jaw (Fig. 15/1) outwards and hold it.

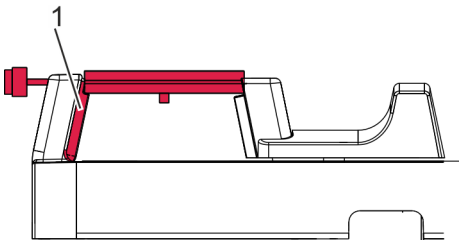

Fig. 16: Watch movement clamped without housing

2. Place the watch movement on the clamping area so that the plate is positioned above the signal sensor (Fig. 16/1).

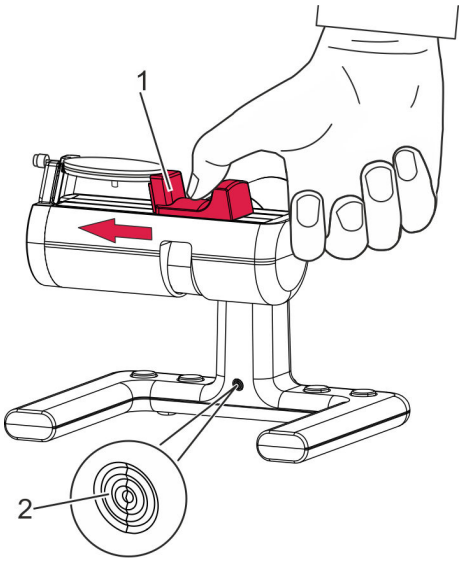

Fig. 17: Releasing the clamping jaw

3. Carefully guide the clamping jaw (Fig. 17/1) to the watch movement.

⇨
- The watch movement without housing is clamped.
- The LED on the device (Fig. 17/2) flashes at the same frequency as the watch beats.
- The measuring process starts automatically (Fig. 18).

Alternatively, the measurement can be started using the *'Restart'* button in the display software.

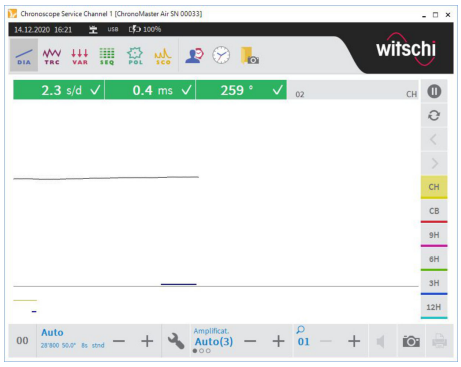

Fig. 18: The measuring process starts automatically

Information in the software manual
Information on the measuring process and on controlling the measurement is to be found in the corresponding software manual.

4.3 Controlling the measurement using control keys

The device features 4 control keys (Fig. 19) that are used to operate the software.

The following functions are assigned to the control keys:

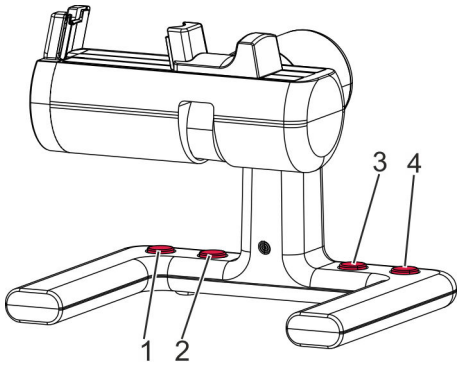

Fig. 19: Control keys

No.	Function
1	Program selection, select next lower program.
2	Program selection, select next higher program.
3	Restart current measurement.
4	Pause/continue current measurement.

Information in the software manual
Information on the individual functions can be found in the corresponding software manual.

4.4 Monitoring and configuring the measurement

The measurements are monitored and configured using the *'Chronoscope Service'* display software.

This includes:

- Monitoring the measurement and the measurement results
- Setting the signal strength
- Pausing and resuming the measurement
- Printing the measurement results
- Creating screenshots
- Restarting a measurement

Information in the software manual

Information on monitoring and configuring the measurements is to be found in the corresponding software manual.

5 Device transport and storage

5.1 Device shutdown

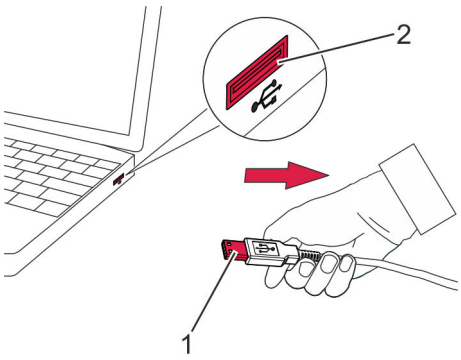

Fig. 20: Device shutdown

Prerequisite:

- The measurement has been completed.

1. Pull the clamping jaw outwards and hold it.
2. Remove the watch or watch movement from the microphone.
3. Carefully release the clamping jaw.
4. Disconnect the USB cable (Fig. 20/1) at the USB plug from the USB port of the PC or tablet computer (Fig. 20/2).
5. ChronoMaster Air only: move the slide switch to the "OFF" position.

5.2 Device transport and storage

Improper transport

NOTICE!

Risk of material damage due to improper transport!

In the event of improper transport, the device may fall or topple. This can cause significant material damage.

- Transport the device in its original packaging only.
- Always transport packages upright and never throw them.
- Only transport the device when it is shut down.
- Transport the device with two hands only.

Improper storage

NOTICE!

Risk of material damage due to improper storage!

Improper storage can cause significant material damage to the device.

- Store the device in its original packaging only.
- Do not store the device outdoors.
- Store the device in a dry and dust-free environment.
- Do not expose the device to any aggressive media.
- Protect the device from sunlight.
- Protect the device from mechanical vibrations.
- Store the device at a temperature between –20 °C and +70 °C.
- Store the device at a relative humidity of between 10 % and 80 % (non-condensing).

Prerequisite:

- The device has been shut down (*Chapter 5.1 'Device shutdown' on page 35*).

1. Pack the device in its original packaging.
2. Transport and/or store the device.

6 Device maintenance and cleaning

6.1 Safety during maintenance

Short-circuit or damage to the electronics

NOTICE!

Risk of material damage during maintenance!

A short-circuit or damage to the electronics of the device is possible during maintenance if the following instructions are not observed:

- Only allow Customer Service to perform work on the device's electronics.
- Before performing any work for maintenance or cleaning, disconnect the USB cable from the PC or tablet computer.
- Keep moisture away from live parts.

6.2 Replacing the rechargeable batteries (ChronoMaster Air only)

When the runtime of the rechargeable batteries decreases, this is due to ageing of the rechargeable batteries that are installed. The ChronoMaster Air features a design that allows the operator to replace the rechargeable batteries.

Ensure that the rechargeable batteries are replaced correctly!

- *Do not replace rechargeable batteries with primary batteries (non-rechargeable batteries).*
- *Do not replace individual rechargeable batteries, but rather all 4 rechargeable batteries at once.*
- *Use rechargeable batteries of type "Eneloop" in size AAA (HR03) – they can be ordered from the company Witschi AG.*

Personnel: ■ Operator

Prerequisite:

- The ChronoMaster Air has been switched off and disconnected from the power supply.

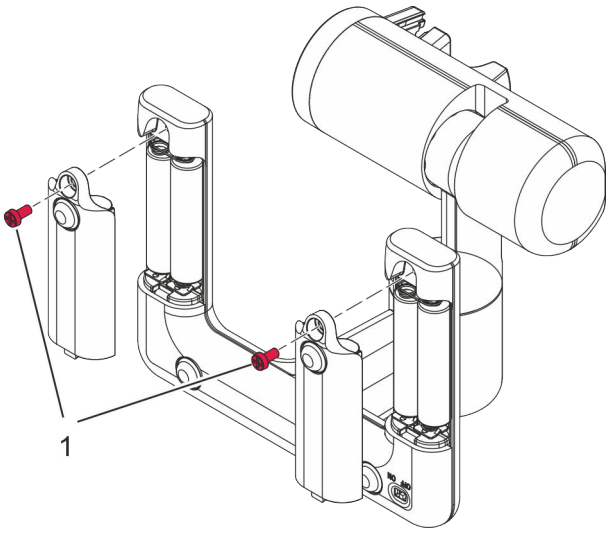

Fig. 21: Replacing rechargeable batteries

1. Unscrew the screws (Fig. 21/1) using a screwdriver and open the battery compartments.
2. Insert new rechargeable batteries using the markings on the covers of the rechargeable batteries, and ensure the polarity is correct.
3. Close the battery compartments.
4. Recalibrate the charge status display.

Recalibrating the charge status display

The charge status display is electronically monitored and calculated. After inserting new rechargeable batteries, recalibrating the charge status display is recommended. To do so, the new rechargeable batteries in the ChronoMaster Air must be discharged completely and then be recharged again. After completion of the discharge/charge phase, the calibration is complete and the charge status display provides reliable values.

Personnel: ■ Operator

Prerequisite:

- New rechargeable batteries have been inserted.

1. Switch on the ChronoMaster Air and connect it to the PC or tablet computer using Bluetooth.
2. Perform the long-term measurement until the rechargeable batteries have been discharged completely.

   ⇨ The rechargeable batteries have discharged completely after 20 –24 hours.

3. Charge the rechargeable batteries to the full charge level using the USB cable.

   ⇨ The calibration is complete, and the charge status display once again provides correct values.

6.3 Maintenance schedule

Interval	Maintenance work	Personnel
Daily	Clean the device with a microfibre cloth.	Operator
Annually	Have the device calibrated.	Customer Service

Calibration instruction

Fig. 22: Calibration label

Regular calibration of the device ensures that measurement results are reliable.

We recommend having the device calibrated and its functionality checked ***once a year****.*

7 Troubleshooting

7.1 Error messages in the display software

Information in the software manual

Information on errors messages in the display software is to be found in the corresponding software manual.

7.2 Damage to the device

Improper repair of damage

NOTICE!

Damage due to improper repair of material damage!

The improper repair of material damage to the device can result in additional material damage.

- Stop operating the device in the event of material damage.
- Only allow Customer Service to repair the device.

If there is any visible external damage, proceed as follows:

1. Shut down the device (*Chapter 5.1 'Device shutdown' on page 35*).
2. Contact Customer Service (*'Customer Service' on page 3*).

7.3 Troubleshooting

Fault description	Cause	Remedy
Implausible measurement result	The watch or watch movement is not positioned correctly.	Re-position the watch or watch movement (*Chapter 4.2 'Positioning the watch and starting a measurement automatically' on page 29*).
Diagram with interference	Signal setting too strong/weak.	Regulate the signal strength. Information on how to do this can be found in the corresponding software manual.
The LED in the base of the device does not light up/ flash (ChronoMaster Air only)	The slide switch is not in the "ON" position.	Move the slide switch to the "ON" position.

Fault description	Cause	Remedy
The LED in the base of the device does not light up/ flash (ChronoMaster Air only)	The rechargeable batteries are not charged.	• Ensure that the rechargeable batteries have been charged. • Connect the device to a power supply using the USB cable. • Move the slide switch from "ON" to "OFF" and back to "ON".
The device is not listed in the selection list for channel assignment.	The device is not connected to the PC or tablet computer correctly.	• Move the slide switch from "ON" to "OFF" and back to "ON". • Close the selection window for channel assignment, and open it again. • Ensure that the device is connected to the right PC or tablet computer.
The Bluetooth connection is interrupted (ChronoMaster Air only)	Unstable Bluetooth connection.	• Place the ChronoMaster Air closer to the PC or tablet computer. • Use the external Bluetooth dongle "Laird" (item no. JB15-BT851) for a more stable connection.
The capacity of the rechargeable batteries is not displayed correctly (ChronoMaster Air only)	The charge status display was not calibrated after replacing the rechargeable batteries.	Recalibrating the charge status display (↯ *'Recalibrating the charge status display' on page 38*).

8 Disposal

8.1 Device disposal

If no return or disposal agreement has been made, take the device to a recycling facility.

ENVIRONMENT!

Incorrect disposal poses an environmental hazard!

The device contains electrical and electronic components. Incorrect disposal may result in hazards to the environment.

- Do not dispose of the device along with the household waste. Hand over the device to a municipal collection point or have it disposed of by a specialist.
- Only have authorised specialists dispose of the device.
- If in doubt about environmentally sound disposal, contact your local authority or a specialist waste disposal company.

8.2 Rechargeable battery disposal (ChronoMaster Air only)

Rechargeable batteries can contain substances that can be recycled and/or substances that are hazardous to health and the environment.

ENVIRONMENT!

Incorrect disposal poses an environmental hazard!

The device contains electrical and electronic components. Incorrect disposal may result in hazards to the environment.

- Do not allow rechargeable batteries to end up waterways, the sewer system, the ground or household rubbish, and instead have them recycled or disposed of by a specialist company.
- Dispose of the rechargeable batteries separately from the device (↯ 38).

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Appendix

A Declaration of conformity

Declaration of conformity CE/UKCA

Dichiarazione di conformità CE/UKCA

Declaración de conformidad CE/UKCA

EN | IT | ES

We *La / Nosotros:*	**Witschi Electronic AG** **Bahnhofstrasse 26** **CH-3294 Büren a.A.** **Switzerland / Svizzera / Suiza**

declare under our sole responsibility that the product
dichiara sotto la sua esclusiva responsabilità che il prodotto
declaramos por responsabilidad propia, que el producto

Name *nome / denominación:*	**ChronoMaster**
Typ-Nr. *N. tipo / N° de tipo:*	**13.3210**
Serial-Nr. *N. di serie / N° de fabricación*	**1 – 10'000**
Function *funzione / función:*	**Test instrument for mechanical watches with integrated measuring electronic**
doc. management Gestione doc./ Administración de documentos	Witschi Electronic AG, Roman Siegfried, Bahnhofstr. 26, CH-3294 Büren a.A.
Quality mgt, systems QMS certificate / Sistema de gestión de calidad	SQS, ISO 9001:2015, Scope 19 / Reg. Nr. 12228

to which this declaration applies, is in conformity with the following EC-Directive(s) and standard(s) or other normative document(s):

a cui si riferisce la presente dichiarazione è conforme ai requisiti previsti dalle direttive CE ed alle norme o ai do-cumenti normativi elencati qui di seguito:
al cual hace referencia esta declaración, satisface las disposiciones de la(s) siguiente(s) directiva(s) UE y norma(s) o documento(s) normativo(s):

Guidelines

2014/30/EG	☒	Electromagnetic compatibility
2014/35/EU	☐	EC low voltage directive
2006/42/EG	☐	EX machinery directive
2011/65/EU	☒	RoHS Directive

Generic Standards

EN 61000-6-3: 2011	☒	Electromagnetic compatibility (EMC), Emission standard for residential, commercial and light-industrial environments
EN 61000-6-4: 2011	☐	Electromagnetic compatibility (EMC), Emission standard for industrial environments
EN 61000-6-1: 2016	☒	Electromagnetic compatibility (EMC), Immunity for residential, commercial and light-industrial environments
EN 61000-6-2: 2016	☐	Electromagnetic compatibility (EMC), Immunity for industrial environments
EN ISO 12100-2010	☐	Safety of machinery

Büren a.A., den 9.12.2022

Daniel Hug
CTO

Roman Siegfried
COO

B Declaration of conformity for ChronoMaster Air

CE/UKCA Declaration of conformity

Dichiarazione di conformità CE/UKCA

Declaración de conformidad CE/UKCA

EN | IT | ES

We *La / Nosotros:*	**Witschi Electronic AG** **Bahnhofstrasse 26** **CH-3294 Büren a.A.** **Switzerland / Svizzera / Suiza**

declare under our sole responsibility that the product
dichiara sotto la sua esclusiva responsabilità che il prodotto
declaramos por responsabilidad propia, que el producto

Name *nome / denominación:*	**ChronoMaster Air**
Typ-Nr. *N. tipo / N° de tipo:*	**13.3310**
Serial-Nr. *N. di serie / N° de fabricación*	**1 – 10'000**
Function *funzione / función:*	**Test instrument for mechanical watches with integrated measuring electronic and BLE radio**
doc. management *Gestione doc./* Administración de documentos	Witschi Electronic AG, Roman Siegfried, Bahnhofstr. 26, CH-3294 Büren a.A.
Quality mgt, systems *QMS certificate /* Sistema de gestión de calidad	SQS, ISO 9001:2015, Scope 19 / Reg. Nr. 12228

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a cui si riferisce la presente dichiarazione è conforme ai requisiti previsti dalle direttive CE ed alle norme o ai documenti normativi elencati qui di seguito:
al cual hace referencia esta declaración, satisface las disposiciones de la(s) siguiente(s) directiva(s) UE y norma(s) o documento(s) normativo(s):

Guidelines 2014/30/EG	☒ Electromagnetic compatibility
2011/65/EU	☒ RoHS Directive
Generic Standards EN 61000-6-3: 2007 +A1:2011 +AC:"012	☒ Electromagnetic compatibility (EMC), Emission standard for residential, commercial and light-industrial environments
EN 61000-6-1: 2016	☒ Electromagnetic compatibility (EMC), Immunity for residential, commercial and light-industrial environments
ETSI EN 300 328 V2.2.2:2019 Chapter 4.3.2.9	☒ Wideband transmission systems 2.4 GHz
ETSI EN 301 489-3 V1.6.1	☒ Electromagnetic compatibility (EMC) standard for radio equipment and services

Büren a.A., den 29.11.2022

Daniel Hug
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