

# Chronoscope MMC

# ChronoMaster

Software manual



# General information

**Document** 13.27.920D35e

**Version** 29.11.2021

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# 1 Introduction

The Chronoscope MMC software enables you to connect up to 10 Micromat C and ChronoMaster, or 2 ChronoMaster Air devices to a PC via Bluetooth.

The modular system enables you to compile a customised test system to meet your needs. This offers a range of options: from checking smaller batches in production and in the repair service to analyses in the laboratory.

You can also run long-term measurements of up to 300 hours, calculate the unbalanced error angle, analyse the isochronism and run FFT spectral analyses.

The test system measures the most important functions of a mechanical watch.

## 2 Installation

Chronoscope MMC/ChronoMaster is installed together with WiCoTRACE.

Instructions and information on the installation process are available in the WiCoTRACE installation manual.

**Important note:**

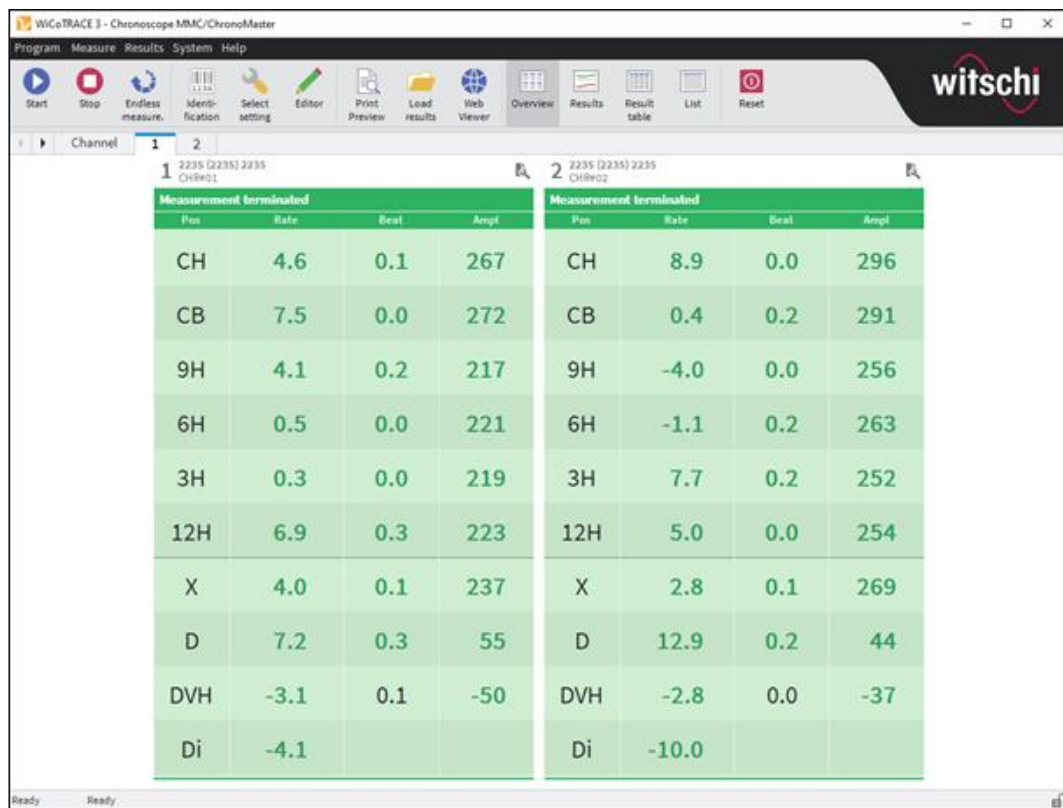
To use the Bluetooth connection of ChronoMaster Air, you need Windows 10, Version 1703 or higher.

## 3 Overview

### 3.1 Screen

The screen is split into several sections. From top to bottom:

- **Menu bar**  
Access to basic functions such as Settings, Print, Channel Configuration, Language, Help and Software Manual.
- **Toolbar**  
Lets you Start and Stop the measurement, Select settings, Save results, display results and reset.
- **Channel selection**  
Channels are organised as tabs.
- **Result display** (with 2 channels shown in the example)  
Most of the screen is reserved for displaying the results. Up to 10 channels can be displayed at the same time.
- **Status bar**  
Status of the measurement and the connected devices.

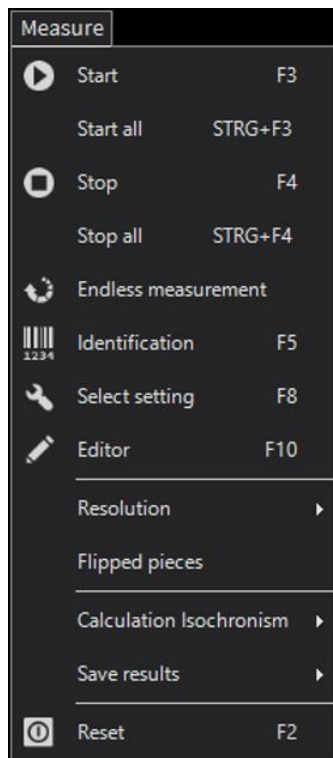


The screenshot shows the Witschi WCoTRACE 3 software interface. The window title is "WCoTRACE 3 - Chronoscope MMC/ChronoMaster". The menu bar includes "Program", "Measure", "Results", "System", and "Help". The toolbar contains icons for Start, Stop, Endless measure, Identification, Select setting, Editor, Print Preview, Load results, Web Viewer, Overview, Results, Result table, List, and Reset. The "witschi" logo is in the top right corner. Below the toolbar, there are two channel tabs labeled "1" and "2". Channel 1 is selected and shows a table of measurement data. Channel 2 is also visible but not selected. The status bar at the bottom shows "Ready" on both sides.

Measurement terminated				Measurement terminated			
Pos	Rate	Beat	Ampl	Pos	Rate	Beat	Ampl
CH	4.6	0.1	267	CH	8.9	0.0	296
CB	7.5	0.0	272	CB	0.4	0.2	291
9H	4.1	0.2	217	9H	-4.0	0.0	256
6H	0.5	0.0	221	6H	-1.1	0.2	263
3H	0.3	0.0	219	3H	7.7	0.2	252
12H	6.9	0.3	223	12H	5.0	0.0	254
X	4.0	0.1	237	X	2.8	0.1	269
D	7.2	0.3	55	D	12.9	0.2	44
DVH	-3.1	0.1	-50	DVH	-2.8	0.0	-37
Di	-4.1			Di	-10.0		

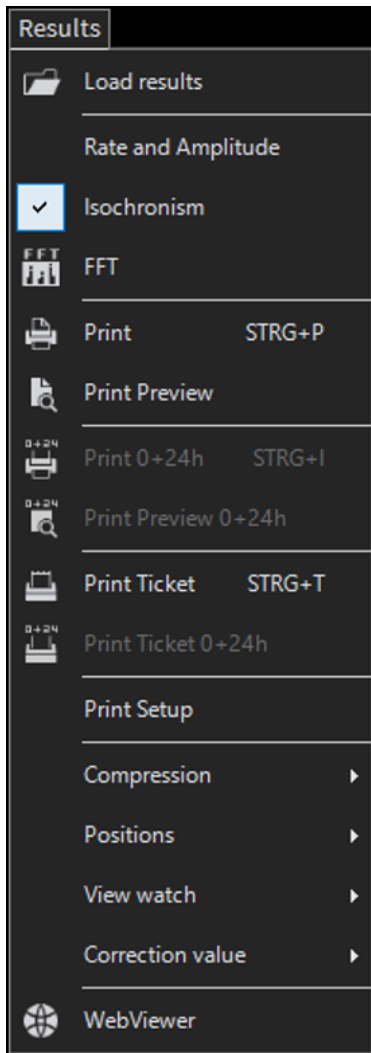
## 3.3 Menu bar

### 3.3.1 Measure



<b>Start</b>	<b>F3</b>	Start measurement.
<b>Start all</b>	<b>Ctrl+F3</b>	Starts the measurement with all connected measuring instruments at the same time. All channels are identified in a window (see also chapter 5.2.2)
<b>Stop</b>	<b>F4</b>	Cancel measurement.
<b>Endless measurement</b>		See Chapter 7.
<b>Identification</b>	<b>F5</b>	Opens the window for entering the identification of the watch mechanism or watch to be tested.
<b>Select setting</b>	<b>F8</b>	Opens the window for selecting the required measurement program.
<b>Editor</b>	<b>F10</b>	Opens the Universal Editor. Access to this function can be disabled in the cockpit (see cockpit manual).
<b>Resolution</b>		Select resolution for displaying the rate measurement: <ul style="list-style-type: none"><li>• <b>0.01 s/d</b></li><li>• <b>0.1 s/d</b></li><li>• <b>1 s/d</b></li></ul>
<b>Flipped pieces</b>		Must be activated if the pieces are placed with the dial side on the microphones.
<b>Calculation Isochronism</b>		Select the calculation mode for Isochronism: <ul style="list-style-type: none"><li>• <b>With the measurement 0h</b></li><li>• <b>With the measurement 24h</b></li></ul>
<b>Save results</b>		Automatically save measurement results when the measurement is complete or after confirmation by the user.
<b>Reset</b>	<b>F2</b>	Cancel measurement, initialise system, import settings again.

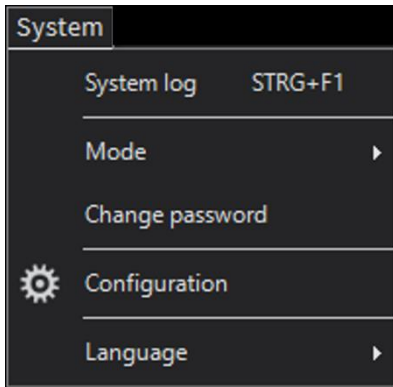
### 3.3.2 Results



<b>Load results</b>		Loads the results of a watch in accordance with its identification.
<b>Rate and Amplitude</b>		Graphic display of the rate and amplitude measurements.
<b>Isochronism</b>		Displays the isochronism.
<b>FFT</b>		Displays the spectral analysis.
<b>Print</b>	<b>CTRL+P</b>	Prints the current results.
<b>Print 0+24h</b>	<b>CTRL+I</b>	Prints the combined results.
<b>Print Preview</b>		Print preview of the current results.
<b>Print Preview 0+24h</b>		Print preview of the combined results. See also chapter 10.2.
<b>Print Ticket</b>	<b>CTRL+T</b>	Printout of the measurement results on a ticket printer that is available as an accessory.
<b>Print Ticket 0+24h</b>		
<b>Print Setup</b>		Opens the window where the settings for the printer (or multiple printers) connected to the PC or network are made. See chapter 10.1.

<b>Compression</b>	<p>Compression of results for long-term measurements.</p> <ul style="list-style-type: none"> <li>• <b>Low</b> (default setting)</li> <li>• <b>Medium</b></li> <li>• <b>High</b></li> </ul> <p>For long-term measurements, we recommend setting the level of compression according to the measuring time and requirements. This enables you to lighten the load on your system, especially if several measuring channels are operated. This shortens the time required to display the measurement results.</p> <p>Recommendation:</p> <ul style="list-style-type: none"> <li>• <b>Low</b>, if FFT analysis is priority</li> <li>• <b>Medium</b> or <b>High</b> for faster result display and print preview</li> </ul>
<b>Positions</b>	<p>This is where you can select the display mode for the measuring positions:</p> <ul style="list-style-type: none"> <li>• Traditional: DU-DD-CD-CL-CU-CR</li> <li>• According to the new standard: CH-CB-9H-6H-3H-12H</li> </ul>
<b>View watch</b>	<p>Select the view of the watch for displaying the angle of the gravity error. Movement side, dial side.</p>
<b>Correction value</b>	<p>Correction values (c1 and c2) can be displayed in ° or in s/d.</p>
<b>WebViewer</b>	<p>Launches the WebViewer for visualising statistics according to various criteria for data selection etc.</p> <p>See also chapter 11.</p>

### 3.3.3 System

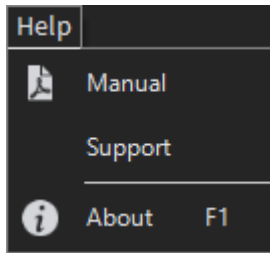


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<b>System log</b>	<b>CTRL+F1</b>	Opens the log files of the system. In case of a fault, this is useful information for our service department.
<b>Mode</b>		Select the user mode: <ul style="list-style-type: none"><li>• <b>User</b></li><li>• <b>System administrator</b></li></ul>
<b>Change password</b>		If available, the password of the system administrator can be changed.
<b>Configuration</b>		Information about the current system configuration. See also chapter 4.3.
<b>Language</b>		Select the language: <ul style="list-style-type: none"><li>• <b>German</b></li><li>• <b>French</b></li><li>• <b>English</b></li><li>• <b>Spanish</b></li><li>• <b>Italian</b></li><li>• <b>Chinese</b></li></ul>

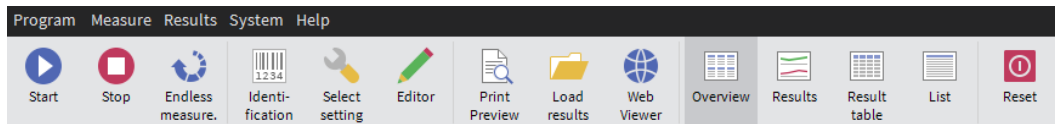
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### 3.3.4 Help



<b>Manual</b>	Software user manual.
<b>Support</b>	Link to Witschi Support: <a href="https://support.witschi.com">support.witschi.com</a>
<b>About</b>	Information about the software.

### 3.4 Toolbar



Starts a measurement cycle.



Interrupts a measurement cycle. Before you can start a new measurement cycle after an interruption, you must first click on the Reset symbol.



Starts the endless measurement and recording of the beat noises. You can use the joystick of the Micromat C to select the measuring position.



Opens the window for selecting the identification mode. This enables you to personalise a watch.



Opens the window for selecting the caliber and settings to be used for the measurement cycle.



Opens the Universal Editor in which calibers and settings can be edited and created. Access to this function can be disabled in the cockpit (see cockpit manual).



Print preview of the current results.



Loads the measurement results of a watch in accordance with its identification.



Opens the WebViewer where you can search for results and statistics in the central database.



Displays an overview of all numeric results of all channels.



All results are traced as diagrams and the numeric values are presented in a table.



Opens the list of results.



Opens the list of measurements.



The testing system is re-initialised (Reset).

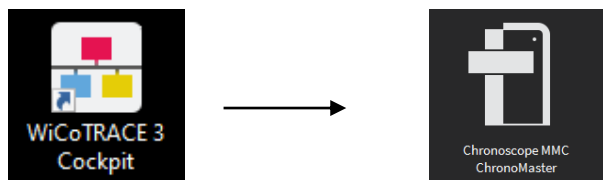
## 4 Preparation

### 4.1 Setting up WiCoTRACE

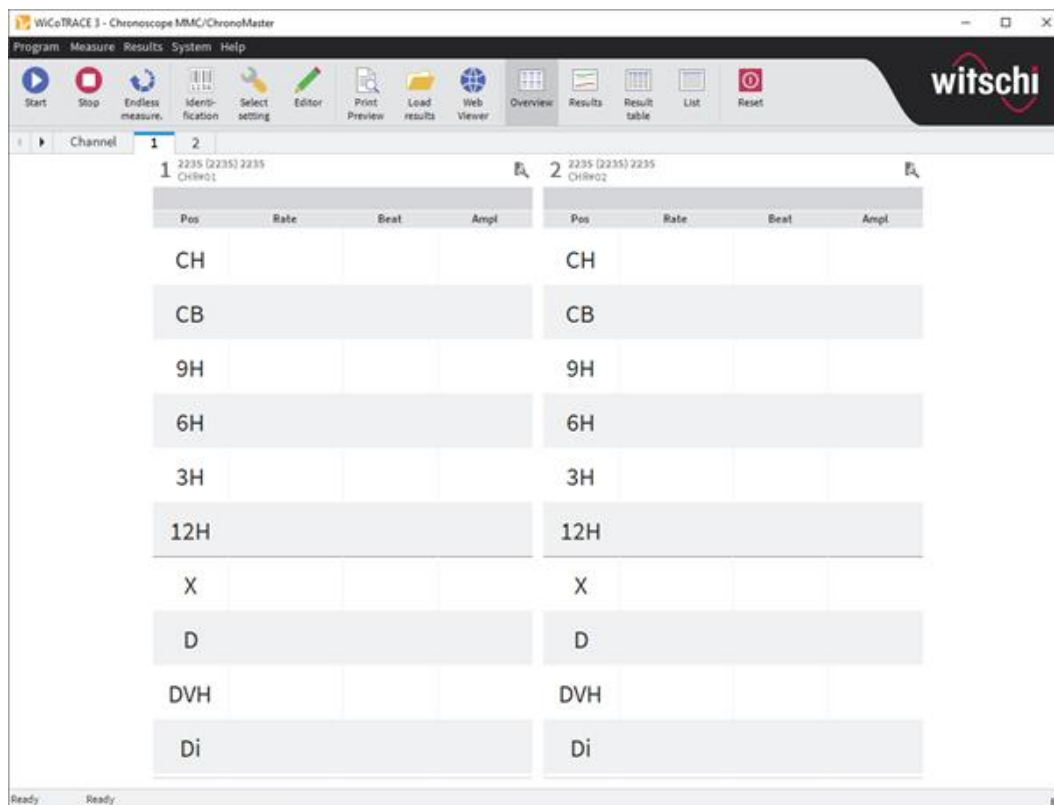
For information on setting up the database connection, changing the basic settings of WiCoTRACE, and display settings, refer to the Cockpit manual.

### 4.2 Starting the software

Depending on the installation, the program starts automatically after starting the PC or when you double click on:



Following that, depending on the number of connected devices, one or more measuring channels are displayed.

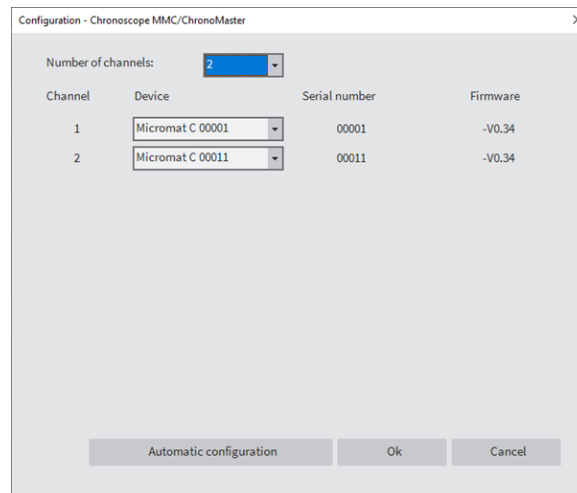


### 4.3 Configuring devices

To display and configure the connected devices, go to the **System** menu and select **Configuration**.

Choose the **Number of channels** (number of devices) that you want to use.

Devices connected via USB are detected automatically. For ChronoMaster Air, the connection has to be established manually via Bluetooth.



A max. of 2 ChronoMaster Air devices can be connected to the software via Bluetooth.

For ChronoMaster Air, the priority of the **Connection** can be configured:

- **Auto**  
Automatic connection via USB cable. If no USB cable is connected, the connection is established via Bluetooth.
- **USB**  
The connection is only established via USB.
- **Bluetooth**  
The connection is only established via Bluetooth.


For a connection to ChronoMaster Air, the battery level and signal strength are displayed in the respective channel.

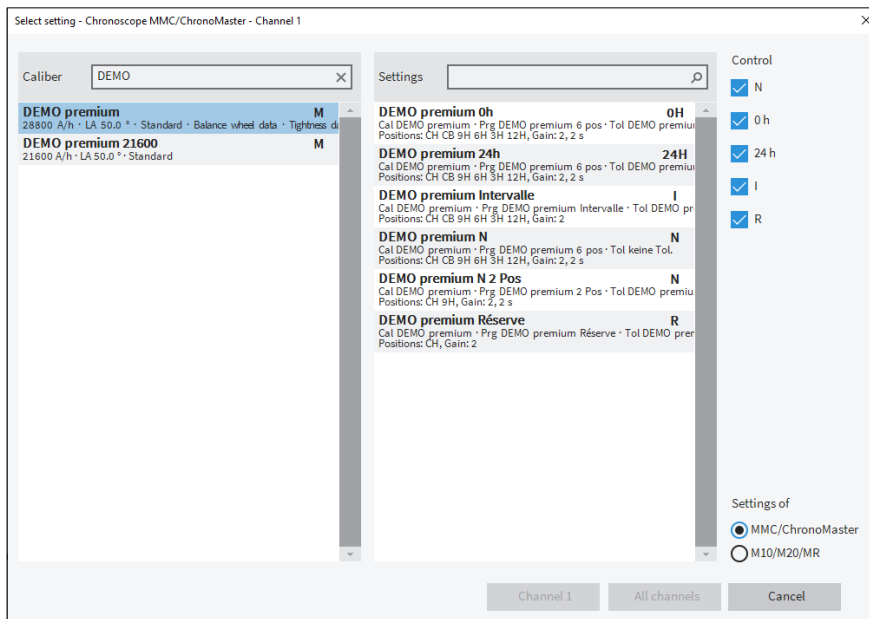


## 5 Performing a measurement

### 5.1 Selecting calibers and settings

Before a measuring cycle is started, a caliber and settings must be chosen. For each measuring channel, individual settings can be selected. The result window then opens. It is still empty except for information such as Caliber, Settings etc. Alternatively, you can start an endless measurement without choosing a measurement program. However, no results are stored in that case. This mode is suitable for controlling or analysing the watch. For more information, see chapter 6.

Select the corresponding measuring channel and then click the  symbol to open the window with the listed calibers and their settings.



#### Control

If you click one (or more) of the test modes belonging to the caliber, it is masked.

- **N** Normal
- **0H** 0h measurement (see also chapter 6)
- **24H** 24h measurement (see also chapter 6)
- **I** Interval
- **R** Reserve


#### Settings of

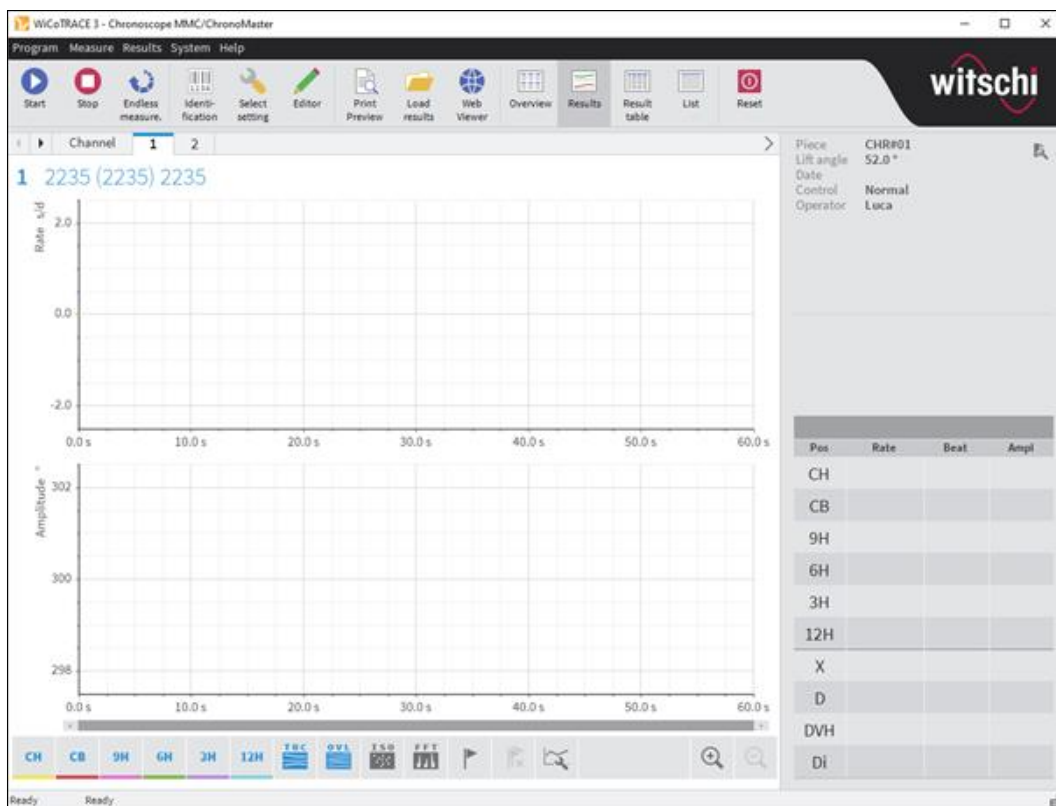
Display only the settings of **MMC/ChronoMaster** or **M10/M20/MR** devices, depending on the settings you wish to use.

If you select **M10/M20/MR**, the M10 settings belonging to the caliber are displayed (if they are available). The M10 settings can also be used for the measurement of mechanical watches with Micromat C.

Select the caliber and the required settings for the measuring cycle. To confirm the selection, click on the **Channel** with the corresponding number or on **All channels** to assign the same settings to all measuring channels.



When you click on the  symbol, the “Results” display mode appears for the respective measuring channel. You can switch from one display mode to the other while a measurement is running.



The  symbol enables you to configure how the diagrams are displayed.

**Lines**            **Lines** – the curves are not smoothed

**Splines** – the curves are smoothed

**Axis**            **Automatically** or **Manually**

**Range**           **Automatically** or **Manually**


**Amplitude**      Range → 5, 10, 20, 50, 100, 200 oder 360            Minimum 0<sup>0</sup>, Maximum 999<sup>0</sup>

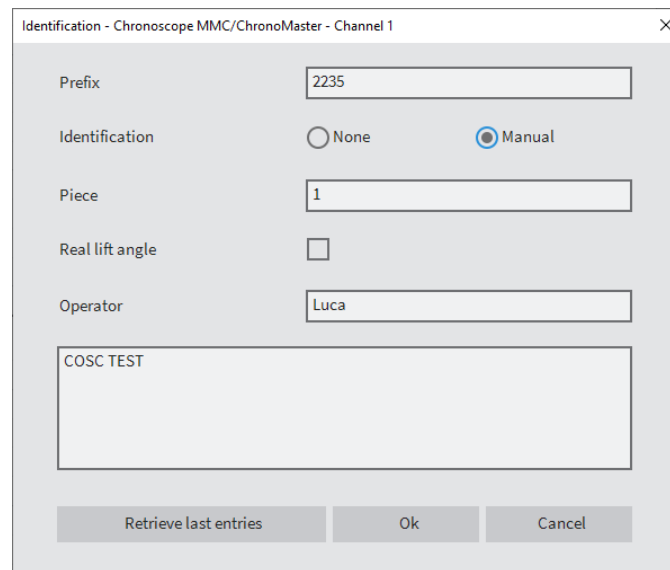
**Rate**            Range → 5, 10, 20, 50, 100, 200 oder 500            Minimum -999.9 s/d, Maximum +999.9 s/d

**Isochronism**    Isochronism displayed in **Points**, **Lines** or **Points and Lines**.

## 5.2 Identification

### 5.2.1 Single channel identification

Click the  symbol to open the following window. Here you can assign an individual identification to the item to be tested in the currently selected channel.



Identification - Chronoscope MMC/ChronoMaster - Channel 1

Prefix

Identification  None  Manual

Piece

Real lift angle

Operator

Select the **Manual** identification mode. You must/can then enter the following details:

- **Use the prefix:** Using a prefix (e.g. batch name, lot number etc.) can be helpful for selective and fast searches in the WebViewer. Not required for traceability.
- **Piece:** Identification of the test sample (number, text or mixed), 20 characters maximum.
- **Real lift angle:** You can enter the real lift angle, if known. It must not deviate from the value of the selected caliber by more than  $+4^{\circ}/-12^{\circ}$ . "Use real lift angle" must be selected in the corresponding measurement program in the Universal Editor.
- **Operator:** Initials or name of the user, 20 characters maximum. Not required for traceability.

In addition, there are four lines for entering information, comments etc.

The entries are saved and also appear on the print-out of the measurement results.

If you click on **Retrieve last entries**, the most recent entry appears. This is a useful function for repeating a measurement with the same test sample. This function can also be used if all information apart from the identification remains the same. You therefore only need to enter the ID of the new test sample.

Select **None** in Identification if no identification is required. In this case, the test sample is automatically assigned a number. The number corresponds to the measuring channel (for example, CHR# 1).

As long as the **Manual** identification mode is activated, you must enter the identification. If None is selected as the mode, you are not prompted to enter the identification. However, the measurement results are still saved in the database.

## 5.2.2 Multi-channel identification

The **Measure/Start All (Ctrl-F3)** function starts all connected channels simultaneously. The identification information for all channels can be defined in the Identification window.

Identification - Chronoscope MMC/ChronoMaster														
Prefix	<input type="text"/>													
Identification	<input type="radio"/> None	<input checked="" type="radio"/> Manual	<input type="radio"/> Box	<input type="text"/>										
Piece	<table border="1"><tr><td>109616</td><td>106083</td><td>108996</td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td></tr></table>				109616	106083	108996							
109616	106083	108996												
Operator	<input type="text" value="mh"/>													
<input type="text"/>														
<input type="button" value="Retrieve last entries"/>		<input type="button" value="Ok"/> <input type="button" value="Cancel"/>												

You can choose from different identification methods:

- **None:** The channels are labeled CHR#1, CHR#2, etc.  
In test mode **N** (Normal), identification of watches is not required but can be useful for finding existing measurement results of a specific watch at a later stage (traceability)
- **Manual:** You have to enter the identification in every field that corresponds to a measuring channel.
- **Box:** Enter the identification in the corresponding field. The identification code is automatically numbered and entered into the fields of the measuring channels.

Using the non-mandatory **Prefix** is beneficial for subsequent searches of saved results via the Web Viewer.

- Examples with **Prefix** "phbl" and Box identification "T-S5P".  
Without an identification, the frame of the measuring channel shows the **Prefix** with the corresponding channel number:  
"phbl,CHR#1 to... #10".
- With an identification, the frame of the measuring channel shows the **Prefix** as well as the box identification with the corresponding channel number:  
"phbl,T-S5P -1 ... -10".


Click on **Retrieve last entries**, if you want to repeat a measurement with the same identification code.

The identification code can also be read using a bar-code reader that is available as an accessory.


Click on **OK** to confirm the identification and then trigger the measuring cycle.

### 5.3 Starting a measurement

Select the desired measuring channel (only if several devices are connected) before you start the measurement.

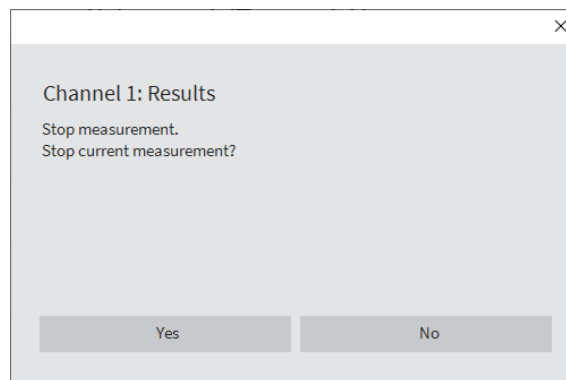
To start a measurement, click on 

### 5.4 Stopping a measurement

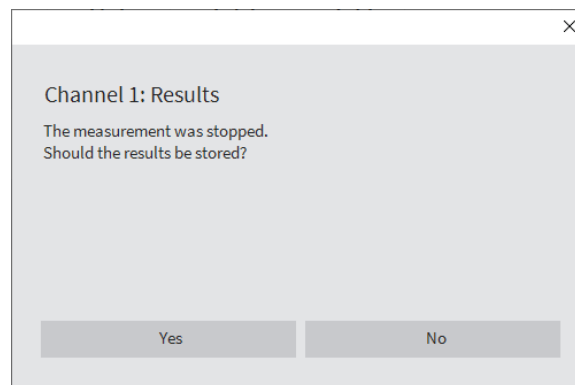
To stop a running measurement, click on 

If you stop or reset a measurement, a confirmation prompt appears, if:

- the measuring time of a test position exceeds 10 minutes
- the measuring time of an interval measurement exceeds 10 minutes




If you have selected **Yes** you have to decide whether you want to save the results.



## 5.5 Reset



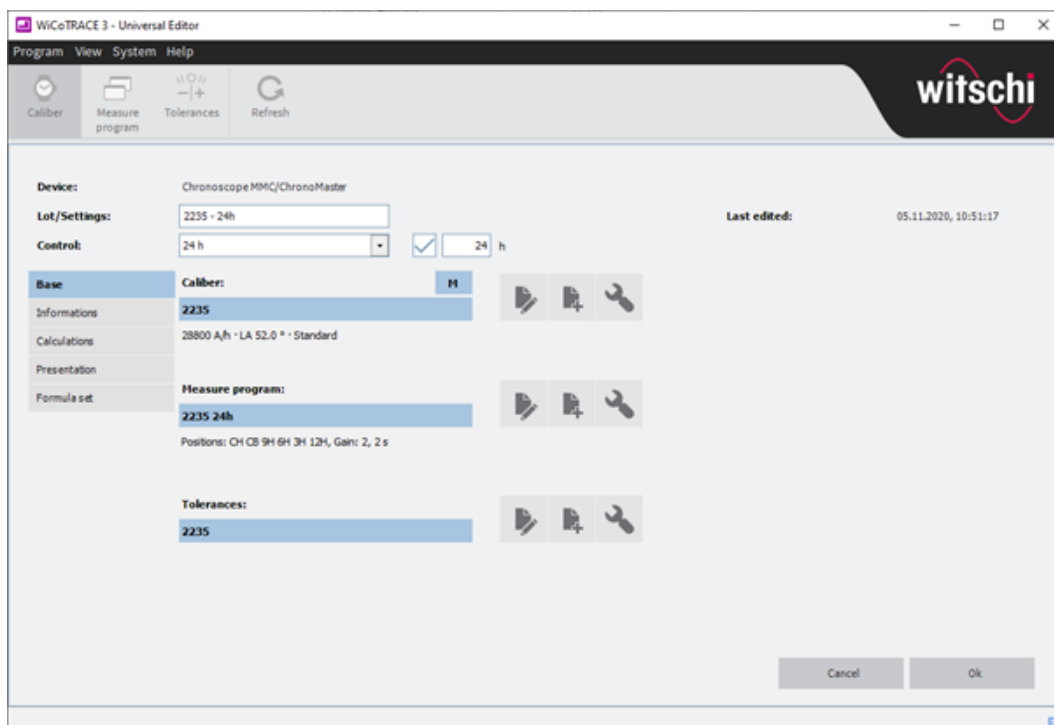
If a reset is necessary, click on the  symbol

A reset causes all results on the screen to be deleted, and causes the devices connected to the PC to be initialised.

The reset function is especially useful if you are receiving error messages. In most cases transfer problems between the PC and the devices can be eliminated.

## 6 0h-24h Measurement


To perform a 0h and 24h measurement, the programs have to be created in the Universal Editor (see Universal Editor manual).

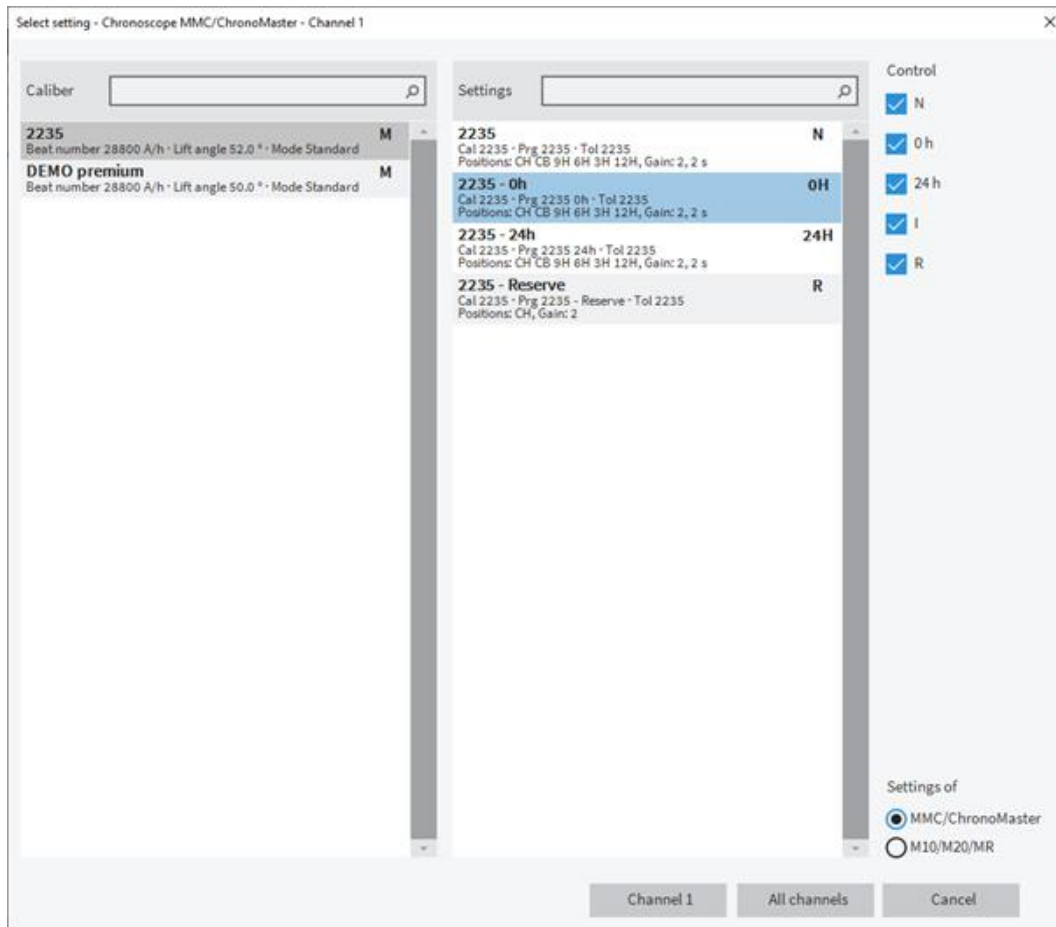


For **Control** you can choose between 0h and 24h measurement.

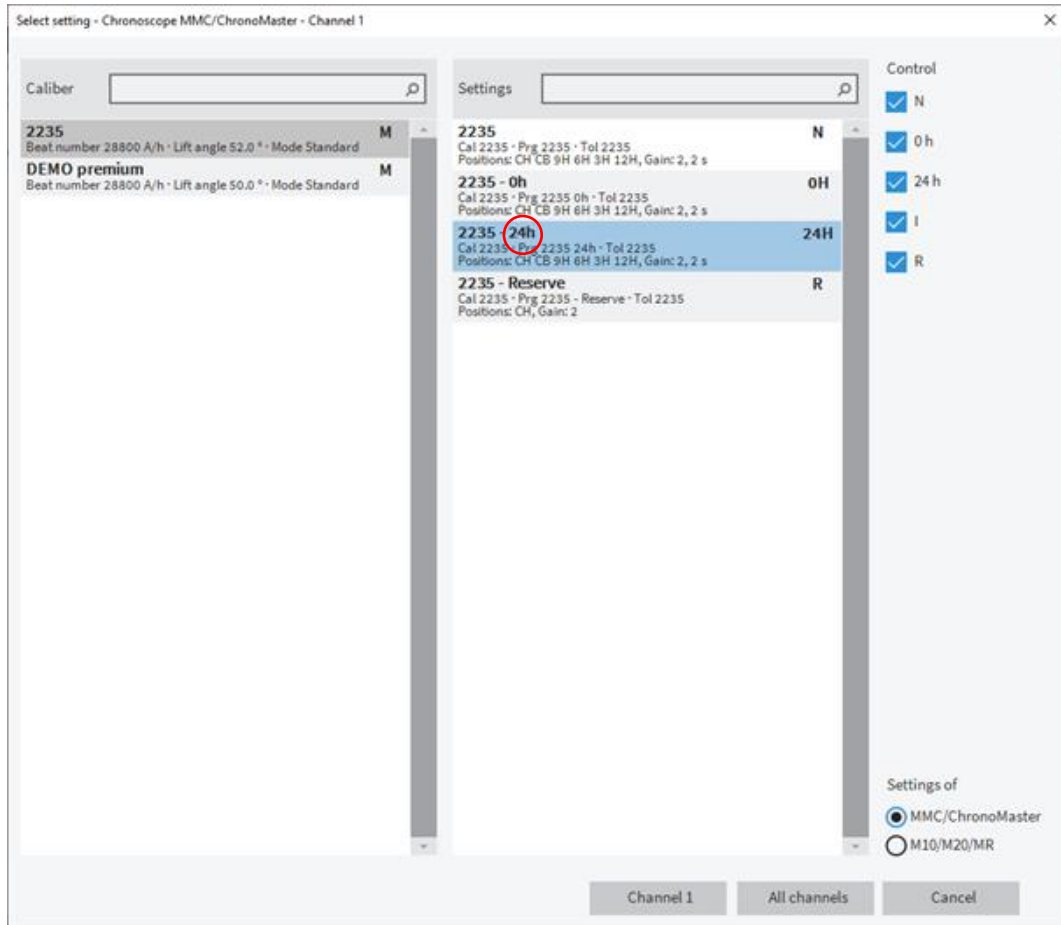
For the 24h measurement you have the option to choose a different numerical value (1h to 300h are possible).

Create the measurement program according to the instructions in the software manual of the Universal Editor and close the window.

Following that, click on the  symbol and the window for selecting the Settings opens. The 0h measurement can be selected after choosing the respective caliber:



This is also where you will find the 24h measurement:



If there are several Micromat C devices, you have to make sure that the identification of the watches matches the 0h measurement for the 24h measurement.

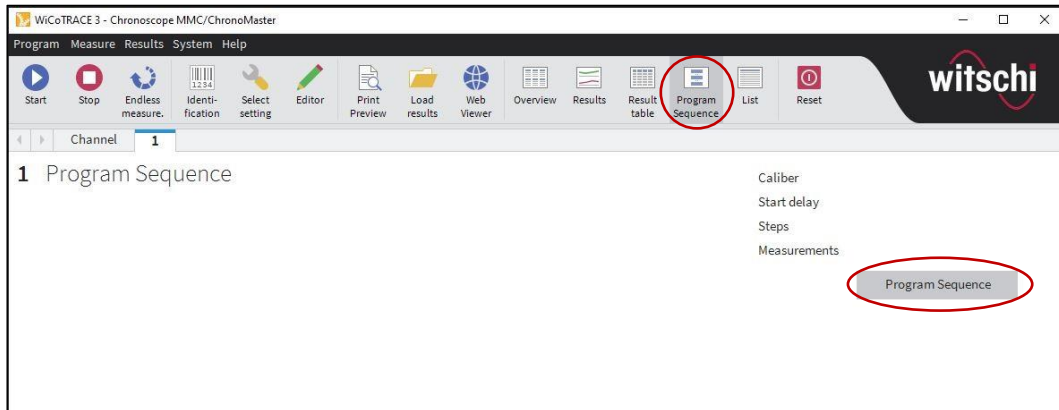
The following steps are identical to a normal measurement. An example of measurement results of a 0h-24h measurement is shown in the following window.

## 7 Program sequence

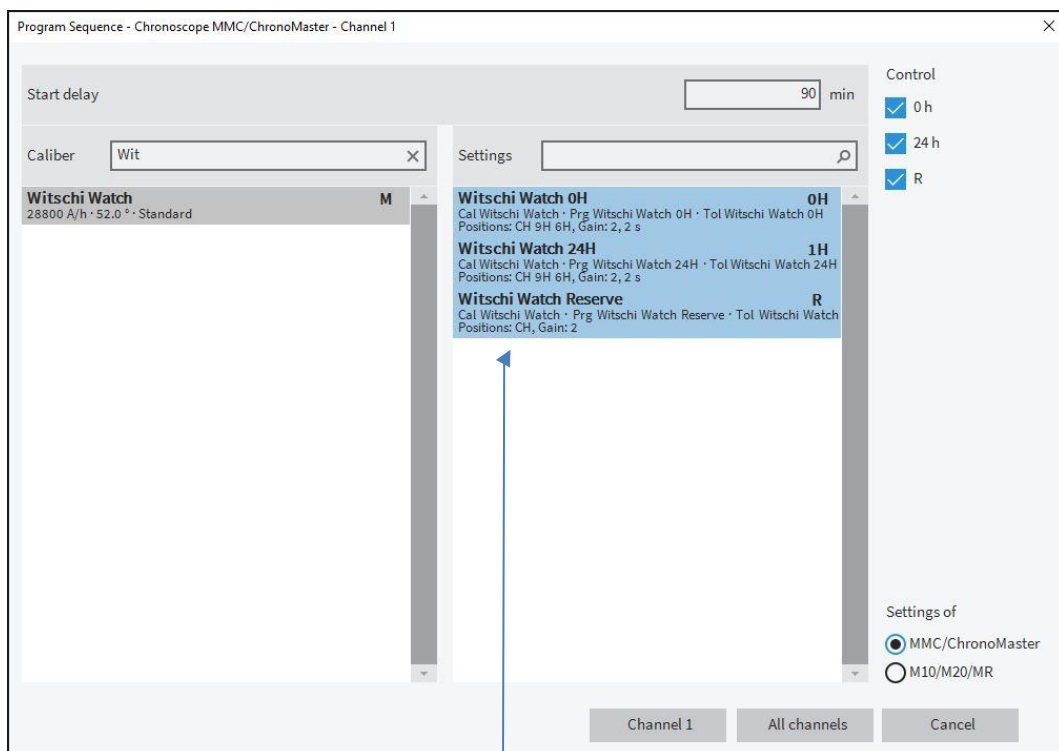
This function allows the user to conduct several measurements in succession, including the time remaining until the watch stops. This function is particularly well suited to measurements that are conducted over a weekend.

All measurements that were conducted can be viewed in the WebViewer or in the application.

The function can be started using the »Program sequence« buttons in the menu bar of the Chronoscope MMC/ChronoMaster application.



In order to conduct a program sequence measurement, the programs will need to be set up in the Universal Editor (see the manual for the Universal Editor).




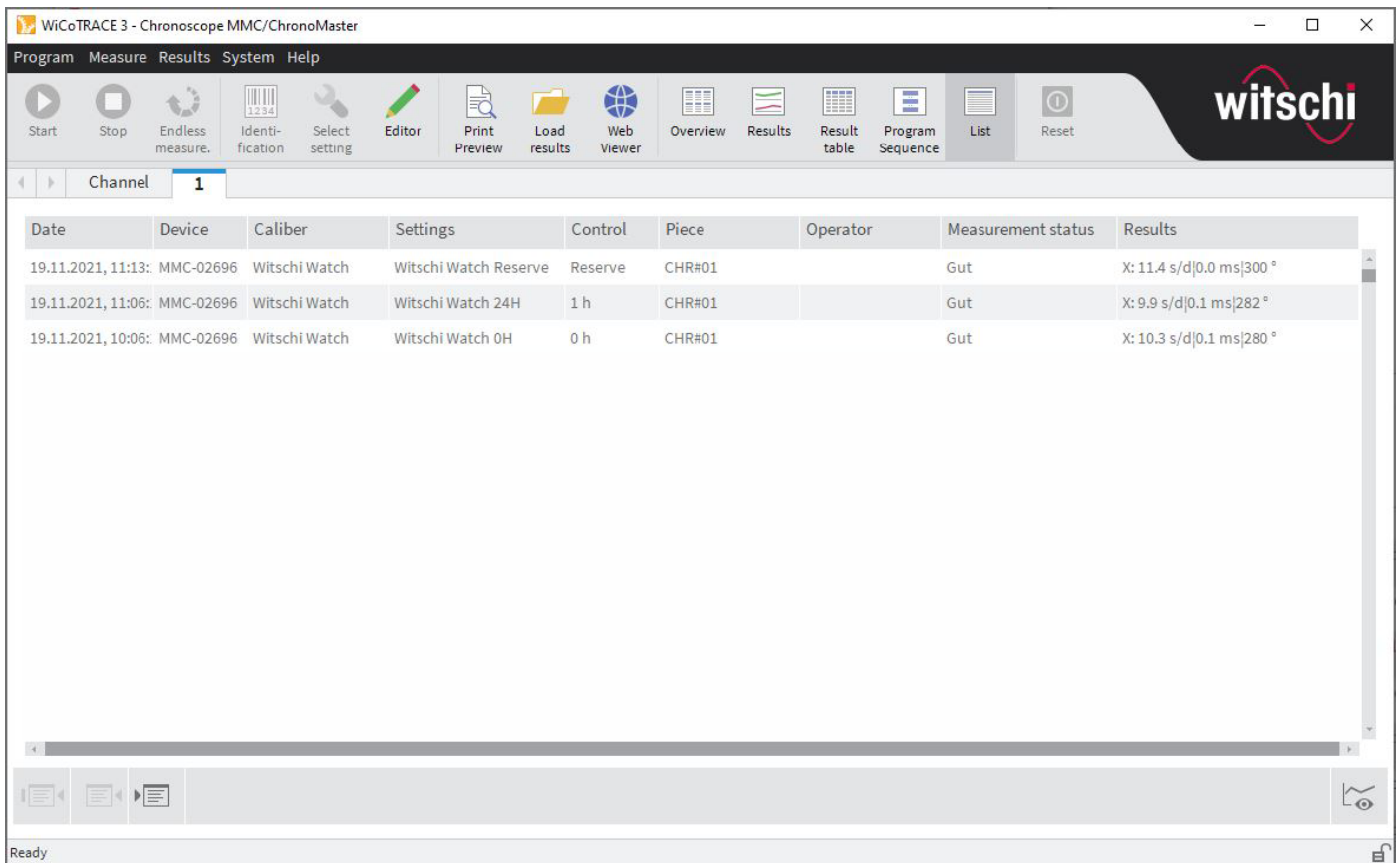
You can select several measurements all at the same time.

An example of a programmed sequence measurement might look like this:

1. Enter the start delay in minutes (e.g. 90 minutes after fully winding the watches)
2. Select 0 h measurement
3. Select 24 h measurement (several measurements for the 24 h control can also be selected. They must have different times to do so e.g. 24 h, 48 h etc.)
4. Select Reserve measurement (measurement of the remaining power reserve until the watch stops)

## 7.1 Numeric measurement results

To open the list showing the results, click on the **List** symbol 



The screenshot shows the Witschi WiCoTRACE 3 software interface. The title bar reads "WiCoTRACE 3 - Chronoscope MMC/ChronoMaster". The menu bar includes "Program", "Measure", "Results", "System", and "Help". The toolbar contains various icons for "Start", "Stop", "Endless measure.", "Identification", "Select setting", "Editor", "Print Preview", "Load results", "Web Viewer", "Overview", "Results", "Result table", "Program Sequence", "List", and "Reset". The "List" icon is highlighted. Below the toolbar, a "Channel" dropdown is set to "1". The main area displays a table with the following data:

Date	Device	Caliber	Settings	Control	Piece	Operator	Measurement status	Results
19.11.2021, 11:13:	MMC-02696	Witschi Watch	Witschi Watch Reserve	Reserve	CHR#01		Gut	X: 11.4 s/d 0.0 ms 300 °
19.11.2021, 11:06:	MMC-02696	Witschi Watch	Witschi Watch 24H	1 h	CHR#01		Gut	X: 9.9 s/d 0.1 ms 282 °
19.11.2021, 10:06:	MMC-02696	Witschi Watch	Witschi Watch 0H	0 h	CHR#01		Gut	X: 10.3 s/d 0.1 ms 280 °

The status bar at the bottom left shows "Ready".

Now click on the results file you require, and then click the  button. This displays the selected result.

## 8 Endless measurement

### 8.1 Starting

To start an endless measurement, click

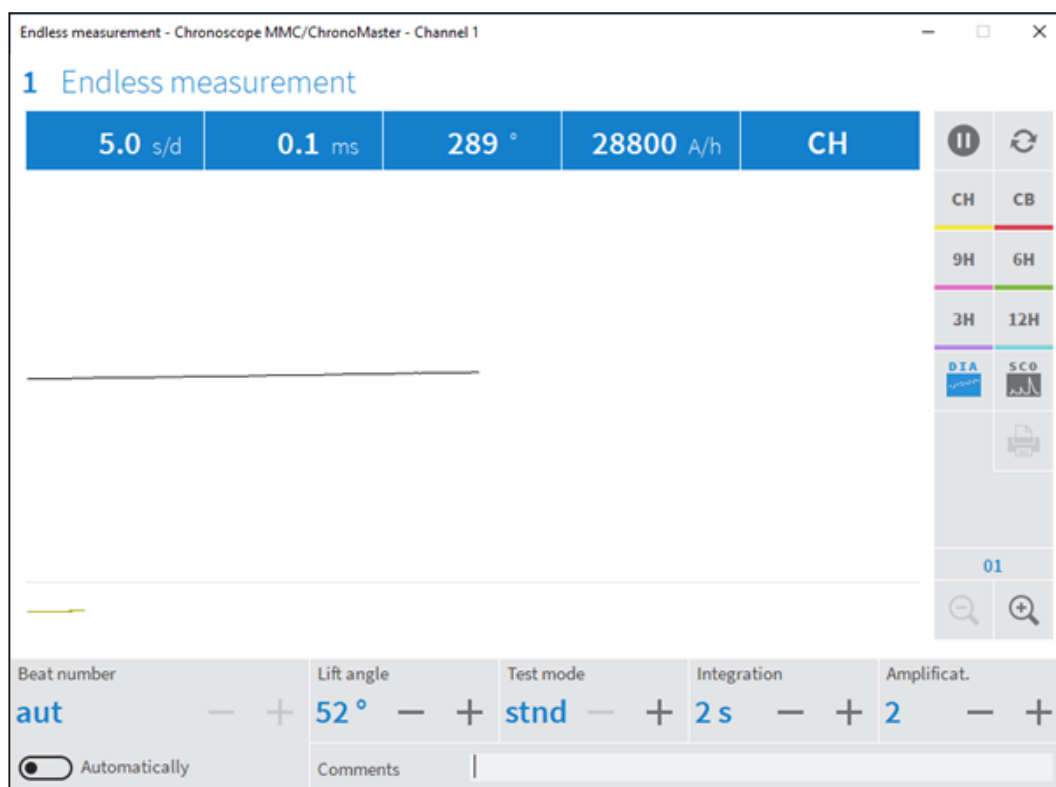


### 8.2 Overview

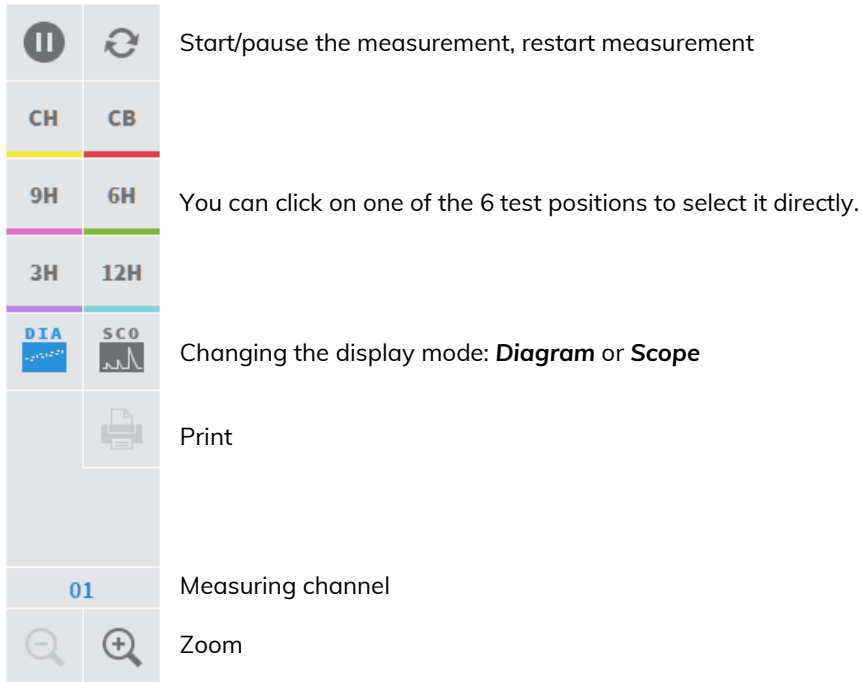
#### 8.2.1 Screen

The screen is split into four sections. From top to bottom:

- **Numeric display of results**  
Numerical display of rate, beat error (Repère), amplitude, beat number and position of the current measurement.
- **Graphic display of results**  
Graphic display of the results as a **diagram** or **scope**
- **Toolbar on the right**  
Channels are organised as tabs.
- **Settings**  
Status of the measurement and the connected devices.



## 8.2.2 Toolbar on the right



## 8.2.3 Settings

The following settings must match the watch to be tested and are entered in the bottom section of the window.

- **Beat number** **Automatic** or **Manual**: 18,000, 19,800, 21,600, 23,040, 25,200, 28,800, 36,000, 43,200, 50,400, 57,000, 64,800, 72,000 and 360,000 (A/h)
- **Lift angle** adjustable: 10° to 90°
- **Amplification** adjustable: 1 to 4 (usually 2)
- **Test mode**
  - Standard** mode for watches with Swiss lever escapement
  - Special 1** Mode for watches with co-axial escapement
  - Special 2** Mode for watches with AP escapement.
  - Special 4** Mode with specific amplitude filter for measuring watches with Swiss lever escapement. If you are measuring amplitudes of 360° in standard mode, we recommend selecting this mode
  - Special 6** Mode for “Foudroyante” Chronograph (flashing second)

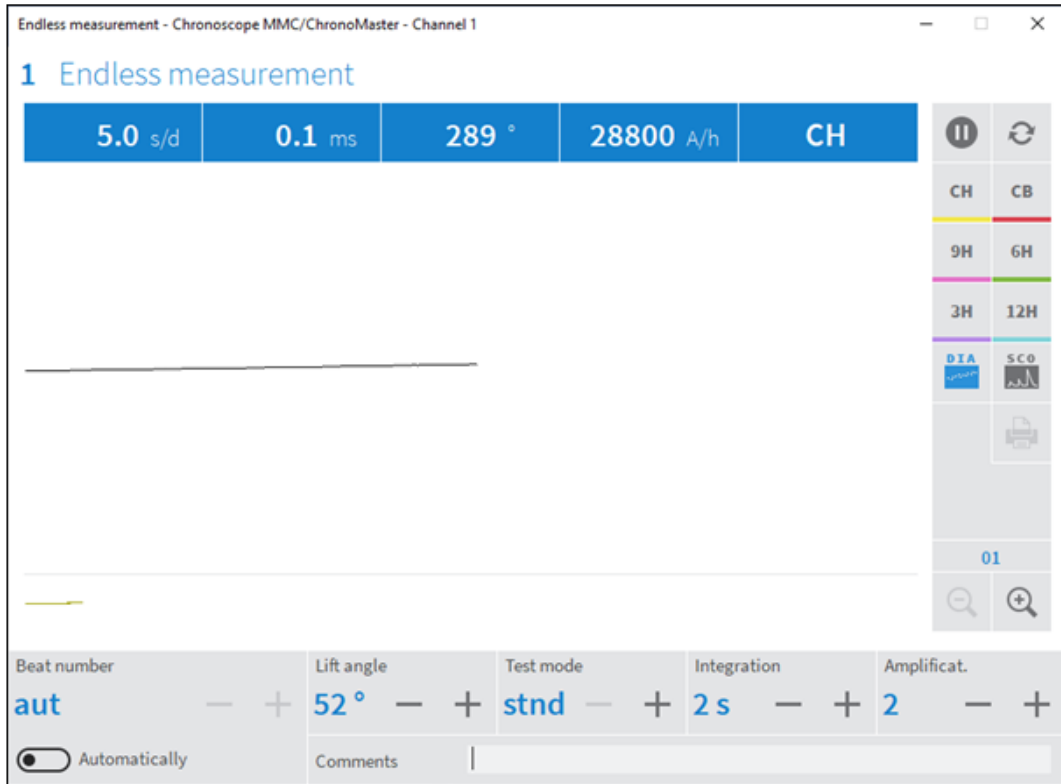
The other test modes (reserve) cannot be selected.
- **Integration** Selectable integration time: 4A (4 vibrations), 2s, 4s, 8s, 10s, 20s, 30s and 60s
- **Comments** You can enter text in this field

### 8.3 Diagram display mode





To display the diagram, click on  in the toolbar on the right.

The rate deviation, beat error (repère), amplitude, beat number and position of the current measurement are displayed in the top bar.



The Micromat C's joystick lets you select 8 vertical and 2 horizontal test positions.

You can use the   buttons to change the slope of the diagram. 1, 2, 4, 8, 16-fold

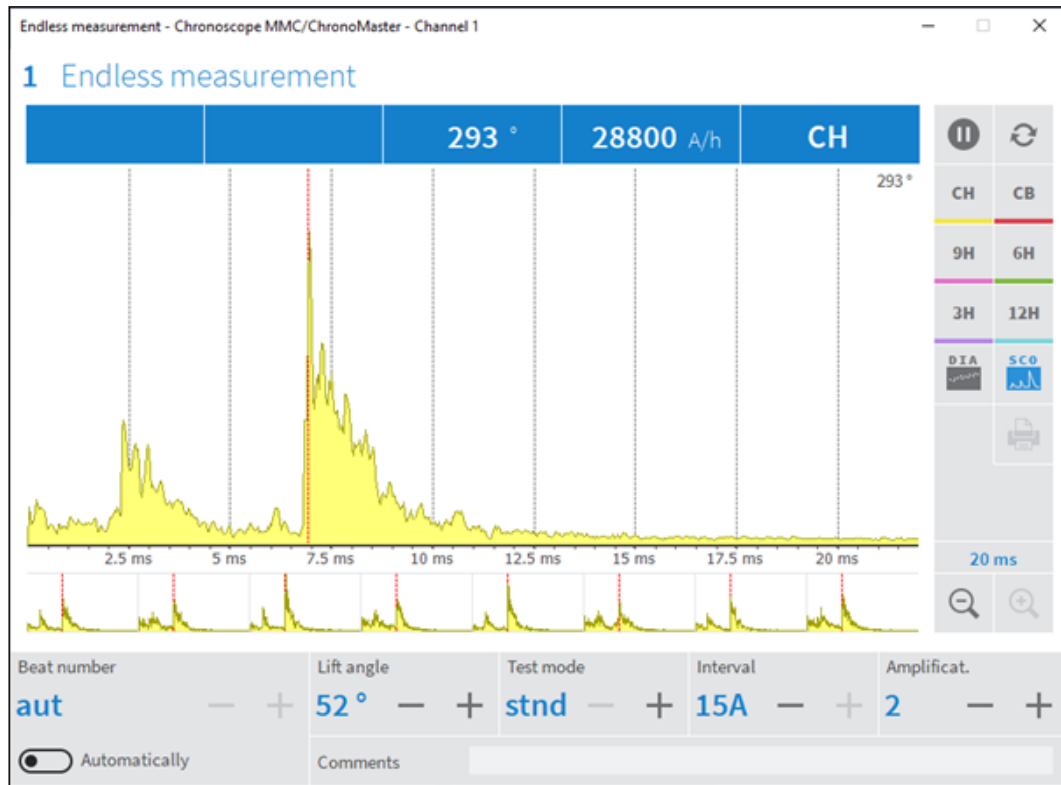
The last eight diagram pages are shown as small format strips under the current diagram, if the measurements took place over a longer period of time. After stopping the measurement, you can have the desired diagram displayed in a large format by clicking on the small format.



## 8.4 Scope display mode



To visualise the beat noise, click on  in the toolbar on the right.

The top bar shows the beat number and the current test position.



The   buttons can be used to select a time range of 20 ms, 200 ms or 400 ms.

The last eight beat noises are shown as small format strips under the current beat noise, if the measurements took place over a longer period of time. After stopping the measurement, you can have the desired beat noise displayed in a large format by clicking on the small format.



After stopping the measurement, click on the print button  to display the print preview, which you can then print or save.

## 9 Measurement result display

### 9.1 Numeric measurement results

The example below shows the numerical measurement results of all channels in table form.

1 2235 - 24h (2235) 2235 2235.1							2 2235 - 24h (2235) 2235 2235.2						
Measurement terminated							Measurement terminated						
Pos	R0h	R24h	B0h	B24h	A0h	A24h	Pos	R0h	R24h	B0h	B24h	A0h	A24h
CH	5.5	4.5	0.1	0.1	279	276	CH	6.8	6.8	0.0	0.0	307	307
CB	6.7	6.8	0.0	0.0	273	277	CB	0.5	0.4	0.1	0.1	309	311
9H	3.7	3.9	0.2	0.2	215	217	9H	-3.7	-3.9	0.0	0.0	263	262
6H	0.7	1.3	0.0	0.0	221	224	6H	-2.3	-1.7	0.1	0.2	269	267
3H	0.4	0.3	0.0	0.0	219	217	3H	-8.1	8.7	0.2	0.2	259	261
12H	6.6	7.0	0.3	0.3	218	220	12H	5.7	6.0	0.0	0.0	267	269
X	3.9	4.0	0.1	0.1	238	239	X	2.5	2.7	0.1	0.1	279	280
D	6.3	6.7	0.3	0.3	64	60	D	11.8	12.6	0.2	0.2	50	50
DVH	-3.3	-2.5	0.1	0.1	-58	-57	DVH	-1.7	-1.3	0.0	0.1	-44	-44
Di	-4.8	-3.2					Di	-9.1	-8.5				
DVm			∅				DVm	15.5	15.9	∅		148	150
Im*		1.0	N*			0.8	Im*		-0.6	N*			1.3

In addition to the average values of all measured positions (rate deviation, beat error and amplitude), further analysis values can be displayed, if they are activated under tolerances in the measurement program.

- **X** Average for the rate, the beat error and the amplitude across all measured positions.
- **D** Maximum difference for the rate, the beat error and the amplitude across all measured positions.
- **DVH** Rate and amplitude difference between  $\bar{X}_V$  and  $\bar{X}_H$ .
- **Di** Rate difference between CL and DU.
- **Im** Isochronism across all 4 test positions as per NIHS 93-10.
- **Im\*** Isochronism across all measured test positions
- **le** Isochronism for the stability of the rate between 0h and after 24h. Is calculated using the absolute value of the difference of the rate average of all 6 positions after 2 measurements.
- **N** Quality factor as per NIHS standard.
- **N\*** Quality factor across all measured test positions.
- **Xp** Weighted average: In the formula editor (Universal Editor), you can enter a formula for calculating the weighted average Xp.
- **XH** Minimum and maximum tolerance values for average values for rate, beat error and amplitude in all horizontal measured positions.
- **XV** Minimum and maximum tolerance values for average values for rate, beat error and amplitude in all vertical measured positions.
- **DH** Maximum tolerance values for difference between the largest and smallest measured values (delta value) for rate, beat error and amplitude in all horizontal measured positions.
- **DV** Maximum tolerance values for difference between the largest and smallest measured values (delta value) for rate, beat error and amplitude in all vertical measured positions.


- **DVm** Standardised rate difference proportional to the gravity error; i.e. theoretical maximum rate difference caused by the gravity error of the balance wheel, at an amplitude of 270°, in both vertical positions in which the gravity error is at the bottom or top on the vertical.
- **c1 / c2** Correction values for “masselotte” or “micro vis réglante” (if activated and all required results are available).

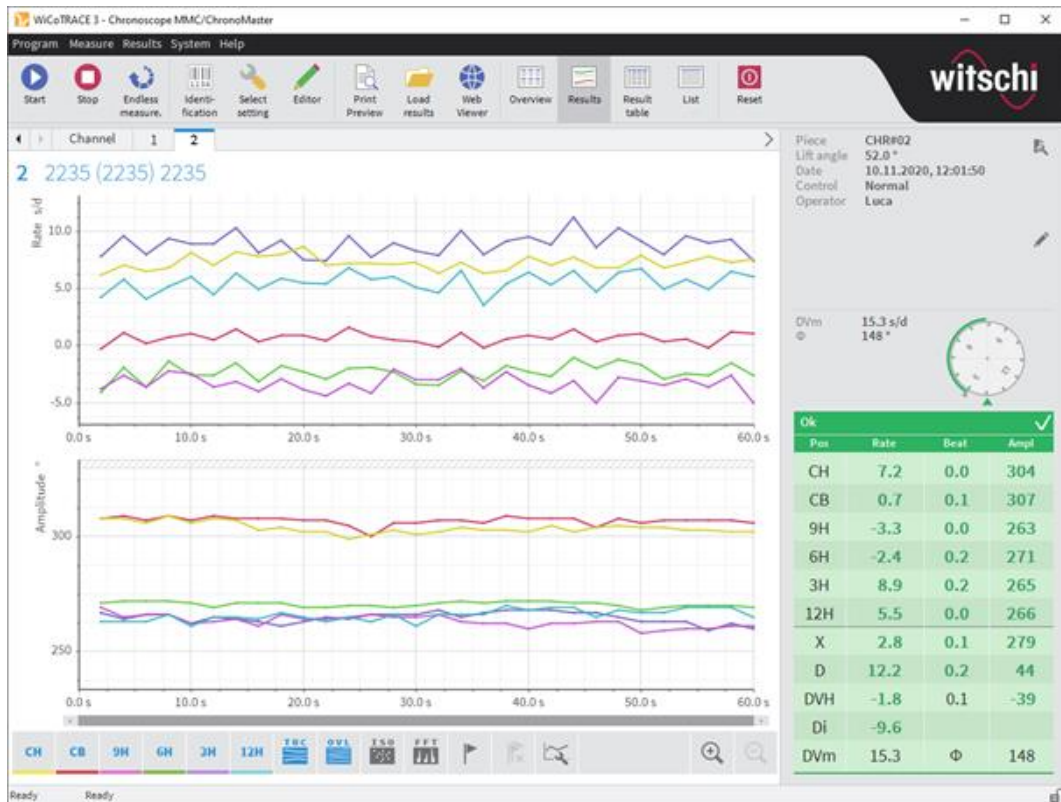
The measured values for the rate, the beat error and the amplitude across all measured positions. Measured value that are outside the tolerance are displayed in red.

If the criteria X, D, DVH and/or Di are not activated in the selected settings, the measurement results are displayed and saved nonetheless.


## 9.2 Numerical and graphical display of measurement results




When you click the  symbol, the **Results** display mode appears for the respective measuring channel. You can switch from one display mode to the other while a measurement is running.



On the left side of the window, the measuring points for rate and amplitude of all processed measurement positions of the measuring cycle are displayed as diagrams. The display is not compressed.

The right side features an information window, which you can show or hide by clicking on the  symbol. It shows additional information on the current measurement:

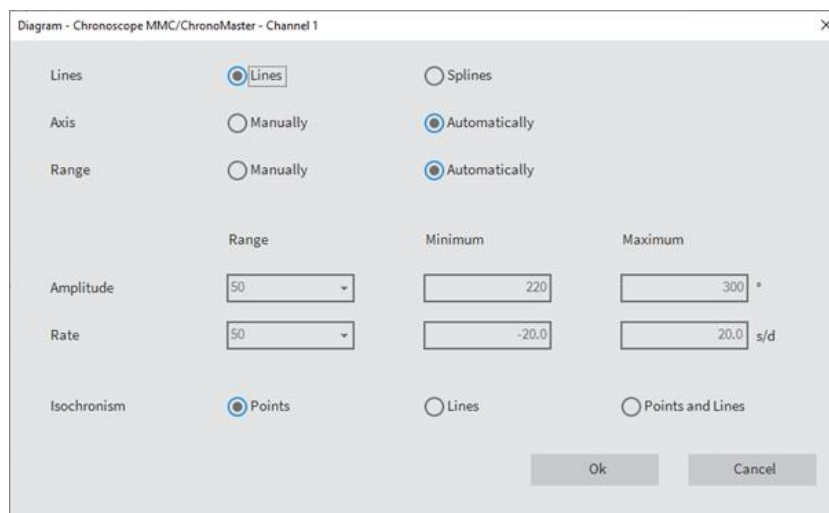
- Information on the test sample and the test, which can be edited with the pencil symbol during and after the measurement. Use  to create a report for the measurement, including the settings used
- The middle section contains numeric values and a graphic display of the gravity errors. Double-click the dial to change view side. Numeric display of the unbalanced error angle, calculated from the 3 o'clock position. If Reglowitch settings are available, the unbalanced error is also displayed directly on the balance wheel.
- The lower section shows the test results in table form.

The following functions can be activated/selected on the menu bar:



1. Activates/deactivates the display of a position.
2. Rate and amplitude diagram
3. Activates/deactivates the overlay
4. Display of the isochronism
5. Display of the fast Fourier transformation (FFT)
6. Activates/deactivates markers
7. Deletes all markers
8. Changes the diagram display (see below)
9. Increases + / decreases - the curve

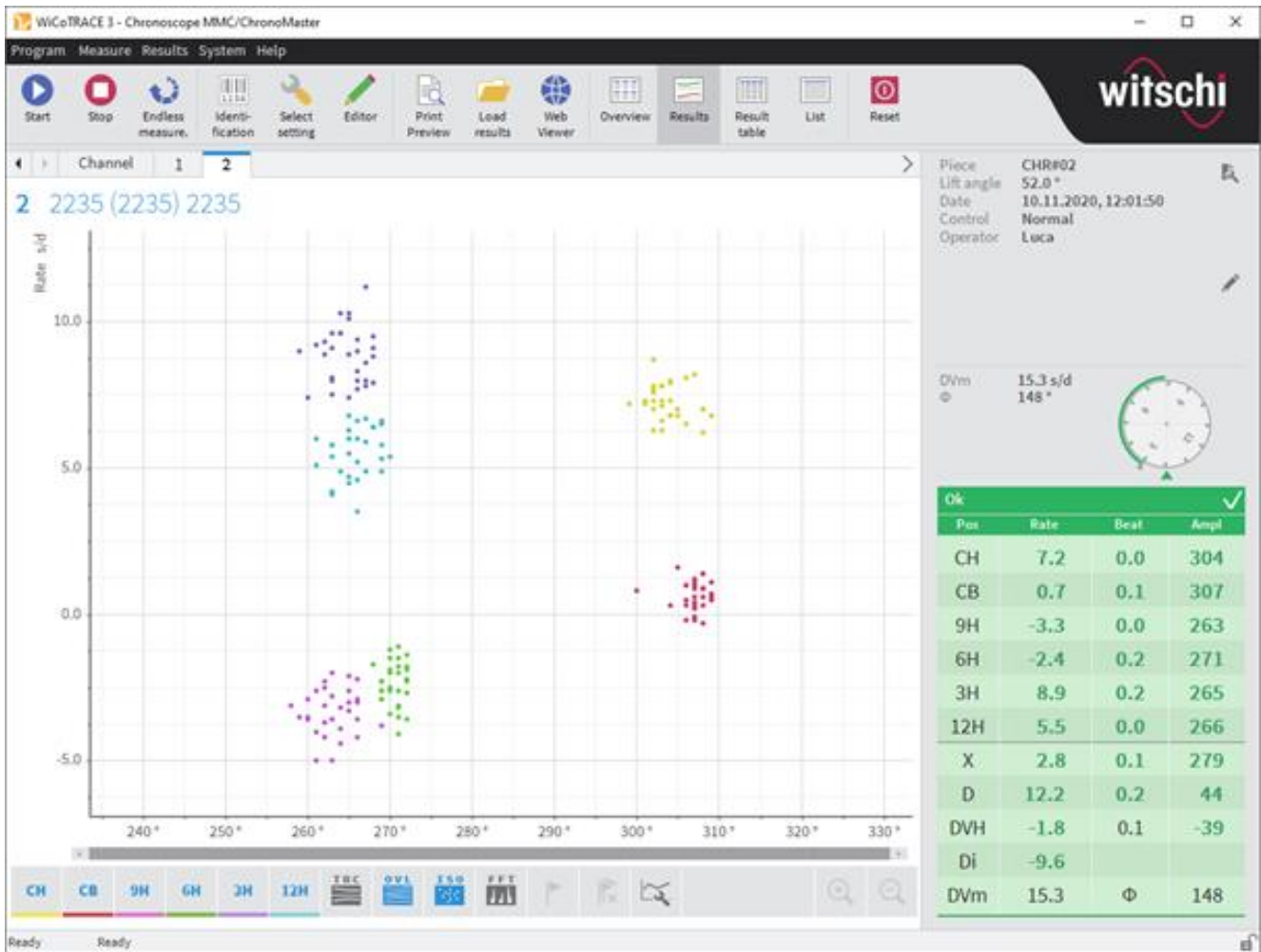
The  symbol enables you to configure how the diagrams are displayed.



- **Lines** Displays simple **Lines** or smoothed **Splines**
- **Axis** **Automatic** or **Manual** definition of the axes: Minimum and Maximum
- **Range** **Automatic** oder **Manual** definition of the axes: Range
- **Amplitude** Determination of the axis values **Range**, **Minimum** and **Maximum** for the amplitude
- **Rate** Determination of the axis values **Range**, **Minimum** and **Maximum** for the rate
- **Isochronism** Isochronism diagram displayed in **Points**, **Lines** or **Points and Lines**.

### 9.3 Isochronism

To open the graphic display of the isochronism, click on **ISO**. The Points (depending on the configuration, also the Lines or Points and Lines) of the amplitude values (x axis) are displayed with the corresponding rate measurement values (y axis).



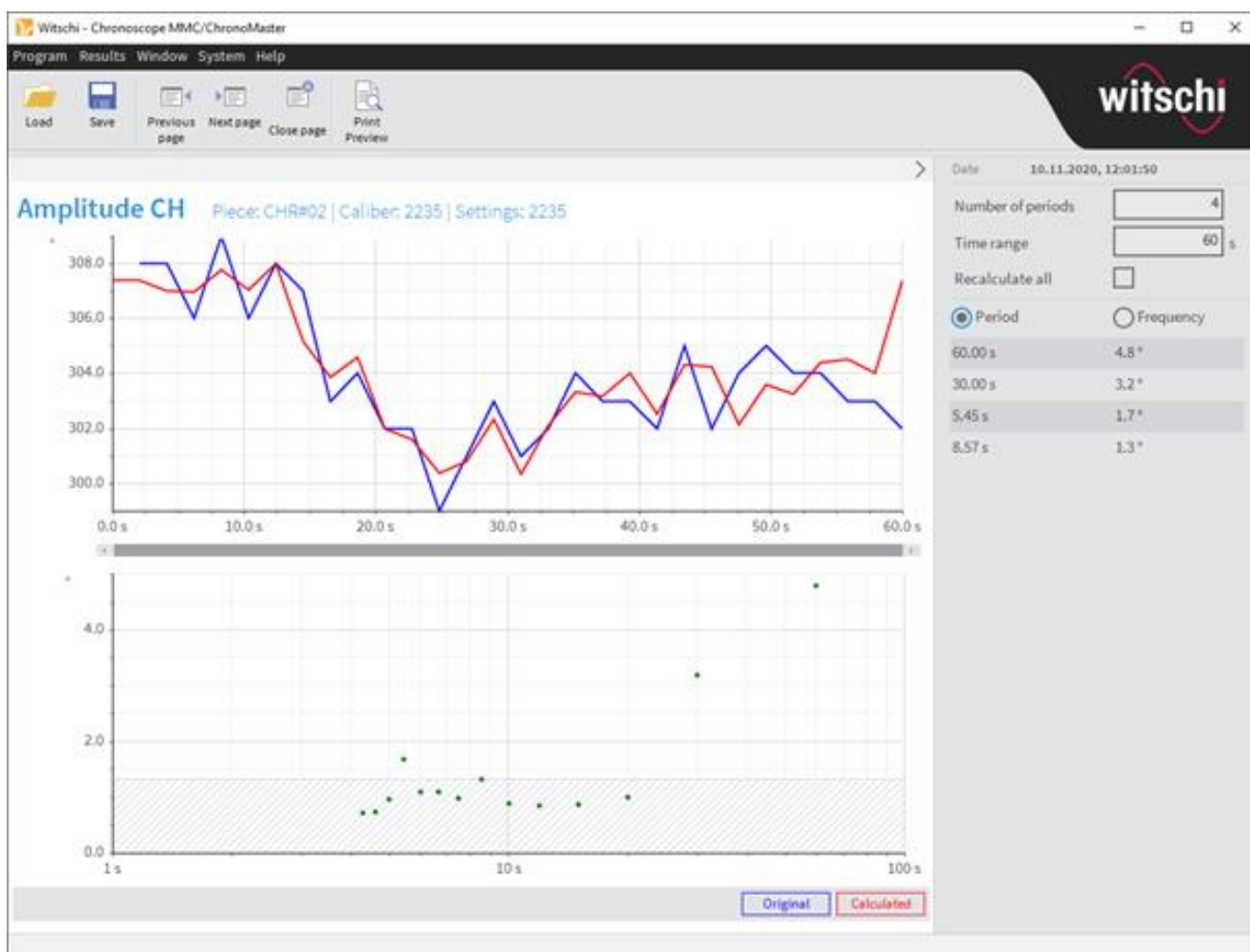
Analogous to the graphic display of the measurement results, the right side features an information window, which you can show or hide by clicking on the > symbol. It shows additional information on the current measurement.

## 9.4 Spectral analysis

Spectral analysis to examine the periodicities caused by the power transmission in the gear train.


To open the spectral analysis, click on **FFT**. Before the curves can be displayed, you first have to select the corresponding positions for which the rate and amplitude measurements are to be displayed. Then click on **OK**.

	Rate	Amplitude
CH	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
CB	<input type="checkbox"/>	<input type="checkbox"/>
9H	<input type="checkbox"/>	<input type="checkbox"/>
6H	<input type="checkbox"/>	<input type="checkbox"/>
3H	<input type="checkbox"/>	<input type="checkbox"/>
12H	<input type="checkbox"/>	<input type="checkbox"/>



The original curve is displayed in blue and the calculated curve is displayed in red.

Spectral analysis makes it possible to locate repetitive errors in a mechanical movement (e.g. in the gear train). To make it easier to locate errors, we recommend choosing long measuring times, possibly several hours.

The right side features an information window, which you can show or hide by clicking on the  symbol. It shows additional information on the current measurement:

- Enter the **number of periods** for the frequency analysis
- Enter the **time range** for the frequency analysis
- **Recalculate all**
- **Period/Frequency**  
Displays the periods as a time period or as a frequency. The calculated periods from the frequency analysis are displayed accordingly underneath.

## 9.5 Result table



To open the result table, click on  in the toolbar.

For each test position, the measurement results for rate, amplitude and beat error are displayed. As long as the measurement cycle is running, the measurement results are displayed according to the selected integration interval.

The time column shows the time elapsed since the start of measurement with the corresponding measurement results.

Long-term measurements over several days (watches with a large power reserve) generate a very voluminous table.

**Example 1** Integration mode 2s / watch with 28,800 A/h (result recorded every 2 seconds).  
**Results saved over 24 hours = 43,200 result lines.**

**Example 2** Integration mode 4A / watch with 28,800 A/h (result recorded every 0.5 seconds).  
**Results saved over 24 hours = 172,800 result lines.**

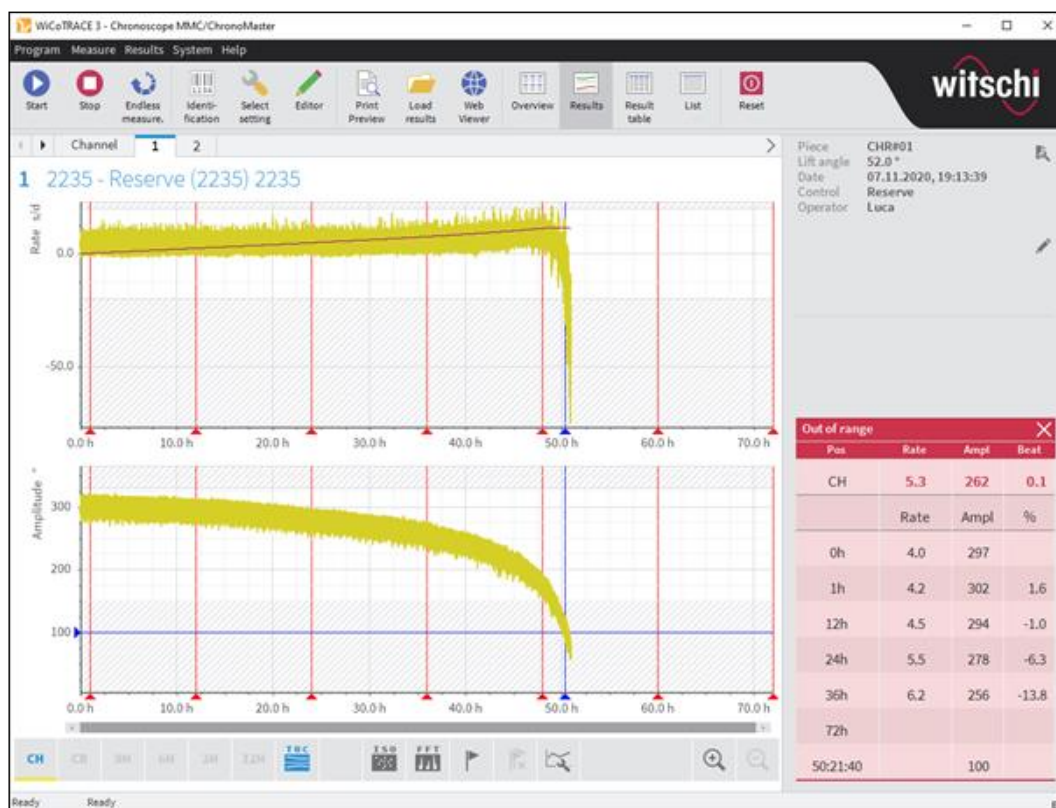
The screenshot shows the WicoTRACE 3 software interface. The main window displays a table of measurement results for Channel 1. The table has columns for 'Zeit' (Time), 'Gang' (Gear), and 'Repere' (Reference). The 'Gang' section includes columns for CH, CB, 9H, 6H, 3H, 12H, X, and D. The 'Repere' section includes columns for CH, CB, 9H, 6H, 3H, 12H, X, and D. The 'Amplitude' section includes columns for CH, CB, and 9H. The table contains 46 rows of data, with the first row starting at 00000002 and the last row at 00000046. An 'Export' button is visible at the bottom right of the table area.

Zeit	Gang							Repere							Amplitude					
	CH	CB	9H	6H	3H	12H	X	D	DVH	CH	CB	9H	6H	3H	12H	X	D	CH	CB	9H
00000002	4.9	7.4	2.3	1.7	1.2	3.1	3.4	6.2	-4.1	0.1	0.0	0.2	0.0	0.0	0.3	0.1	0.3	278	277	219
00000004	3.5	5.4	1.7	-0.8	-0.3	0.5	1.7	6.2	-4.2	0.1	0.0	0.2	0.0	0.0	0.3	0.1	0.3	277	275	219
00000006	3.4	6.7	2.8	0.4	-0.8	4.6	2.9	7.5	-3.3	0.1	0.0	0.2	0.0	0.0	0.3	0.1	0.3	280	278	221
00000008	4.0	6.4	2.2	0.3	0.7	3.5	2.9	6.1	-3.5	0.1	0.0	0.2	0.0	0.0	0.3	0.1	0.3	280	277	219
00000010	4.0	6.4	2.7	0.2	-0.2	2.2	2.6	6.6	-4.0	0.1	0.0	0.2	0.0	0.0	0.3	0.1	0.3	279	278	221
00000012	3.2	5.5	3.9	2.4	2.7	5.1	3.8	3.1	-0.8	0.1	0.0	0.2	0.0	0.0	0.3	0.1	0.3	281	278	221
00000014	5.3	8.7	4.0	1.0	1.3	4.1	4.1	7.7	-4.4	0.1	0.0	0.2	0.0	0.0	0.3	0.1	0.3	279	277	220
00000016	5.0	7.5	5.1	-0.1	2.2	3.3	3.8	7.6	-3.6	0.1	0.0	0.2	0.0	0.0	0.3	0.1	0.3	281	278	221
00000018	4.0	8.3	4.4	3.1	0.9	3.5	4.0	7.4	-3.2	0.1	0.0	0.2	0.0	0.0	0.3	0.1	0.3	281	274	218
00000020	3.9	8.3	5.3	2.2	1.1	2.5	3.9	7.2	-3.3	0.1	0.0	0.2	0.0	0.0	0.3	0.1	0.3	280	273	218
00000022	5.5	7.5	7.2	2.5	3.3	6.5	5.4	5.0	-1.6	0.1	0.0	0.2	0.0	0.0	0.3	0.1	0.3	281	274	217
00000024	4.2	6.1	4.6	1.8	0.4	3.6	3.5	5.7	-2.6	0.1	0.0	0.2	0.0	0.0	0.3	0.1	0.3	277	274	214
00000026	4.5	6.0	3.7	1.2	-0.1	4.3	3.3	6.1	-3.0	0.1	0.0	0.2	0.0	0.0	0.3	0.1	0.3	280	276	217
00000028	5.0	6.8	3.8	1.2	-2.1	4.0	3.1	8.9	-4.2	0.1	0.0	0.2	0.0	0.0	0.3	0.1	0.3	280	276	215
00000030	3.3	6.4	4.4	0.2	-0.8	2.2	2.6	7.2	-3.4	0.1	0.0	0.2	0.0	0.0	0.3	0.1	0.3	279	276	216
00000032	5.3	5.8	3.6	0.6	1.5	3.3	3.4	5.2	-3.3	0.1	0.0	0.2	0.0	0.0	0.3	0.1	0.3	281	279	215
00000034	3.4	6.2	2.6	0.5	-0.5	3.6	2.6	6.7	-3.3	0.1	0.0	0.2	0.0	0.0	0.3	0.1	0.3	279	278	215
00000036	3.3	5.4	2.9	0.3	-0.4	2.9	2.4	5.8	-2.9	0.2	0.0	0.2	0.0	0.0	0.3	0.1	0.3	282	281	218
00000038	4.1	4.2	1.9	0.3	-0.3	3.3	2.3	4.5	-2.9	0.1	0.0	0.2	0.0	0.0	0.3	0.1	0.3	283	281	217
00000040	3.4	8.6	3.1	0.8	0.4	4.5	3.5	8.2	-3.8	0.1	0.0	0.2	0.0	0.0	0.3	0.1	0.3	283	282	219
00000042	4.1	7.0	4.6	3.5	1.8	4.9	4.3	5.2	-1.9	0.1	0.0	0.2	0.0	0.0	0.3	0.1	0.3	284	283	219
00000044	4.4	7.5	3.1	2.3	1.8	5.4	4.1	5.7	-2.8	0.1	0.0	0.2	0.0	0.0	0.3	0.1	0.3	283	281	218
00000046	4.0	6.6	5.4	3.4	3.1	4.4	4.5	3.5	-1.2	0.1	0.0	0.2	0.0	0.0	0.3	0.1	0.3	285	282	220

The table can be saved as a text file.

## 9.6 Results long-term measurement (reserve)

The "Reserve" test mode allows you to check watches with a power reserve of several days. A measuring time of up to 300 hours (12.5 days) can be selected.



By means of marking, you can display the measurement results of rate and amplitude at any point.

The test is stopped automatically if the **Stop on Amplitude rate reserve** option is activated in the measurement program and the minimum programmed amplitude has been reached before the measuring time has elapsed.

The data stored during the entire measuring time allows an additional diagram recording (dark blue line), which shows the state development during a long-term measurement. You can click on **OVL** to switch the display of the recording on and off.


By clicking on the corresponding test position (highlighted), only the additional recording is displayed.

The mark on the purple (E) line indicates how many seconds the watch has gained or lost since the start of measurement.

The table contains following measured values:

- **1st Line**  
Test position of the watch and continuous display (in 2-second intervals) of the measured values of rate accuracy, amplitude and beat error.
- **0h**  
Display of the average values of rate and amplitude of the first measuring minute.
- **1h, 12h, 24h. . . 72h**  
Display of the average values of Rate and Amplitude of the last measuring minute, before reaching the displayed measuring time. In addition, the deviation of the amplitude in %, in relation to the amplitude at 0h is also displayed.

## 9.7 List of results

To open the list showing the results, click on the **List**  symbol

WCoTRACE 3 - Chronoscope MMC/ChronoMaster

Program Measure Results System Help

Start Stop Endless measure Identification Select setting Editor Print Preview Load results Web Viewer Overview Results Result table List Reset

Channel 1 2


Date	Device	Caliber	Settings	Control	Piece	Operator	Measurement status	Results
10.11.2020, 12:01:	MMC-00001	2235	2235	Normal	CHR#01	Luca	En dehors de la toléranc	X: 3.4 s/d/0.1 ms/239 *
10.11.2020, 12:01:	MMC-00011	2235	2235	Normal	CHR#02	Luca	Bon	X: 2.8 s/d/0.1 ms/279 *
10.11.2020, 11:50:	MMC-00001	2235	2235	Normal	CHR#01	Luca	En dehors de la toléranc	X: 3.7 s/d/0.1 ms/244 *
10.11.2020, 11:50:	MMC-00011	2235	2235	Normal	CHR#02	Luca	Bon	X: 2.8 s/d/0.1 ms/277 *
10.11.2020, 09:01:	MMC-00011	2235	2235	Normal	CHR#02	Luca	Bon	X: 2.8 s/d/0.1 ms/269 *
10.11.2020, 09:01:	MMC-00001	2235	2235	Normal	CHR#01	Luca	Bon	X: 4.0 s/d/0.1 ms/237 *
10.11.2020, 08:50:	MMC-00011	2235	2235	Normal	CHR#02	Luca	En dehors de la toléranc	X: 3.4 s/d/0.1 ms/262 *
10.11.2020, 08:50:	MMC-00001	2235	2235	Normal	CHR#01	Luca	En dehors de la toléranc	X: 3.3 s/d/0.1 ms/231 *
07.11.2020, 19:13:	MMC-00001	2235	2235 - Reserve	Reserve	CHR#01	Luca	Pas de signal	X: 5.3 s/d/0.1 ms/262 *
07.11.2020, 18:49:	MMC-00011	2235	2235 - Reserve	Reserve	CHR#02	Luca	Pas de signal	X: 9.5 s/d/0.0 ms/266 *
05.11.2020, 11:11:	MMC-00001	2235	2235 - 24h	24 h	1	Luca	Bon	X: 4.9 s/d/0.1 ms/264 *
05.11.2020, 11:11:	MMC-00011	2235	2235 - 24h	24 h	2	Luca	Bon	X: 2.9 s/d/0.1 ms/272 *
05.11.2020, 11:01:	MMC-00001	2235	2235 - 0h	0 h	1	Luca	Bon	X: 5.0 s/d/0.1 ms/281 *
05.11.2020, 11:01:	MMC-00011	2235	2235 - 0h	0 h	2	Luca	Bon	X: 3.0 s/d/0.1 ms/270 *
05.11.2020, 10:31:	MMC-00001	2235	2235 - 24h	24 h	1		En dehors de la toléranc	X: 4.7 s/d/0.1 ms/262 *
05.11.2020, 10:31:	MMC-00011	2235	2235 - 24h	24 h	2		Bon	X: 2.8 s/d/0.1 ms/268 *
05.11.2020, 10:21:	MMC-00011	2235	2235 - 0h	0 h	2		Bon	X: 2.8 s/d/0.1 ms/267 *
05.11.2020, 10:21:	MMC-00001	2235	2235 - 0h	0 h	1		Bon	X: 5.2 s/d/0.1 ms/264 *
05.11.2020, 09:52:	MMC-00001	2235 - 24h	2235 - 24h	24 h	1		Bon	X: 5.4 s/d/0.1 ms/266 *
05.11.2020, 09:52:	MMC-00011	2235 - 24h	2235 - 24h	24 h	2		Bon	X: 3.0 s/d/0.1 ms/267 *

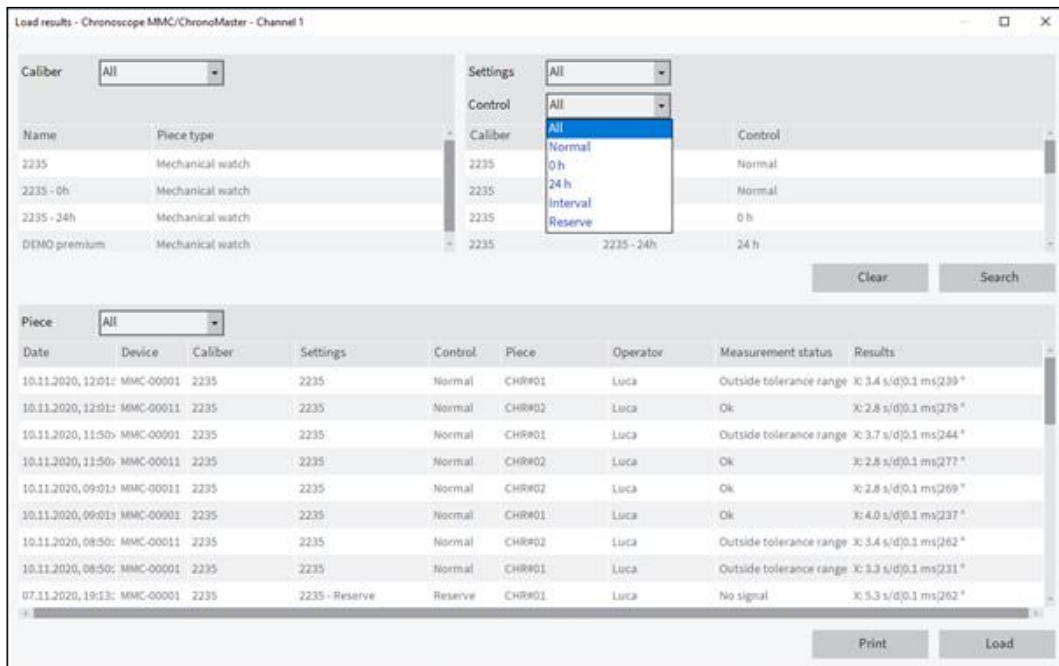
Ready Ready

You can click on the column of a category to sort the results in ascending or descending order.

Now click on the desired results file and then click the  button. The desired result is then displayed.

## 9.8 Load results

To open results that have already been saved, click on the  symbol.



The screenshot shows the 'Load results' window in Chronoscope MMC/ChronoMaster. It features several filter sections: 'Caliber' (set to 'All'), 'Settings' (set to 'All'), 'Control' (set to 'All'), and 'Piece' (set to 'All'). A 'Caliber' dropdown menu is open, showing options: 'All', 'Normal', '0 h', '24 h', 'Interval', and 'Reserve'. Below these filters is a table with columns: Date, Device, Caliber, Settings, Control, Piece, Operator, Measurement status, and Results. The table contains 12 rows of measurement data. At the bottom right, there are 'Print' and 'Load' buttons.

Date	Device	Caliber	Settings	Control	Piece	Operator	Measurement status	Results
10.11.2020, 12:01:	MMC-00001	2235	2235	Normal	CHR#01	Luca	Outside tolerance range	X: 3.4 s/d/0.1 ms/239 *
10.11.2020, 12:01:	MMC-00011	2235	2235	Normal	CHR#02	Luca	Ok	X: 2.8 s/d/0.1 ms/279 *
10.11.2020, 11:50:	MMC-00001	2235	2235	Normal	CHR#01	Luca	Outside tolerance range	X: 3.7 s/d/0.1 ms/244 *
10.11.2020, 11:50:	MMC-00011	2235	2235	Normal	CHR#02	Luca	Ok	X: 2.8 s/d/0.1 ms/277 *
10.11.2020, 09:01:	MMC-00011	2235	2235	Normal	CHR#02	Luca	Ok	X: 2.8 s/d/0.1 ms/269 *
10.11.2020, 09:01:	MMC-00001	2235	2235	Normal	CHR#01	Luca	Ok	X: 4.0 s/d/0.1 ms/237 *
10.11.2020, 08:50:	MMC-00011	2235	2235	Normal	CHR#02	Luca	Outside tolerance range	X: 3.4 s/d/0.1 ms/262 *
10.11.2020, 08:50:	MMC-00001	2235	2235	Normal	CHR#01	Luca	Outside tolerance range	X: 3.3 s/d/0.1 ms/231 *
07.11.2020, 19:13:	MMC-00001	2235	2235 - Reserve	Reserve	CHR#01	Luca	No signal	X: 5.3 s/d/0.1 ms/262 *

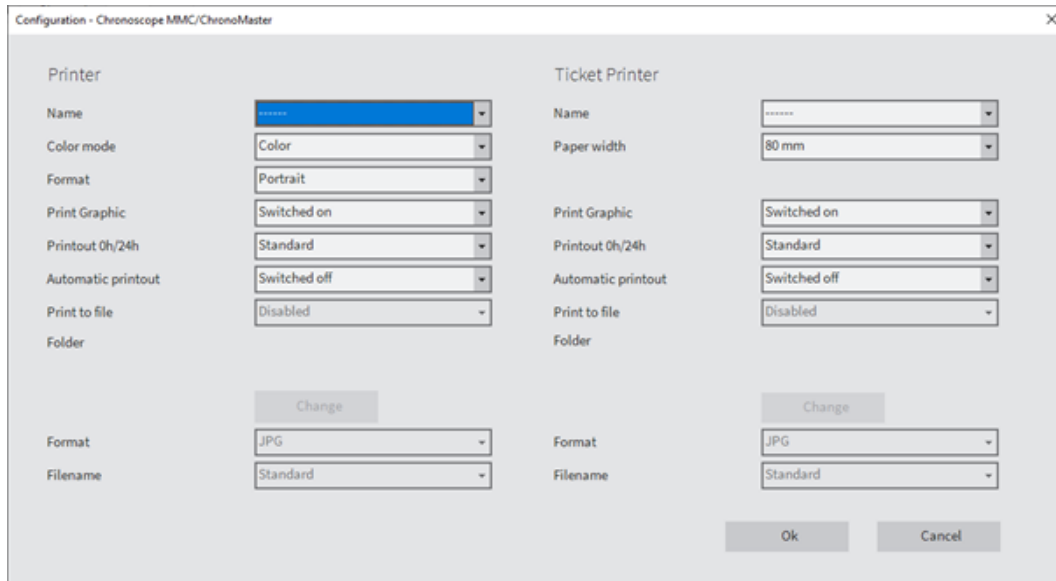
You have various options for searching for results.

- If you select **All** in the selection fields, the list of all measurements performed appears. If a large number of measurements are stored in the database, searching for a single measurement can be slow and tedious.
- For a fast and efficient search, we suggest entering as many search criteria as possible in the corresponding fields.
- **Functions**
  - Delete** All selection fields are reset to **All**.
  - Search** Starts the search according to the search criteria entered and opens the results list.
  - Print** The selected measurement results are printed.
  - Load** The selected measurement results are displayed on the screen.

# 10 Print

## 10.1 Print Setup

You can access the print functions via **Results** in the menu bar.



---

**Name** List of local and network printers. Select the printer to be used. Printing can also be deactivated.

---

**Color mode** **Black & white** printing or **color** if available.

---

**Format** Print format selection:

- **Portrait**
- **Landscape**

---

**Print Graphic** The printout of all graphic elements can be switched on or off.

---

**Printout 0h/24h**

- **Standard**
- **Combined**

---

**Automatic printout** Select the print mode:

- **Switched off**
- **Defective watches**
- **Good watches**
- **All watches**

**Important:** To save the files, one of the print modes must be activated.

---

**Print to file** Select the print mode:

- **Switched off**
- **Print and file**
- **Only file**

---

**Folder** Select the folder in which the files are to be saved.

---

**Format** Select file format:

- **JPG**
- **PDF**
- **PNG**

---

**Filename** Select the file name:

---

- 
- **Standard**
  - **Simplified**
- 

Ticket Printer:

- 
- Paper width**
- **80 mm (default)**
  - **60 mm**

**Attention:** If the paper width is changed, the printer configuration must also be adjusted (see label printer instructions).

---

**Print Graphic**      Activate or deactivate the printout of the graphic display of the unbalance.

---

## 10.2 Print Preview

You can access the print preview via **Results** in the menu bar.



The right side of the print preview shows the icons that can be activated with one click.

Save files in PDF, JPG or PNG format

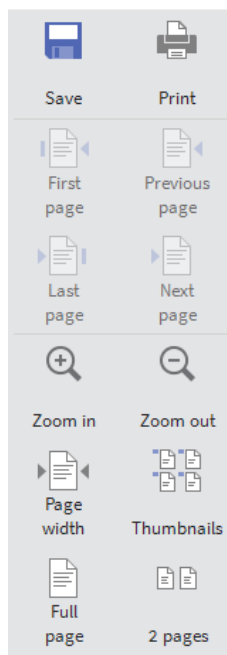
First page

Last page

Zoom in\*

Fit preview to page width

Display a whole page



Print

Previous page

Next page

Zoom out\*


Display up to four pages

Display two pages

\* If you hold down the mouse button, you can zoom in on the selected section and click on the preview to zoom out.

## 11 WebViewer



Click the  symbol to start the WebViewer.

The WebViewer makes it possible to analyse, print out and present the results. You can use any PC that is connected to the network in which the database is installed.

The WebViewer is a separate software and described in its own manual.