



LinMot-Talk Oscilloscope

Optimization and diagnostic tool during commissioning

Classification: Public
 LinMot internal

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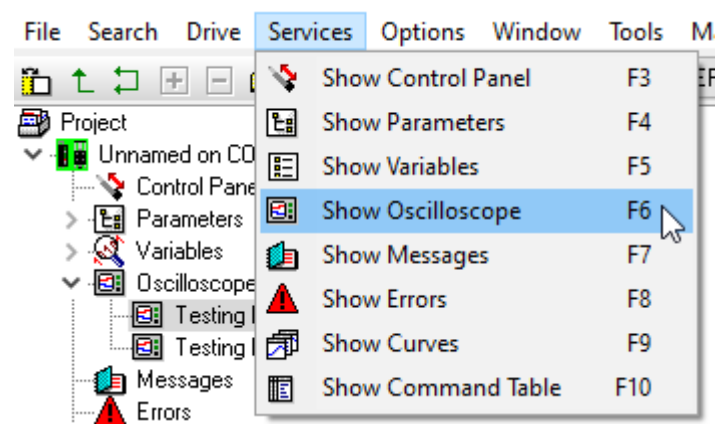
Introduction

Description: The LinMot-Talk software features an oscilloscope function for recording desired data from your LinMot drive. The recording provides information about accuracy, motion control, power reserves, and is a helpful tool for error analysis and commissioning.

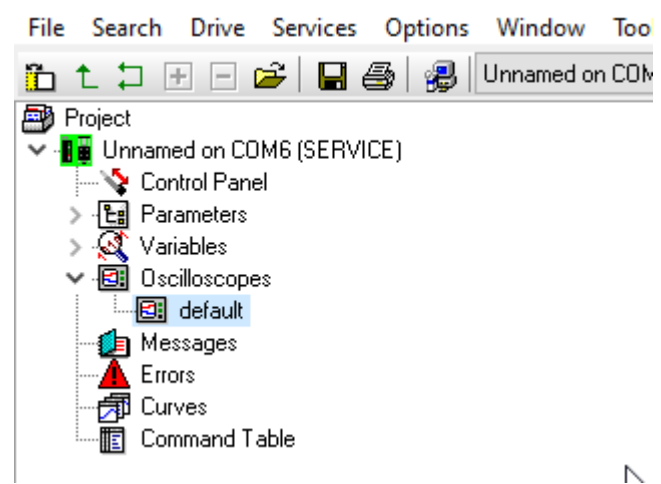
General

Call Oscilloscope

The oscilloscope view is called up by using the menu bar under “Services” -> “Show Oscilloscope” or directly by using either the oscilloscope symbol or the F6 key.



The oscilloscope settings and data are given in the Project tree under *Project/Oscilloscopes/Default*.



Oscilloscope Overview



1. Oscilloscope - Control Tab

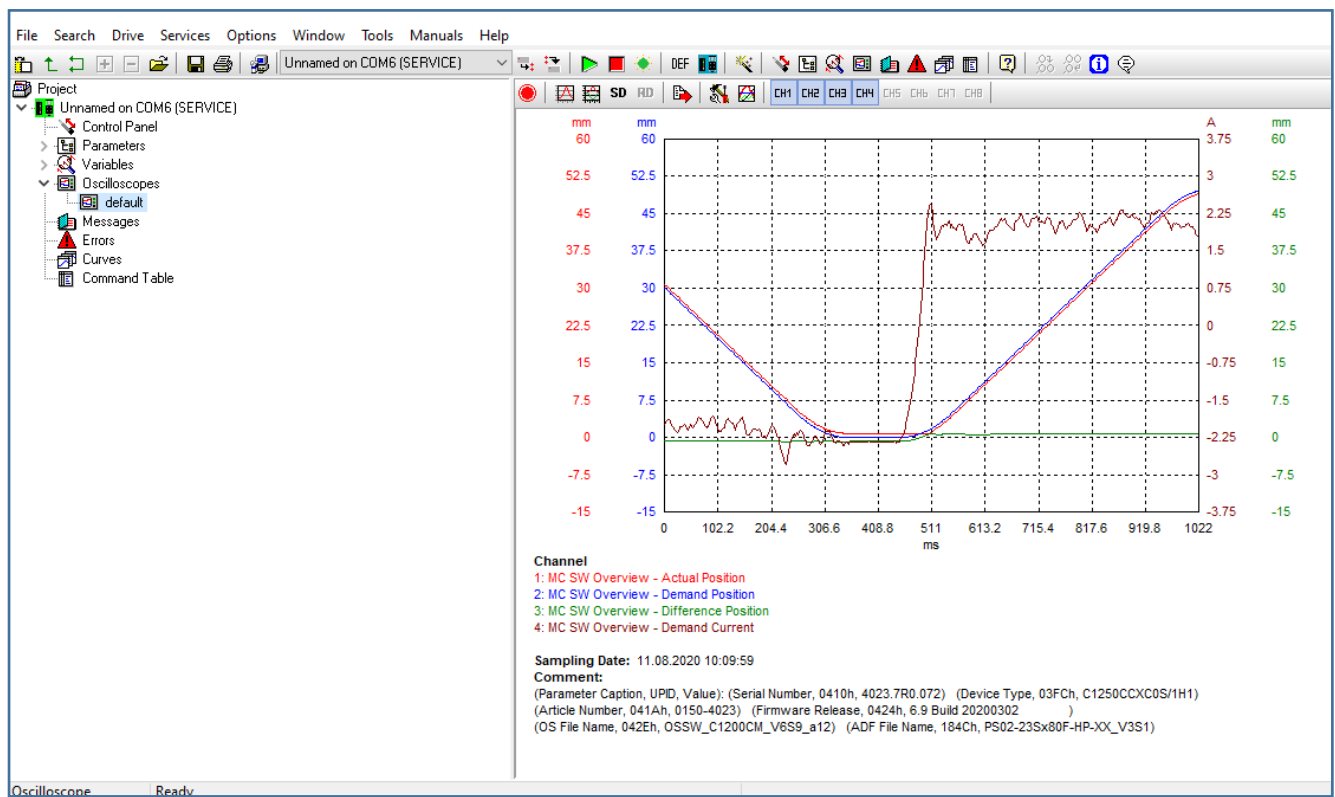
	Start	
	Continuous Recording	
	Cancel	
	Customize View	
	Adjust view and use same scaling from same values	Fehler! Verweisquelle konnte nicht gefunden werden.
	Save View	
	Open saved view	
	Export Data	See 3.3.2 Exporting Data
	Open settings	See 3.1.2 Display and scale channels
	Call up scaling of the channels	See 3.1.2 Display and scale channels
	View activate/deactivate channels	See 3.1.2 Display and scale channels
	Cursor 1 (red) enable/disable / Cursor location in ms	See 3.2.1 Cursor
	Cursor 2 (blue) enable/disable / Cursor location in ms	See 3.2.1 Cursor

2.	Oscilloscope – Channel 1...X	Cursor 1	Cursor 2	C2 – C1 Value	C2 – C1 Time
1	Channel 1 – MC SW Overview – Actual Position (Default)	X mm	X mm	X mm	X ms
2.	Channel 2 – MC SW Overview – Demand Position (Default)	X mm	X mm	X mm	X ms
3.	Channel 3 – MC SW Overview – Difference Position (Default)	X mm	X mm	X mm	X ms
4.	Channel 4 – MC SW Overview – Demand Current (Default)	X A	X A	X A	X ms

3.	Oscilloscope – Information	
	Sampling Date:	Date, actual recording time
	Comment:	Comment, can be added manually to each recording
	Parameter Values	Information on servo drive, motor, and firmware version

Oscilloscope Messages

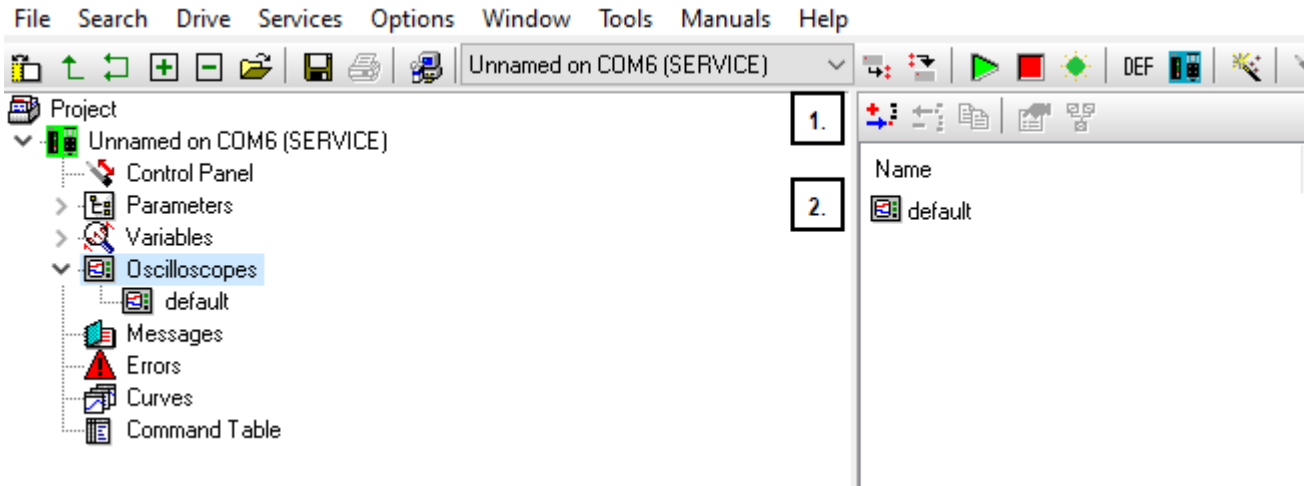
The following messages are displayed at the bottom of the window:



Oscilloscope - State:	Meaning:
Ready	Oscilloscope is ready
Sampling...	Data recording
Read data channel 1	Data is read out
Waiting for trigger	Waiting for trigger condition(s)
Waiting for oscilloscope service	Waiting for oscilloscope—another oscilloscope is still active

Manage Recording

In the main path of the parameter tree, all created records are displayed on the right side of the window. Further information, such as date / time and comments, can be seen. In this view, the recordings can be created and managed.



1.	Oscilloscope – Edit Tab	Remark
	Add oscilloscope	Several recordings can be created
	Clear oscilloscope	Minimum number is one oscilloscope
	Copy and add oscilloscope from the list	Identical settings are applied to a new oscilloscope
	Add/edit name or comment	Helps with the overview and is visible in the export
	Compare and add two oscilloscope recordings	See 3.1.4 Comparing two recordings

2.	Oscilloscope - Edit Window		
	Oscilloscope 1 "Name"	Oscilloscope 1 "Date"	Oscilloscope 1 "Comment"
	Oscilloscope 2 "Name"	Oscilloscope 2 "Date"	Oscilloscope 2 "Comment"
....	Oscilloscope n "Name"	Oscilloscope 3 "Date"	Oscilloscope 3 "Comment"

1 Oscilloscope - Settings

Without reconfiguring any settings, recording is initially defined for a 1s (1000ms) duration, one-time execution for actual position, demand position, differential position and current. The settings can be adjusted as required before starting. This chapter shows how to configure the optimal settings for your desired data collection.

Further information on the operation and function of the oscilloscope can be found in [User Manual LinMot-Talk](#). A video tutorial is available at [Youtube - LinMot Tutorial - Basic Oscilloscope](#).

1.1 Device-dependent Functional Differences

Servo Drive Type	Max. Number of Channels (Default On)	Max. Number of support points	Min. Sample Period
A1100	4 (4)	256	0.00025s (Default 0.016s)
B1100	2 (2)	128	0.016s (Default 0.016)
C1100	4 (4)	256	0.00025s (Default 0.016s)
C1200	8 (4)	4096	0.000125s (Default 0.002s)
C1400	8 (4)	4096	0.000125s (Default 0.002s)
E1100	4 (4)	1024	0.004s (Default 0.004s)
E1200	8 (4)	4096	0.0001s (Default 0.002s)
E1400	8 (4)	4096	0.000125s (Default 0.002s)

1.2 Recording Time

Oszilloskopeinstellungen ✕

General Trigger Advanced

Acquisition Mode: Single Shot ▾

Recording Time: 3069 ms ▾

Channel 1

Group Variable

MC SW Overview ▾ Actual Position ▾

Channel 5

Group Variable

MC SW Overview ▾ Actual Position ▾

Channel 2

Group Variable

MC SW Overview ▾ Demand Position ▾

Channel 6

Group Variable

MC SW Overview ▾ Demand Position ▾

Channel 3

Group Variable

MC SW Overview ▾ Difference Position ▾

Channel 7

Group Variable

MC SW Overview ▾ Difference Position ▾

Channel 4

Group Variable

MC SW Overview ▾ Demand Current ▾

Channel 8

Group Variable

MC SW Overview ▾ Demand Current ▾

Save Color Set
Ok
Cancel



Hint: The recording duration should be kept as short as possible. The longer the recording time, the lower the sampling rate or the resolution of the recording.

1.3 Channels

Oscilloscope Settings
✕

General Trigger Advanced

Acquisition Mode: Single Shot ▼

Recording Time: 1000 ms ▼

<input checked="" type="checkbox"/> Channel 1 Group: Variable MC SW Overview ▼ Actual Position ▼	<input type="checkbox"/> Channel 5 Group: Variable MC SW Overview ▼ Demand Velocity ▼
<input checked="" type="checkbox"/> Channel 2 Group: Variable MC SW Overview ▼ Demand Position ▼	<input type="checkbox"/> Channel 6 Group: Variable MC SW Overview ▼ Actual Velocity ▼
<input checked="" type="checkbox"/> Channel 3 Group: Variable MC SW Overview ▼ Difference Position ▼	<input type="checkbox"/> Channel 7 Group: Variable MC SW Overview ▼ Demand Acceleration ▼
<input checked="" type="checkbox"/> Channel 4 Group: Variable MC SW Overview ▼ Demand Current ▼	<input type="checkbox"/> Channel 8 Group: Variable MC SW Overview ▼ Difference Velocity ▼

Save Color Set
Ok
Cancel



Hint: The number of activated channels should be reduced to a minimum. The more active channels, the lower the sampling rate or the resolution of the recording.

The variables are divided into groups ("Group"). First, the group must be selected so that the desired variable can be chosen. An overview of the existing variables can be found in the parameter tree under "Variables".

1.3.1 Useful Variables

Motor optimization (Tuning):

Group	Variable
MC SW Overview	Actual Position
	Demand Position
	Difference Position
	Demand Current
	Demand Velocity
	Actual Velocity
	Demand Acceleration
	Difference Velocity
MC SW Status Word	In Target Position

State-Machine Handling:

Group	Variable
MC SW Control Word	Control Word
	Switch On
	Home
MC SW Status Word	Status Word
	Operation Enabled
	Error
	Homed
	Motion Active
	Voltage Enabled (STO – 1S option)

Interface:

Group	Variable
MC SW	MC Command Header

Command Table:

Group	Variable
MC SW Command Table	Last Evaluated Command Table ID
	Actual Linked Command Table ID
	Command Table Variable 1
	Command Table Variable 2

Force control with TF [Force Control SW](#)

Group	Variable
MC SW Force Control	Target Force
	Measured Force
MC SW Status Word	Special Motion Active

Error “Position Lag Always Too Big”:

Group	Variable
MC SW Overview	Actual Position
	Demand Position
	Difference Position
	Demand Current
MC SW Status Word	Error

Error “Motor Supply Voltage Too Low”:

Group	Variable
MC SW Monitoring	Motor Supply Voltage

Error: “Motor Short Time Overload” / “Error Motor Hot Sensor”:

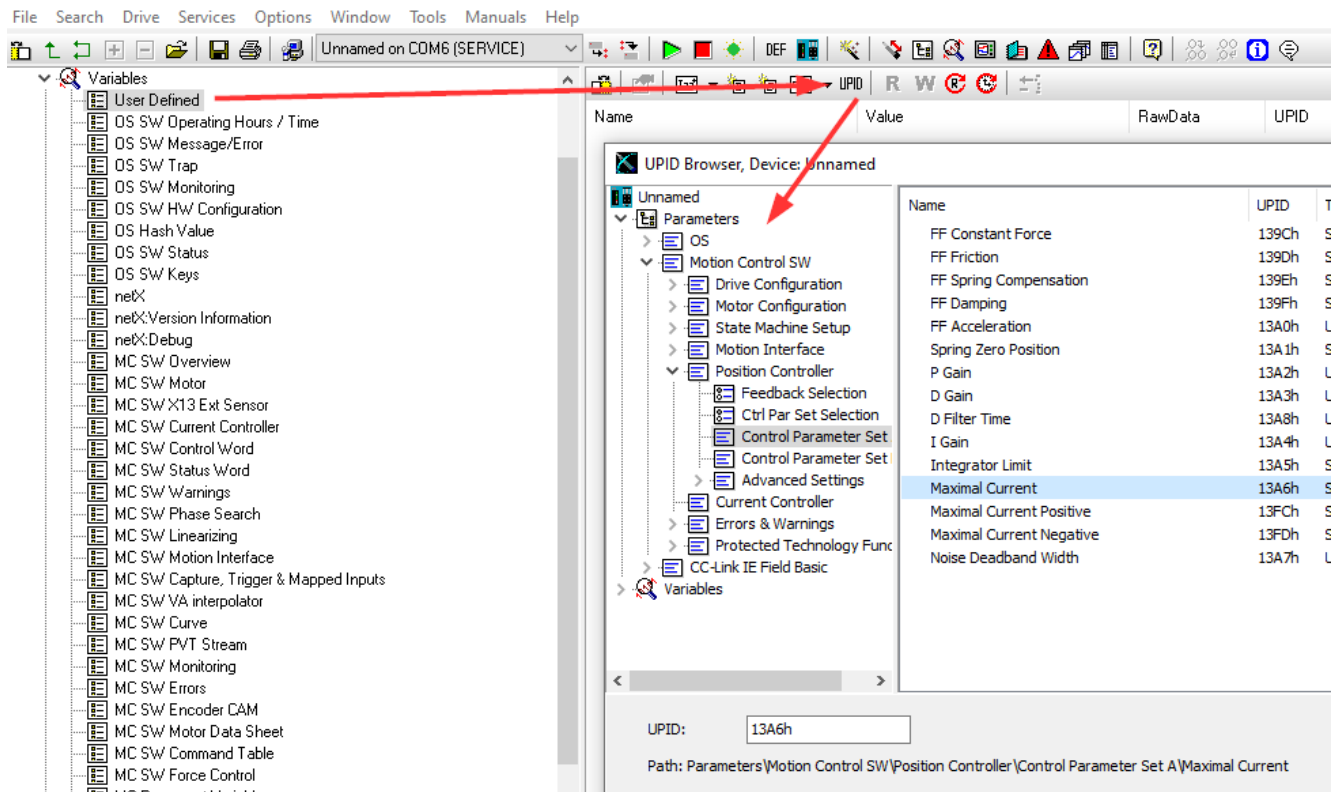
Group	Variable
MC SW Overview	Demand Current
MC SW Motor	Full Motor Model Ph1 Winding Temp
	Full Motor Model Ph2 Winding Temp
	Full Motor Model Ph1 Sealing Compound Temp
	Full Motor Model Ph2 Sealing Compound Temp
	Min Motor Temperature reserve
	Max Read Out Motor Temp

1.3.2 Adding Parameters

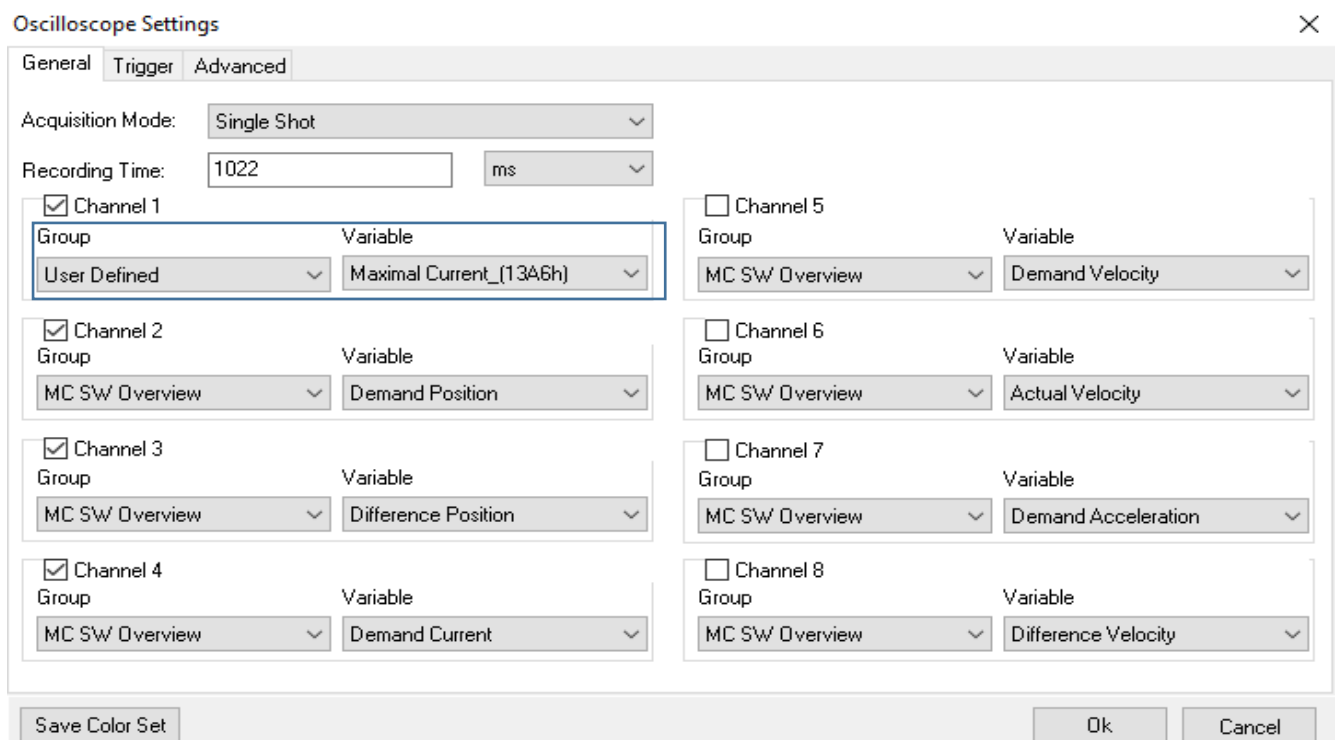
Application-related example:

The parameter "Maximal Current" (UPID 13A6h) is to be recorded. In this example application, the value of this parameter is limited by the controller for certain process steps. This current limitation is to be monitored.

Add parameter in at "Variables" -> "User Defined":



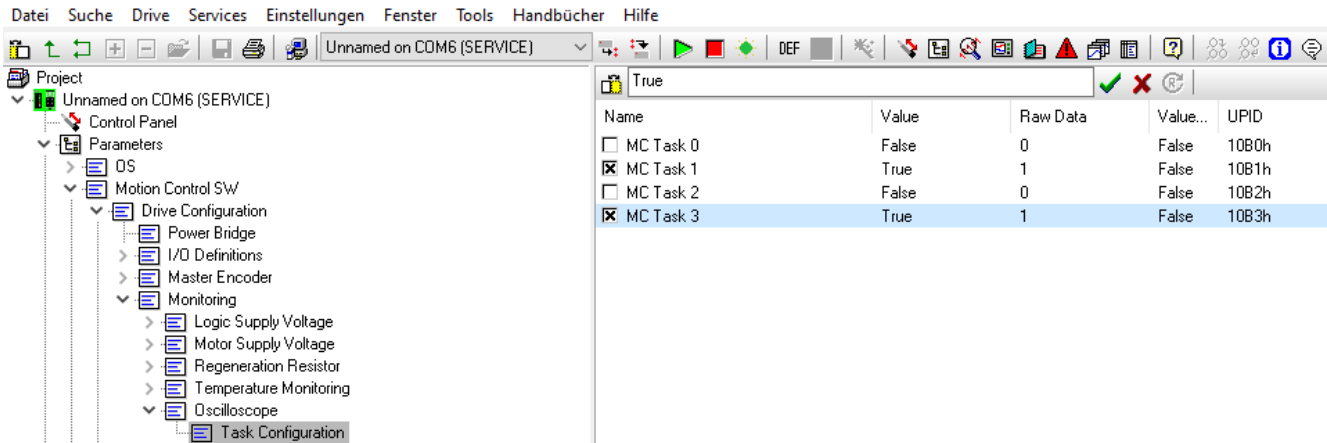
"User Defined" is now selected as "Group" in the oscilloscope settings and the parameter "Maximal Current_(13A6h)" is now available for selection.



1.4 Increasing the Time Resolution of a Recording

1.4.1 Activate Task Synchronization (not B1100/E1100)

To enable high-resolution recording, certain CPU tasks must be synchronized with each other. Use tasks 1 & 3.



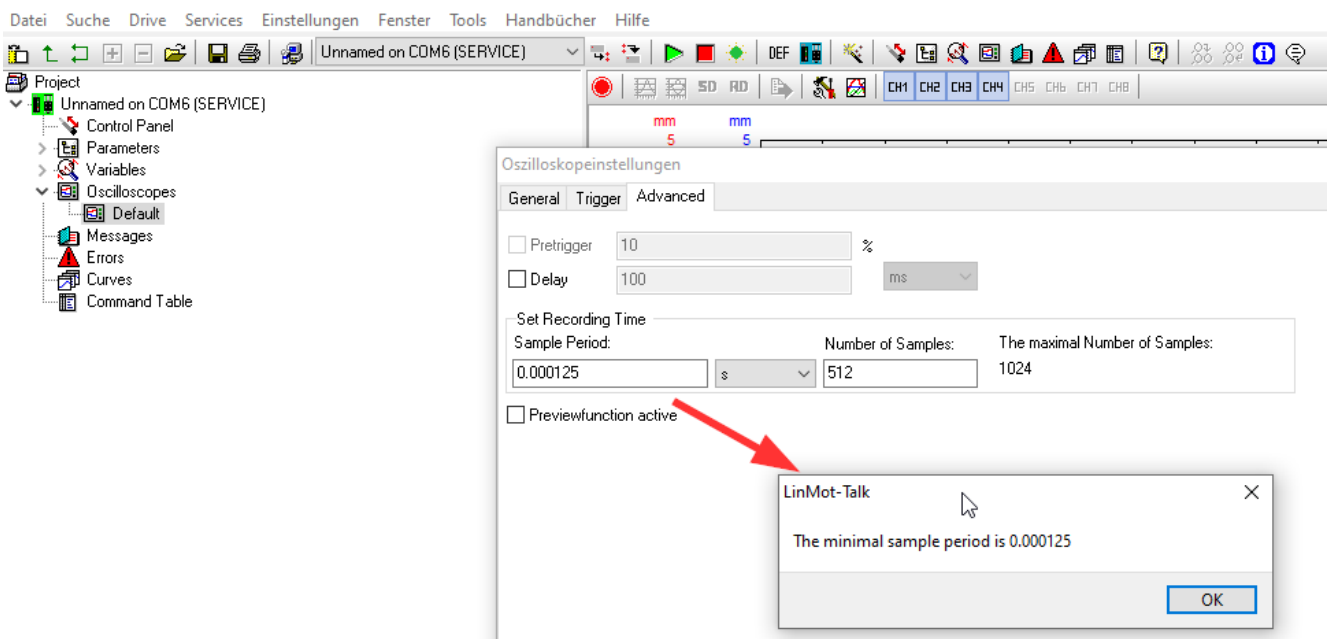
Attention: In infrequent cases, synchronization of the oscilloscope can lead to increased CPU utilization. The application is stopped, and a Run Time Error is displayed (Error Code 0090h / 0091h / 0092h / 0093h).



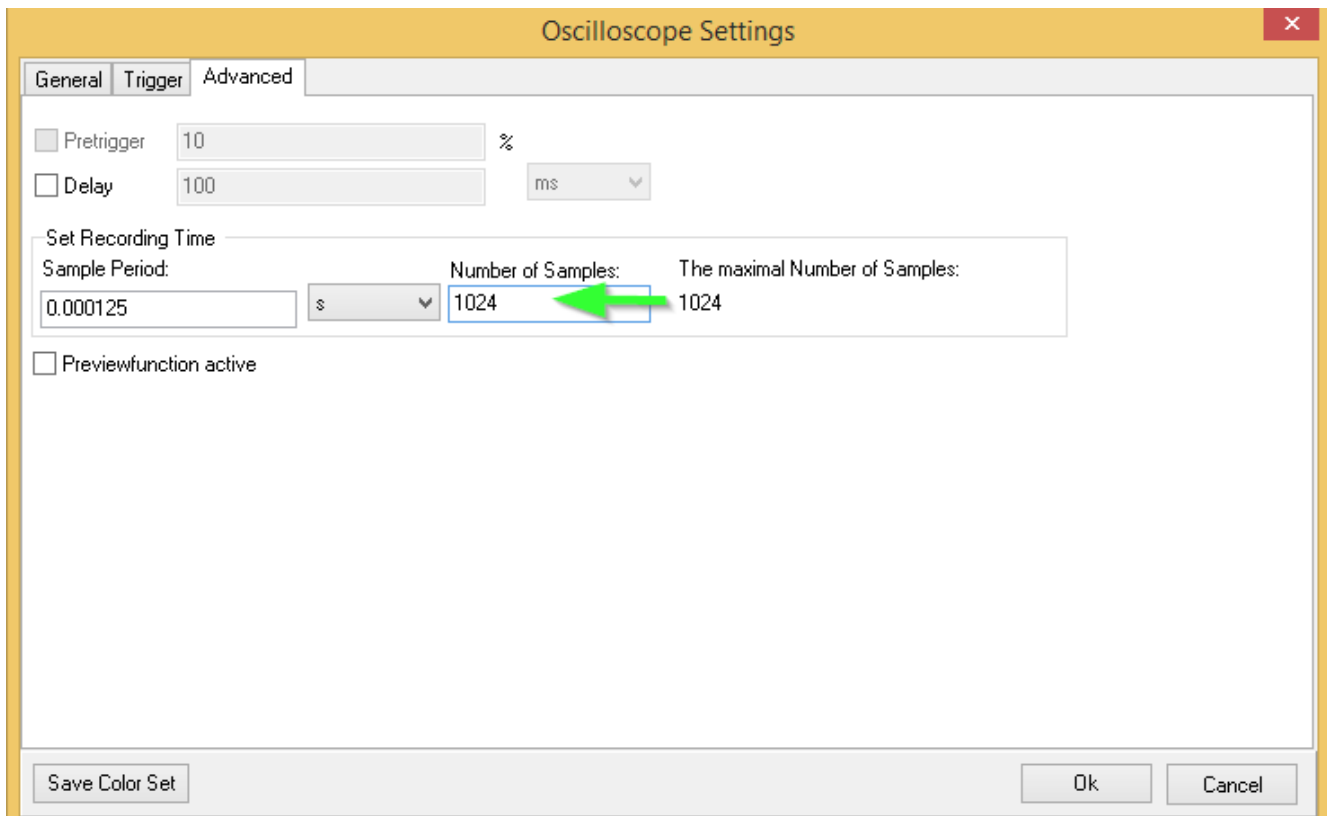
Note: The activation of the task requires a restart (reboot) of the device.

1.4.2 Recording with Maximum Resolution

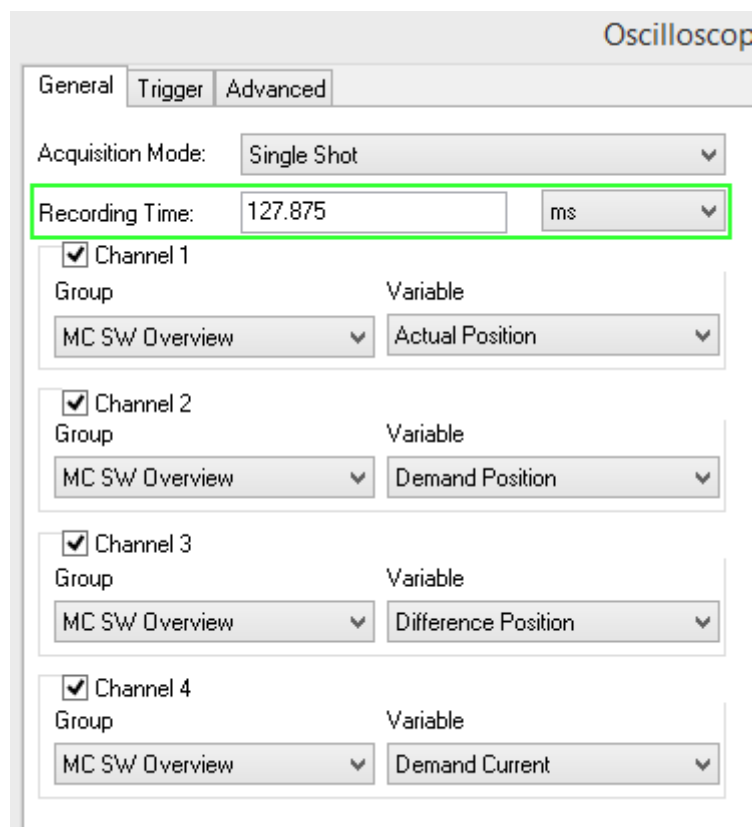
To apply the settings, the oscilloscope must be started once, or you must reconnect to the device. Afterwards, you can enter a small value as sample period and take the smallest possible value from the error message.



This value should be used as the current setting. Also, the recommendation of the number of samples should be changed accordingly to get the maximum amount of data from the recording.

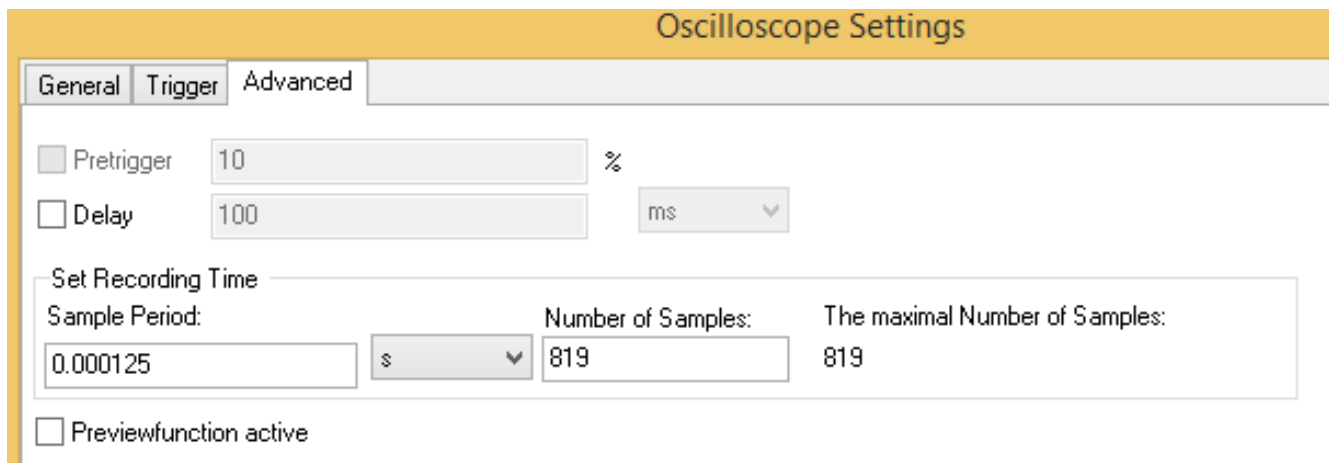
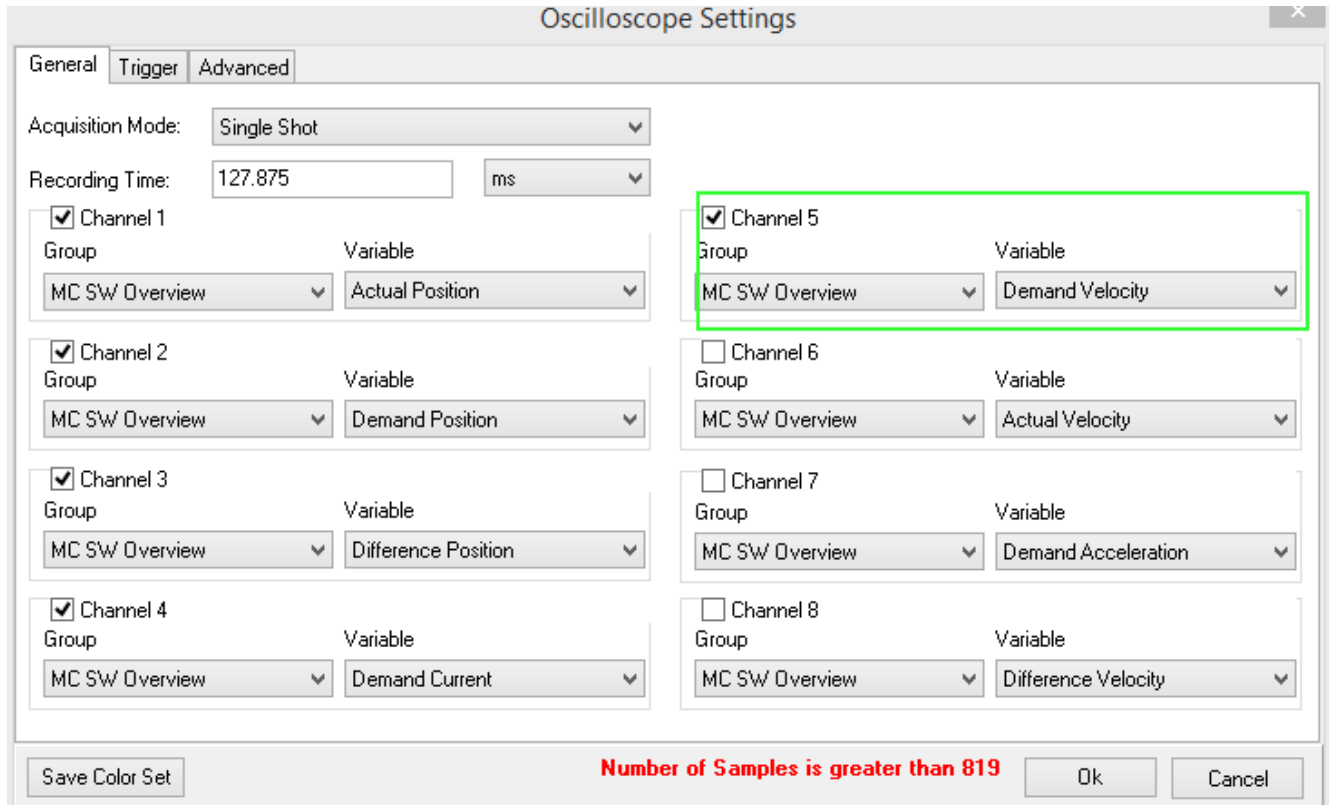


This also automatically generates the "Recording Time" of the oscilloscope.



1.4.3 Adding Additional Channels

The settings will need to be adjusted if the selected channels change.



Note: When more channels are activated, there will be a smaller number of data points allotted for each channel and this will result in a shorter recording.

2 Functions

2.1 Recording Method (Acquisition Mode)

A recording can be acquired in two ways:

Oscilloscope Settings

General **Trigger** Advanced

Acquisition Mode: Continuous Single Shot Continuous

Recording Time: Continuous

Single Shot: Starts a single recording. As soon as the recording is finished, this data can be evaluated.

Continuous: Starts the recording several times. If a trigger condition is defined, the oscilloscope is restarted when this trigger condition is met. If no trigger is activated, the recording is restarted as soon as a recording is finished. To evaluate the data, the oscilloscope must be stopped immediately by double-clicking the Start button. With a single click, the recording is executed once more and is then finished.

2.2 Trigger

Up to two trigger conditions can be defined. Conditions “A” and “B” can be linked logically with “AND” or “OR”. As soon as this condition becomes true, the recording is performed. The oscilloscope is activated with the “Start” button and waits for the “Trigger Condition”.

Oscilloscope Settings ✕

General **Trigger** Advanced

Trigger Condition: A

Condition A

Group	Variable
MC SW Overview	Demand Position
Event	Value [mm]
Rising edge	20

Condition B

Group	Variable
MC SW Overview	Demand Current
Event	Value [A]
Rising edge	0

Save Color Set
Ok
Cancel



Note: Changes in the oscilloscope settings are only applied when the oscilloscope is stopped. It is recommended to make settings on the oscilloscope before starting it and to make changes only in the “Ready” state.



Attention: It is not possible to start/carry out several recordings at the same time. If a recording is waiting for the trigger, a second recording cannot be started in parallel.

2.2.1 Advanced Settings

If a trigger is used to start recording, the recording window can be shifted (pre-trigger/delay):

Oscilloscope Settings

General Trigger **Advanced**

Pretrigger %
 Delay ms

Recording with trigger condition A:

Variable: Demand Position
 Value: 20mm
 Event: Rising edge

The recording is started when the target position is >20mm.

Recording with advanced trigger 10%:

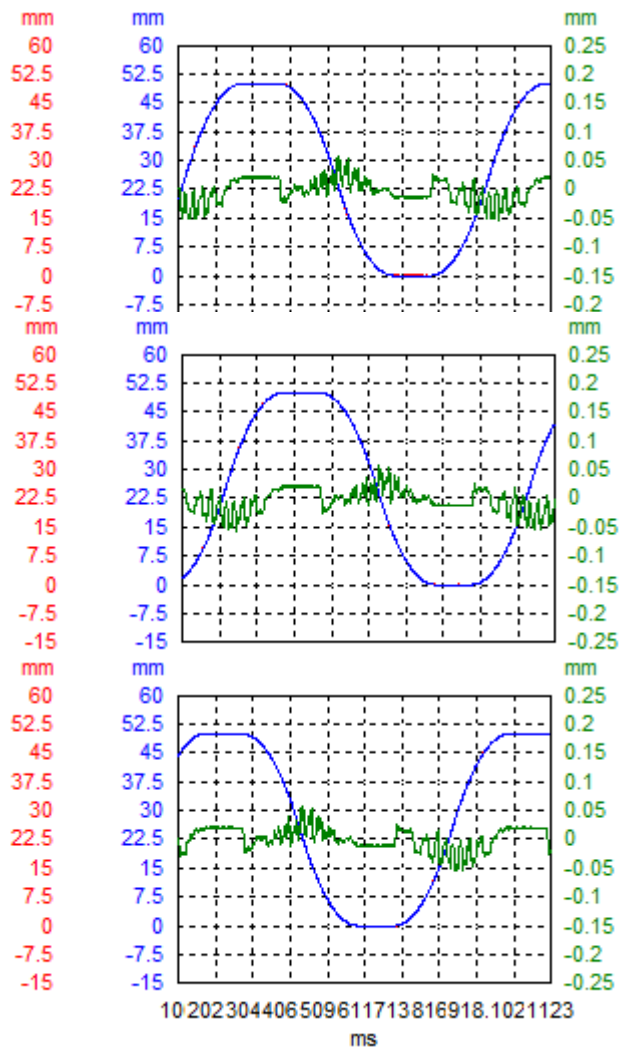
Variable: Demand Position
 Value: 20mm
 Event: Rising edge
 Pre-Trigger: 10%

In relation to the recording time, the recording time is set 10% before the trigger signal.

Recording with delay 100ms:

Variable: Demand Position
 Value: 20mm
 Event: Rising edge
 Delay: 100ms

The recording is only recorded with a delay of 100ms. The trigger condition is not visible in the recording, because it is in the past.



2.2.2 Delayed Readout (from Drive)

The oscilloscope can be started with the LinMot-Talk software and read out later by logging in again with the LinMot-Talk software.



Attention: The oscilloscope service is stopped when the Servo Drive is restarted, e.g. when the logic supply is switched off or with a reboot.



Attention: Delayed read-out does not work with “User Defined Variables” – “Add Parameter”



Note: Only one oscilloscope can be read out. Since memory is limited, it will not work if you start several oscilloscope triggers and then want to read out several recordings.

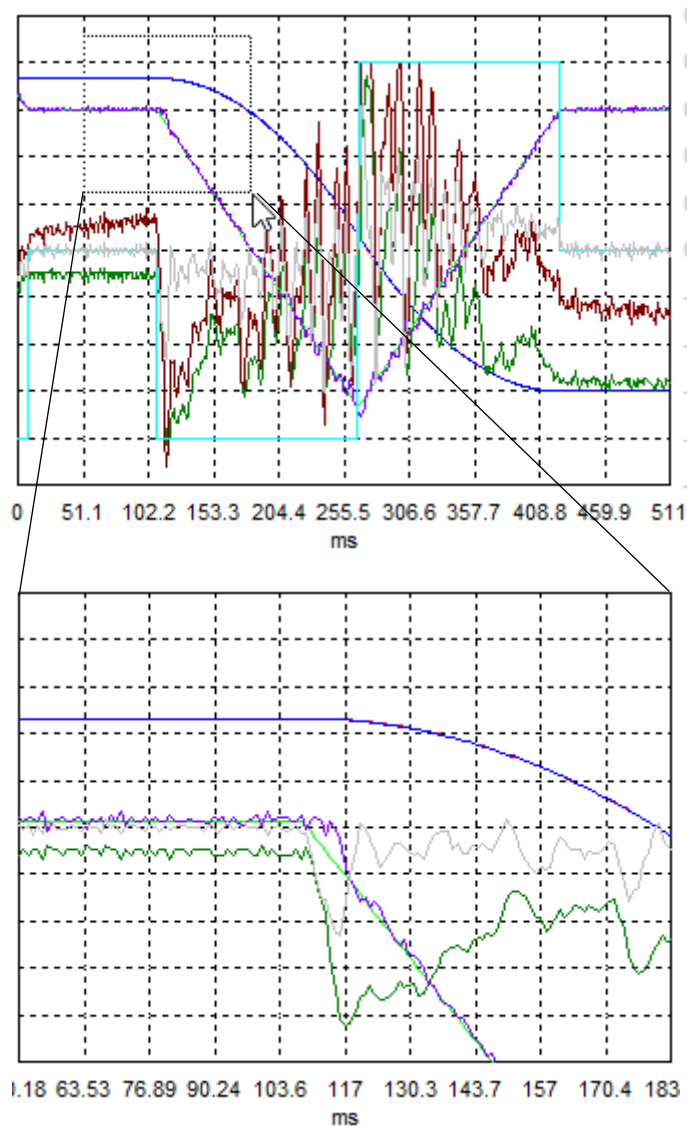
This function is often used when an error on the application is not reproducible and only occurs occasionally. A recording (e.g. trigger on error) can be started and as soon as the error has occurred, you can log in again and read the values in the oscilloscope.

3 Evaluation

3.1 View

3.1.1 Navigating/Zooming

The mouse pointer can be used to select a window in the recording to enlarge the desired area. To do this, click and drag from left to right, top to bottom.

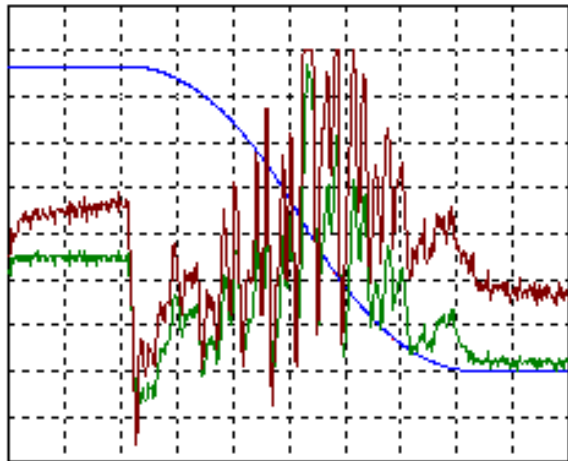


The user can also zoom the display window in and out by scrolling with the mouse wheel.

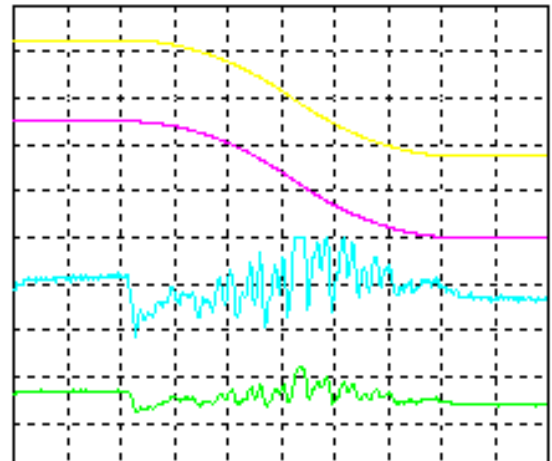
3.1.2 Display and Scale Channels

Unused channels can be hidden in the oscilloscope toolbar. The function keys "Fit View" or "Fit View (same unit same fit)" scale the view automatically. In the "Display Settings" window, the display of the curves can be changed manually, and the colors of the channels can be adjusted.

The same recording with different display settings (Offset/Division width):



0 51.102.153.204.255.306.357.408.459.951



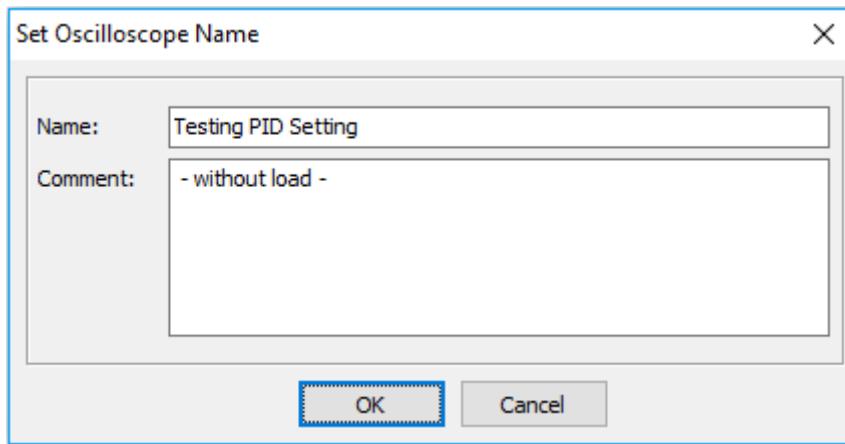
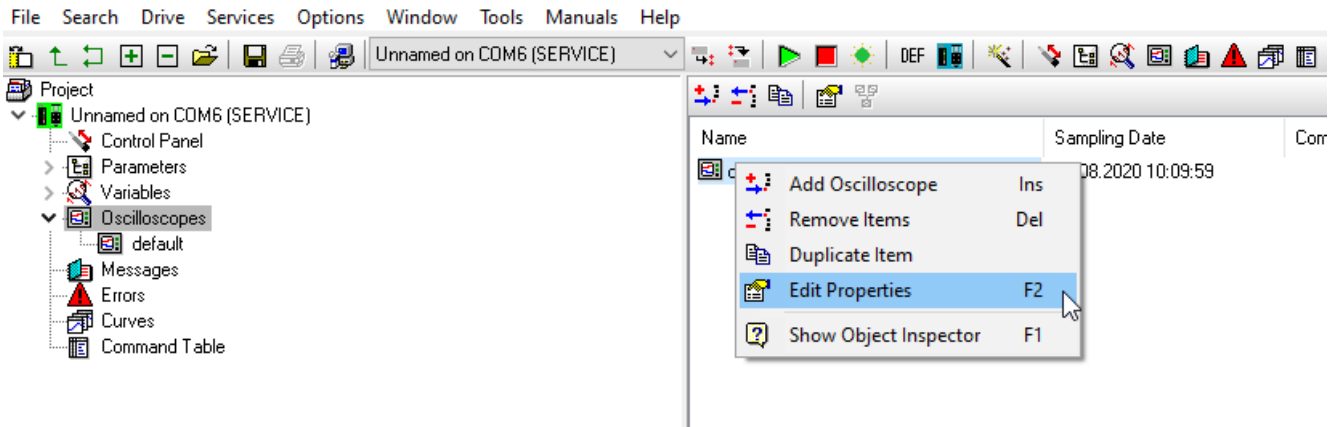
0 51.102.153.204.255.306.357.408.459.951

Time	
ms	
Offset:	Division width:
0	51.1
<input checked="" type="checkbox"/> Channel1: MC SW Overview - Actual Position [mm]	
Offset:	Division width:
22.5	7.5
<input checked="" type="checkbox"/> Channel2: MC SW Overview - Demand Position [mm]	
Offset:	Division width:
22.5	7.5
<input checked="" type="checkbox"/> Channel3: MC SW Overview - Difference Position [mm]	
Offset:	Division width:
0.025	0.0125
<input checked="" type="checkbox"/> Channel4: MC SW Overview - Demand Current [A]	
Offset:	Division width:
0.1	0.1

Time	
ms	
Offset:	Division width:
0	51.1
<input checked="" type="checkbox"/> Channel1: MC SW Overview - Actual Position [mm]	
Offset:	Division width:
-35	20
<input checked="" type="checkbox"/> Channel2: MC SW Overview - Demand Position [mm]	
Offset:	Division width:
0	20
<input checked="" type="checkbox"/> Channel3: MC SW Overview - Difference Position [mm]	
Offset:	Division width:
0.35	0.1
<input checked="" type="checkbox"/> Channel4: MC SW Overview - Demand Current [A]	
Offset:	Division width:
0.5	0.4

3.1.3 Labeling/Notes

A recording can be labeled before or after the recording. The name “Default” can be adjusted, and a comment can be added to each recording.



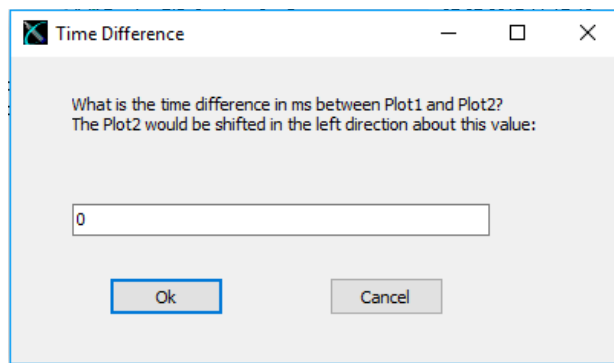
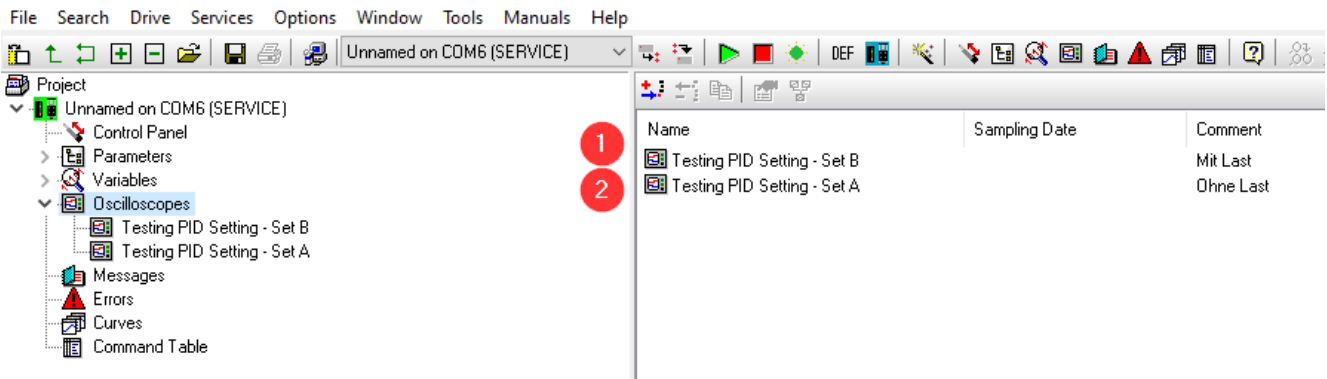
3.1.4 Comparing Two Recordings

In the LinMot-Talk Oscilloscope, two recordings with a maximum of four channels each can be compared. It is also possible to import a recording of a second axis (select Import only Oscilloscope) and then compare the recording with the current one.

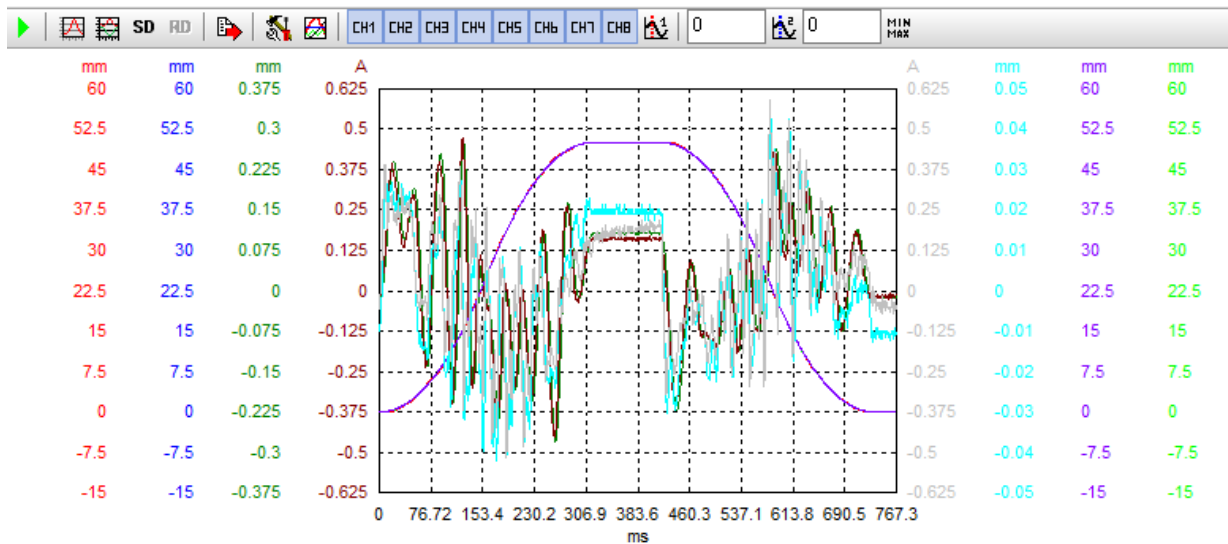


Note: By using the trigger function, it can be ensured that the two recordings begin at the same time and therefore the comparison of the data does not involve any time lag. Small deviations can still be corrected later.

Create and record two oscilloscope recordings. Then, select both in the window and use the Compare function to create a new oscilloscope.



The new oscilloscope is created automatically. Channels CH1 to CH4 are occupied by the first recording and channels CH5 to CH8 are occupied by the second recording.



- Channel**
- 1: MC SW Overview - Actual Position
 - 2: MC SW Overview - Demand Position
 - 3: MC SW Overview - Difference Position
 - 4: MC SW Overview - Demand Current
 - 5: MC SW Overview - Actual Position
 - 6: MC SW Overview - Demand Position
 - 7: MC SW Overview - Difference Position
 - 8: MC SW Overview - Demand Current

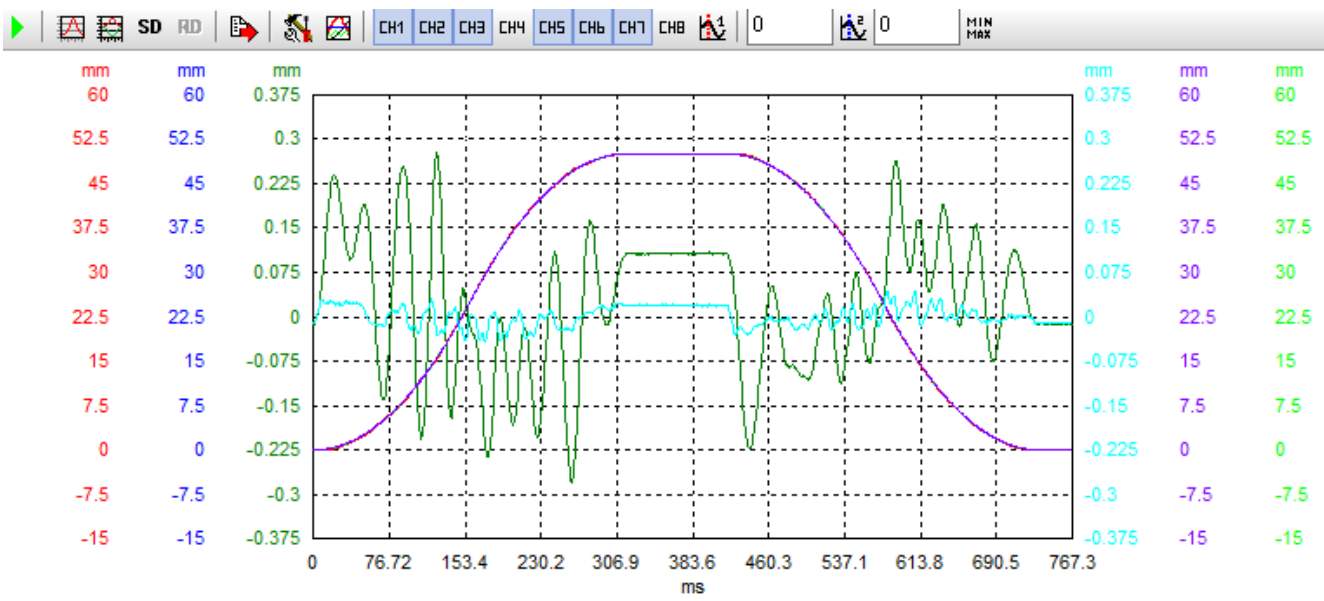
1

2

Now the irrelevant channels can be deactivated, and the scaling of the same sizes can be adjusted

<input checked="" type="checkbox"/> Channel1: MC SW Overview - Actual Position [mm] Offset: <input type="text" value="22.5"/> Division width: <input type="text" value="7.5"/>	<input checked="" type="checkbox"/> Channel5: MC SW Overview - Actual Position [mm] Offset: <input type="text" value="22.5"/> Division width: <input type="text" value="7.5"/>
<input checked="" type="checkbox"/> Channel2: MC SW Overview - Demand Position [mm] Offset: <input type="text" value="22.5"/> Division width: <input type="text" value="7.5"/>	<input checked="" type="checkbox"/> Channel6: MC SW Overview - Demand Position [mm] Offset: <input type="text" value="22.5"/> Division width: <input type="text" value="7.5"/>
<input checked="" type="checkbox"/> Channel3: MC SW Overview - Difference Position [mm] Offset: <input type="text" value="0"/> Division width: <input type="text" value="0.075"/>	<input checked="" type="checkbox"/> Channel7: MC SW Overview - Difference Position [mm] Offset: <input type="text" value="0"/> Division width: <input type="text" value="0.075"/>
<input type="checkbox"/> Channel4: MC SW Overview - Demand Current [A] Offset: <input type="text" value="0"/> Division width: <input type="text" value="0.125"/>	<input type="checkbox"/> Channel8: MC SW Overview - Demand Current [A] Offset: <input type="text" value="0"/> Division width: <input type="text" value="0.125"/>

As an example, the following errors of the two recordings will be compared. In this view it is now clearly visible that the following error of the second configuration is significantly smaller than in the first recording. The channels (CH4 and CH8) of the demand current are deactivated from both recordings to improve the overview.



- Channel**
- 1: MC SW Overview - Actual Position
 - 2: MC SW Overview - Demand Position
 - 3: MC SW Overview - Difference Position
 - 4: MC SW Overview - Demand Current
 - 5: MC SW Overview - Actual Position
 - 6: MC SW Overview - Demand Position
 - 7: MC SW Overview - Difference Position
 - 8: MC SW Overview - Demand Current

3.2 Tools

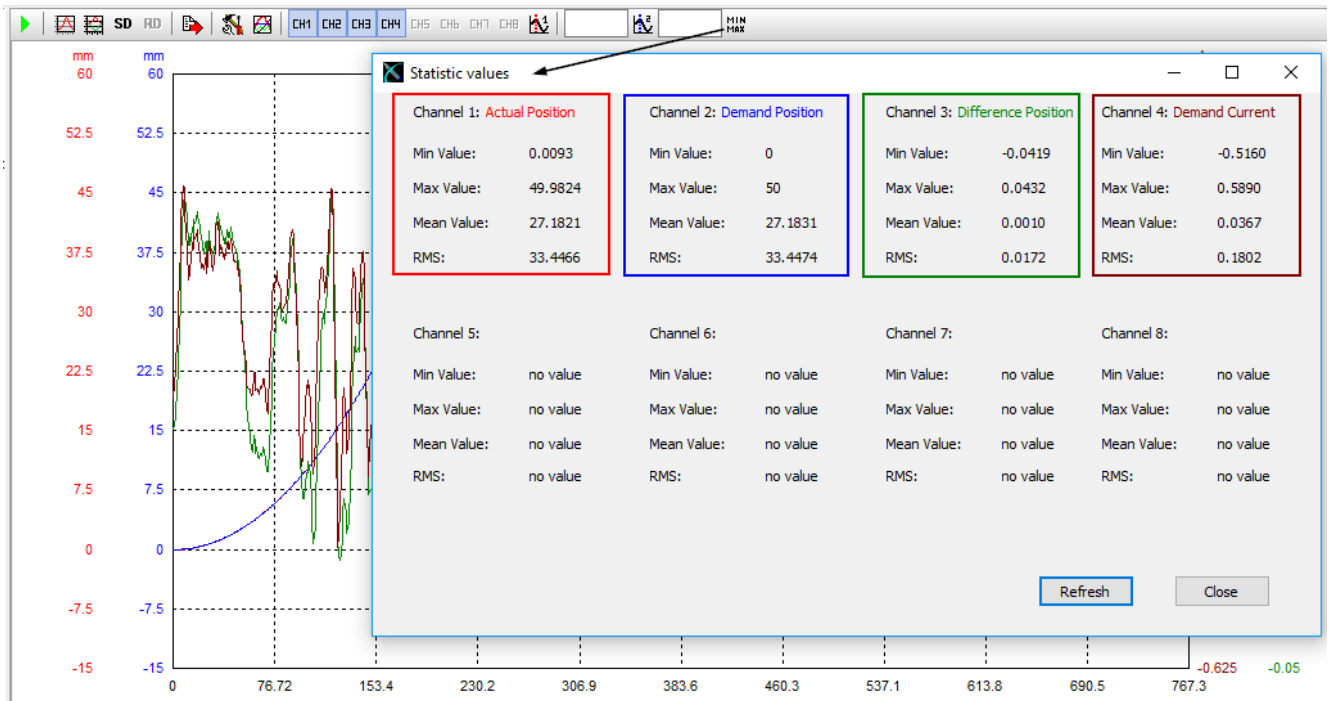
3.2.1 Cursor

Two cursors are available. The cursor can be moved on the X-axis with the mouse by clicking and dragging on the line. The data is displayed below the oscilloscope. Further data, such as the difference between the two cursors (cursor 2 - cursor 1) and the time between the two cursors are read out.

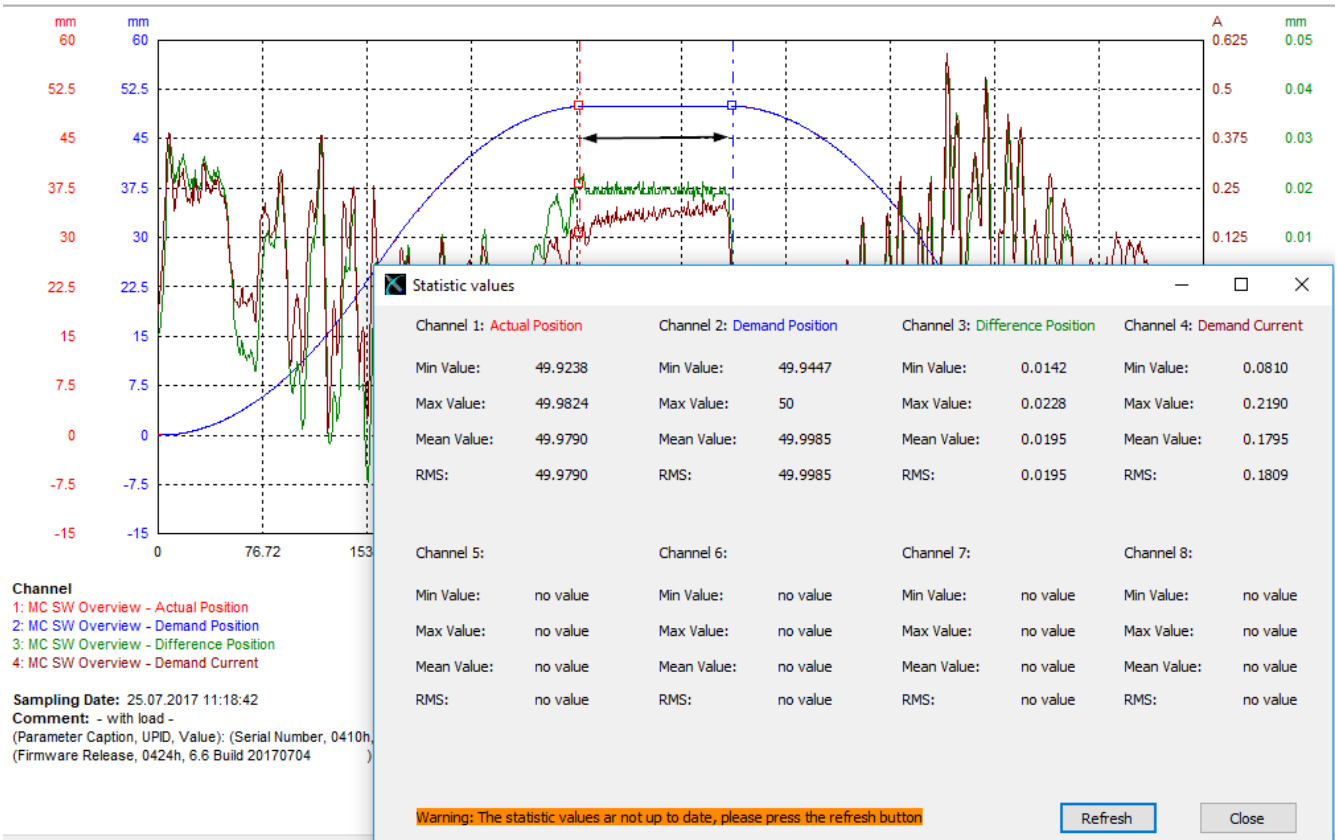


3.2.2 Min/Max/Mean/RMS Values

In the statistics, the minimum value (“Min”), maximum value (“Max”), mean value (“Mean”) and effective value (“RMS”) are calculated. The evaluation shows the values of the individual channels. If no cursor is activated, the calculations are made for the values over all displayed data points.



You can use the cursor to restrict the range for statistics. If you move the cursor 1 and/or cursor 2 horizontally, you must update the calculations by using the refresh button.



3.2.3 Display Settings

Display

Time:

Offset: Division width:

Channel1: MC SW Overview - Actual Position [mm]
 Offset: Division width:

Channel2: MC SW Force Control - Measured Force [N]
 Offset: Division width:

Channel3: MC SW Force Control - Target Force [N]
 Offset: Division width:

Channel4: MC SW Overview - Demand Current [A]
 Offset: Division width:

Channel5: MC SW Overview - Demand Velocity [m/s]
 Offset: Division width:

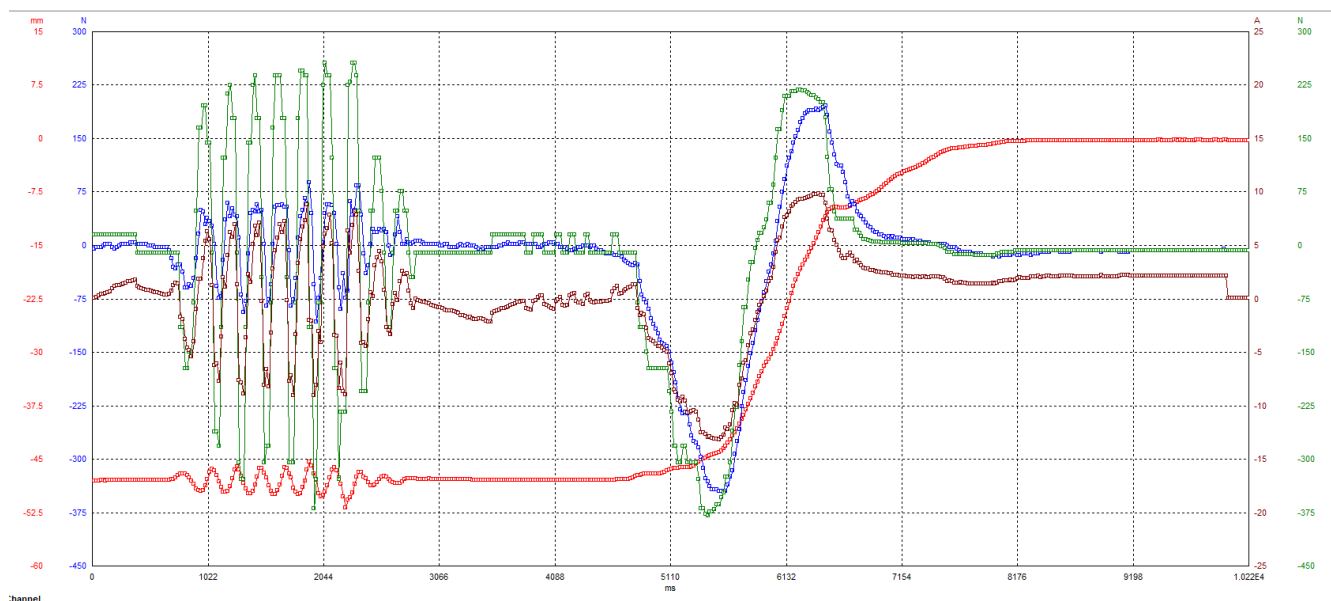
Channel6: MC SW Overview - Actual Velocity [m/s]
 Offset: Division width:

Channel7: MC SW Overview - Demand Acceleration [m/s²]
 Offset: Division width:

Channel8: MC SW Overview - Difference Velocity [m/s]
 Offset: Division width:

Show the Graph with a Line or with Setpoints:

1. "Display Settings" – "Display": Graph Display Options
- Line
 - Setpoints
 - Line and Setpoints



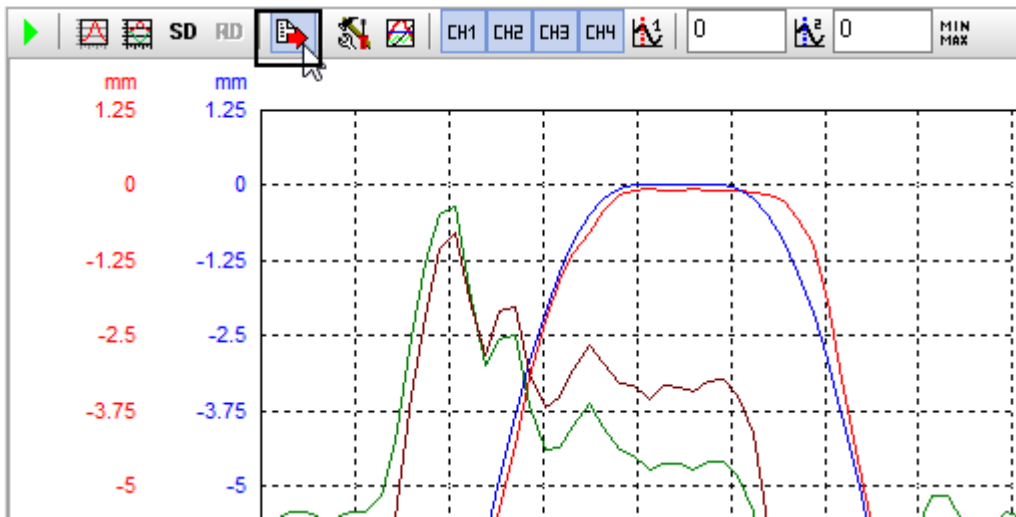
3.3 Export

3.3.1 Export Recording

The recordings can be exported and processed in different ways which are shown in the following chapters.

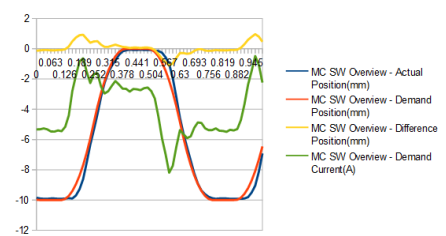
3.3.2 Exporting Data (.csv)

With Data Export the support points are exported to a CSV file.

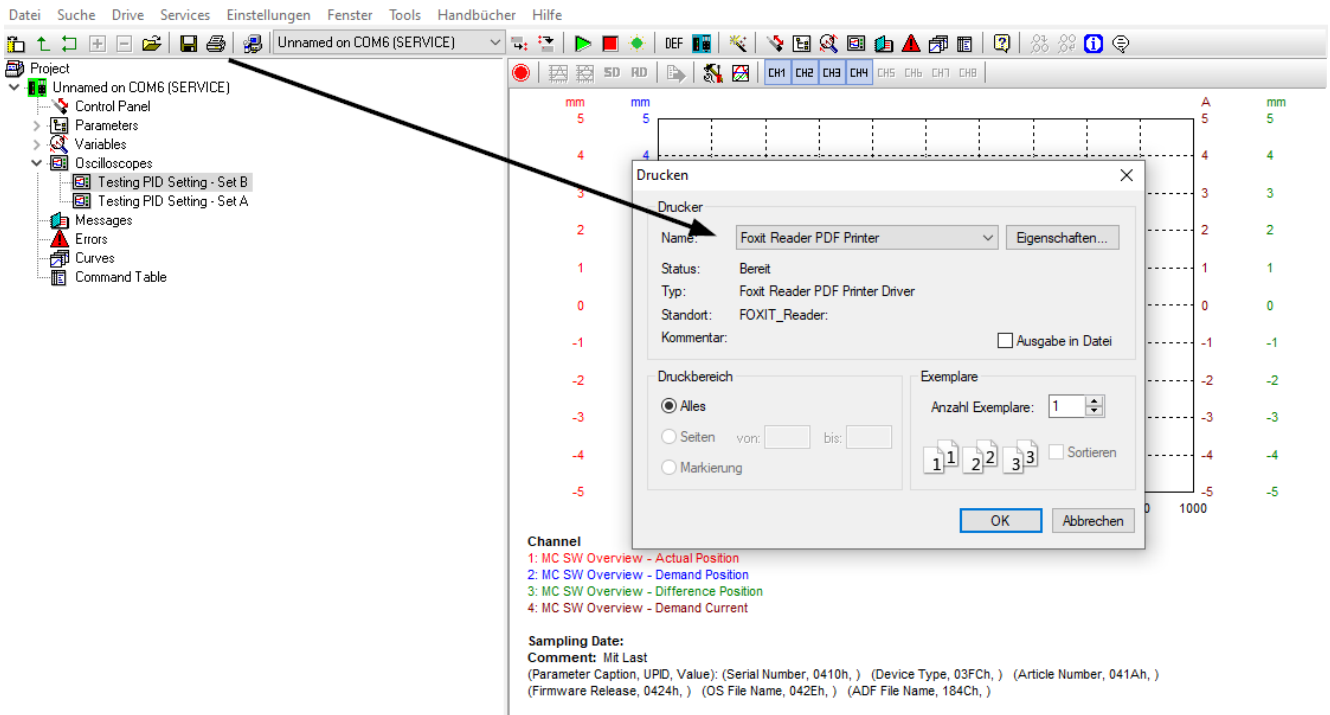


The created CSV file can then be opened and edited with a table editing program (Excel, Calc..). In the first column is the time reference and in the following columns the individual channels are displayed.

A	B	C	D	E	F	G	H	I	J	K	L	M
Time(s)	MC SW Overview - Actual Position(mm)	MC SW Overview - Demand Position(mm)	MC SW Overview - Difference Position(mm)	MC SW Overview - Demand Current(A)								
1	0	-9.8517	-9.9803	-0.1286	-5.33							
2	0.01575	-9.8956	-10	-0.1044	-5.323							
3	0.0315	-9.9182	-10	-0.0818	-5.263							
4	0.04725	-9.9182	-10	-0.0818	-5.324							
5	0.063	-9.8968	-10	-0.1032	-5.463							
6	0.07875	-9.8974	-10	-0.1026	-5.474							
7	0.0945	-9.9182	-10	-0.0818	-5.399							
8	0.11025	-9.9182	-9.9994	-0.0812	-5.45							
9	0.126	-9.8968	-9.9246	-0.0278	-5.164							
10	0.14175	-9.8749	-9.7258	0.1491	-4.418							
11	0.1575	-9.8968	-9.4029	0.4939	-2.779							
12	0.17325	-9.6979	-8.956	0.7419	-1.76							
13	0.189	-9.2859	-8.3851	0.9008	-0.835							
14	0.20475	-8.6181	-7.5902	0.9279	-0.629							
15	0.2205	-7.5299	-6.8712	0.6587	-1.51							
16	0.23625	-6.3293	-6.9282	0.4011	-2.265							
17	0.252	-5.3497	-4.863	0.4867	-1.673							
18	0.26775	-4.3274	-3.8257	0.5017	-1.615							
19	0.2835	-3.1842	-2.9127	0.2715	-2.499							
20	0.29925	-2.2467	-2.1238	0.1229	-2.956							
21	0.315	-1.5881	-1.4591	0.129	-2.805							
22	0.33075	-1.123	-0.9186	0.2044	-2.448							
23	0.3465	-0.7782	-0.5025	0.2757	-2.13							

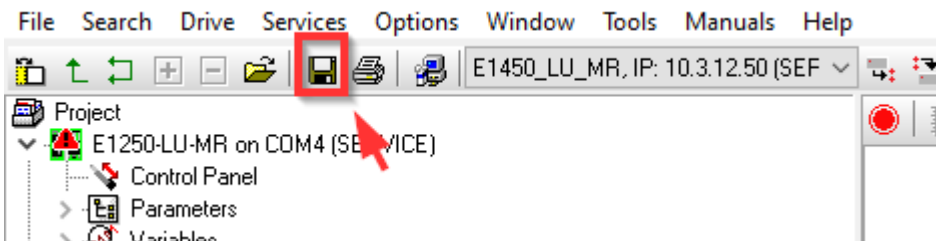


3.3.3 Printing Data (e.g. with .pdf printer)



3.3.4 Records for Support Requests

For support requests, please save the entire configuration via "File" -> "Save". All oscilloscope recordings are also saved. In offline mode, the recording can then be evaluated with LinMot Talk at any time.



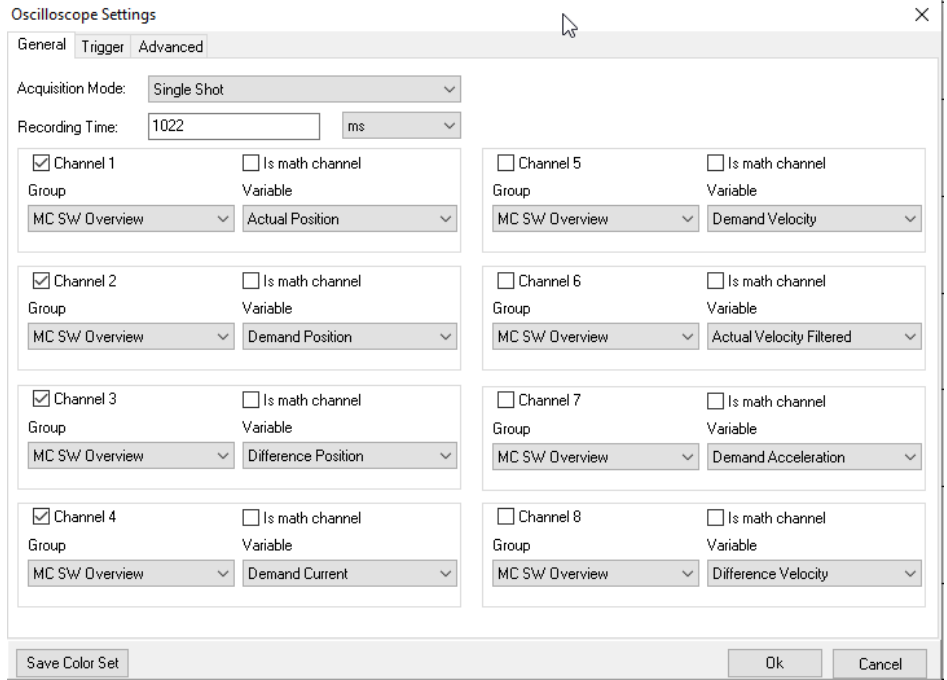
4 Practical Examples

4.1 Trigger – Error

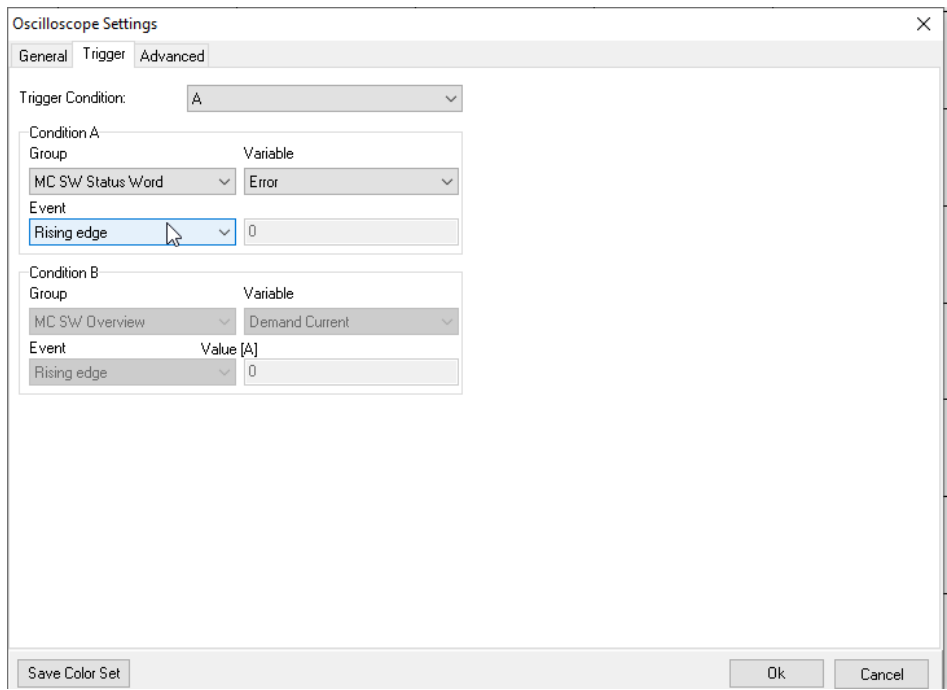
In this example, an oscilloscope is configured so that recording is triggered in the event of an error. To see the course of events that could have led to the error, a recording lead is additionally defined in the form of a pre-trigger.

4.1.1 Settings

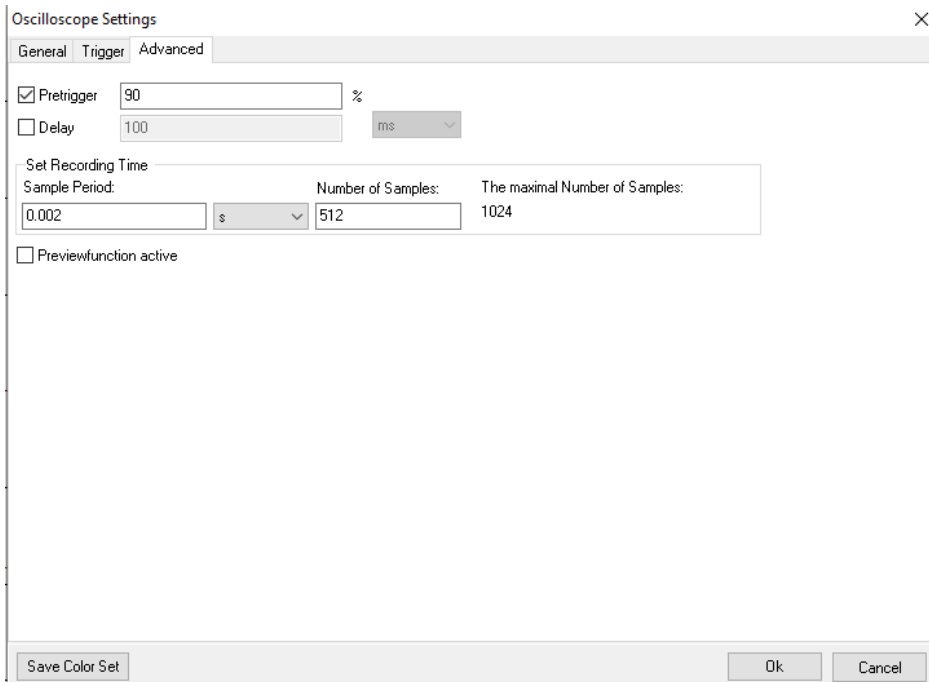
a. “Oscilloscope Settings” – “General”



b. “Oscilloscope Settings” – “Trigger”

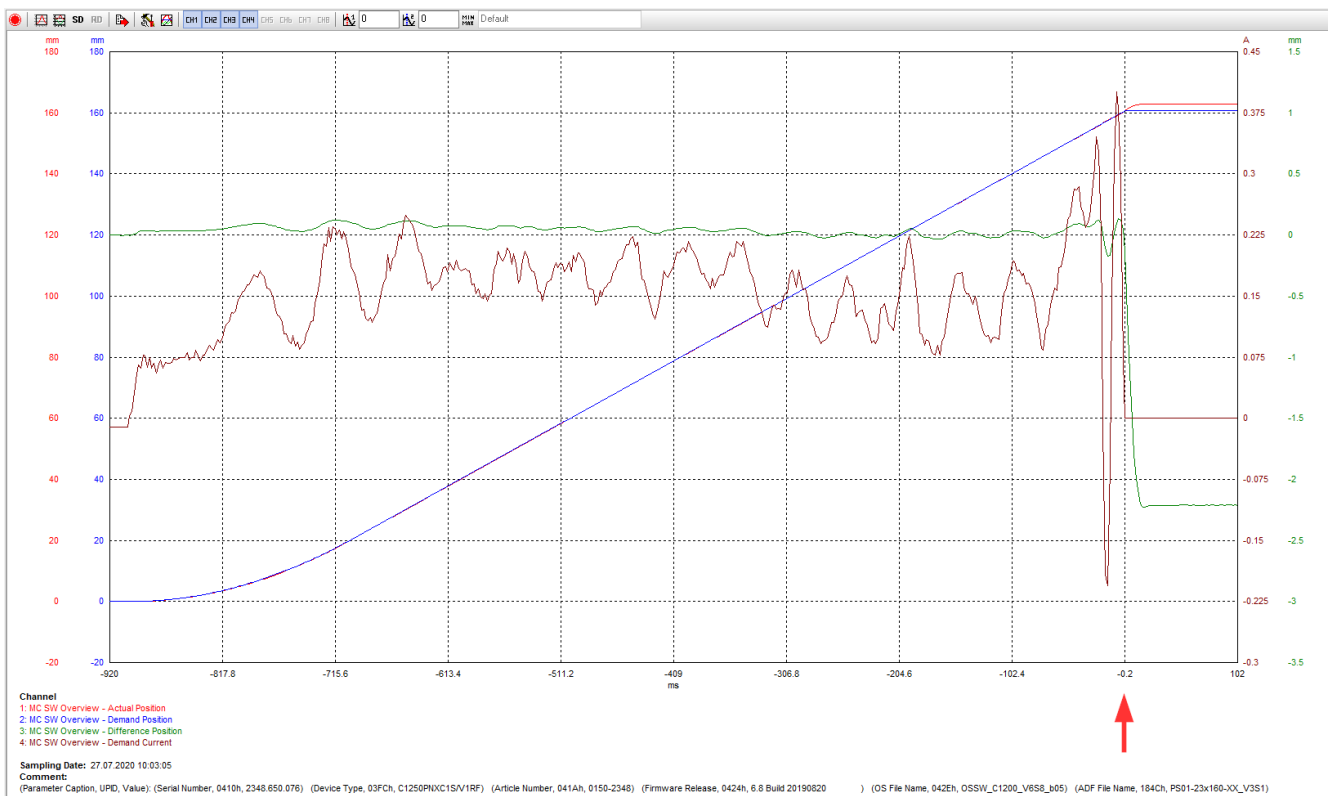


c. "Oscilloscope Settings" – "Advanced"



4.1.2 Result

The red arrow marks the time of the trigger. There the recording was started by the error, and 90% of the data collected occurred before this trigger due to the pre-trigger of 90%. This allows you to record a possible reason for an error state if the variables are selected correctly.

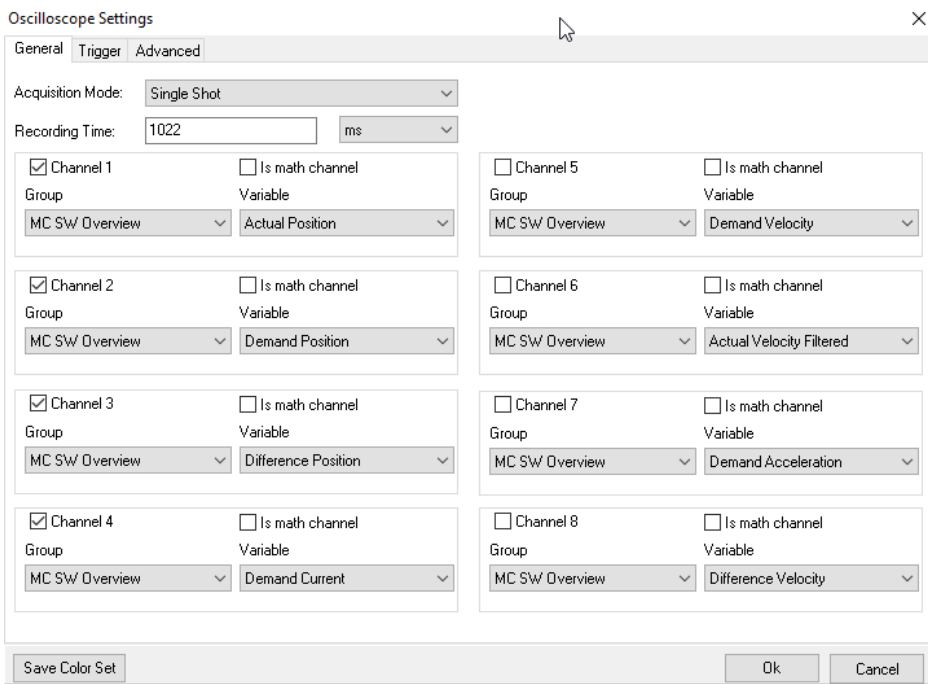


4.2 Trigger – Position

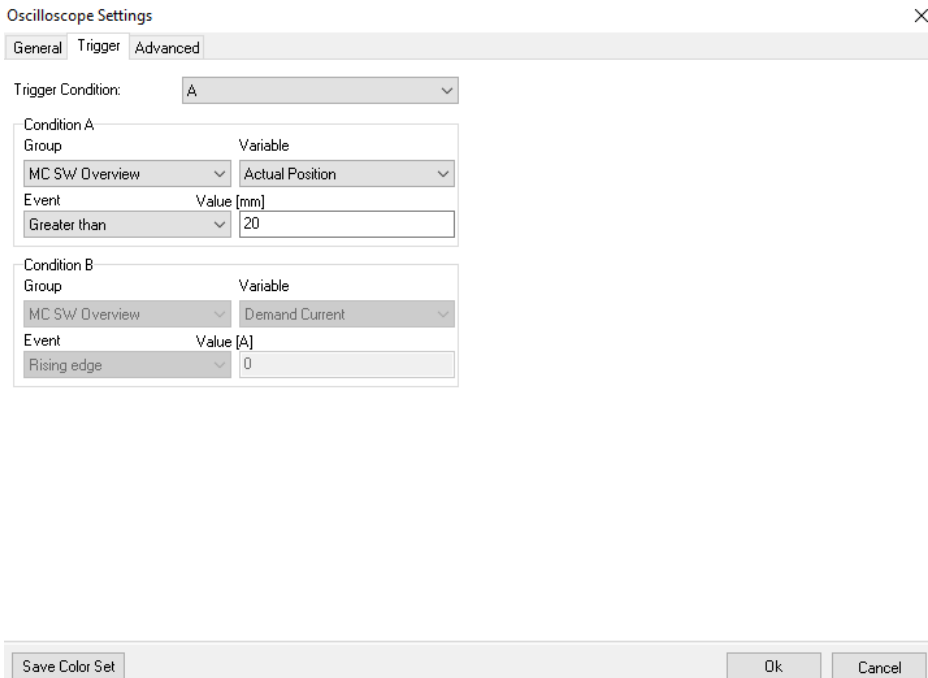
Sometimes, it may be necessary to limit the recording range to avoid losing many data points to curves of less importance.

4.2.1 Settings

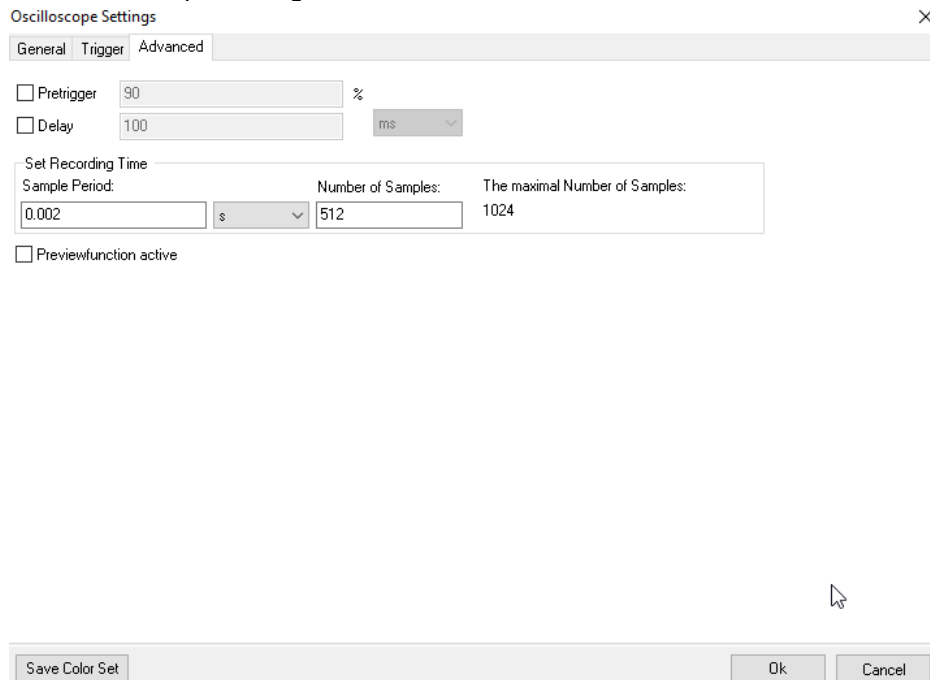
a. “Oscilloscope Settings” – “General”



b. “Oscilloscope Settings” – “Trigger”

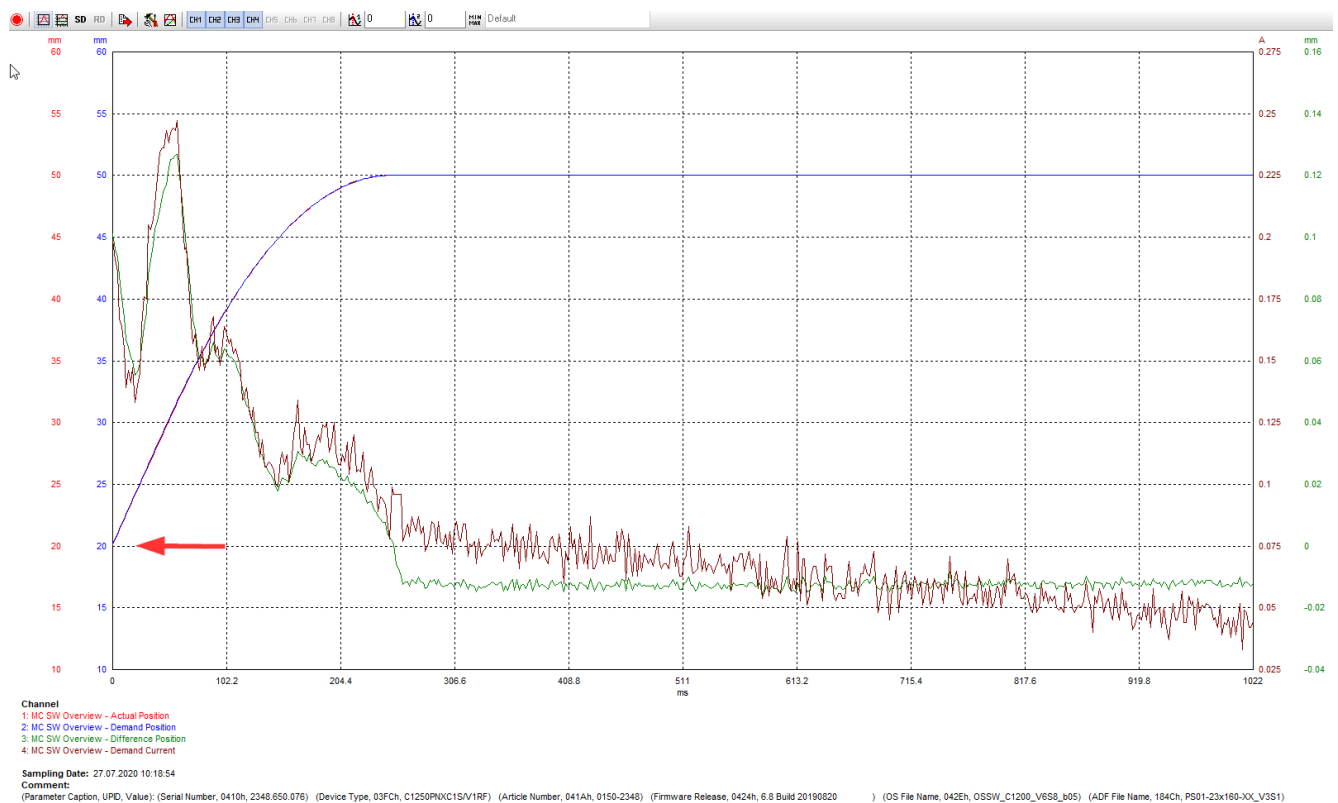


c. "Oscilloscope Settings" – "Advanced"



4.2.2 Result

The red arrow marks the trigger condition "Greater Than 20mm". As soon as the actual position has become larger than 20mm, the recording was started. This method can be used to limit a recording range if necessary.

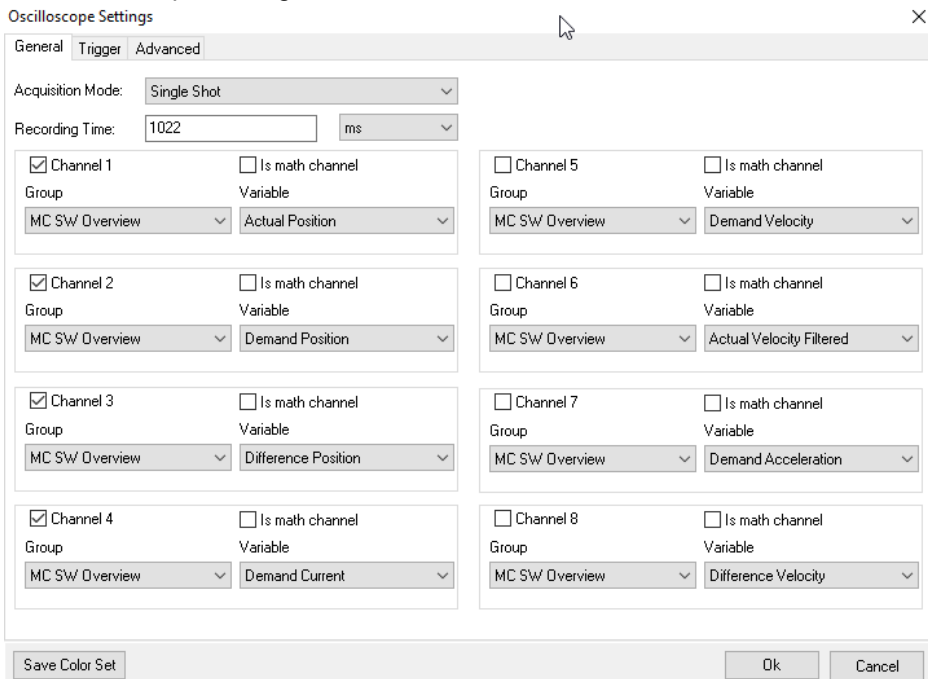


4.3 Trigger – Motion Active

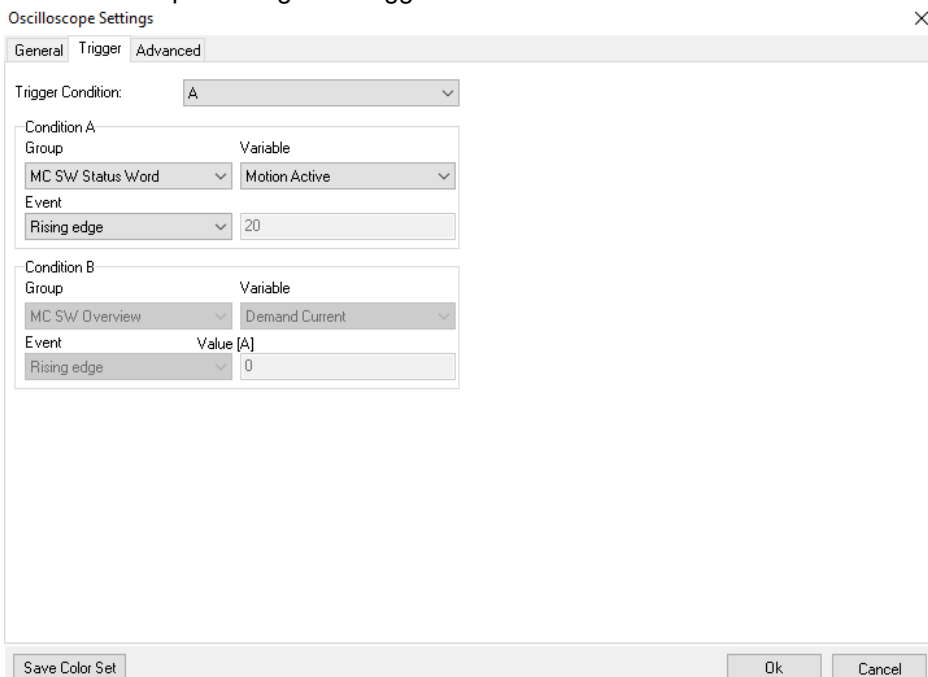
In some cases, you may want to have a recording start automatically as soon as motion starts.

4.3.1 Settings

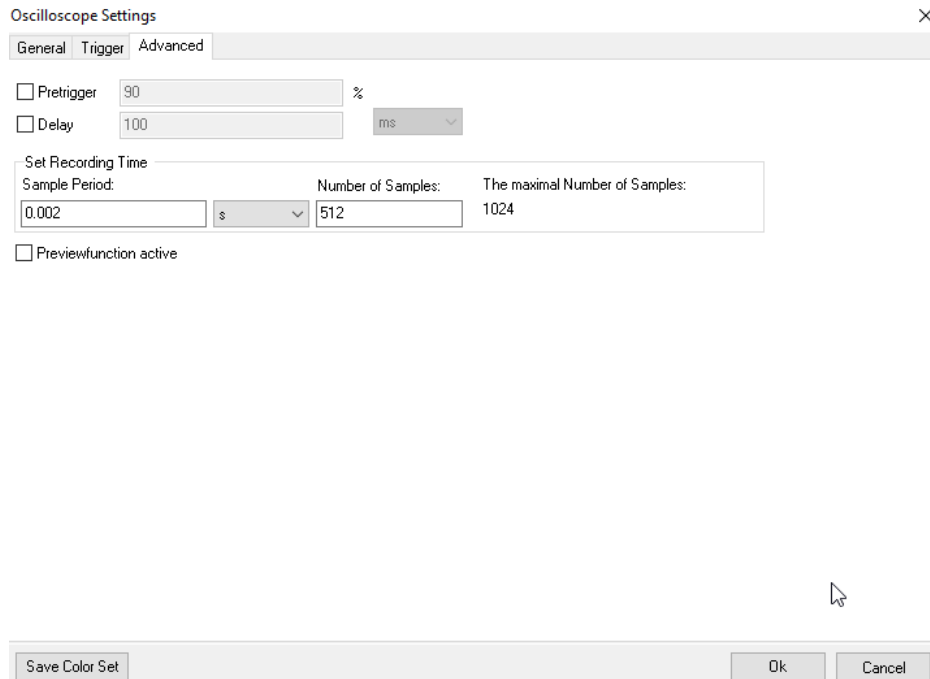
a. “Oscilloscope Settings” – “General”



b. “Oscilloscope Settings” – “Trigger”

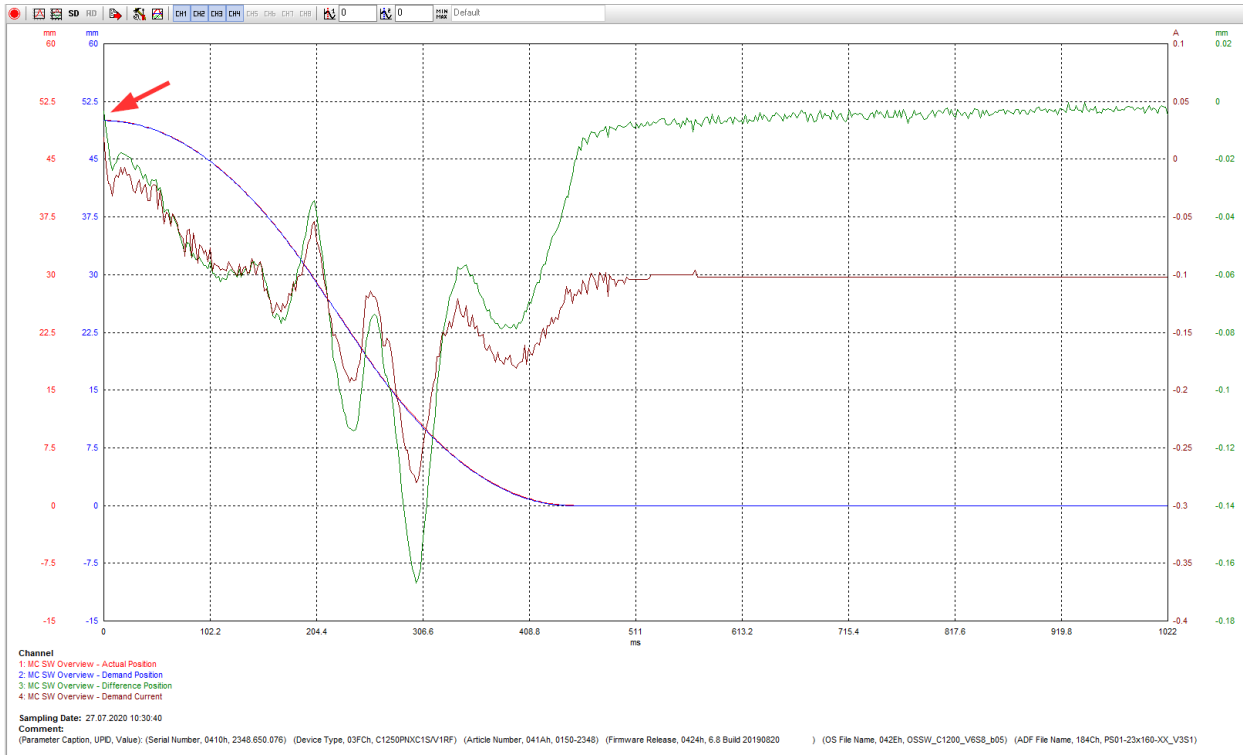


c. "Oscilloscope Settings" – "Advanced"



4.3.2 Result

The red arrow shows the point at which the motor started to move.



5 Document Version

Version	Date	Author	Description
1V0	01.05.2017	mm	Initial Version
1V1	17.05.2018	mm	Chapter 1.4.3 added
1V2	30.05.2018	mm	Update to version LT6.7
1V3	11.08.2020	mr	Update to version LT6.9, samples added

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Note

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