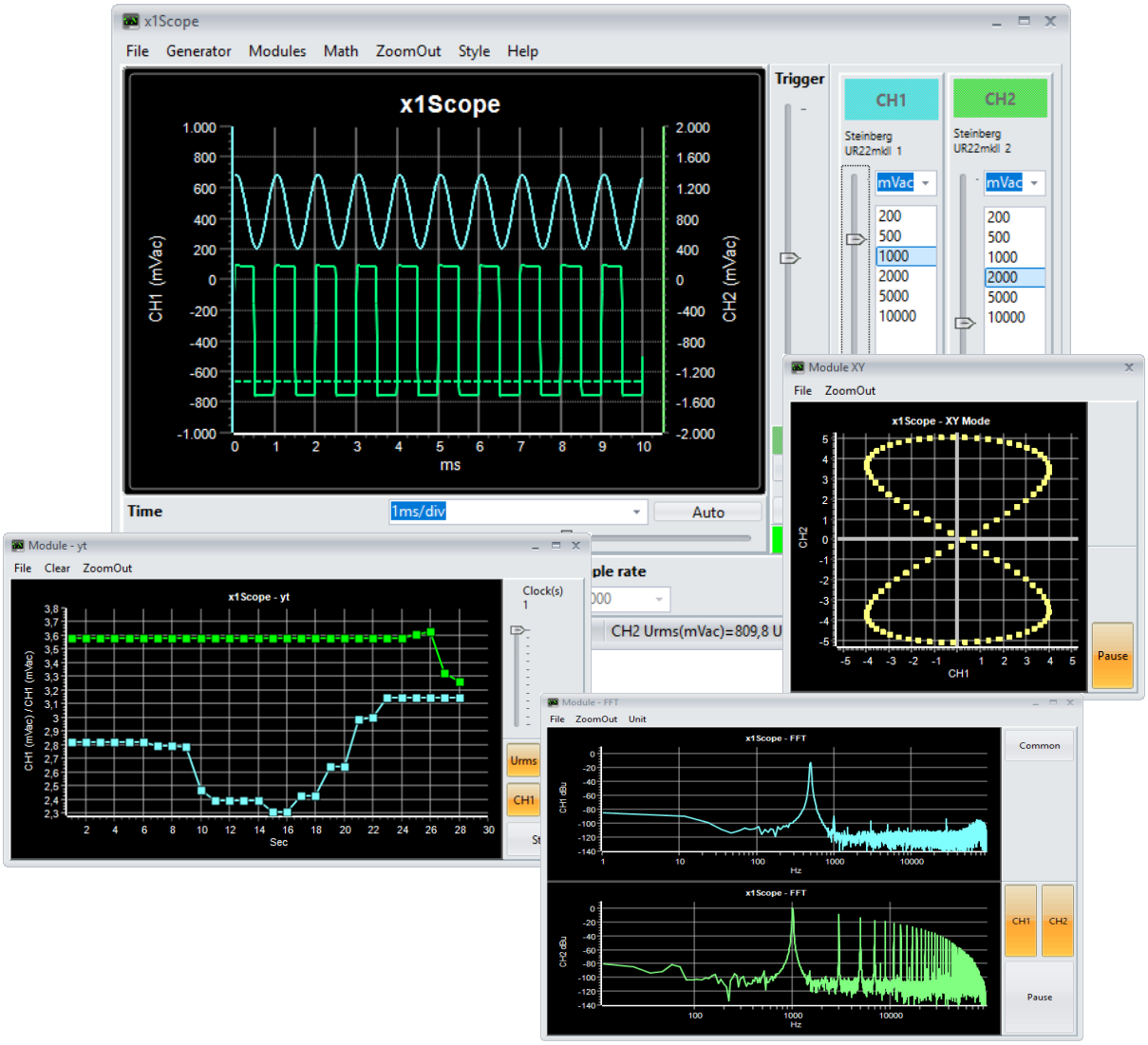
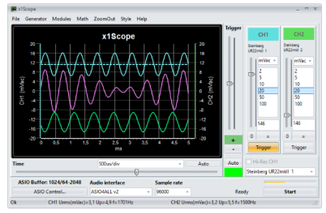


x1Scope

Oscilloscope – FFT – yt – XY – Generator

STUTE Engineering

1 Features



- Max. Resolution 192kHz (x axes) 32bit (y axes)
- 2 channel oscilloscope
- 2 channel yt-Logger: Voltage and Frequency
- 2 channel FFT Spectrum
- XY view (Lissajous-figures)
- Channel mathematics
- Zoom In / Out
- Voltmeter: Measurement per channel of effective value, peak value, and frequency
- Integrated low distortion 2-channel sine wave generator (max 32bit)
- Saving measurement diagrams from all modules
- “Active Viewer” function for viewing saved measurement diagrams
- Exporting measurement diagrams as BMP files
- Copying measurement diagrams to the clipboard (applies to all modules)

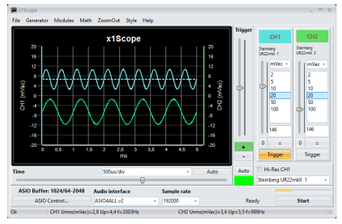
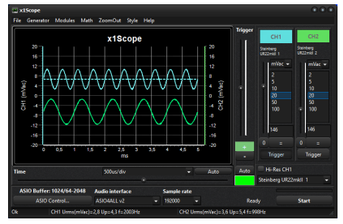
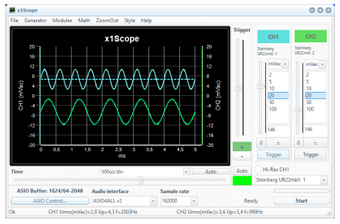
With x1Scope and a standard audio interface, you get a powerful oscilloscope with many additional functions. External USB audio interfaces with input gain controls for the 2 input channels are best suited.

1.1 Download / DEMO

You get the software as a demo/full version from our download page. You need administrator rights to run the setup file.

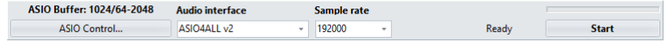
1.2 Styles

The user interface is available in 3 colour styles.

2 Measurement

- Select first an audio interface
- Choose the sample rate, recommended 96000Hz
- Check the ASIO buffer size. It must be 1024 or higher. If necessary, change it using the “ASIO Control” button.



The AC voltage is applied via the sound card inputs (channel 1 = CH1 and channel 2 = CH2).
Important: Observe the maximum permissible input voltage of the sound card and its conditions.

Press the “Start” button to start the measurement with the oscilloscope. This is also the basis for the FFT, yt-Logger, and XY modules measurement.

3 Function modules

3.1 Oscilloscope

Display alternating voltage signals over time.

3.2 Module FFT

FFT Frequency spectrum of the signals from channel 1 and/or channel 2.

3.3 Module yt-Logger

The yt data logger measures the voltage (Urms) or frequency (Hz) from channel 1 and/or 2 at the set time interval.

3.4 Module XY

The XY module views Lissajous-figures.

3.5 Generator

The generator produces sine wave signals. The output is on channel 1 and/or 2. The level is variable.

3.6 Active Viewer

With the “Active Viewer,” you can view the stored measurement diagrams for the oscilloscope, FFT module, YT module, and XY module.

4 Mouse gestures

You can navigate the measurement diagrams of the modules as follows.

4.1 Zoom

- Zoom In: Drag a rectangle from **left to right** around the area of interest with the mouse
- Zoom Out: Press the “Zoom Out” button or drag any rectangle from **right to left**

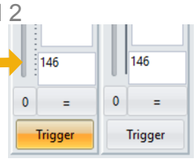
4.2 Scroll

- Press and hold the right mouse button in the diagram
- Move the mouse to move the zoomed diagram section up/down and left/right

5 Calibrate voltage measurement

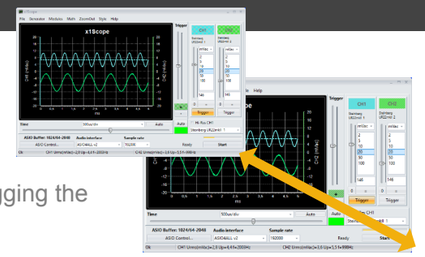
To ensure that the correct values are displayed when “mV” is selected in CH1 (channel 1) or CH2 (channel 2), x1Scope must be calibrated as follows:

- Select the unit “Fs%” in CH1 and CH2
- Start the “Generator” in x1Scope, frequency 100Hz, level -6dB
- Measure the voltage at the output of the sound card with an AC voltmeter at output 1 and output 2
- If not already done, connect input 1 and 2 of the sound card to outputs 1 and 2
- Enter the measured value in mV in CH1 and CH2 from step 3
- Press the “=” button in CH1. Press the “=” button in CH2.



The calibration is now complete. **After calibration do not change any settings at the gain level of the audio interface!**

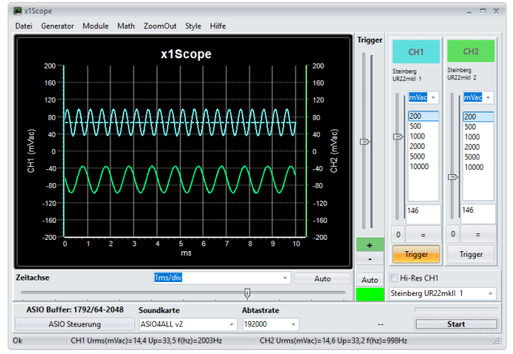
6 Operation



6.1 Scale screen size

The size of the screen can be changed by clicking and dragging the corners (except for module XY).

6.2 Oscilloscope



The module displays graphically the measured AC signal from the two audio interface inputs. Use the time base to set the scale for the x-axis and the voltage range to set the scale for the y-axis.

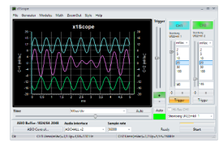
6.2.1 Menu

File	Description
Save (Scope)	Save current oscilloscope view (display with Active Viewer)
Open	Open the “Active Viewer” module and display the measurement diagram “Oscilloscope (file extension x1s)”, “FFT (x1f)”, “XY (x1x)” or “yt (x1y)”.
Export as BMP	Export current view of the oscilloscope as a bitmap file
Clipboard	Copy the current view of the oscilloscope to the clipboard
Close	Close x1Scope and all modules

Generator	Decription
Generator	View Sinus Generator module

Modules	Description
yt-Logger	View module yt-Logger
XY	View module XY
FFT	View module FFT

Math	Description
Reset	Delete diagram from mathematical calculation
CH1-CH2	Calculation CH1-CH2. Displayed as third measurement curve in pink. Y scaling via CH1 settings.
CH2-CH1	Calculation CH2-CH1. Displayed as third measurement curve in pink. Y scaling via CH1 settings.
CH1+CH2	Calculation CH1+CH2. Displayed as third measurement curve in pink. Y scaling via CH1 settings.

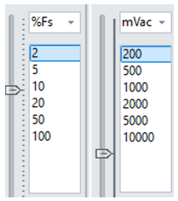


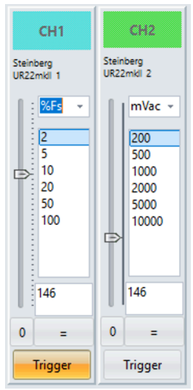
ZoomOut	Description
ZoomOut	Display measurement curve in full

Style	Description
Style	Switch the color scheme of the program interface per click

Help	Description
Help PDF	Display PDF instructions for x1Scope from the Internet. PDF Reader SW must be installed.
Info	Show x1Scope program version & installation key

6.2.2 CH1 / CH2 (Audio interface 1 & 2)

	Description
CH1	Turn channel CH1 (channel 1) on/off
CH2	Turn channel CH2 (channel 2) on/off
%Fs or mVac	Unit y axis: %Fs: Percent Fs (Full Scale), value range -100..0..+100 mVac: Millivolt AC, value range depends on audio interface and calibration
	Y-axis scaling The value shown corresponds to the positive and negative maximum values of the y-axis. Example 200 => -200..0..+200
	Millivolts AC used to calibrate the y-axis unit “mVac”
Vert. slider	Shift measurement curve CH1 or 2 horizontally
Button “0”	Set measurement curve CH1 or CH2 to y-value “0”
Button “=”	Calibrate y-axis CH1 or CH2 (voltage mVac). Enter the AC measured value in mV in the query window (see Chapter 4).
Button “Trigger”	Trigger on CH1 or CH2



6.2.3 Time base

	Description
Slider & Listbox	Scale time axis in fixed ms/div or us/div steps
Auto	Select automatic x scaling for the input signal

6.2.4 Trigger

Function	Description
Vert. Slider	Trigger level for the selected channel CH1 or CH2 (see trigger button under CH1 or 2)
Button “+”	Trigger on positive edge at the selected trigger level
Button “-”	Trigger on negative edge at the selected trigger level
Button “Auto”	Automatically determine trigger for input signal
Colored rectangle	Scope triggers on input signal. Measurement diagram display Scope does not trigger. No measurement diagram display!

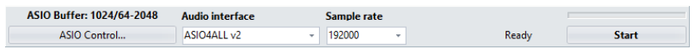
6.2.5 Hi-Res

Hi-Resolution Mode improves the display of the measurement curve for sine signals with a frequency with few sampling points (e.g., frequency signal greater than 0.25 x sampling rate).

Bsp: 10kHz, fs=44,1kHz, Hi-Res Off 10kHz Signal, fs=44.1kHz, Hi-Res On

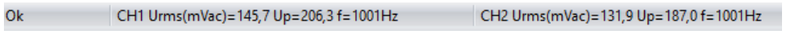
	Description
Hi-Res	Selected: Function active, the selected channel CH1 or CH2 is displayed Note: The function can only be selected from 1kHz and above
Channel listbox “CH1 xxx” or “CH2 xxx”	Select which channel should be displayed in Hi-Res Mode

6.2.6 „Start“ measurement, Setup audio interface



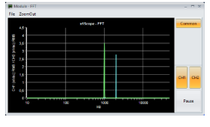
	Description
ASIO Buffer	Displays the currently selected buffer size in bytes and the possible range. 1024 bytes or higher are required for smooth operation!
ASIO Control	Opens via a form the ASIO control panel. Change the ASIO buffer size here if necessary. Follow the shown instruction. Note: Do not change the sample rate here.
Audio interface	Select sound card. Only sound cards with ASIO drivers or those that work with ASIO4ALL are supported.
Sample rate	Setting the sampling rate. Note: A countdown to 0 runs when changing settings. Measurements can then be taken.
“Ready”	Status message, such as countdown to change of sampling rate
Button “Start”	Start / Stop measurement

6.2.7 Footer / Measurements

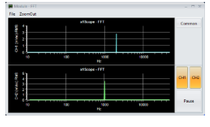


	Description
Ok	Status messages, please note
CH1 / 2	Urms = RMS Voltage, unit mVac or %Fs Up = Peak value, unit mVac or %Fs f(Hz) = Frequency in Hertz

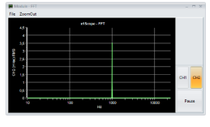
6.3 Module „FFT“



View: “Common =On” (CH1+2 in one diagram)



“Common off” (two diagrams)



Only one channel

The “FFT” module displays the frequency spectrum for the signals from the oscilloscope measurement of CH1 and/or CH2.

6.3.1 Menu

File	Description
Save (FFT)	Save FFT diagramms to file (view in Active Viewer). FFTs from CH1 and CH2 are saved in separate files. The second FFT is given the name extension “_ 2”. Example: CH1 “Test.x1f”, CH2 “Test_2.x1f”
Clipboard FFT 1	Copy the first/top FFT view to the clipboard
Clipboard FFT 2	Copy the lower FFT view to the clipboard, if available (see image above “Common” mode off).
Close	Close FFT module

ZoomOut	Description
ZoomOut	Display measurement curve in full

Unit	Description
mV, dBu, dBV	Change the unit of the y axes. Default: mV

6.3.2 Controls

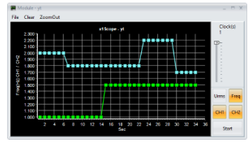
Buttons	Description
Common	Enabled: Display FFT from CH1 and 2 in one graph Disabled: Display FFT from CH1 and CH2 in two graphs
CH1 / CH2	Channel CH1 or CH2 enable / disable
Pause	Pause FFT measurement even if the scope continues to acquire data

Please note:

- For the best FFT display, the time axis is preset to 10 ms/div. Please do not change this setting while the FFT display is running.
- In the oscilloscope view, you can zoom in on the scope view using the mouse gestures

described above if necessary.

6.4 Module „yt-Logger“



The “yt-Logger” module cyclically acquires the measured values from CH1 and/or CH2 (amplitude or frequency) and adds them to the measurement curve of the data logger. The clock rate starts at 1 second.

6.4.1 Menu

	Description
Save yt	Save diagram to file (view in Active Viewer)
Clipboard	Copy diagram to clipboard
Close	Close modul yt-Logger

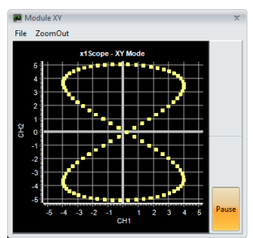
ZoomOut	Description
ZoomOut	Display measurement curve in full

Clear	Description
Clear	Delete measurement, set time to 0

6.4.2 Controls

	Description
Clock(s) / Slider	Measurement cycle in seconds
Start / Stop	Start / Stop recording
CH1 / CH2	Perform recording for CH1 and/or CH2
Urms	Recording voltage from CH1 and/or CH2
Freq	Recording frequency from CH1 and/or CH2

6.5 Module „XY“



The XY module displays Lissajous figures. These are graphs created by the superposition of two harmonic oscillations at right angles to each other. The shape of the figures allows precise conclusions to be drawn about the frequency and phase of the two voltages.

6.5.1 Menu

	Description
Save XY	Save chart to file (View with Active Viewer)
Clipboard	Copy chart to clipboard
Close	Close module XY

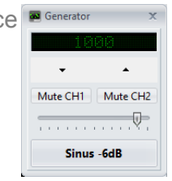
ZoomOut	Description
ZoomOut	Display measurement curve in full

6.5.2 Control

Button	Descriptions
Pause	XY Darstellung pausieren, auch wenn das Scope weiter Daten erfasst

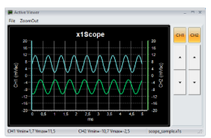
6.6 Generator

The generator outputs sine wave signals via the stereo outputs of the audio interface . The output can be limited to channel 1 or 2. The level corresponds to the dB full scale of the audio interface D/A converter. If the sound card has its own level controls for the output, the level can also be changed using these.



	Description
Button “Up / Down”	Change frequency • Below 100Hz in 10Hz increments • In the range 100Hz to 1000 Hz in 100Hz increments • Above 1000Hz in 1000Hz increments
Button Mute CH1 / CH2	Mute output CH1 or CH2 or both
Level slider	Change output level (digital)
Button “Sinus”	Start / Stop sine output. dB value for signal in dbFs (Full scale)

6.7 Module „Active Viewer“



You can view saved diagrams from the oscilloscope, FFT module, YT module, and XY module later using Active Viewer. You can zoom in on the graphic using mouse gestures, hide individual channels, or move them horizontally using the arrow keys.

6.7.1 Menu

File	Description
Clipboard	Copy diagramms to clipboard
Close	Close module

ZoomOut	Description
ZoomOut	Display measurement curve in full

6.7.2 Controls

Buttons	Description
CH1 / CH2	Disable / enable channel 1 or 2 view
Up / Down	Move channel horizontal

7 Technical specifications

7.1 Measurement

- X axes sample rate 44,1kHz/48kHz/96kHz/192kHz (depends on audio interface spec.)
- Y axes 16bit, 24bit, 32bit (depends on audio interface spec.)
- Qty. I/O channels: 2
- Time base: 5us/Div to 10ms/Div with 10 Div
- Voltage:
  - Unit %Fs (Full Scale A/D converter): 2, 5, 10, 20, 50, 100
  - Unit mVac: Alternating voltage in mV. Depends on the settings (line control) of the audio interface and calibration.
  - AC input voltage range depending on the sound card, e.g.
    - Behringer U-PHORIA UMC0202HD LineIn Max +20dBu (approx. 10Vrms), Rin 1MOhm (Instrument) at Input Gain Minimum
    - ONYX Producer LineIn Max +24dBu (approx. 12Vrms) at Input Gain Minimum
- Frequency range: 20Hz to 50% sample rate (see X axes)
- Measured value for CH1 and CH2 (scope footer): effective voltage (Urms), peak value, frequency

7.2 Generator

- Waveform: sine
- Frequency range: 20Hz to half the sampling rate
- Digital output level: -60dBFs to 0dBFs (FS full scale D/A converter)
- Mute output channel 1 or 2
- For resolution, see section 6.1 Measurement

7.3 Module yt-Logger

- Time base: 1 second to 120 seconds. Recording of current measured value at clock intervals
- Measured values: Effective value (Urms) or frequency (Hz)
- Measured values from CH1 and/or CH2

7.4 Module „FFT“

- 16384 support points (scope time base = 10 ms/div)
- Frequency range 20 Hz to half the sampling rate (see chapter 6.1 measurement)
- 2-channel measurement (CH1/CH2)
- Units mV, dBu, dBV

8 System requirements

8.1 PC

- MS-Windows 10 / 11 32 or 64bit
- CPU i3 2GHz or faster
- Display 1024x768 pixels or more

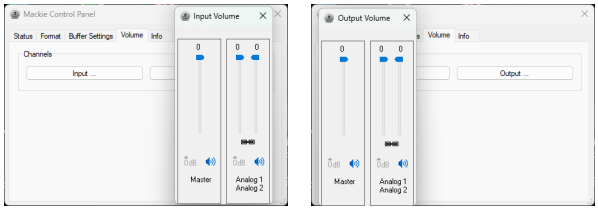
8.2 Audio Interface

- 2 channel audio interface with ASIO driver support (WDM not supported), sample interfaces:
  - Mackie Onyx Producer 2.2 (See FAQ 9.1)
  - Steinberg UR22 mkII or C
- Sample rate 44100Hz or higher

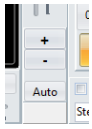
9 FAQ

9.1 No display on the oscilloscope despite input signal?

A) Check in the ASIO control window whether there is a “Volume” tab. Set all the controls for the output and input to “0” (e.g., for Mackie Onyx 2.2).



B) The trigger threshold may not match the input signal. Switch off the trigger for testing purposes (the “+” and “-” buttons are light gray).



Web: http://x1scope-en.stute-engineering.de