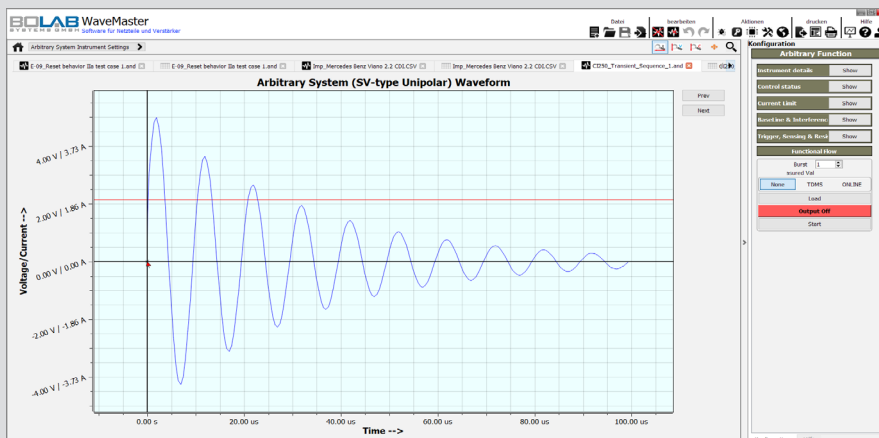


BOLAB WaveMaster Software + BOLAB AnyWave Unit

Generate Arbitrary Waveforms
with standard power supplies
and 4 quadrant amplifiers



Your contact:

Schulz-Electronic
 Professional Power Supplies

Schulz-Electronic GmbH
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 Vertrieb@schulz-electronic.de
 www.schulz-electronic.de

Including libraries for:

LV124 / V80000

LV148 / VDA 320

LV123 / VW80300

JLR

GMW

PSA

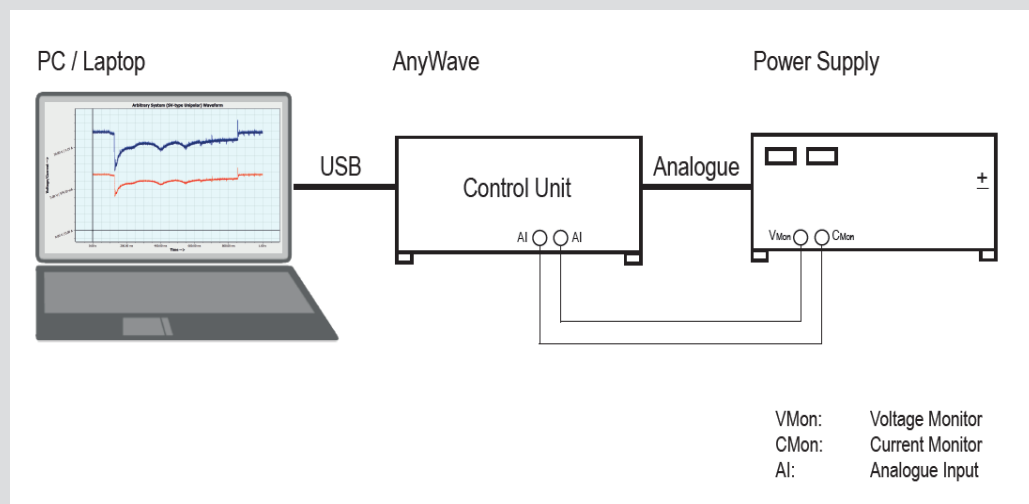
Etc.

BOLAB WaveMaster Software

Easy to use – magic in its functionality!

BOLAB Wavemaster Software

- Easy to use graphic waveform editor and tabular input
- Reference waveform and data acquisition with live graphics
- Including standard libraries for
 - LV124, VW 80000
 - LV148, VDA 320
 - LV123, VW 80300
 - GMW
 - JLR
 - etc.
- Command library to build-up or for integration into automated test systems such as:
 - LabView
 - Vector CANoe (CAPL)
 - Vector via C# real time!
 - Python
 - C#
 - C++
 - ANSI C
 - MATHLAB
 - etc.
- Simulation of imported oscilloscope signals
- Protocol report with reference data and measurement



General

BOLAB WaveMaster software and the BOLAB AnyWave control unit allow the control of power supplies as well as 4 quadrant amplifiers via the analogue interfaces.

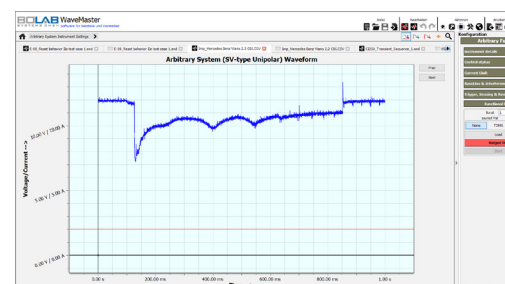
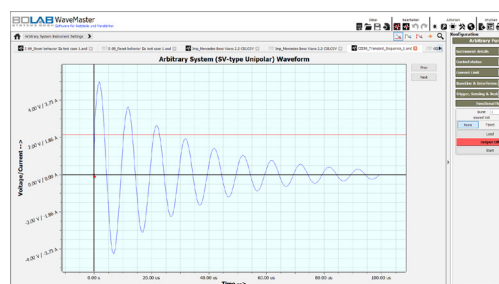
The powerful and easy to use BOLAB WaveMaster software is unique in the world. Without any knowledge in software development, designing ordinary and complex waveforms is very easy.

A graphic waveform editor allows the generation of individual curves in no time. Also, with a tabular input all types of waveforms can be produced instantly.

The simplicity of how fast oscilloscope data signals can be imported is exceptional. Reading ASCII and TDMS data files is also possible the same way.

BOLAB AnyWave is a control unit that allows to generate analogue signals for the power supplies and 4 quadrant amplifiers as well as for recording data for both voltage and current measurements to produce these synchronous and live in parallel to the reference waveform.

Data generation and data acquisition was never that easy.



BOLAB AnyWave Control Unit

Flexible - to be used for all power supplies and 4 quadrant amplifiers with analogue inputs

www.BOLAB-Systems.com

BOLAB AnyWave Control Units

Type	Interface	Analogue Output Sampling rate	Number of analogue outputs	Resolution
9242-6112	USB	250 kS/s	2	16 bit
9242-6361	USB	2,8 MS/S ¹⁾	2	16 bit

1) When using one channel / waveform

General

The BOLAB AnyWave control unit controls all kind of power supplies as well as 4 quadrant amplifiers via the analogue interfaces. It has two analogue outputs to provide two waveforms synchronously to different power supplies / 4 quadrant amplifiers. Sampling rates of 2,8 MS/s, 16 bit and 250 kS/s, 16 bit units are available.

BOLAB's AnyWave control unit provides a bandwidth of up to 300 kHz very easy. W
It's internal memory is handled by a double buffer mode which provides endless data streams without any interruption! Waveforms of almost infinite lengths can be simulated. This provides the most advantage in comparison to any function generator solutions which are limited in their memory and speed due to their limited arbitrary function!

BOLAB Wavemaster Control Unit

- Up to 2,8 MS/s sampling rate (approx. 330ns resolution)
- 2 synchronous output channels
- 16 bit resolution
- Analogue input channels
- Almost endless data streams for waveform generation
- No limitation as is the case with function generators
- Trigger inputs / outputs for real time actions (starting waveform / activating measurement)

2 Channel Arbitrary Waveform Generation

Live Data Acquisition

Graphic / Tabular Waveform Design

Importing Real Waveforms (e.g. from Oscilloscopes)

Complete Standard Waveform Libraries

Protocol Report with Recorded Data

DLLs for Python, LabView, CANoe, etc.



BOLAB WaveMaster Software

Easy to use – magic in its functionality!

BOLAB WaveMaster Software Remote DLLs

With the BOLAB WaveMaster Software, remote DLLs are available for nearly all programming languages. With its command library, users can control the 4-quadrant amplifiers and power supplies perfectly. There is no need to handle hardware interfaces such as USB or LAN. One command for each function handles all interfaces. Data files are sent to the instrument within milliseconds. No need to be concerned about memory space and resolution of the amplifiers and power supplies.

A simple “load” command calculates the best possible resolution for the waveform and sends data to the arbitrary unit. In every DLL (LabView-TM, Vector CANoe, C#, C++, ANSI C, Python, etc.), all commands are identical. This allows switching between programming languages very convenient.

Commands for creating waveforms from user programming surroundings are included as well. Variable waveforms for simulation of timely ramp increases, variation of frequency and many other applications are typical test scenarios.

Command library to integrate automated test systems:

- LabView™
- Vector CANoe (CAPL)
- Vector via C# (real time / ASYNC mode)
- C#
- C++
- ANSI C
- Python

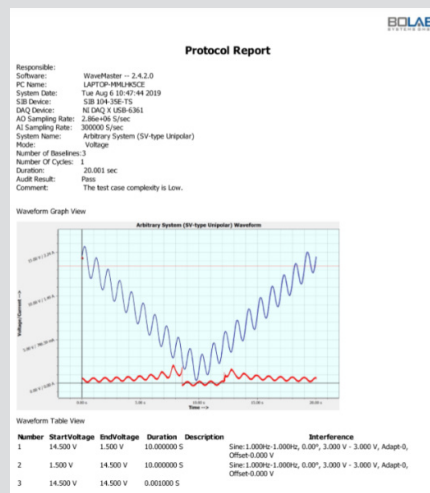
Tabular and Graphic Inputs

Individual waveforms are easily generated in tabular and / or in graphical spreadsheets. Sine, triangle, rectangle and other possibilities allow user-defined waveform generation instantly.

Copy / paste functions, both inside the BOLAB WaveMaster Software as well as data exchanges from / to EXCEL, allow for endless possibilities.

Hundreds of thousands of baselines can be maintained!

Protocol Report



WYSIWYG (What you see is what you get)

These waveforms are shown in their real time and amplitude ratio. The display portrays an accurate rendition of the waveforms.

If changes are implemented in the waveform, the graphic display is instantly updated and shown with actual dimensions.

Import Oscilloscope / ASCII Data

The screenshot shows an 'Import' dialog box with the following settings:

- Separator Option:** ☐ Tab, ☒ Comma, Voltage Column: 1, ☐ Space, ☐ Semicolon, Time Column: 2, ☐ Others
- Column Setting:** ☐ Use 1st row as column Header
- Decimal Settings:** ☒ 12,345, ☐ 12,345
- Huge Waveform:** ☐ Faster Import

Buttons: OK, Cancel

Database library for standards

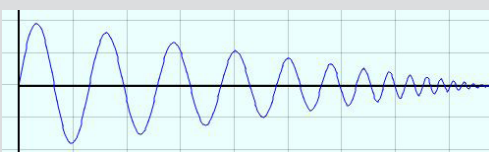
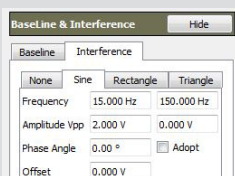
An existing large and constantly growing data base library exists. Each waveform has its own file. At any time, files can be copied to other places. Individual database structures are also possible.

Permanently latest updates and new standards can be downloaded from the web.

BOLAB's libraries are always kept up to date. Upcoming new standards do not need to be purchased since downloads will be available at no cost.

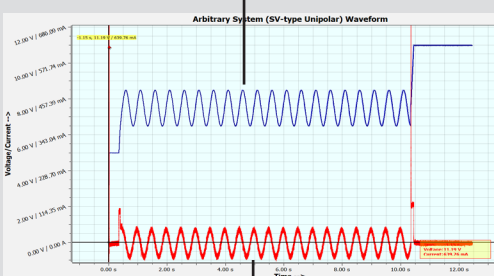
Sine Interference Input

Easy input of complex functions:



Online Measurement

Reference Voltage as well as Voltage measurement



Current measurement

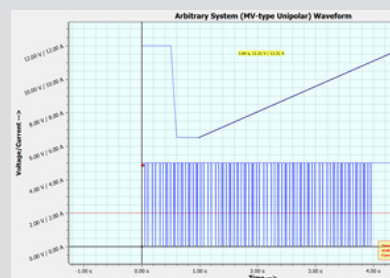
TDMS

While running a waveform, data can be stored in time to the hard disc for both voltage- and current measurement. These data can be analyzed later again with BOLAB's WaveMaster Software, Diadem, MathLab, etc.

Also captured / generated TDMS files from other applications can be opened and simulated.

Two channels

Two waveforms can be simulated synchronously.



Control of two power supplies / 4 quadrant amplifiers in parallel with different waveforms.

Auto Code Generator

```
print ,Auto generated script for Python 27 (32-bit)...
import WaveMaster_PY27_x32
import time
# Establish connection with the server
moduleObject.Connect()
print ,Connect successful'
# Open file
filed = moduleObject.OpenFile('C:\Program Files
(x86)\WaveMaster\Standard_Lib\LV_124_13\E-
11_Start puls severe.and" )
# Load the file in to the system
sys.Load()
# switch device to Execute Mode
sys.Execute()
# Start the waveform execution
sys.Start(1)
time.sleep( 0.5 )
# check waveform running state
run = sys.IsRun()
print run
while run == 1:
    time.sleep( 0.2 )
    run = sys.IsRun()
    print run
print run
# Close file
filed.Close()
# Disconnect from server
moduleObject.Disconnect()
print ,End of the Test!!!'
```

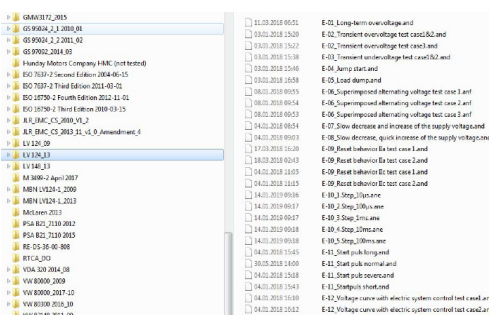
BOLAB WaveMaster software can be installed on any computer; no limit for number of installations on multiple PC's / laptops.

The "Auto Code Generator" records all steps and activities that are manually interacted in sequence.

For example, a waveform can be opened, loaded and executed.

When finishing recording, a Python code is automatically generated.

Automated tests do not require much programming skills!



Waveform Libraries

Excerpts from our extensive portfolio

LV 124 / VW80000 2009 / 2013 / 2017 / ...

✓	E-01	Long-term overvoltage
✓	E-02	Transient overvoltage
✓	E-03	Transient undervoltage
✓	E-04	Jump start
✓	E-05	Load dump
✓	E-06	Superimposed alternating voltage
✓	E-07	Slow decrease and increase of the supply voltage
✓	E-08	Slow decrease, quick increase of the supply voltage
✓	E-09	Reset behavior
✓	E-10	Short interruptions
✓	E-11	Start pulses
✓	E-12	Voltage curve with electric system control
✓	E-13	Pin interruption
✓	E-15	Reverse polarity

Accordingly, GS 95024
MBN LV124 standards, etc. are also available.

LV 148 / VDA 320 2013 / 2014 / ...

✓	E48-01a	Long-term overvoltage
✓	E48-02	Transient overvoltage
✓	E48-03	Transient process in the lower operating range with limited function
✓	E48-04	Recuperation
✓	E48-05	Superimposed AC voltage
✓	E48-06	Slow decrease and increase of the supply voltage
✓	E48-07	Slow decrease, quick increase of the supply voltage
✓	E48-08	Reset behavior
✓	E48-09	Short interruptions
✓	E48-10	Start pulses
✓	E48-15	Operation in the range without functional limitation
✓	E48-16	Operation in the upper range with functional limitation
✓	E48-17	Operation in the lower range with functional limitation
✓	E48-18	Overvoltage range
✓	E48-19	Undervoltage range

ISO 7637-2 2002 / 2004 / 2007 / 2011 / ...

✓	Test Pulses 2b
✓	Test Pulses 4

Some waveforms and tests require additional hardware components. Please contact us for assistance.

ISO 16750-2 2003 / 2006 / 2010 / 2011 / ...

✓	4.3.x	Overvoltage Systems
✓	4.4.2	Superimposed altering Voltage
✓	4.5	Slow decrease and increase of supply voltage
✓	4.6	Slow decrease and increase of supply voltage
✓	4.6.2	Reset Behavior at Voltage Drop Code
✓	4.6.3	Starting Profile
✓	4.6.4	Load Dump
✓	4.7	Reversed Voltage

LV 123 / VW80300
 2014 / 2016 / ...

	VW80300	LV 123	
✓	EHV-01	10.4.1	Operation within the regular HV operating voltage range
✓	EHV-02	10.4.2	Operation within the HV overvoltage range
✓	EHV-03	10.4.3	Operation within the HV undervoltage range
✓		10.4.4	Range of highly limited operating capability
✓	EHV-05	10.4.5	Generated HV voltage dynamics
✓	EHV-06	10.4.5	System HV voltage dynamics
✓	EHV-07	10.4.5	HV voltage dynamics of energy storage devices
✓	EHV-08	10.4.6	Generated HV voltage ripple
✓	EHV-09	10.4.6	System HV voltage ripple
✓		10.4.7	Overvoltage
✓		10.4.8	Undervoltage
✓	EHV-10	10.4.9	Load dump all the way to HV voltage limit
✓	EHV-10	10.4.9	Load dump with rapid rate of change
✓	EHV-13		HV service life

Accordingly, GS 95024
 MBN LV124, Porsche standards, etc. are also available.

JLR EMC
 2010 / 2013 / ...

✓	CI 210	Immunity From Continuous Power Line Disturbances
✓	CI 220	Mode Characteristics
✓	CI 230	CI 230 Immunity from Power Cycling
✓	4.6 CI 250	Continuous Disturbances
✓	CI 250	Transient Sequence
✓	CI 265	Waveform EFTBN Random Sequence
✓	CI 265	Waveform Random Crank
✓	CI 270	Immunity to Voltage Overstress

GMW
 2008 / 2014/ 2015 / ...

✓	8.2.1	Jump Start
✓	8.2.2	Reverse Polarity
✓	8.2.3	Over Voltage
✓	9.2.2	Power Supply Interruptions
✓	9.2.3	Battery Voltage Dropout
✓	9.2.4	Sinusoidal Superimposed Voltage
✓	9.2.5	Pulse Superimposed Voltage
✓	9.2.17	Stop Start Crank Waveforms
✓	9.2.18	Switched Battery Lines

Other libraries available:

- Hyundai
- McLaren
- PSA Peugeot - Citroen
- Fiat
- Ford
- MAN
- Renault
- Toyota
- Etc.

If any standard is not available in our library:

We help and implement your standards and individual waveforms at no charge in only a few days!*)

*) If technically feasible

Applications, Options and Systems



LV 123 System, 105 kW

LV 123 / VW 80300 Test Systems

- 15 KW – 200 KW systems
- 15A ... 660 A
- DC ... 200 kHz
- Including Load Dump tests!
- Automated Tests
- Prepared for future waveforms due to individual waveform design graphically and tabular
- Integration via DLL 's into programming languages

LV 124 / LV 148 / VDA 320 Test Systems

- 500 W – 18.000 W systems
- 15 A ... 660 A
- Up to 100 V / μ s
- Starting with 1 kW, modularly extendable up to 18 kW
- Automated tests
- Additional hardware components for E-16, E-18, E-19, E-20, E-21, E-22 available



LV 124 System, 4 kW

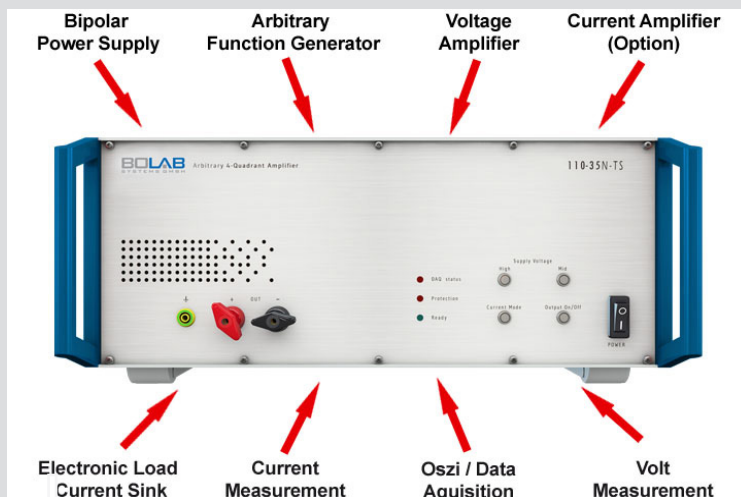
E-10 / E-13 Pulses out of LV124

According to LV124, E-10 and E-13 pulses, interruptions need to be simulated. Therefore additional electronic switches are necessary. These switches are controlled by BOLAB's WaveMaster software and the control units built-in counter outputs.

No additional function generator is necessary which allows to build up a fully automated HIL test system.

Ask for our rental options!

LV 124 / VW 80000 System
LV 148 / VDA 320 System



70 V / 40 A / 1.000 W

Special Features

- DC ... 200 kHz full range bandwidth
- DC up to 1 MHz (small signal -3 dB)
- Output voltage 35 V / 70 V / 75 V
- Rise time / fall time up to 100 V/ μ s
- Arbitrary function with 1.000.000 memory data points
- Internal resistor 0 ... 200 m Ω (Option)
- Analogue input 0 ... ± 10 V for voltage control
- Option for operating as a current amplifier
- Monitor outputs for measured values of voltage and current
- WaveMaster software for graphic waveform generation
- Simulation of imported oscilloscope signals
- Modularly expandable up to 18 kW (Systems > 1 kW)
- USB interface standard
- Voltage resolution less than 0.001 V
- Linearity 0,1% DC
- DC - Offset < 1 mV
- DLL's for C++, LabViewTM, Vector-CAPL, Python,
- C#, MathLab, etc

Coupling Transformers

General:

For conducted susceptibility tests according to CS101 / MIL-STD-461 E/F and DO160G, Section 18.

Frequency range: 10 Hz – 250 kHz

Turns ratio (step down): 2 : 1

Saturation (AC or DC): 50 A / 100 A



Some waveforms and tests require additional hardware components. Please contact us for assistance.

BOLAB Laboratory Products

Follow us on
www.BOLAB-Systems.de

Instrument Trolleys



Equipment Rack



19" Rack



Rack Accessories

- Monitor Arm
- PC-Holder
- Side shelves
- Electrical outlet strip
- Etc.

Technical Data

BOLAB AnyWave Control Unit

Technical Data

BOLAB AnyWave Control Unit

Model type	9242-6112	9242-6361
Interface	USB	USB
Analogue Output		
Number of Outputs	2	2
Sampling rate	250 kS/s	2,8 MS/S1)
Resolution	16 bit	16 bit
Analogue Inputs		
Number of Inputs	8 single ended 4 differential	8 single ended 4 differential
Max. Sampling rate	400 kS/s	1 MS/s
Resolution	16	16
Digital Inputs / Outputs		
Number	24	24
Counter Inputs / Outputs		
Number	4	4
Weight	5,5 kg	5,5 kg
Dimension WxHxD (mm)	450 x 100 x 280	450 x 100 x 280
Instrument size	3 U, 19"	3 U, 19"

Not all hardware I/O's are used by the BOLAB WaveMaster Software. Some are redundant. Sampling rates in the BOLAB WaveMaster Software can differ based on maximum hardware capabilities.

Ordering Information

9242-6112	2 x Analogue outputs 250 kS/s, 16 bit
9242-6361	2 x Analogue outputs 2,8 MS/s, 16 bit

Inclusive BOLAB WaveMaster software; no limitation for installations on multiple PC's / laptops.

Options

Coupling Transformers

Fast Interrupt Switches

FIS 60-75	60 V , 75 A
FIS 60-125	60 V, 125 A
FIS 60-300	60 V, 300 A
FIS 60-400	60 V, 400 A

19" Rack mount kit for Control Unit

19" Rack 15 U ... 42 U

Instrument Trolley

Equipment rack

Accessories for trollies and racks

Your contact:



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