

**BOLAB Systems GmbH**  
BOLAB AnyWave Control Unit



# BOLAB WaveMaster Software + BOLAB Any- Wave Control Unit

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**Generate Arbitrary Waveforms with Standard Power Supplies and  
4-Quadrant Amplifiers**

LV 124 / VW 80000, LV 148 / VDA 320, LV 123 / VW 80300, JLR, PSA B217112,  
ISO 7637-2 / ISO 21498 etc.

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## Contact

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**BOLAB**

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# BOLAB WaveMaster Software

Easy to use - magic in its functionality!

## General

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

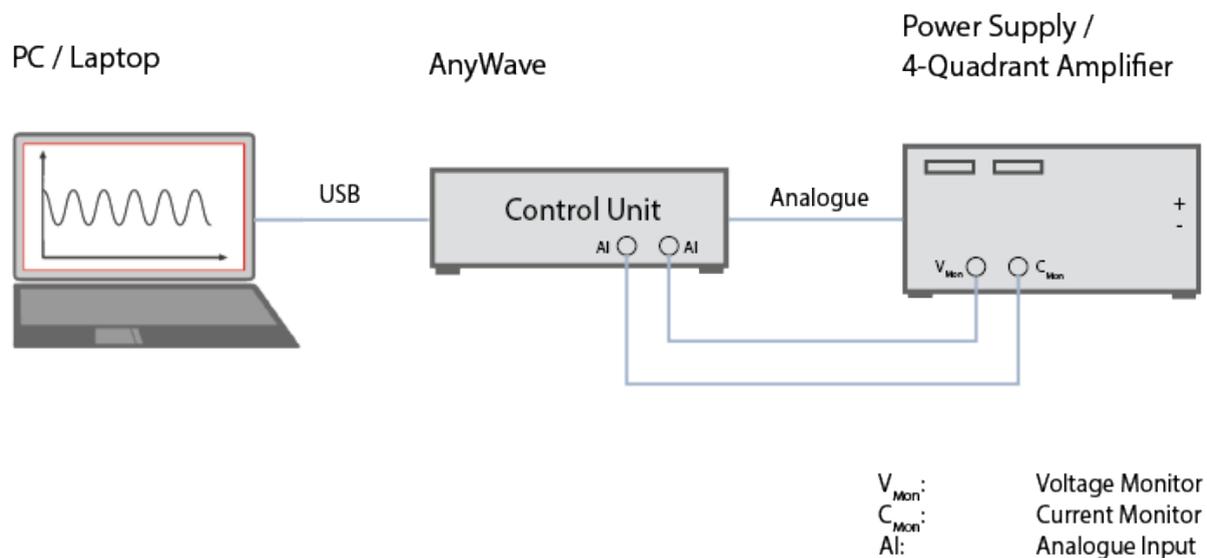
The powerful and easy to use BOLAB WaveMaster software is unique in the world. Without any knowledge in software development, designing ordinary and complex waveforms is very easy.

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 WaveMaster Software allows to generate analog 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 WaveMaster Software**

- Easy to use graphic waveform editor and tabular inputDC up to 1 MHz (small signal -3 dB)
- 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



# BOLAB AnyWave Control Unit

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

## BOLAB AnyWave Control Units

Type	Analogue Output Samplingrate	Number of Analogue outputs	Analogue Input Sampling Rate
400 - 6212	250 kS/s	2	25 kS/s
400 - 6361	2,86 MS/S <sup>1)</sup>	2	300 KS/s

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 analog interfaces. It has two analog 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.

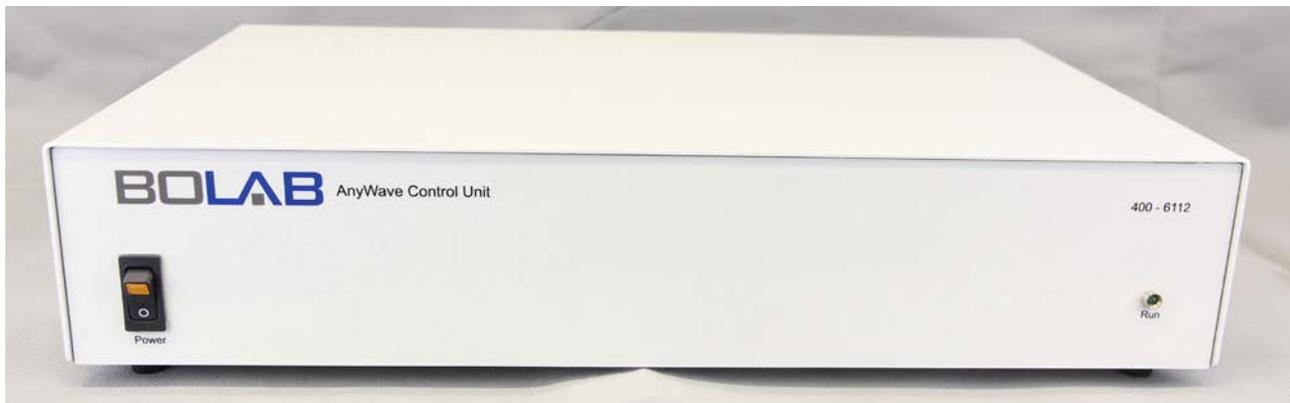
BOLAB's AnyWave control unit provides a bandwidth of up to 300 kHz very easy.

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!

- **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 AnyWave Control Unit

- Up to 2,8 MS/s sampling rate (approx. 330ns resolution)
- 2 synchronous output channels
- 16 bit resolution
- Analog 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)





## BOLAB WaveMaster Software

### Tabular and Graphic Inputs

Individual waveforms are easily generated in tabular and or graphical spreadsheets. Sine, triangle, rectangle and other possibilities allow user defined waveforms to be generated instantly.

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

Hundreds or thousands of baselines can be maintained!

### WYSIWYG

(What you see is what you get)

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

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

## Protocol Report



### Protocol Report

Responsible: WaveMaster -- 2.42.0  
 Software: LAMPON-MSU-MSCE  
 PC Name: LAMPON-MSU-MSCE  
 System Date: Tue Aug 6 10:47:44 2019  
 SIB Device: SIB 104-256-15  
 DAQ Device: NI DAQ V 1608-6361  
 AD Sampling Rate: 2.86e+06 S/sec  
 AI Sampling Rate: 300000 S/sec  
 System Name: Arbitrary System (SV-type Unipolar)  
 Mode: Voltage  
 Number of Baselines: 3  
 Number of Cycles: 1  
 Duration: 20.001 sec  
 Audit Result: Pass  
 Comment: The test case complexity is Low.

#### Waveform Graph View



#### Waveform Table View

Number	Start Voltage	End Voltage	Duration	Description	Interference
1	14.500 V	1.500 V	10.000000 S		Sine: 1.000Hz=1.000Hz, 0.00°, 3.000 V - 3.000 V, Adapt-0, Offset: 0.000 V
2	1.500 V	14.500 V	10.000000 S		Sine: 1.000Hz=1.000Hz, 0.00°, 3.000 V - 3.000 V, Adapt-0, Offset: 0.000 V
3	14.500 V	14.500 V	0.001000 S		

## Import Oscilloscope / ASCII Data

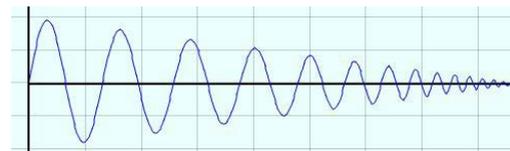
## Database library for Standards

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

The latest updates and new standards can be downloaded at any time 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, covered by BOLAB's support agreement.

## Sine Interference Input

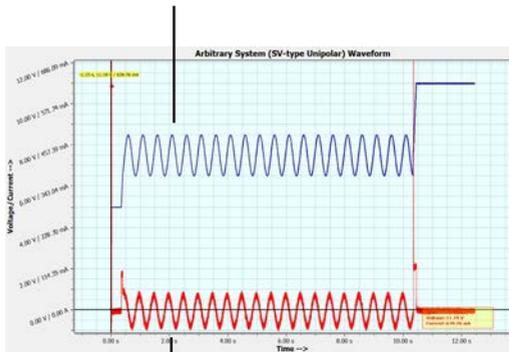
Easy input of complex functions:





## ● Online Measurement

Reference voltage as well as voltage measurement



Current measurement

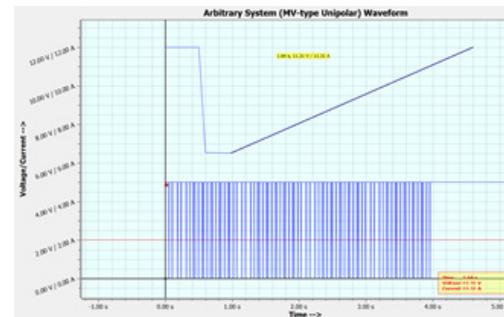
## ● TDMS

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

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

## ● Two Channels

Two waveforms can be simulated synchronously.



Control of two power supplies / 4-Quadrant Amplifiers synchronously 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
fileId = 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 fi le
fileId.Close()
# Disconnect from server
moduleObject.Disconnect()
print ,End of the Test!!!'
```

The “Auto Code Generator” records all steps and activities that are manually interacted in sequence in WaveMaster software.

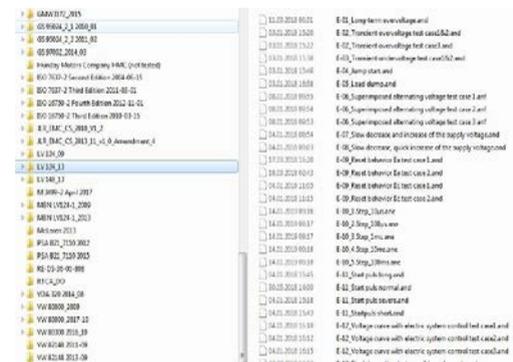
For example, a waveform can be opened, loaded and executed.

When recording finishes, a Python code is automatically generated. This can be done the same way for C#, C++, LabView, VectorCAPL, etc.

Automated tests do not require much programming skills!

## Installation

BOLAB WaveMaster software can be installed with no limit for the number of installations on multiple PCs / laptops.





## 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 use 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 or the 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™, Vector CANoe, C#, C++, ANSI C, Python, etc.), all commands are identical. This makes switching between programming languages very convenient. Commands for creating waveforms from user programming surroundings are included as well. Variable waveforms for simulating 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)
- C#
- C++
- ANSI C
- Python
- etc.

# Waveform Libraries - Excerpts from our extensive portfolio

## LV 124 / VW 80000 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.

## 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.



**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 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 / VW 80300**  
**2014 / 2016 / ...**

BOLAB feasibility	VW 80300	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-04	-	Pre-charging
✓	EHV-05	10.4.5	Generated HV voltage dynamics
✓	EHV-06	10.4.5	System HV voltage dynamics
✓	EHV-07	-	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	-	Load dump with rapid rate of change
✓	EHV-11	-	HV voltage offset (two HV power supplies needed)
✓	EHV-13	-	HV service life
✓	EHV-16	-	HV pulse

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



## 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

## JLR EMC 2010 / 2013 / ...

✓	CI 210	Immunity From Continuous Power Line Disturbances
✓	CI 220	Mode Characteristics
✓	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

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 / VW 80300 Test Systems

- 15 kW – 200 kW systems
- 15A ... 1500 A
- Ripple Generator DC ... 500kHz
- 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 /  $\mu$ 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

## Example

### 220-70R-TS (12 kW)



## 4-Quadrant Amplifiers

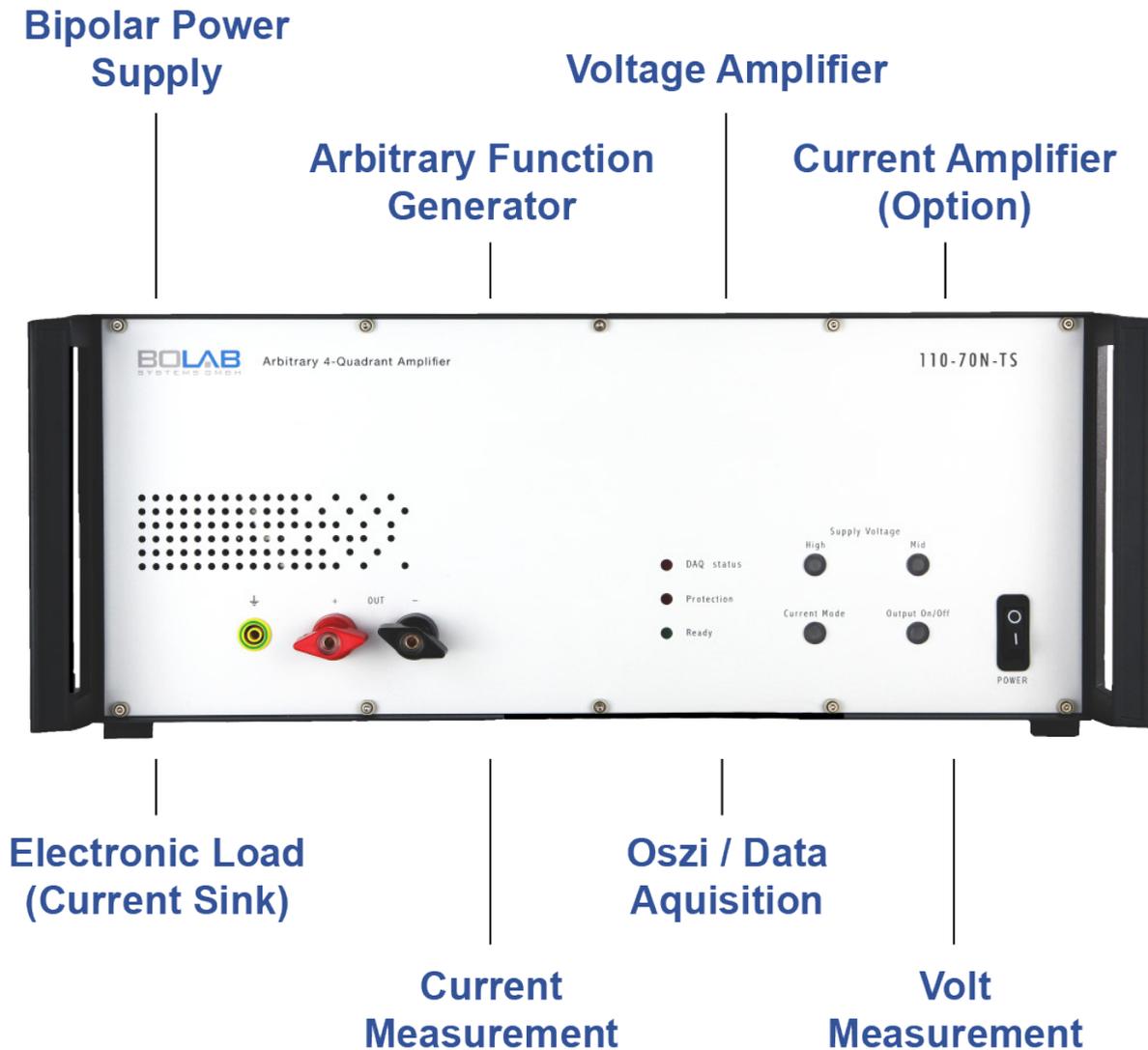
**110 - 75N** 4 Quadrant Amplifier  
 $\pm 75$  Vpeak, 40 Apeak,  
1.000 W

**110 - 75N - TS** 4 Quadrant Amplifier  
 $\pm 75$  Vpeak, 40 Apeak,  
1.000 W  
incl. WaveMaster  
Software for  
Waveformgeneration



## Multiple Instrument Functions In One Device

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



→ Ask for our rental options!

## 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/ $\mu$ s
- Arbitrary function with 1.000.000 memory data points
- Internal resistor 0 ... 200 m $\Omega$  (optional)
- Analog input 0 ...  $\pm$ 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++, LabView<sup>TM</sup>, Vector-CAPL Python, C#, MathLab, etc.

\* Technical data may vary according to the model



## BOLAB Laboratory Products

### Equipment Rack 690 series



Height mm	Width mm	Model 690
750	700	690-075 070
	900	690-075 090
	1000	690-075 100
1000	700	690-100 070
	900	690-100 090
	1000	690-100 100
1250	700	690-125 070
	900	690-125 090
	1000	690-125 100
1500	700	690-150 070
	900	690-150 090
	1000	690-150 100

### Instrument Trolleys 680 series



Width mm	Depth mm	Model 680
500	800	680-050 080
	1000	680-050 100
700	800	680-070 080
	1000	680-070 100

### 19" Rack 700 series (18 - 24 HE)



Height mm	Depth	Model 700
15 HE	600	706-15 5007
	800	708-15 5007
18 HE	600	706-18 5007
	800	708-18-5007
24 HE	600	706-24 5007
	800	708-24 5007

### Instrument Trolleys 680 series



Height mm	Depth mm	Model 700
33 HE	600	706-33 5007
	800	708-33 5007
36 HE	600	706-36 5007
	800	708-36 5007
42 HE	600	706-42 5007
	800	708-42 5007



# Technical Data

## BOLAB AnyWave Control Unit

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Model type	400 - 6112	400 - 6361
Interface	USB	USB
Analogue Output Number of Outputs Sampling rate Resolution	2 250 kS/s 16 bit	2 2,8 MS/s <sup>1)</sup>
Analogue Inputs Number of Inputs Max. Sampling rate Resolution	8 single ended, 4 differential 400 kS/s 16	8 single ended, 4 differential 1 MS/s 16
Digital Inputs / Outputs Number	24	24
Counter Inputs / Outputs Number	4	4
Weight	5,5 kg	5,5 kg
Dimensions WxHxD (mm)	450 x 100 x 290	450 x 100 x 290
Instrument size	2 U, 19"	2 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.

1) When using one channel / waveform

## ● Ordering Information

400 - 6112	2 x Analog outputs 250 kS/s, 16 bit
400 - 6361	2 x Analog outputs 2,8 MS/s, 16 bit
400 - 19	Rack mount kit for AnyWave Control Unit

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

## ● Laboratory Products

19" Rack	700 series (see page 19)
Instrument Trolley	680 series (see page 18)
Equipment rack	690 series (see page 18)

## ● Accessories

- Monitor arm 15 A ... 660 A
- PC-Holder
- Side shelves
- Electrical outlet strip
- Etc.



07/2022 · Subject to change · We assume no liability for the topicality, correctness, completeness or quality of the information.

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