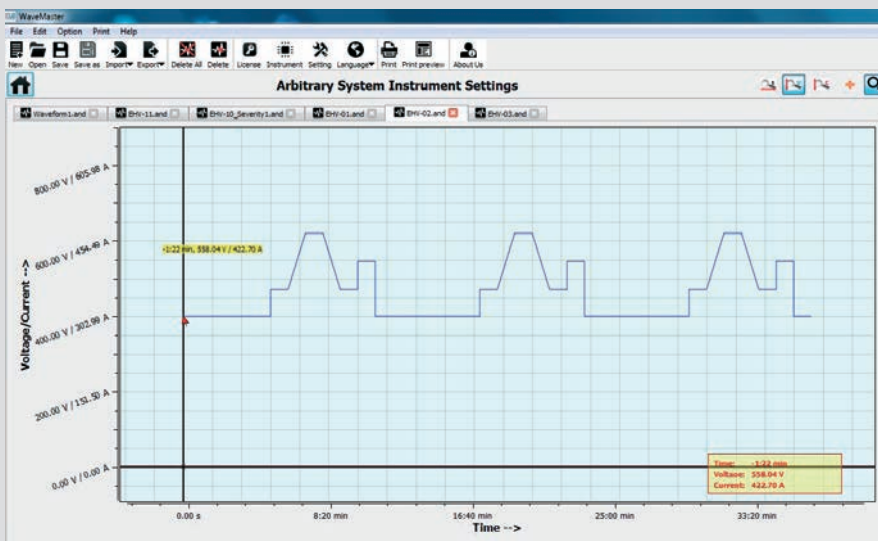# VW 80300 / LV 123 :
Electric Vehicle Test Systems

World´s most powerful, modular, compact, mobile and flexible solution for High Voltage testing for Electrical Vehicles!

LV 123
VW 80300
VW 80303
MBN LV 123
Porsche VW 80303
PSA B21 7112
ETC.

Including Waveform libraries for:
LV123
VW 80300
VW 80303
PSA
Porsche
Etc.

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ABSOLUTE *EMC* Llc.
Covering sales in North America
United States, Mexico, & Canada

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info@absolute-emc.com

BOLAB High Voltage Electric Vehicle Test Systems for
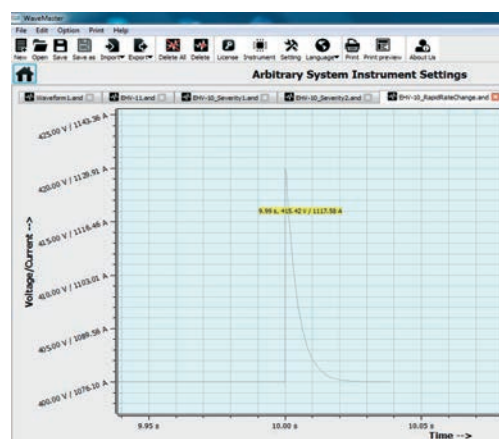
LV 123
VW 80300
VW 80303

General

BOLAB´s new and world´s unique solutions in testing High Voltage profiles for Electric Vehicles are very powerful, flexible and modular.

Three different solutions for high speed testing, a medium range for covering most profiles and a low budget. Powerful solutions for starting and gaining experience are available.

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

As well as …

MBN LV 123
BMW GS 95023
Porsche VW 80303
PSA B21 7112
ETC.

Modular Design

Modularity is one of the most important characteristics in BOLAB´s systems. Start with a "small" system of 15 KW (1.000 V, 15 A) and expand module by module as applications require and budgets allow.
It was never this easy to get involved with high voltage tests for Electric Vehicles and to build up these tests to a most powerful solution.

Powerful

Wide ranges of power requirements are covered by the BOLAB systems.
15 kW to 200 kW Systems with voltages up to 1.000 V and currents from 15 A to more than 400 A are available

High Speed

Even Load Dump pulses are covered with BOLAB´s, unique in the world, high end test systems for Electric Vehicles.

3000 V/ms for 20 V is required in VW80300 with a 7µs rising time.

BOLAB´s solution: → 1µs!

250 V/ms increase for 150 V:

figure II: C2:Uload: DC+AC , Load Dump, Load: 100R, Uout_ac: -16V to +70V, Ub_high mode

Flexible

An unmatched and exceptional feature is the flexibility of BOLAB´s systems. The medium and high end systems can be used equally for all kind of standards, such as LV 124, VW80000, LV 148, VDA 320 in
same way as OEM standards.
For example, BOLAB's systems are designed to test DC/DC converters on both sides of low- and high voltage applications.

Compact and Mobile

There is no other complete high end **mobile** test solution for Electric Vehicles for VW80000 with 15 kW (1.000 V / 15 A) in a small 19" rack with 10 U height on the market

BOLAB systems also cover voltage profiles for LV 124 / LV 148 / VW80000 / VDA 320 and OEM standards up to 40A!
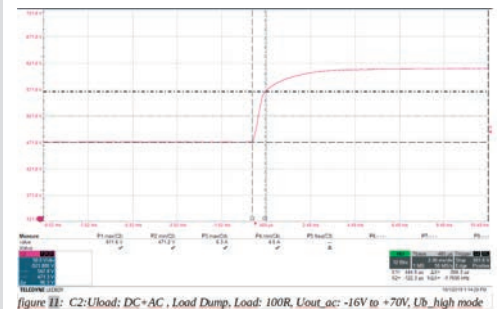
WaveMaster

BOLAB´s WaveMaster Software includes all kind of Library standards such as for LV 123, VW80300, VW80303, as well as OEM standards from MBN LV123, PSA Peugeot – Citroen, Porsche, etc.
Everyone can edit easy these standards. But this is not all: new and individual waveforms can also be generated in tabular or/and in graphic spread sheets. Sine, triangle, rectangle and other possibilities allow user defined waveforms generation instantly.

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

BOLAB´s WaveMaster solution is not only generating voltage profiles, it´s also a data acquisition instrument at the same time.
Both live voltage and current measurements with graphic displays, recording and storing data in time to the hard disc for voltage- and current to TDMS files are included.

Coupling Network Transformers (CDN)

LV 123

Setup

For voltage ripple tests on HV batterie lines there is an easy and economical solution. We use standard HV power supplies. Our 4 quadrant amplifier system 110-75N-TS generates powerful sine interferences. The BOLAB coupling transformer 450-100 (100 A) allows for high frequency sine signals.

The BOLAB measurement unit 480-WM measures the AC amplitude that is provided directly to an analog input of the BOLAB 4 quadrant amplifier. BOLAB´s WaveMaster software compares reference signals with measured signals and adjusts automatically the amplitude to meet the automotive standards requirement.

Please note that only one sine wave interferences are possible. Load Dump transients are not feasible.

High voltage system setup with coupling network
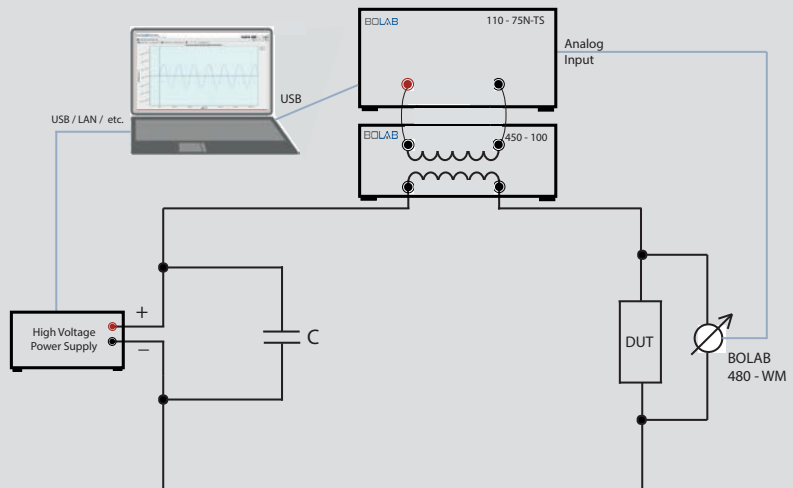
Advantages

- Easy setup
- Economical
- Modularity. Several amplifiers and coupling transformers can be operated in parallel to obtain high currents.
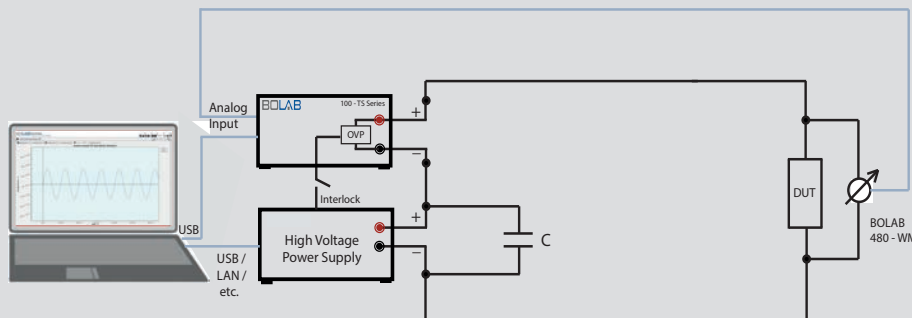
Disadvantages

- Only sine interferences
- Frequency range limitation
- Amplitude limitation
- No Load Dump possible

High Voltage DC Power Supply + 4 Quadrant Amplifier In Series

LV 123 + VW 80300

High voltage system setup with 4-Quadrant Amplifiers in series

Setup

As coupling network transformers (CDN) are limited in speed, frequency ranges, amplitude and especially allow only sine interferences, this solution cannot be used for Load Dump applications. Load Dump requirements are both part of LV 123 and VW 80300 standards.

Our most flexible solution is the combination of a high voltage power supply in series to our 4 quadrant amplifiers. Individual transients and even Load Dump requirements are possible.

In addition, BOLAB's modular design allows the adaption to almost all manufacturers of high voltage power supplies. There is no need to purchase an additional power supply if one is already available.

Advantages

- Highly flexible
- Transient interferences
- Load Dump possible
- High frequency range

Disadvantages

- Higher in price in comparison to coupling transformers

Coupling Network Transformers (CDN)

LV 123

High voltage systems with coupling network

System	Voltage	Current	Power
15/30-1000 1C	1000 V	-30 ... +30 A	15 kW
30/60-1000 1C	1000 V	-60 ... +60 A	30 kW
45/90-1000 1C	1000 V	- 90 ... +90 A	45 kW
60/120-1000 1C	1000 V	-120 ... +120 A	60 kW
75/150-1000 1C	1000 V	-150 ... +150 A	75 kW
90/180-1000 1C	1000 V	-180 ... +180 A	90 kW
105/210-1000 1C	1000 V	-210 ... +210 A	105 kW
120/240-1000 1C	1000 V	-240 ... +240 A	120 kW
135/270-1000 1C	1000 V	-270 ... +240 A	135 kW
150/300-1000 1C	1000 V	-300 ... +300 A	150 kW
165/330-1000 1C	1000 V	-330 ... +330 A	165 kW
180/360-1000 1C	1000 V	-360 ... +360 A	180 kW
195/390-1000 1C	1000 V	-390 ... +390 A	195 kW
210/420-1000 1C	1000 V	-420 ... +420 A	210 kW

LV 123 System, 105 kW

Parallel mode for high current

Coupling transformers can be put in parallel to obtain higher currents. E.g. 4 x 450-100 in parallel will allow tests up to 400 A.

Every coupling transformer needs one 100-75N Amplifier.
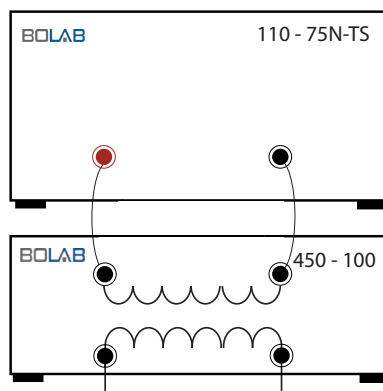
4 Quadrant Amplifiers

110-75N	4 Quadrant Amplifier ±75 V$_{peak}$, 40 A$_{peak}$, 1.000 W
110-75N-TS	4 Quadrant Amplifier ±75 V$_{peak}$, 40 A$_{peak}$, 1.000 W incl. WaveMaster Software for Waveform-generation

Coupling transformers

| 450-50	Coupling transformer 50 A
450-100	Coupling transformer 100 A

# High Voltage DC Power Supply + 4 Quadrant Amplifier In Series

LV 123 + VW 80300

High voltage systems with 4-Quadrant Amplifiers in series

DC-Power Supply	+	4Q Amplifier	Voltage	Current	Power
15/30-1000 1C	+	110-70N-TS S	1000 V	-30 ... +30 A	15 kW
30/60-1000 1C	+	120-70N-TS	1000 V	-60 ... +60 A	30 kW
45/90-1000 1C	+	130-70N-TS	1000 V	- 90 ... +90 A	45 kW
60/120-1000 1C	+	140-70N-TS	1000 V	-120 ... +120 A	60 kW
75/150-1000 1C	+	140-70N-TS	1000 V	-150 ... +150 A	75 kW
90/180-1000 1C	+	150-70N-TS	1000 V	-180 ... +180 A	90 kW
105/210-1000 1C	+	160-70N-TS	1000 V	-210 ... +210 A	105 kW
120/240-1000 1C	+	180-70N-TS	1000 V	-240 ... +240 A	120 kW
135/270-1000 1C	+	180-70N-TS	1000 V	-270 ... +240 A	135 kW
150/300-1000 1C	+	180-70N-TS	1000 V	-300 ... +300 A	150 kW
165/330-1000 1C	+	200-70N-TS	1000 V	-330 ... +330 A	165 kW
180/360-1000 1C	+	200-70N-TS	1000 V	-360 ... +360 A	180 kW
195/390-1000 1C	+	220-70N-TS	1000 V	-390 ... +390 A	195 kW
210/420-1000 1C	+	220-70N-TS	1000 V	-420 ... +420 A	210 kW

VW 80300 EHV-10
Load Dump with rapid rate of change
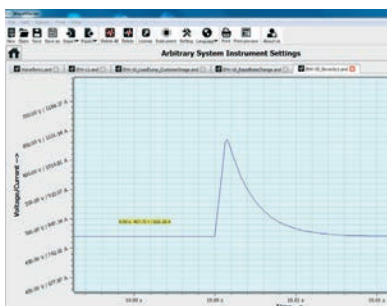
figure II: C2:Uload; DC+AC , Load Dump, Load: 100R, Uout_ac: -16V to +70V, Ub_high mode
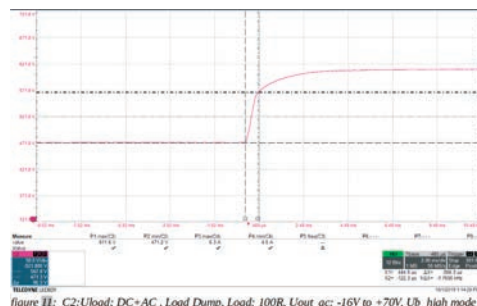
VW 80300 EHV-10
Load Dump all the way to HV voltage limit

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 (LabViewTM, 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.

Tabular and Graphic Inputs

Individual waveforms are easy generated in tabular and / or in graphical spread sheets. Sine, triangle, rectangle and other possibilities allow user defined waveforms 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!
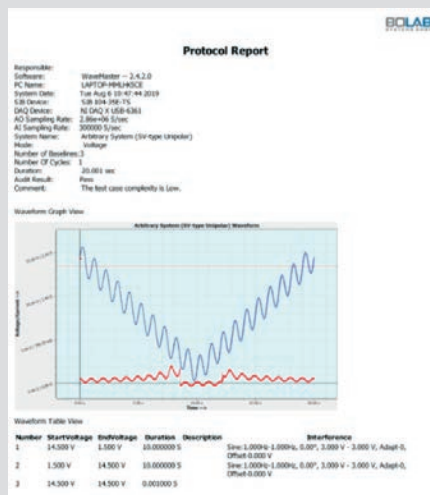
WYSIWYG (What you see is what you get)

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.

Protocol Report

Import Oscilloscope / ASCII Data

Command library to integrate automated test systems:

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

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.
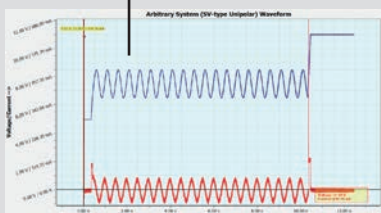
Sine Interference Input

Easy input of complex functions:
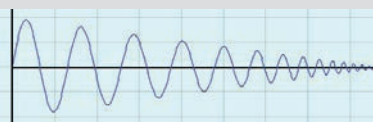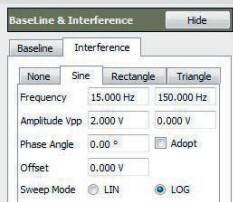
Online Measurement

Reference Voltage as well
as Voltage measurement

Current measurement

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

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

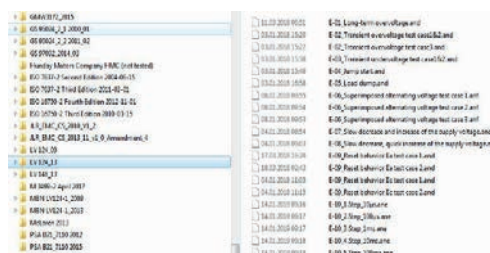Two waveforms can be simulated synchronously.
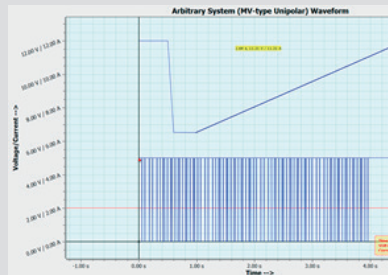
Control of two power supplies / 4 quadrant
amplifiers in parallel with different waveforms.

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
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 file
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 sequen-
ce.

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 program-
ming skills!

Technical Data

DC Power Supply

General

- Bi-Directional power supply
- Source & Sink
- Power Regeneration Technology: sink power is not dissipated but fed back into the grid
- Low audible noise: temperature controlled cooling fans

Safety and security concept

Modules are operated in parallel in one rack. Including emergency stop switches, door switches and isolation monitoring of the output contacts. Power supply modules can be quickly shut down by overvoltage protection (OVP) when connecting to BOLAB amplifiers.

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Voltage	0 … 1.000 V		
	Current	Power	Number of modules
15/30-1000 1C	-30 ... +30 A	15 kW	1
30/60-1000 1C	-60 ... +60 A	30 kW	2
45/90-1000 1C	-90 ... +90 A	45 kW	3
60/120-1000 1C	-120 ... +120 A	60 kW	4
75/150-1000 1C	-150 ... +150 A	75 kW	5
90/180-1000 1C	-180 ... +180 A	90 kW	6
105/210-1000 1C	-210 ... +210 A	105 kW	7
120/240-1000 1C	-240 ... +240 A	120 kW	8
135/270-1000 1C	-270 ... +270 A	135 kW	9
150/300-1000 1C	-300 ... +300 A	150 kW	10
165/330-1000 1C	-330 ... +330 A	165 kW	11
180/360-1000 1C	-360 ... +360 A	180 kW	12
195/390-1000 1C	-390 ... +390 A	195 kW	13
210/420-1000 1C	-420 ... +420 A	210 kW	14

General data Programming speed (resistive load)	One module	
Rise time (10 - 90%) 0 --> 500 V	1,5 ms	
0 --> 1.000 V	4,5 ms	
Fall time (90% - 10%)		
500 V --> 0 V	0,9 ms	
1.000V --> 0 V	3,5 ms	
AC Input		
3 phase, 48 - 62 Hz	342 … 528 V	
rated voltage range	380 … 480 v	
rated frequency	50 / 60 Hz	
rated current	maximum 27 A	
current (400 V / 3 ph., 15 kW)	23 A	
power factor, 15 kW, 7,5 kW	0.996, 0.988	
internal fuses	30 AT	
Efficiency Sink / source mode: 400 V AC, 3 ph. Input		
15 kW, Iout = 100%	95%	
15 KW, Uout = 100%	96%	
Dimensions		
h x w x d (excluding feet)	132 x 483 x 591	19", 3 U
Weight	27 kg	

4 Quadrant Amplifiers System

www.BOLAB-Systems.com

Voltage	-16 … 70 V			
	Current max.	Power	Number of racks	Weight
110-70N-TS	38 A	1 kW	1	110 kg
120-70N-TS	76 A	2 kW	1	150 kg
130-70N-TS	114 A	3 kW	1	190 kg
140-70N-TS	152 A	4 kW	1	230 kg
150-70N-TS	190 A	5 kW	1	270 kg
160-70N-TS	228 A	6 kW	1	310 kg
180-70N-TS	304 A	8 kW	2	2 x 230 kg
200-70N-TS	380 A	10 kW	2	2 x 270 kg
220-70N-TS	456 A	12 kW	2	2 x 310 kg
250-70N-TS	570 A	15 kW	3	3 x 270 kg
280-70N-TS	684 A	18 kW	3	3 x 310 kg

Peak current Pulse, 500ms, 5% Duty Cycle, unipolar	2 x Current max.
Programming speed (resistive load)	
Rise time (10 - 90%)	1,5 µs
Fall time (90% - 10%)	1,5 µs
Frequency	200 kHz
DC- Offset	<1mV DC Per Rack
AC Input	3 phase, 230 V AC (+/-10%, 50 Hz … 60 Hz) 3L+N+PE
Protection	3 x 16 A
Dimensions	19", 36 U

Special Features

- DC ... 200 kHz full range bandwidth
- DC up to 1 MHz (small signal -3 dB)
- Rise time / fall time up to 50 V/µs
- Arbitrary function with almost endless data streams for waveform generation
- Internal resistor 0 ... 200 mΩ (Option)
- Analogue input 0 ... ±10 V for voltage control
- Option for running as current amplifier
- Monitor outputs for measured values of voltage and current
- WaveMaster software for waveform generation and data recording
- Modularly expandable up to 18 kW
- USB interface standard
- Voltage resolution less than 0.001 V
- Linearity 0,1% DC
- DC - Offset < 1 mV

BOLAB
SYSTEMS GMBH

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