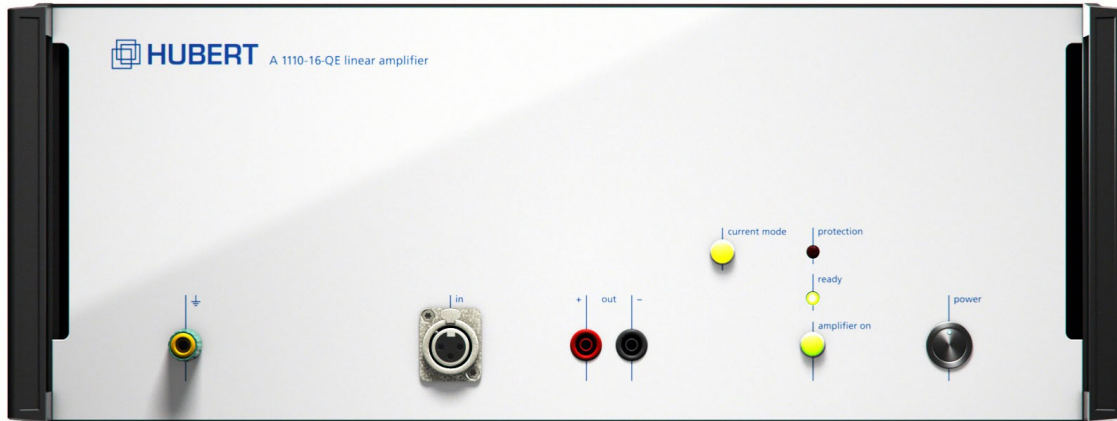


## A1110-16-QE

### 4-quadrant voltage and current amplifier

DC – 1 MHz | 100 V/ $\mu$ s | 1000 W (source) | 650 W (sink)



## DATA SHEET

The A1110-16-QE is a linear, extreme broadband precision power amplifier. It is ideally suited for applications that require quickly changeable signals at high power.

The A1110-16-QE can be operated either as voltage amplifier or as current amplifier. In current amplifier mode it provides constant, frequency-independent output current e.g. for inductive loads.

The amplifier is equipped with “auto-commutating” voltage supply. 3 bipolar supply voltages are automatically or manually switched individually. The amplifier ensures high sink outputs and is also suitable for operation as active load.

Output voltage and output current can be optionally limited. Moreover, low-ohm signal outputs are available as monitoring outputs.

The device is equipped with a low-noise, temperature-controlled fan. In addition to overtemperature shut-down, a feature for dissipation power calculation ensures absolute power monitoring for perfect short-circuit and overload protection.

An interlock ensures optional operation as remote-controlled safety system.

Operation is performed via the control elements on the front panel of the amplifier and the graphical user interface on a PC, which is connected to the amplifier by means of the USB interface (the required software is included in the scope of delivery).

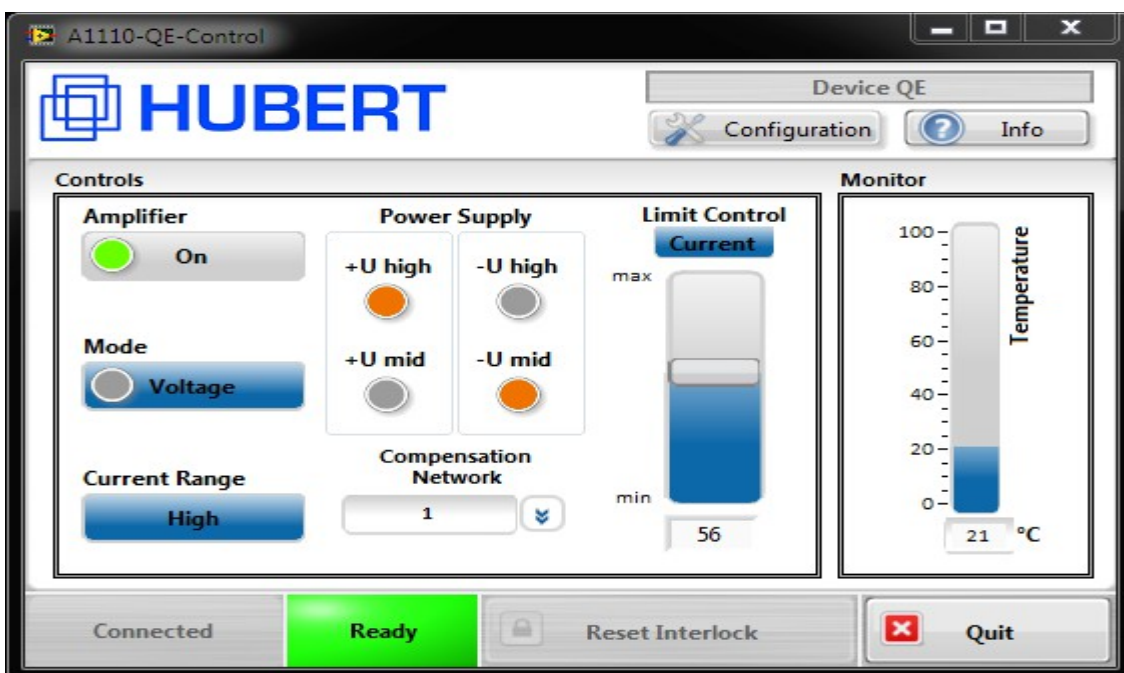
If higher output voltages or higher output currents are needed, configurations with several A1110-16-QE devices connected in series or in parallel are possible.

## Features

- 4-quadrant voltage and current amplifier
- Fully configurable and operable by means of the supplied software
- Output voltage max.  $75 V_{\text{peak}}$
- Output current max.  $28 A_{\text{peak}}$
- Output current  $55 A_{\text{peak}} / 500 \text{ ms}$
- Symmetrical input
- Series / parallel input connection in case of higher voltage / current requirements
- USB port as standard (LAN interface optional)
- Auto-commutating voltage supply
- Interlock
- Voltage / current monitor output
- 6 configurable configuration networks for inductive loads in current amplifier mode

## Software

The scope of delivery includes an application software that ensures fully remote-controlled operation and comprehensive configuration of the amplifier via the USB interface. In this context, disclosure of the line commands guarantee trouble-free integration of existing automated test systems.



## Applications

- General lab applications for research, development and testing
- EMC testing
- Material testing
- MRI
- Component tests
- Plunger coil drives
- Piezo actuation
- Generation of magnetic fields (e.g. with Helmholtz coils)
- Medical engineering
- Laser technology
- Plasma technology

Rear of the amplifier (LAN interface is optional)



## Specifications

Parameters	Specification	Conditions/Moments
	Controlled Voltage Mode	25° C ambient temperature Continuous operation
Input Impedance	100 kOhm 200 kOhm	unbalanced, 1kHz balanced, 1kHz
Maximum Input Level	5.5 V (+14,5 dBV)	< 1 % THD, 1 kHz, 8 Ohm Load
Common-Mode Rejection Ratio	> 60 dB	Rs= 50 Ohm, 10 Hz – 200 kHz, re +34.5 dBV @ Output
Small Signal Frequency Response		
	DC - 200 kHz	+0, -0.5 dB, 1 W @ 8 Ohm High Voltage Mode
	DC - 1 MHz	+0, -3.0 dB, 1 W @ 8 Ohm High Voltage Mode
Phase response	+0, -5 degrees	10 Hz - 30 kHz
Power Response (continuous)		
8 Ohm Load	400 W 200 W	DC - 100 kHz, < 0.5% THD High Voltage Mode DC – 200 kHz, < 0.5% THD High Voltage Mode
3 Ohm Load	1000 W 800 W 450 W	DC - 30 kHz, < 0.5% THD High Voltage Mode DC - 100 kHz, < 0.5% THD High Voltage Mode DC - 200 kHz, < 1% THD High Voltage Mode
Slew Rate	100 V/uSec	
Residual Noise		
10 Hz - 22 kHz	< 100 uV ( < -80 dBV )	All Voltage Modes Input shorted 8 Ohm Load
10 Hz - 80 kHz	< 125.5 uV ( < -78 dBV )	All Voltage Modes Input shorted 8 Ohm Load
10 Hz - 200 kHz	< 158.5 uV ( < -76 dBV )	All Voltage Modes Input shorted 8 Ohm Load
Signal-to-Noise Ratio		
10 Hz - 22 kHz	< -114.5 dB	re +34.5 dBV, < 1% THD 8 Ohm Load High Voltage Mode
10 Hz - 80 kHz	< -112.5 dB	re +34.5 dBV, < 1% THD 8 Ohm Load High Voltage Mode
10 Hz – 200 kHz	< -110.5 dB	re +34.5 dBV, < 1% THD 8 Ohm Load High Voltage Mode

Parameters	Specification	Conditions/Moments
<b>THD+N</b>		
10 Hz – 100 kHz	< 0.5 %	800 W @ 3 Ohm; Auto
10 Hz – 100 kHz	< 0.1 %	800 W @ 3 Ohm High Voltage Mode
<b>Output Offset</b>		
	< 1.0 mV	DC
<b>Output Impedance</b>		
	< 60 mOhm	@1 kHz; Instrument: HP8751A, Network Analyzer
<b>Power, Pulse, 40ms, 20% Duty Cycle</b>		
Peak output		
4 Ohm	75 V, 19.5 A	> 40 us rise time / > 40 us fall time
4 Ohm	75 V, 18.9 A	> 100 ns rise time / > 100 ns fall time
2.5 Ohm	68 V, 27 A	> 40 us rise time / > 40 us fall time
2.5 Ohm	68 V, 27 A	> 100 ns rise time / > 100 ns fall time
0.5 Ohm	14V, 28 A	> 10 us rise time / > 10 us fall time
0.5 Ohm	14V, 28 A	> 100 ns rise time / > 100 ns fall time
<b>Current, Pulse, 500ms, 5% Duty Cycle, unipolar</b>		
Peak Output		
60 mOhm	+ 55 A	+Umid / -Ulow
60 mOhm	- 55 A	+Ulow / -Umid
<b>Power, Sinus, 100Hz, continuous</b>		
4 Ohm	58 V, 15.5 A, 841 W	< 1 % THD+N; Auto or Uhigh
3 Ohm	56 V, 18.5 A, 1036 W	< 1 % THD+N; Auto or Uhigh
2 Ohm	40 V, 19 A, 760 W	< 1 % THD+N; Auto
1 Ohm	19 V, 19 A, 361 W	< 1 % THD+N; Auto
0.5 Ohm	9.5 V, 19 A, 180.5 W	< 1 % THD+N; Auto
0.06 Ohm	1.15 V, 19 A, 21.85 W	< 1 % THD+N; Auto or Umid
<b>Power, DC</b>		
0.9 Ohm	24 V, 26 A, 624 W	Auto or Umid
0.55 Ohm	13.5 V, 24.5 A, 330 W	Auto or Umid
<b>Sink Power, DC</b>		
	650 W	Low Voltage Mode; see U/I-Plot
<b>Voltage Monitor</b>		
	$\pm 100 \text{ mV} \triangleq 1 \text{ V} \pm 2\%$	
<b>Current Monitor</b>		
	High Current Range: $\pm 200 \text{ mV} \triangleq 1 \text{ A} \pm 2.5\%$	Shunt = 20 mOhm
	Low Current Range: $\pm 1.2 \text{ V} \triangleq 100 \text{ mA} \pm 1\%$	Shunt = 2.5 Ohm
<b>Gain</b>		
Controlled Voltage Mode	1 V / 10 V	Uin / Uout

Parameters	Specification	Conditions/Moments
Controlled Current Mode	High Current Range: 1 V / 3 A	U <sub>in</sub> / I <sub>out</sub>
	Low Current Range: n.a.	unspecified
<b>Physical Characteristics</b>		
AC Power	230 VAC / 50 Hz	
	USB	
Remote control	Ethernet (Option)	
Operating Temperature	10 °C to 55 °C	
Humidity	80% or less	non-condensing
Cooling	Forced air	
Dimensions (W x H x D)	449 x 177 x 585.5 mm	
Weight	Approx. 30 kg	

The A1110-16-QE is equipped with three operating voltages and the two auto and manual operating modes.

Mode	+operating voltage	-operating voltage
Auto	10 V, 45 V, 90 V	-10 V, -45 V, -90 V
Manual: + U <sub>mid</sub>	45 V	auto
Manual: + U <sub>high</sub>	90 V	auto
Manual: - U <sub>mid</sub>	auto	-45 V
Manual: - U <sub>high</sub>	auto	-90 V
Manual: + U <sub>mid</sub> , -U <sub>mid</sub>	45 V	-45 V
Manual: + U <sub>high</sub> , -U <sub>mid</sub>	90 V	-45 V
Manual: + U <sub>high</sub> , -U <sub>high</sub>	90 V	-90 V
Manual: + U <sub>high</sub> , -U <sub>high</sub>	45 V	-90 V

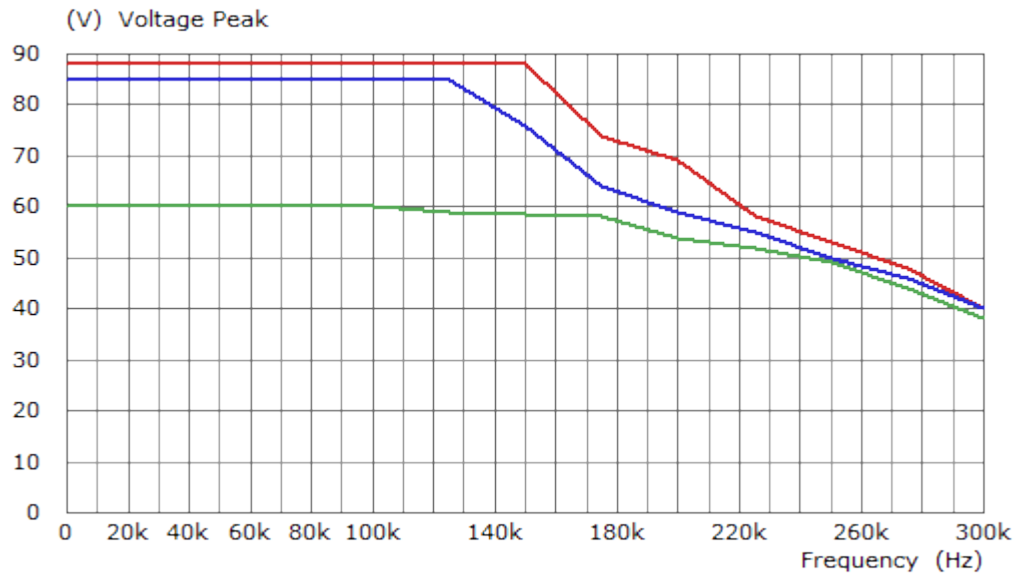
In auto mode the operating voltage is automatically switched on the basis of the signal amplitude. This mode is suitable for real-time applications with DC voltages and sine-wave signals, with which high sink outputs are required at inductive loads.

Output Voltage vs. Frequency (THD + N < 1%)

Red: @ 8 Ohm

Blue: @ 4 Ohm

Green: @ 2 Ohm

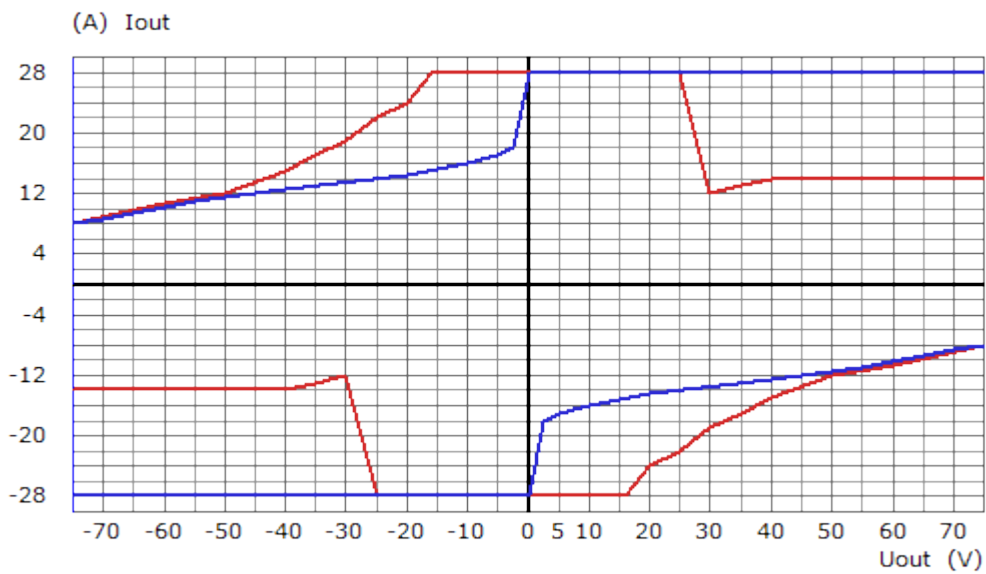


Output Current vs. Output Voltage (THD + N < 1%)

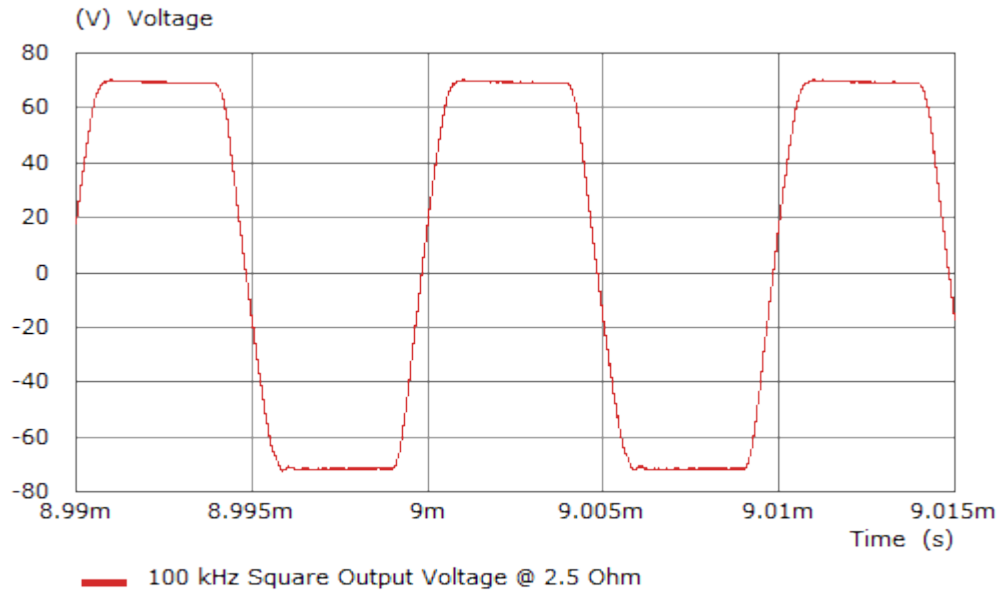
Supply Voltage: Auto

Blue: AC Limit

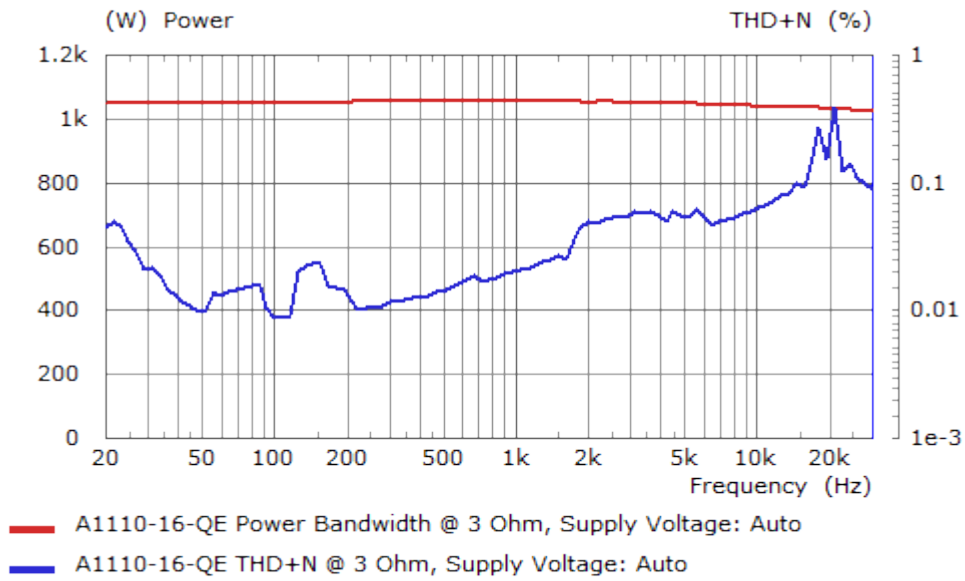
Red: DC Limit



Square wave at 100 kHz and 2,5 Ohm load

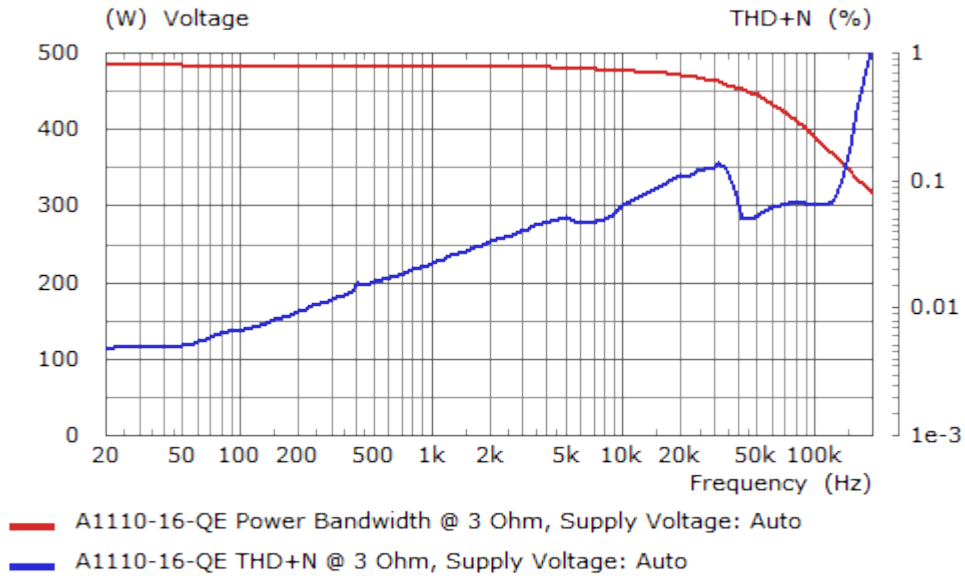


Power bandwidth at 3 Ohm load  
(Input level normalised to max. output level at 30 kHz; THD+N < 1%)

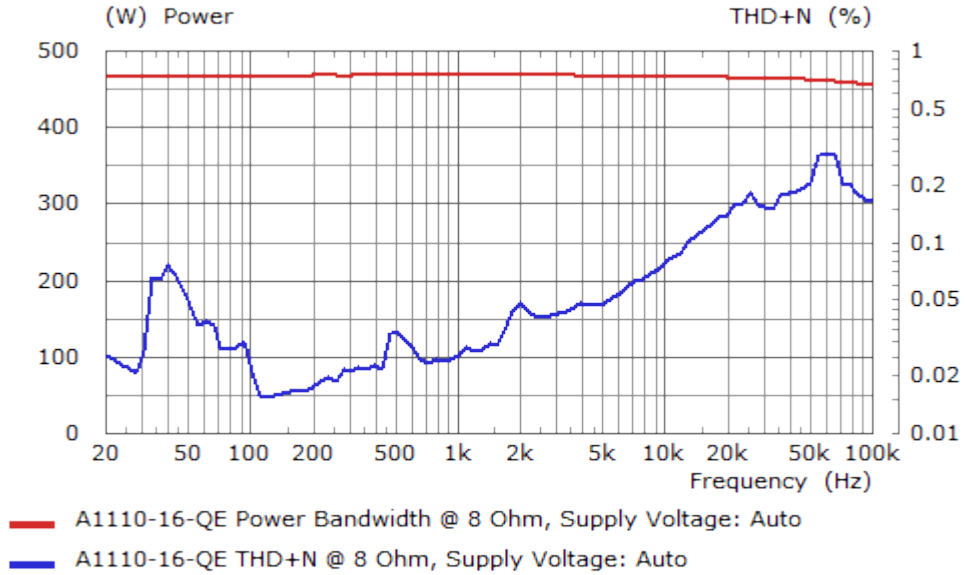




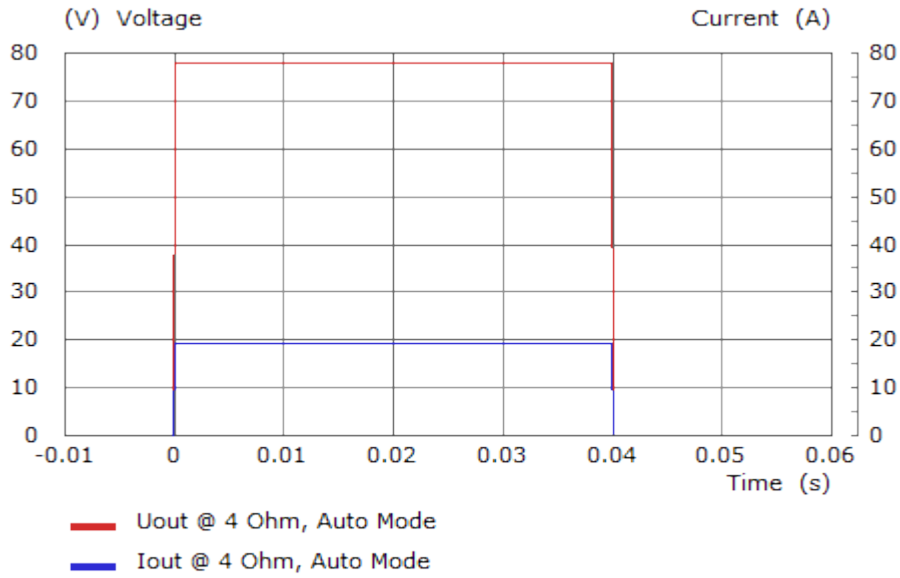
Power bandwidth at 3 Ohm load  
 (Input level normalised to max. output level at 200 kHz; THD+N < 1%)



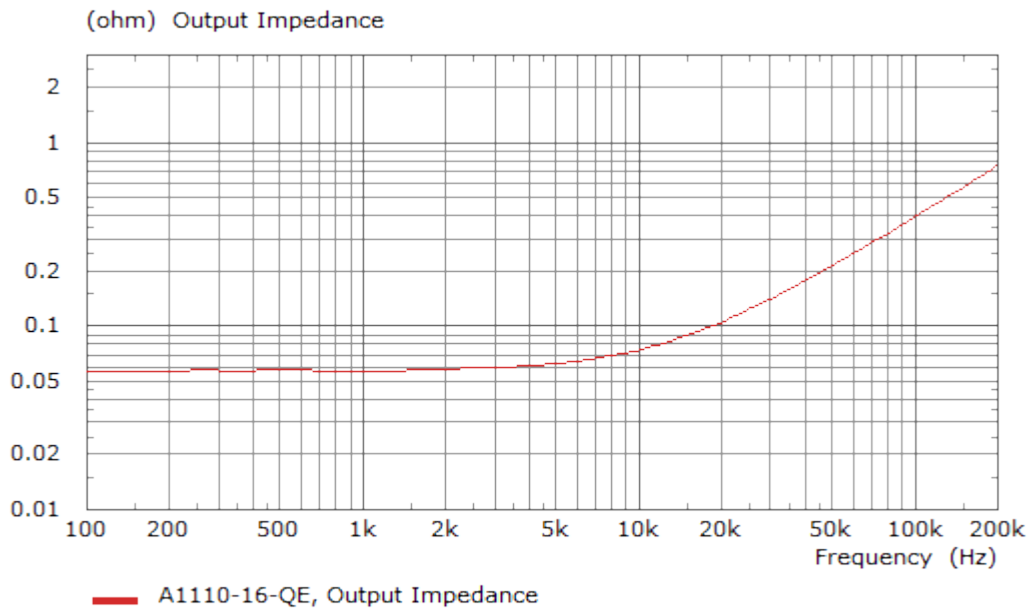
Power bandwidth at 8 Ohm load  
 (Input level normalised to max. output level at 100 kHz; THD+N < 1%)



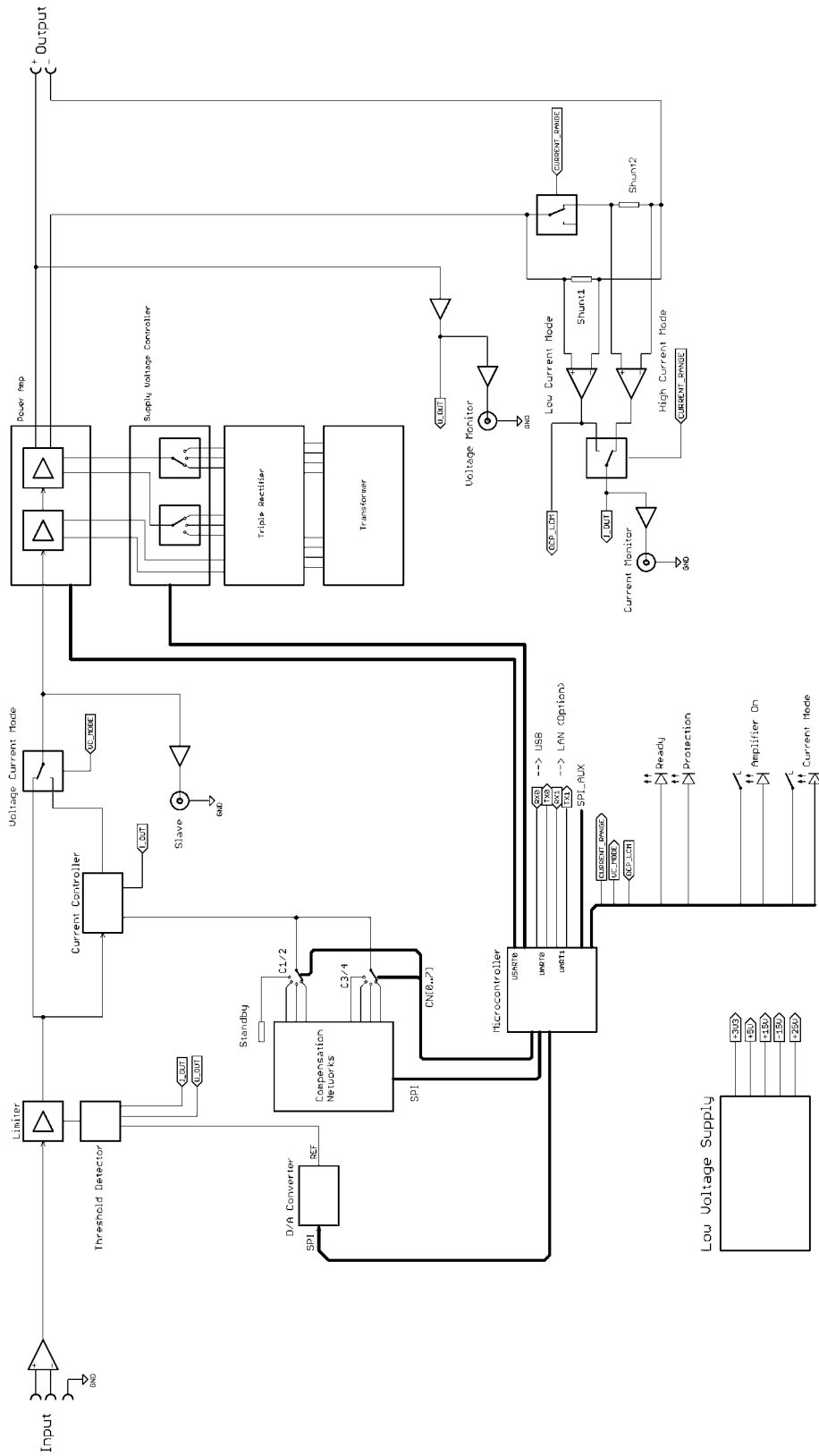
Pulse at 4 Ohm load



Output Impedance



Block diagram A1110-16-QE



## Ordering information

11100070	A1110-16-QE; Precision power amplifier; incl. software
11101020	Option_02: Internal precision current measurement by means of high-performance current transformer 0-50 A; Precision DC +/-0.1%; Bandwidth DC...>800kHz; Output BNC bush, galvanically isolated from the amplifier
11101030	Option_03: Ultra stable gain
11101040	Option_04: Function generator; DC, 0.05Hz - 300 kHz, sine, square, triangle
11101050	Option_05: Isolation amplifier for potential isolation of input and output
11101060	Option_06: Ethernet interface



Dr. Hubert GmbH  
Universitätsstraße 142  
44799 BOCHUM  
GERMANY  
Tel. +49 234 970569-0  
Fax. +49 234 970569-29  
sales@drhubert.de  
www.drhubert.de