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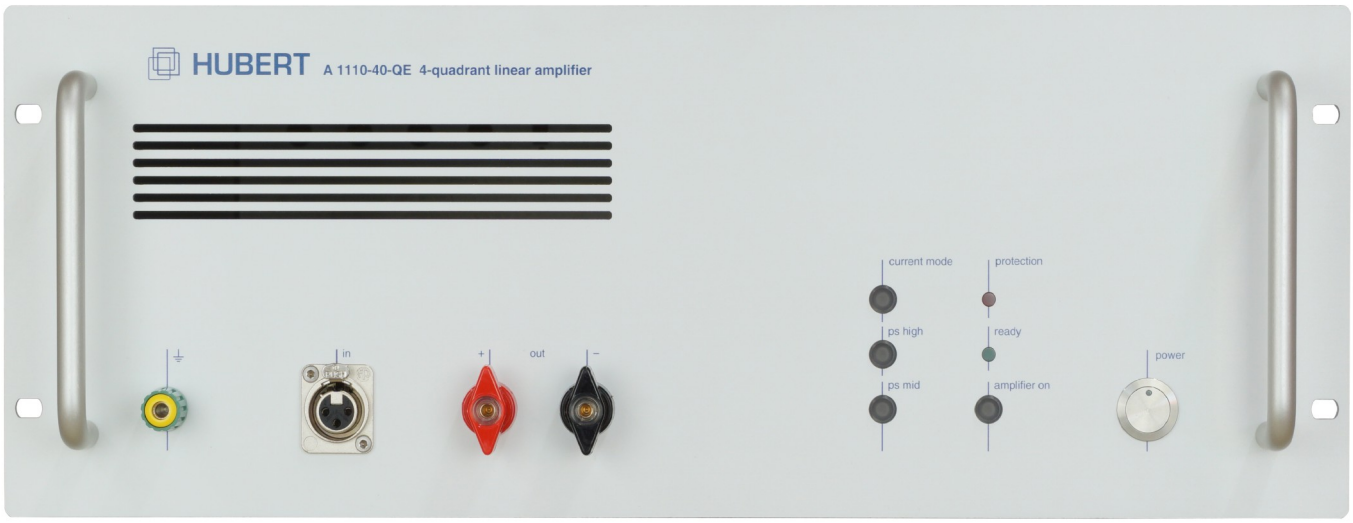
Datasheet



A1110-40-QE

4-Quadrant Voltage and Current Amplifier
DC – 1 MHz

MADE IN GERMANY

Revision 3.2
DS-11100080-04

1 Product Description

The A1110-40-QE is a linear, extreme-broadband, precision power amplifier designed for all applications which require fast-changing signals with high performance.

The A1110-40-QE can be operated as a voltage amplifier or current amplifier. The current amplifier offers a constant, frequency-invariant output current for inductive loads.

Three optional operating voltages per polarity are available for high-voltage/low-current or low-voltage/high-current applications. The voltage switch-over can be implemented optionally as manual or automatic. Especially in case of very low-impedance loads, the operating voltage can be reduced to 1/10 which is associated with a corresponding reduction of the power loss.

Output voltage and output current can be limited and observed on low-impedance monitor outputs.

The device is equipped with a temperature-controlled, quietly-running fan. An over-temperature protection, a power-loss calculation and an absolute-current monitoring guarantees perfect short-circuit and overload protection.

An interlock offers the possibility of a remote-controlled security system.

The device can be operated by using elements on the front panel. Additionally the device can be controlled with the supplied A1110 Control Software via an USB connection.

The device's functionality can even be extended by several product options.

Please find the latest release of this datasheet on our website:
www.drhubert.com

2 Features

- 4-quadrant voltage and current amplifier
- Fully configurable and operable by means of the supplied software
- Output voltage max. 75 V_{peak}
- Output current max. 40 A_{peak}
- Output current 80 A_{peak} / 5 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
- Sensing Inputs
- Up to 6 configurable compensation networks for inductive loads in current amplifier mode. Five general-purpose networks are onboard per default.
- Prepared for rack mounting

3 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

4 Control Software

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

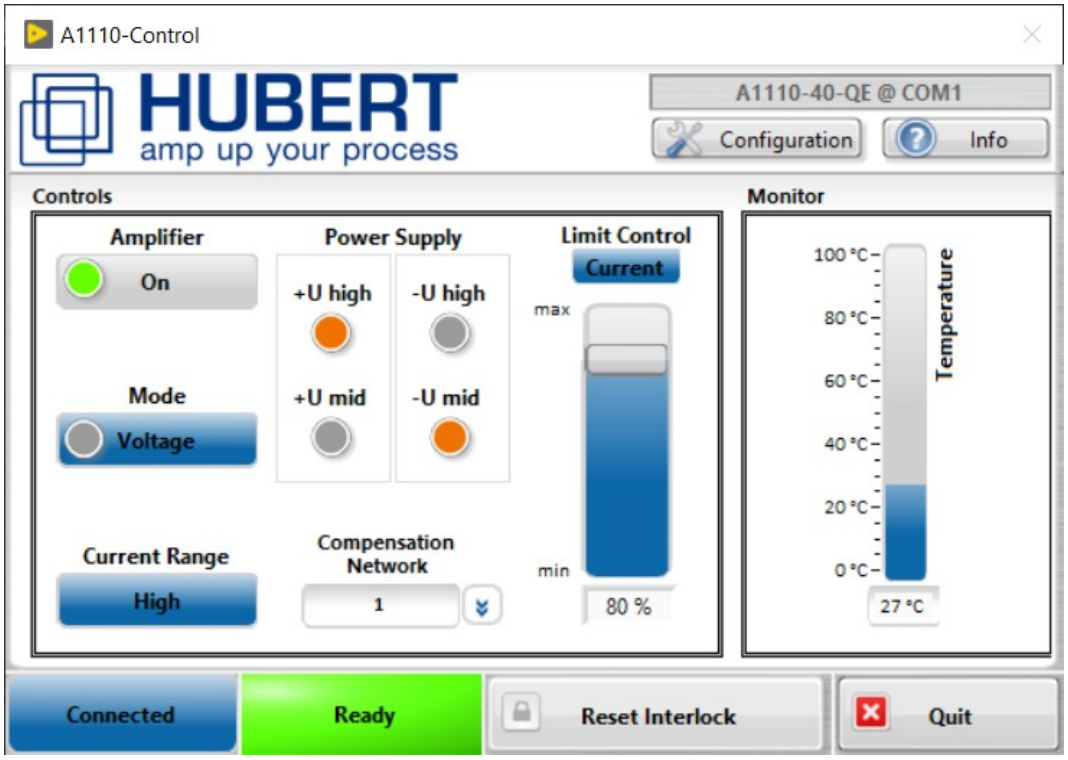


Figure 1: A1110-Control Main Menu

5 Pictures

6 Current Amplifier

In current control mode, the A1110-40-QE behaves like a voltage-controlled current source and delivers a nearly frequency-independent constant load current to an inductive load.

The following compensation networks are equipped ex works.

No	Load	Rc	Cc	Current Range
1	1 Ohm + 500 uH	100 kOhm	10 nF	high
2	0,1 Ohm + 200 uH	68 kOhm	4,7 nF	high
3	1 Ohm + 1mH	150 kOhm	22 nF	high
4	4 Ohm + 1,8 mH	200 kOhm	1 nF	high
5	0,078 R + 88 uH	80 kOhm	6,8 nF	high
6	*Reserved for Option-01*			

Table 1: Compensation Network

The selection is made by our A1110-Control software. Please also note the corresponding recommended current measuring range.

If none of the above compensation networks is suitable for your application, please order your amplifier with Option-01: Custom Current Amplifier. Our engineers will design a custom compensation network specific for your needs. You can add additional networks to your amplifier. Up to six customs networks are possible as existing ones can be removed.

We would be pleased to assist you in the realization of a compensation network for your application.

7 Specifications

Parameters	Specification	Conditions / Moments
	Controlled Voltage Mode	25° C ambient temperature
		Continuous operation
Input Impedance	100 kOhm	unbalanced, 1kHz
	200 kOhm	balanced, 1kHz
Maximum Input Level	± 7.5 V_{peak}	< 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, @ 10 kOhm, High Voltage Mode
	DC - 1 MHz	+0, -3.0 dB, @ 10 kOhm, High Voltage Mode
Power Bandwidth	DC – 200 kHz	+0, -3.0 dB
Phase response	+0, -5 degrees	10 Hz - 30 kHz
Max. Output Current	± 40 A_{dc}	continuous
	± 80 A_{peak}	Pulse, width=5ms, duty cycle 0.25%, fix or automatic mode
Max. Output Voltage	± 75 V	
Slew Rate	70 V/uSec	
Output Noise		
10 Hz - 22 kHz	< 354 uV (< -69 dBV)	All Voltage Modes Input shorted 8 Ohm Load
10 Hz - 200 kHz	< 800 uV (< -62 dBV)	All Voltage Modes Input shorted 8 Ohm Load
Signal-to-Noise Ratio		
10 Hz - 22 kHz	< -103 dB	re +34.5 dBV, < 1% THD 8 Ohm Load High Voltage Mode
10 Hz – 200 kHz	< -96 dB	re +34.5 dBV, < 1% THD 8 Ohm Load High Voltage Mode
Max. Output Power	1200 W	
Max. Sink Power	600 W	
Voltage Monitor	± 100 mV ≙ 1 V ± 0.5 %	DC – 100 kHz
Current Monitor	High Current Range: ± 1V ≙ 10 A ± 1 %	DC – 100 kHz Shunt = 5.4 mOhm

Parameters	Specification	Conditions / Moments
Gain		
Controlled Voltage Mode	1 V / 10 V; ± 0.1% (±0.01%/°C)	Uin / Uout
Controlled Current Mode	1 V / 10 A	Uin / Iout
Physical Characteristics		
AC Power	230 VAC / 50 Hz	
Remote control	USB Ethernet (Option)	
Operating Temperature	10 °C to 55 °C	
Humidity	80% or less	non-condensing
Cooling	Forced air	
Dimensions (W x H x D)	450 x 198 x 676 mm	
Weight	Approx. 30 kg	

The A1110-40-QE is equipped with three operating voltages and the two auto and manual operating modes.

Mode	+operating voltage	-operating voltage
Auto	10 V, 35 V, 90 V	-10 V, -35 V, -90 V
Manual: +Umid	35 V	auto
Manual: +Uhigh	90 V	auto
Manual: -Umid	auto	-35 V
Manual: -Uhigh	auto	-90 V
Manual: +Umid, -Umid	35 V	-35 V
Manual: +Uhigh, -Umid	90 V	-35 V
Manual: +Uhigh, -Uhigh	90 V	-90 V
Manual: +Umid, -Uhigh	35 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 power is required at inductive loads.

7.1 Pulse Response

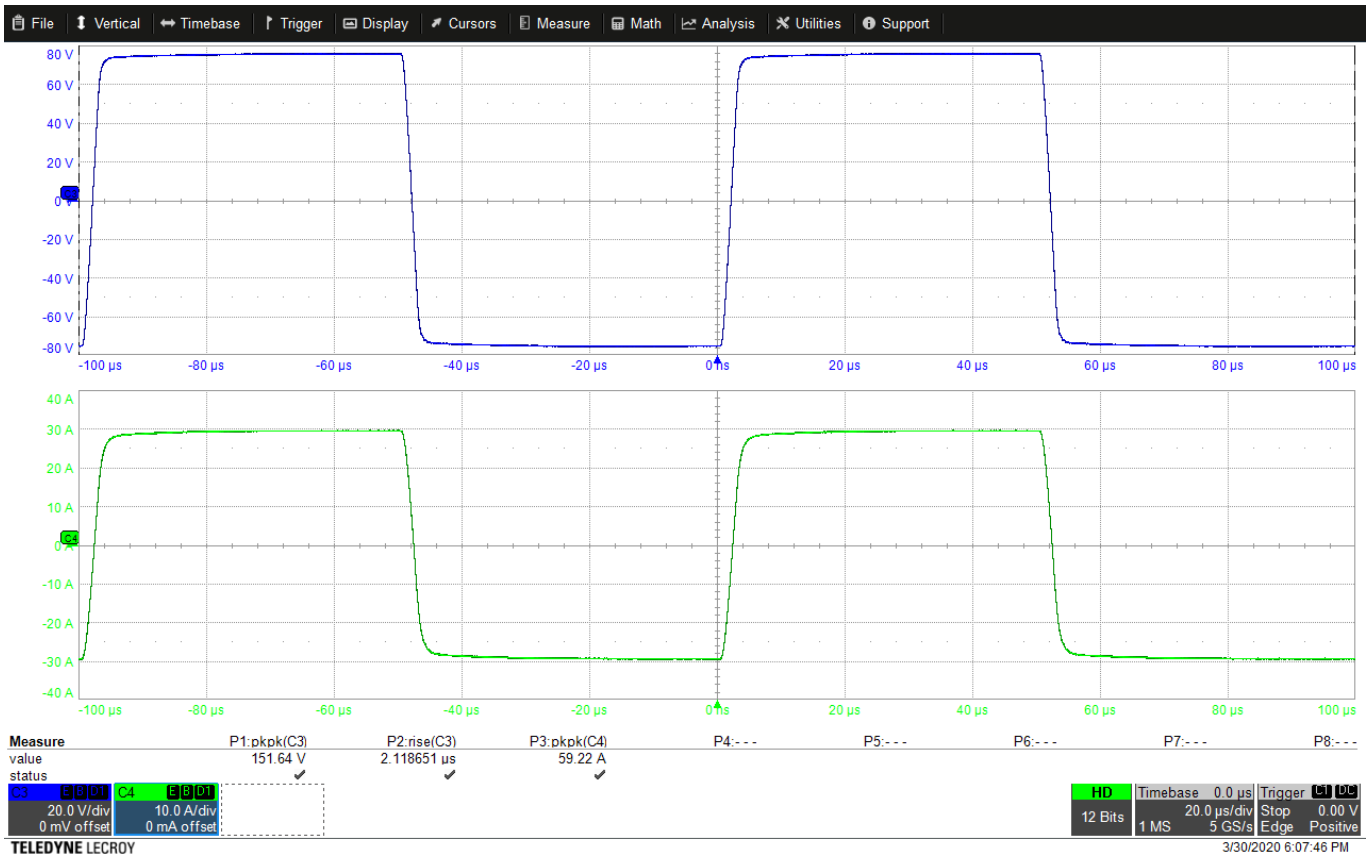


Figure 3: C3: Output Voltage; C4: Output Current
Vin: 10 kHz , Load: 2,5 Ohm

7.2 Frequency Response

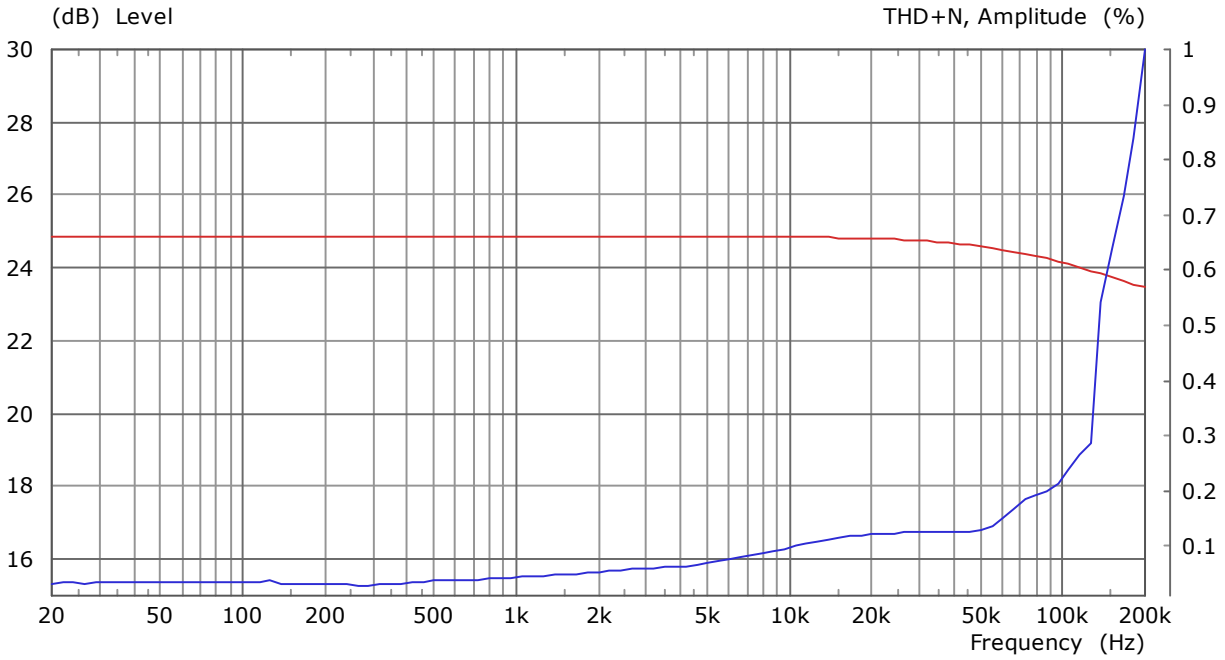


Figure 4: Output Voltage @ 1 Ohm

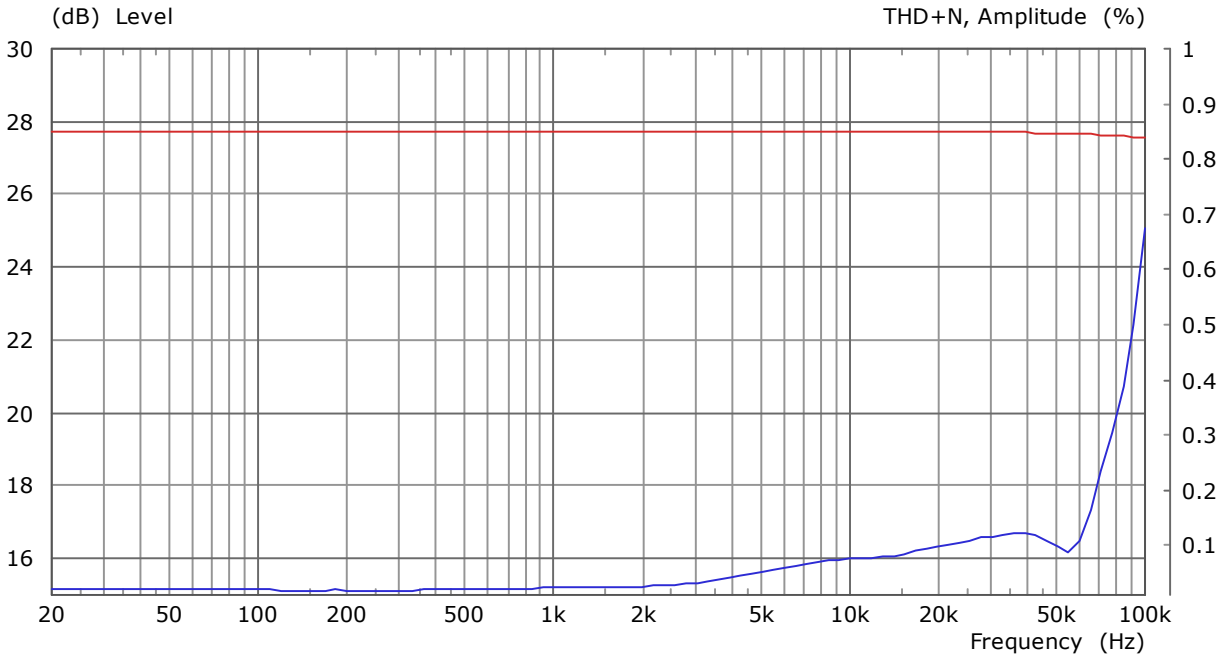


Figure 5: Output Voltage @ 2,5 Ohm

7.3 Output Current Capability versus Output Voltage

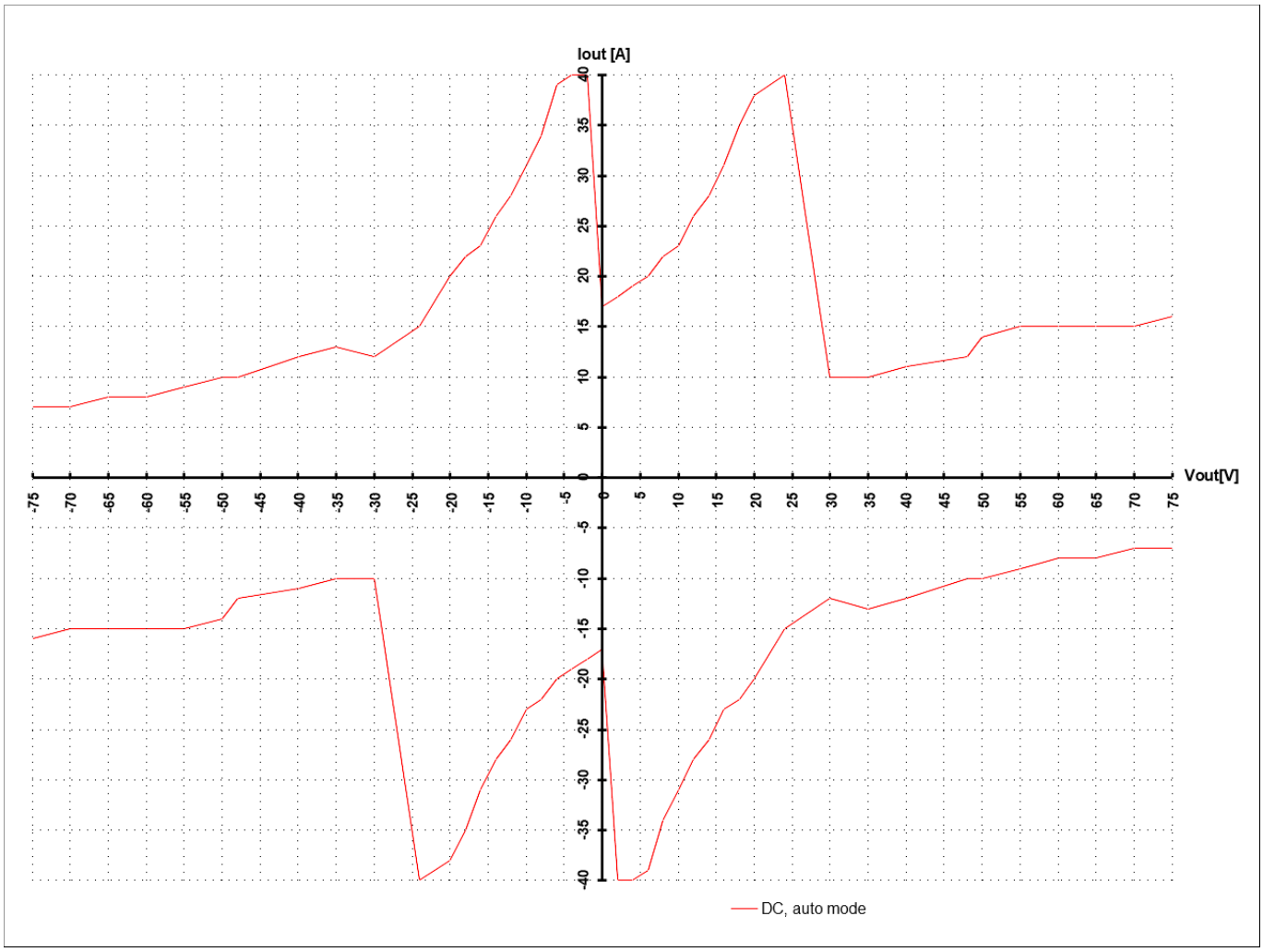


Figure 6 Operating Voltage: auto mode; Output Voltage: DC

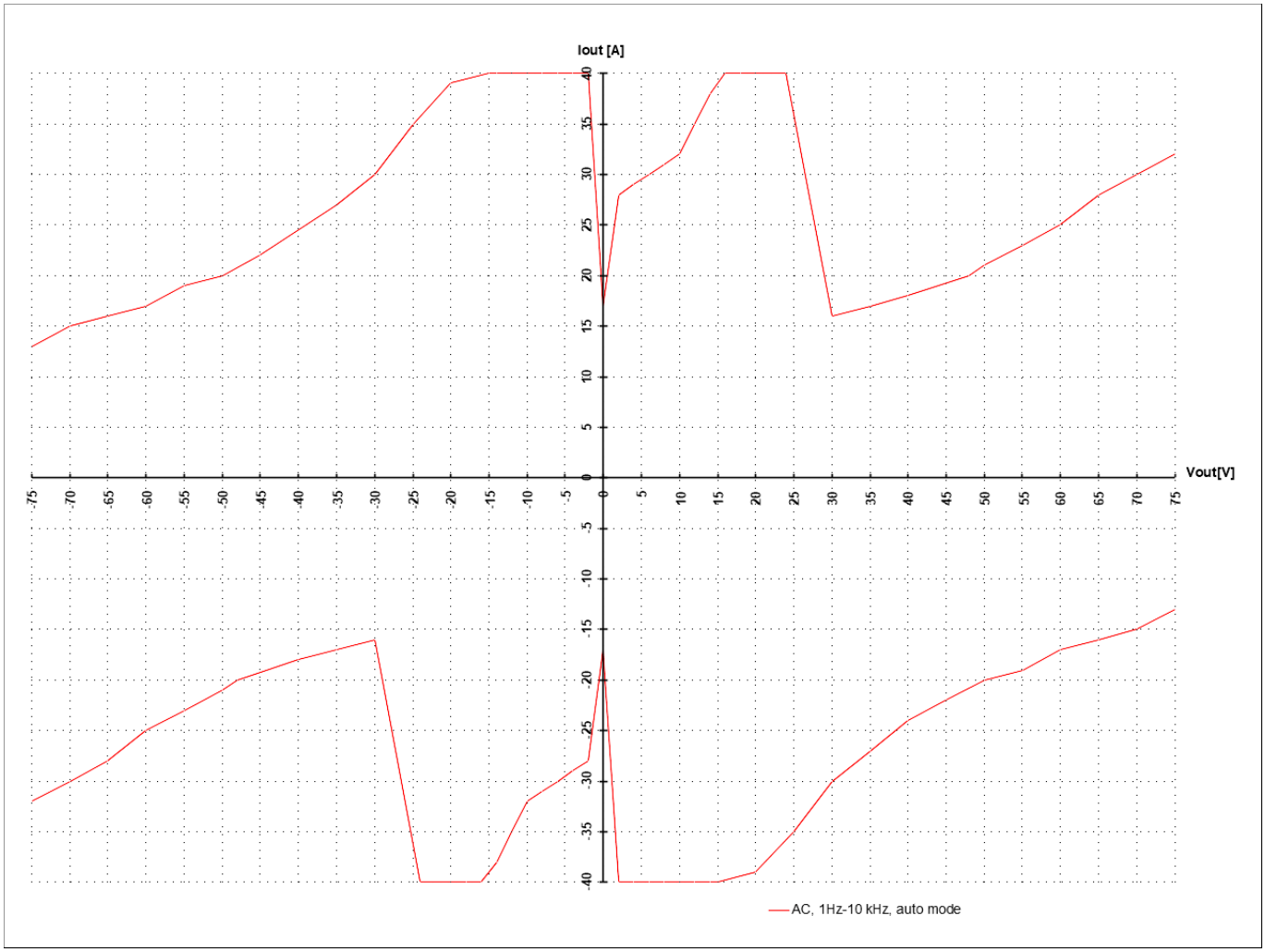


Figure 7 Operating Voltage: auto mode; Output Voltage: AC < 10 kHz

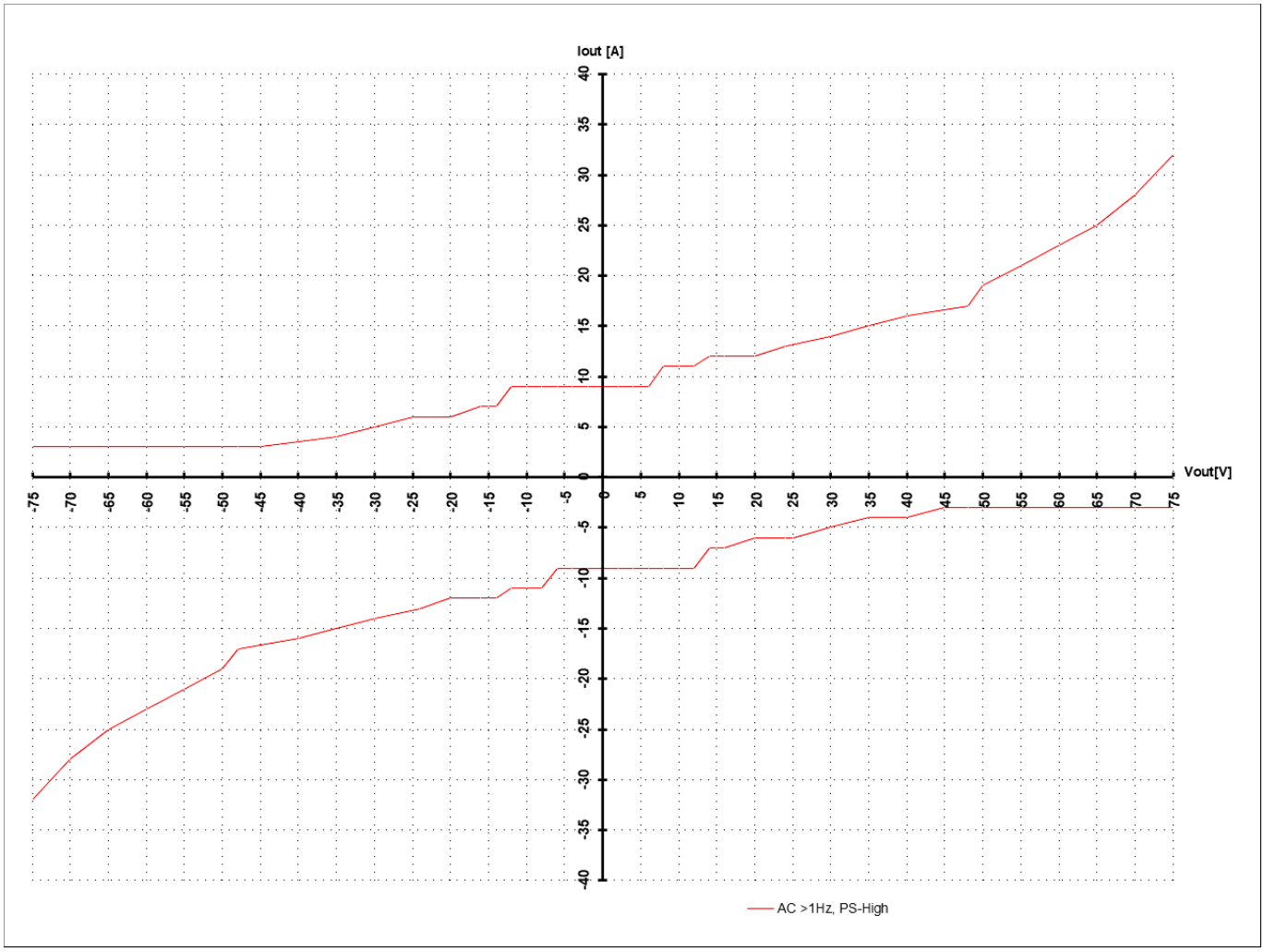


Figure 8: Operating Voltage: PS-High; Output Voltage: AC >1 Hz

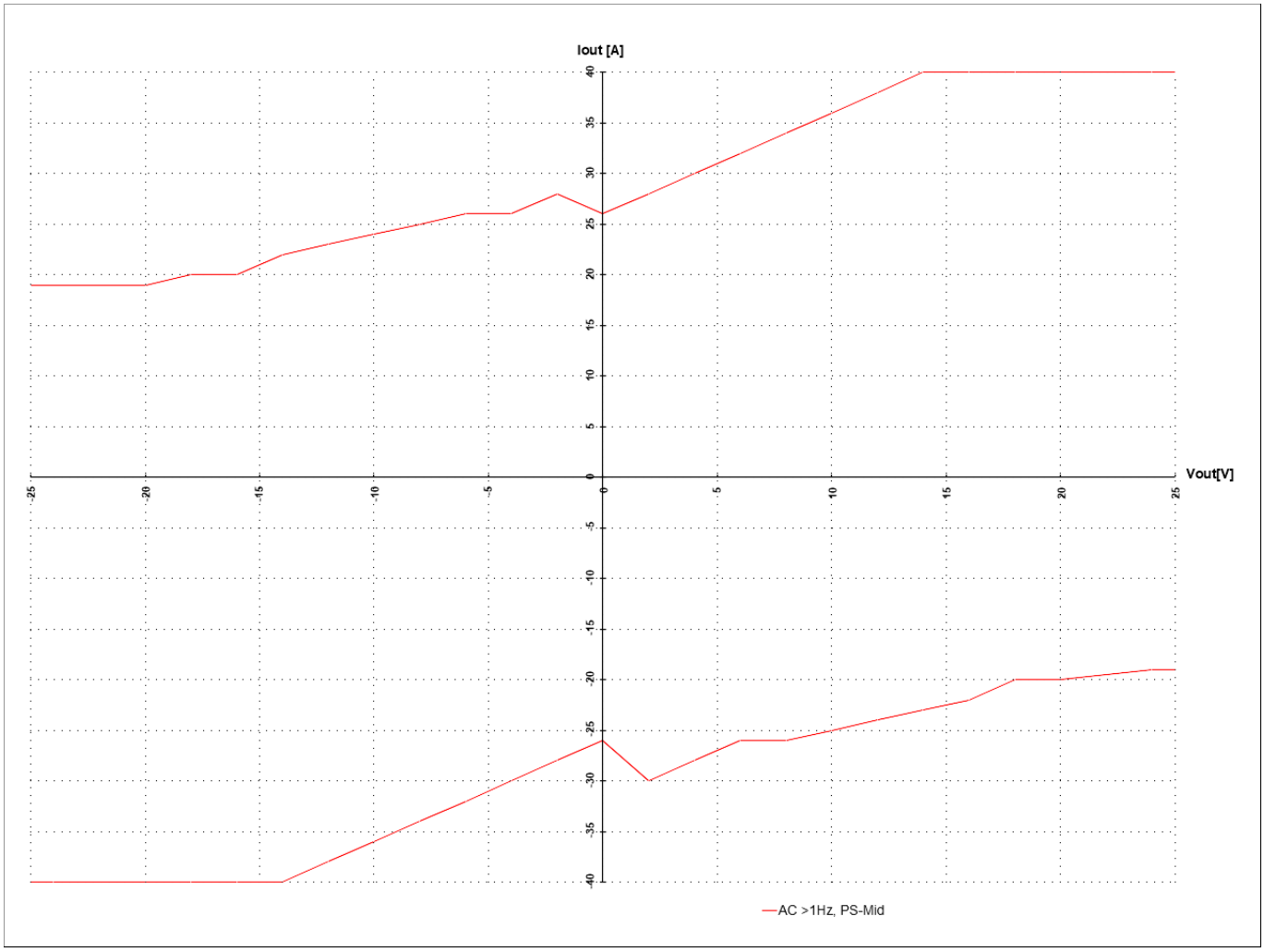


Figure 9: Operating Voltage: PS-Mid; Output Voltage: AC > 1 Hz

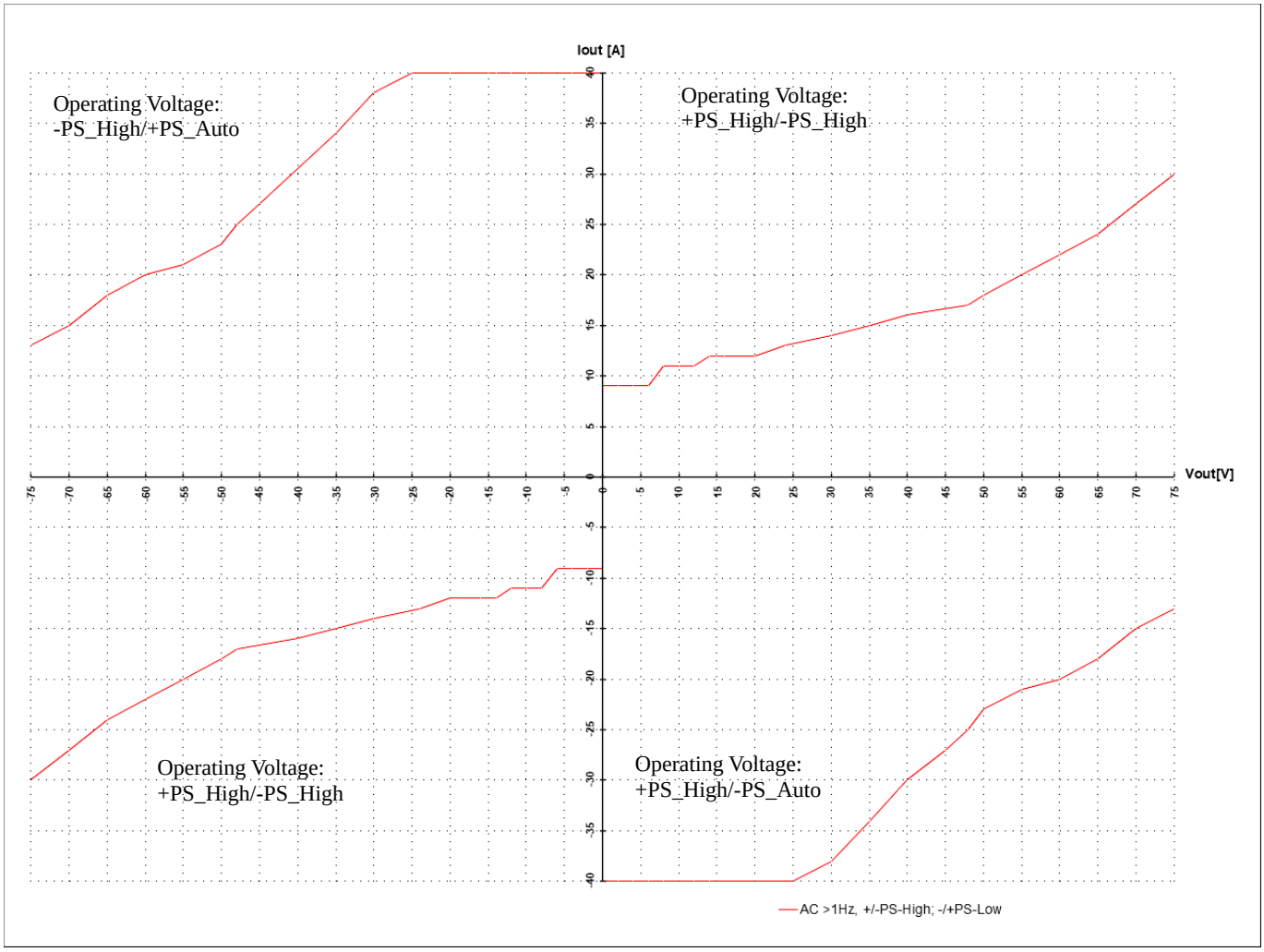
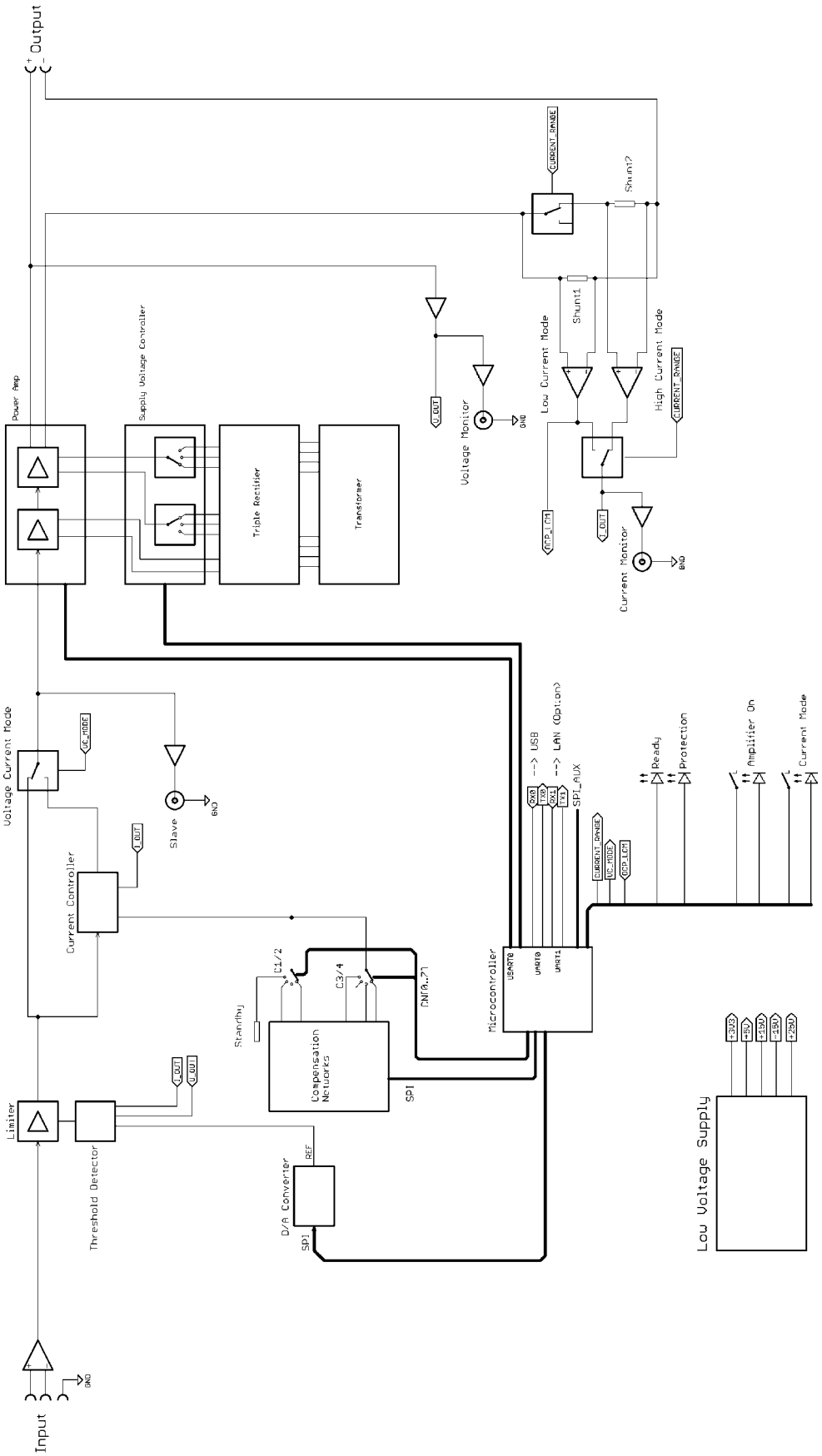


Figure 10 Operating Voltage: asymmetrical, depends on quadrant; Output Voltage: AC >1 Hz

8 Block Diagram



9 Product Options

The following product options are available at the time of placing the order. Upgrades of existing devices are not possible.

Article Name	Article Description
A1110-40-QE	4-Quadrant Voltage and Current Amplifier
Including: Sensing	Adjustable voltage drop: 500 mV / 1V / 2V
Option: Custom Current Amplifier	Additional compensation network for one specified load. The device is equipped with five general-purpose networks by default.
Option: 3-Channel Isolation Amplifier	For potential isolation of input and output
Option: Ethernet Interface	For connection to a computer (RJ45)
Option: Internal Current Measurement	High-performance current transformer; Precision DC +/-0.1%; Output BNC bush, galvanically isolated from the amplifier
Option: Adjustable Output Resistance	R: 0 mΩ – 200 mΩ; Resolution 1 mΩ; Accuracy 0.5%
Option: Overvoltage Protection	For protection of amplifier outputs

10 Contact

Dr. Hubert GmbH
Dietrich-Benking-Str. 41
44805 Bochum - Germany

Tel. +49 234 970569-0
Fax. +49 234 970569-29
sales@drhubert.de

Further information is available on our website www.drhubert.com.

11 Document History

Revision	Date	Changes
2.0	March 2020	First publication in new layout
3.0	May 2021	New housing. Corrections in „Output Current Capability via Output Voltage“.
3.1	May 2022	Options renamed
3.2	October 2022	Options updated