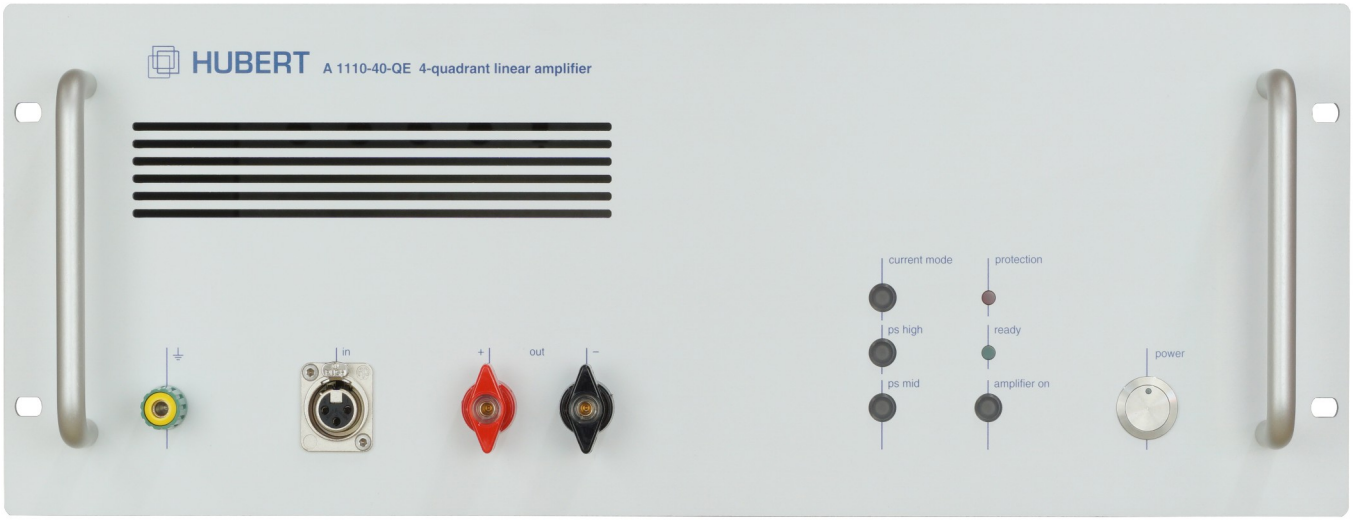
HUBERT
amp up your process

Datasheet



A1110-40-QE

4-Quadrant Voltage and Current Amplifier

Rev. B

MADE IN GERMANY

v1

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 provides 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

amp up your process

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 continuous current max. 40 A_{peak}
- Output peak current 80 A_{peak} / 5 ms
- Symmetrical input
- Series / parallel output 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.

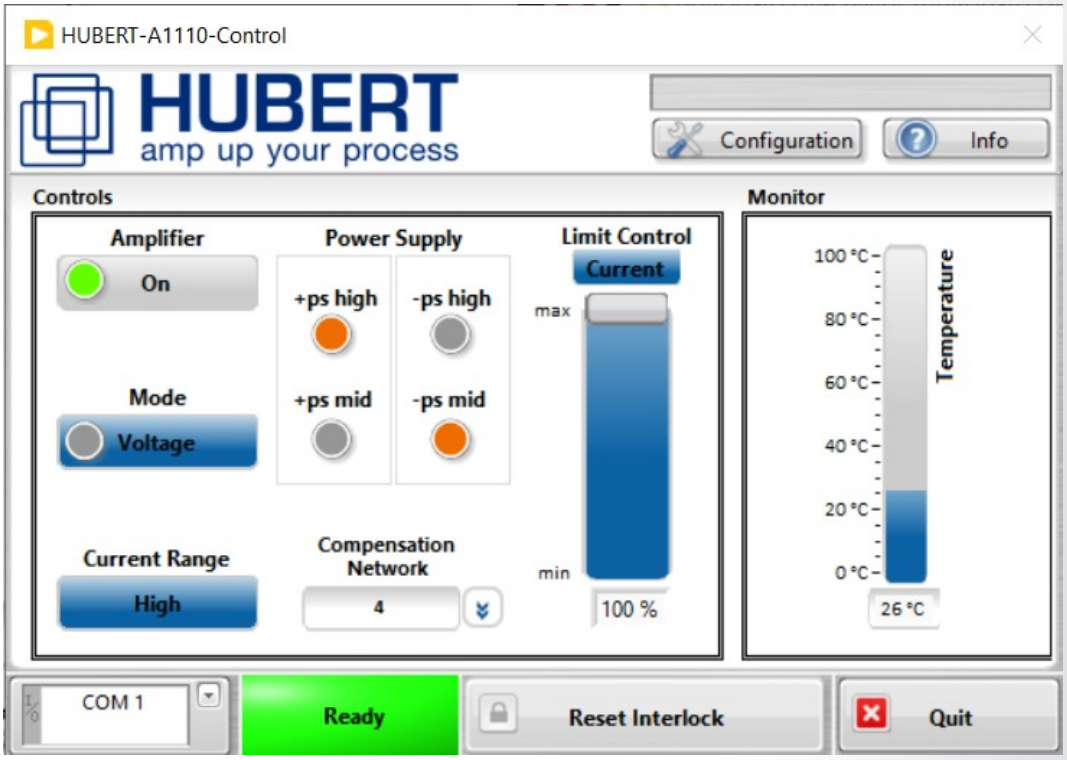


Figure 1: HUBERT-A1110-Control Main Menu

5 Pictures

Figure 2: Back Panel Elements

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 HUBERT-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, 1 Vpp@ 10 kOhm, High Voltage Mode
	DC - 1 MHz	+0, -3.0 dB, 1 Vpp@ 10 kOhm, High Voltage Mode
Power Bandwidth	DC – 200 kHz	+0, -3.0 dB, Voltage Mode
	DC - 100 kHz	+0, -3.0 dB, Current Mode
Phase response	+0, -5 degrees	10 Hz - 30 kHz
Max. Output Current	± 40 A_{dc}	continuous
	± 80 A_{peak}	Pulse, width = 5 ms, duty cycle 0.25%, fix or automatic mode
Max. Output Voltage **...Range I (Auto Mode, PS-Auto)** **...Range II (Mid Voltage, PS-Mid)** **...Range III (High Voltage, PS-High)**	 ± 75 V ± 30 V ± 75V	Auto Mode: rise-/fall-time >50us
Slew Rate	70 V/uSec	
Output Noise		
10 Hz - 22 kHz	< 565 uV (< -65 dBV)	All Voltage Modes Input shorted 8 Ohm Load
10 Hz - 200 kHz	< 1.8 mV (< -55 dBV)	All Voltage Modes Input shorted 8 Ohm Load
Signal-to-Noise Ratio		
10 Hz - 22 kHz	> 99 dB	re +34.5 dBV, < 1% THD 8 Ohm Load High Voltage Mode
10 Hz – 200 kHz	> 99 dB	re +34.5 dBV, < 1% THD 8 Ohm Load High Voltage Mode
Max. Output Power	1200 W	
Max. Sink Power	600 W	

Parameters	Specification	Conditions / Moments
Voltage Monitor	±100 mV ≙ 1 V ± 0.5 %	DC – 100 kHz
Current Monitor	High Current Range: ±1 V ≙ 10 A ± 1 %	DC – 100 kHz Shunt = 5.4 mOhm
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	
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. 39 kg	

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

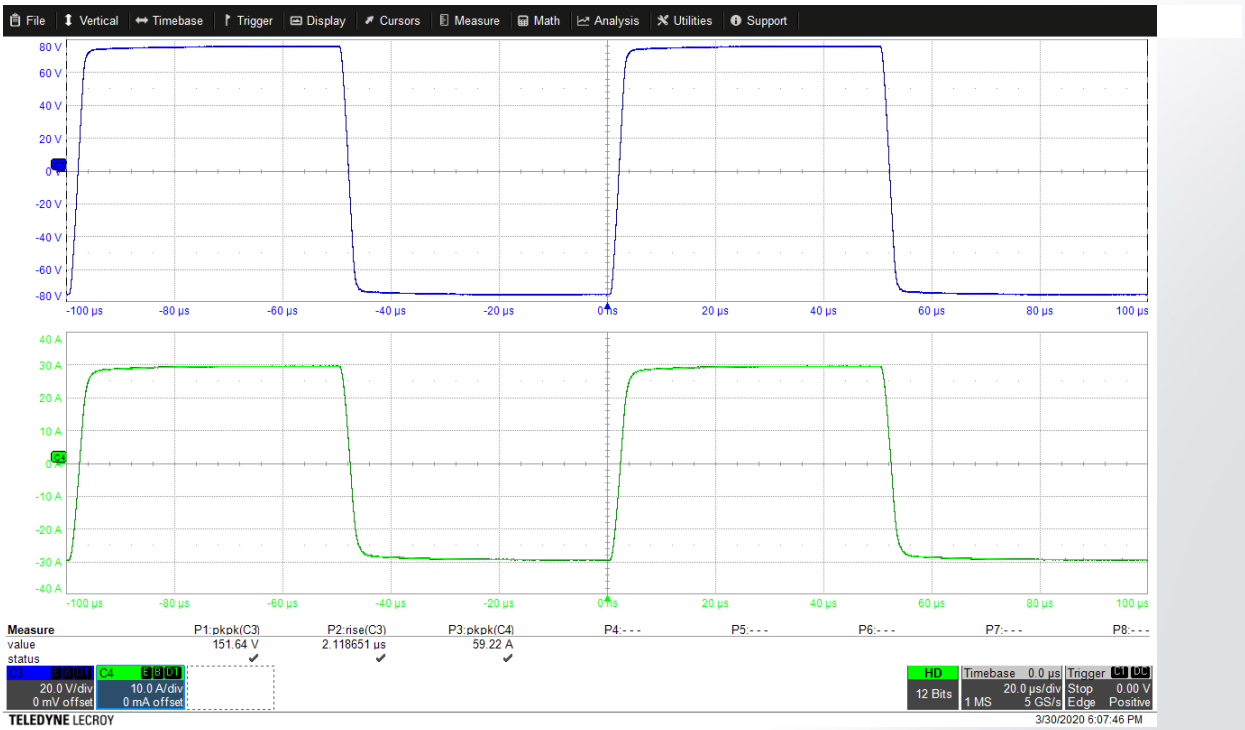


Figure 3: C3: Output Voltage; C4: Output Current
Vin: 10 kHz , Load: 2,5 Ohm

amp up your process

7.2 Maximum Pulse Current

The A1110 has a hardware-based current limiter (HCL) for the maximum pulse current. This prevents an interruption in signal processing, taking into account the time-based protection.

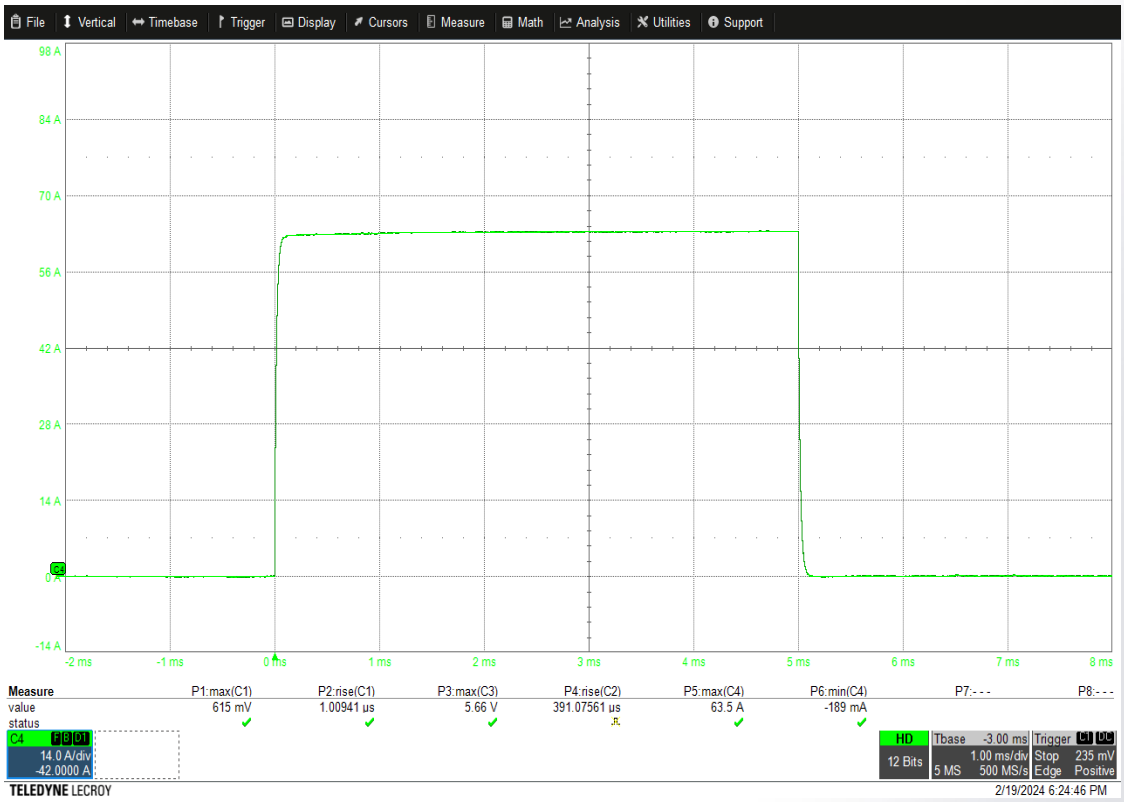


Figure 3 C4: Imon; Load 70 mOhm; HCL is not yet active

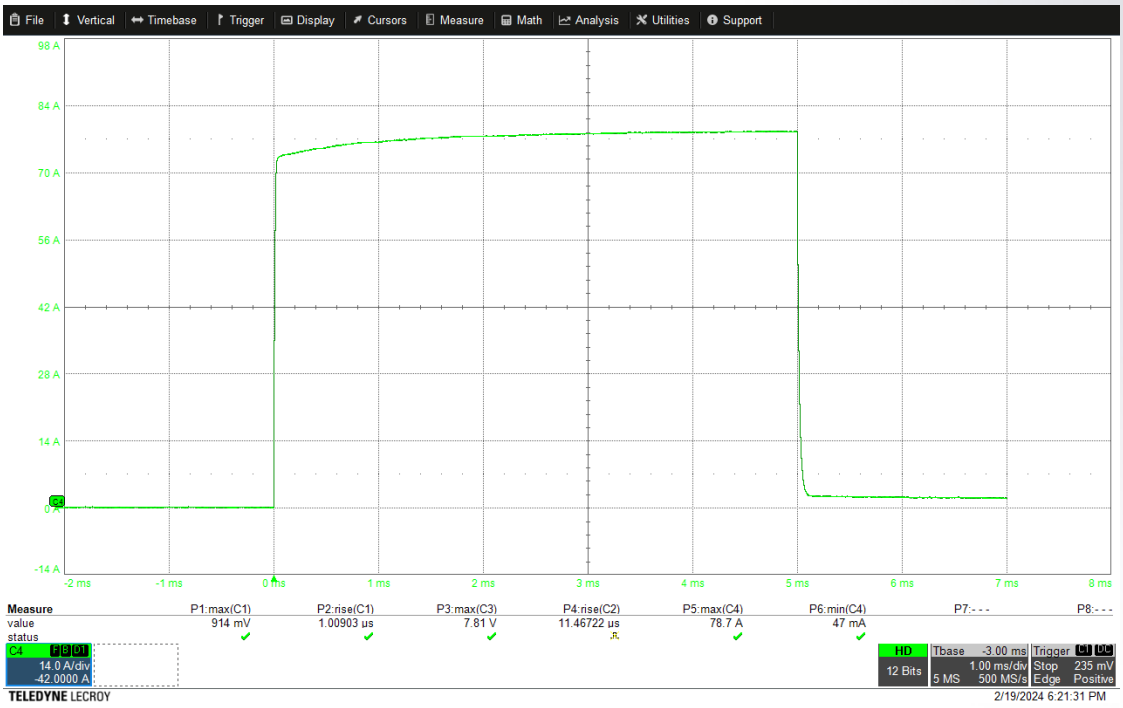


Figure 4: C4: Imon; Load 70mOhm; HCL is active

amp up your process

7.3 Frequency Response

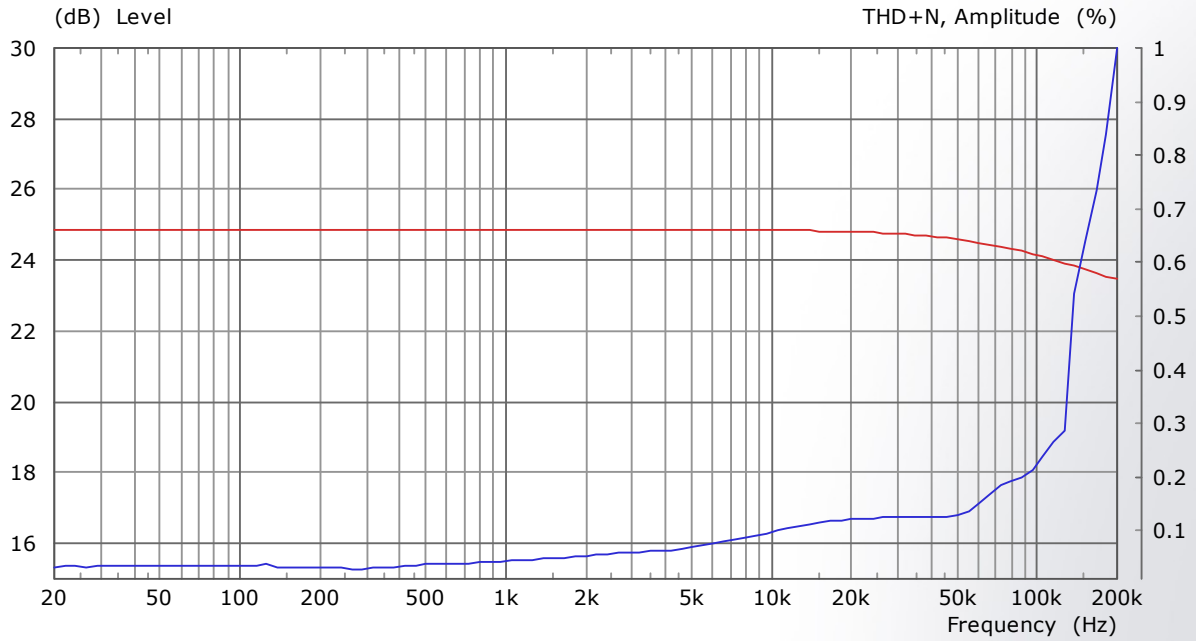
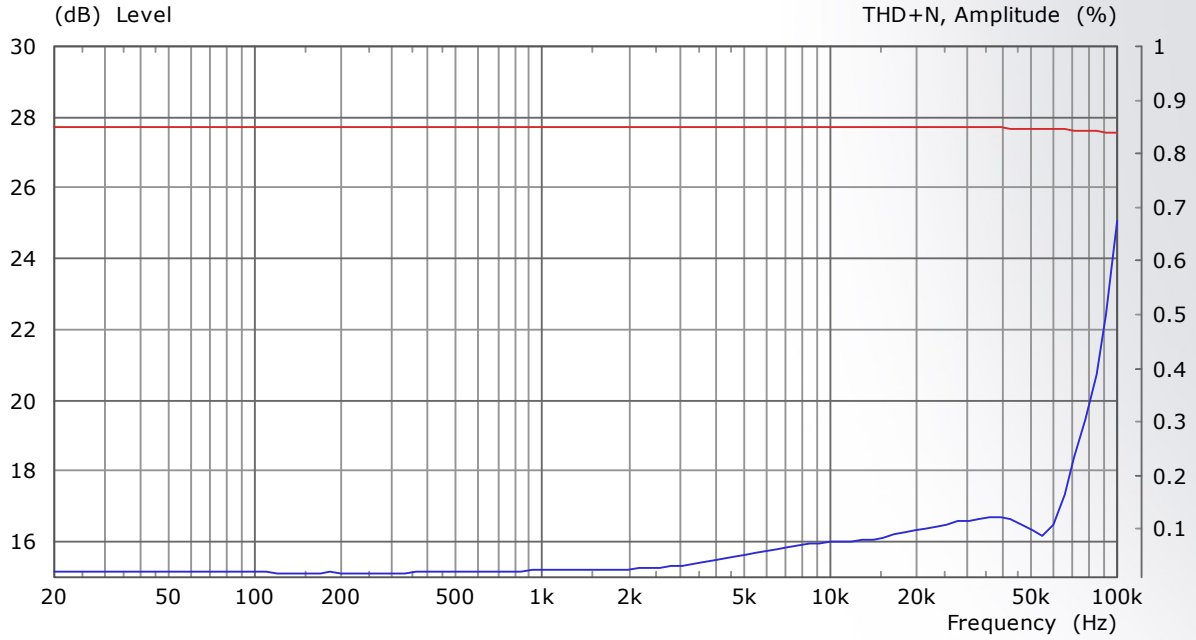


Figure 5: Output Voltage @ 1 Ohm

Figu



re 6: Output Voltage @ 2,5 Ohm

7.4 Output Current Capability versus Output Voltage

7.4.1 Asymmetrical operation (one-quadrant operation)

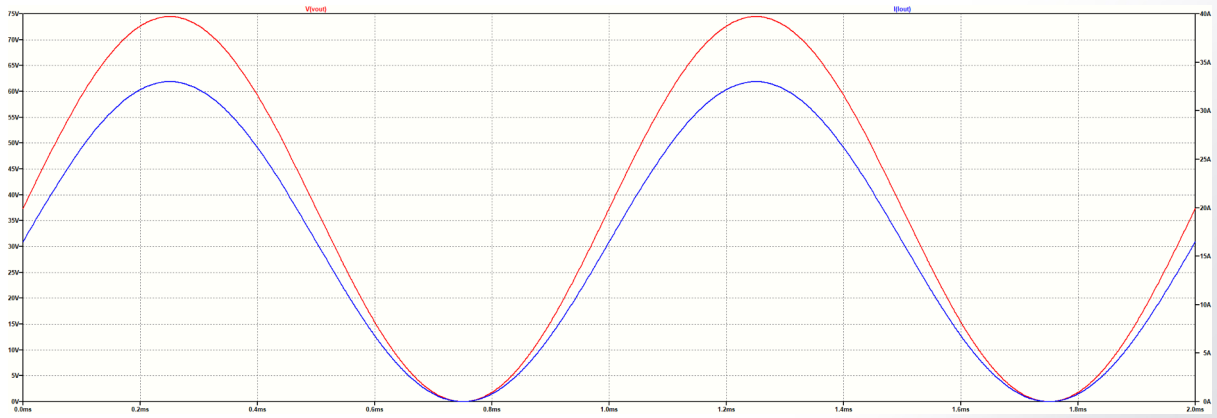
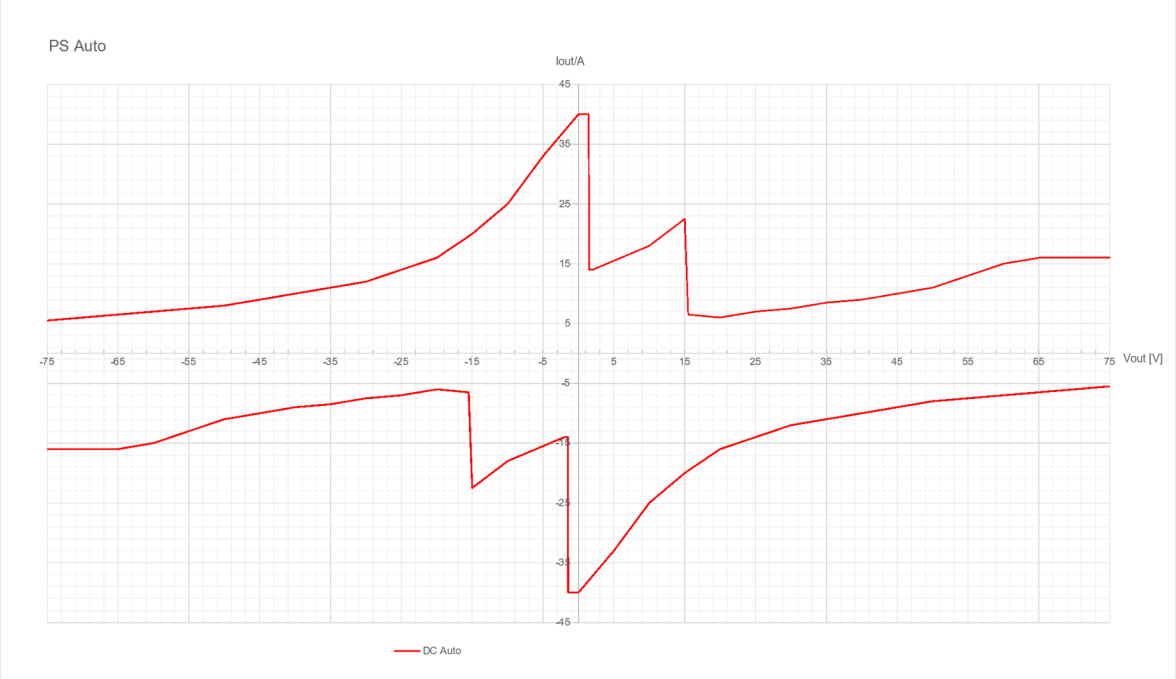
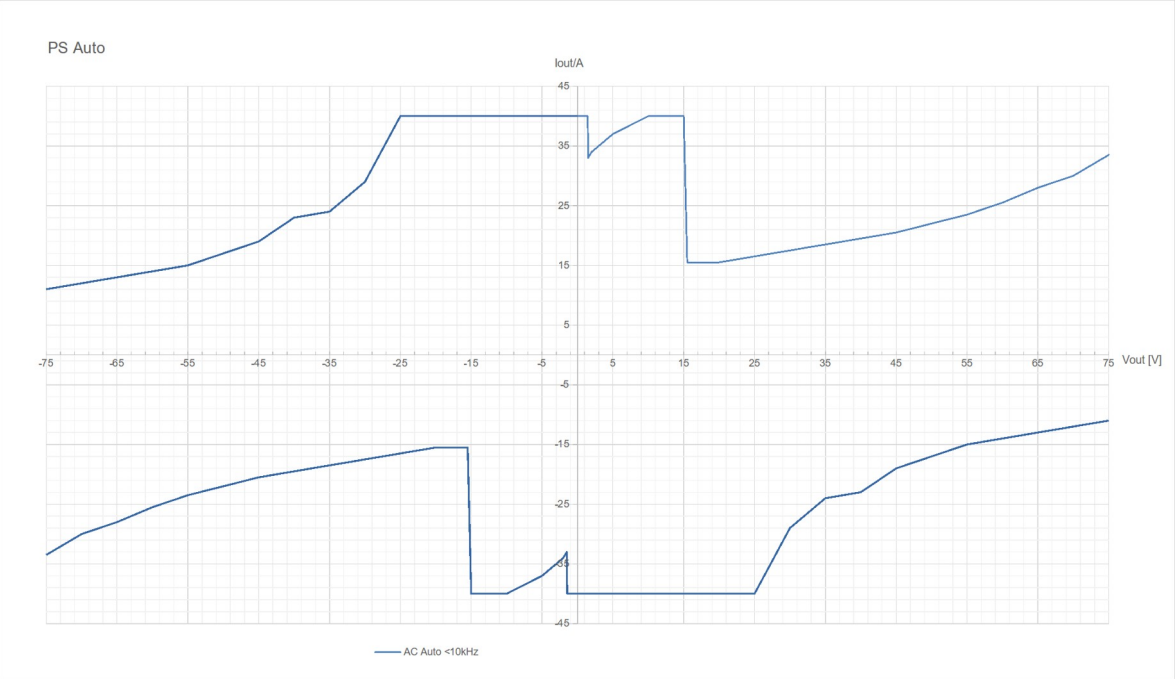
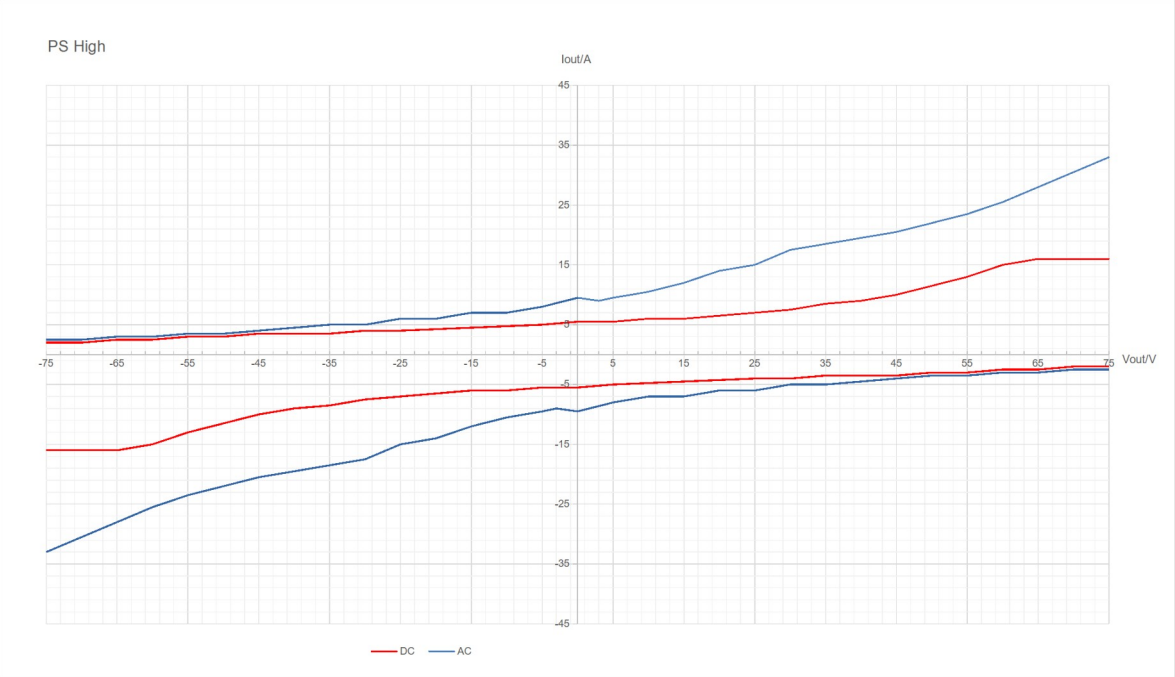


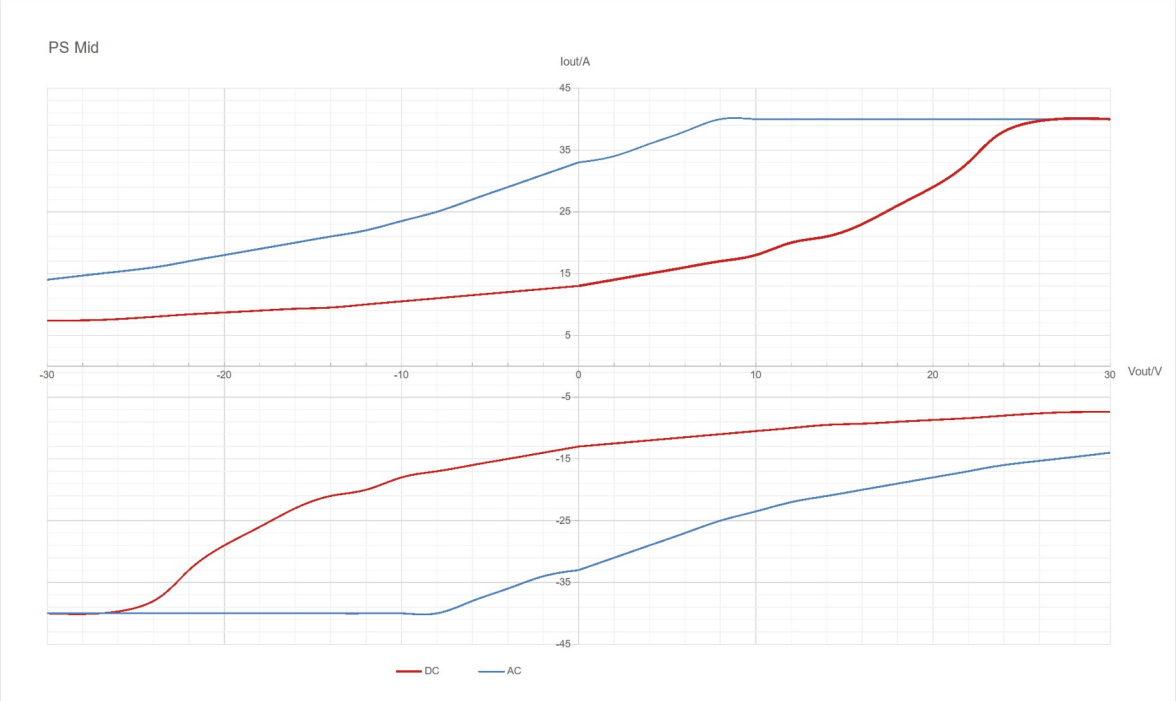
Figure 7: One-quadrant operation; 1st quadrant for example







amp up your process



7.4.2 Symmetrical operation (two-quadrant operation)

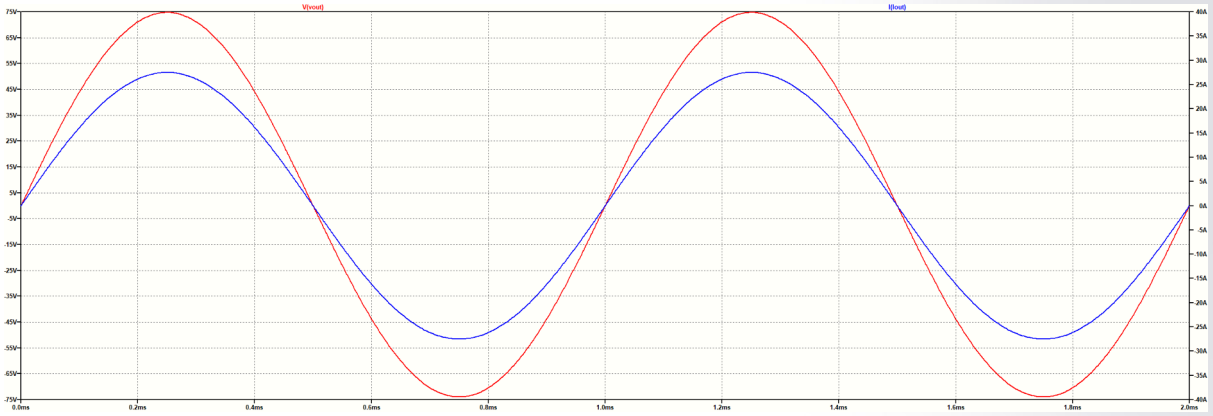
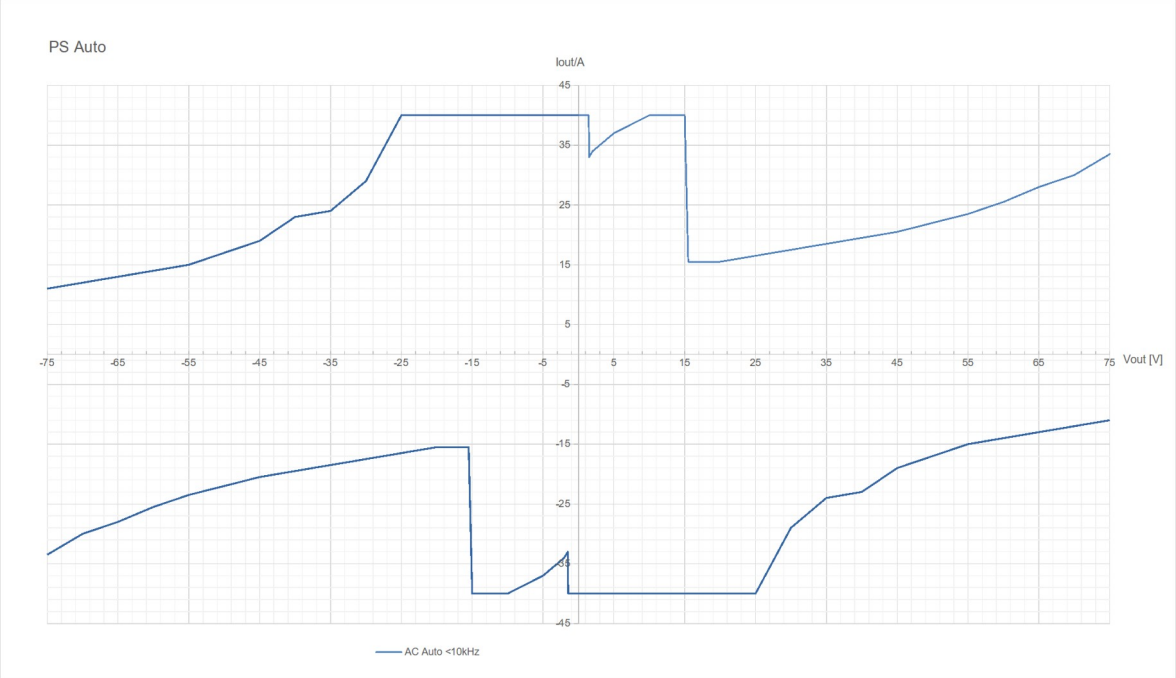
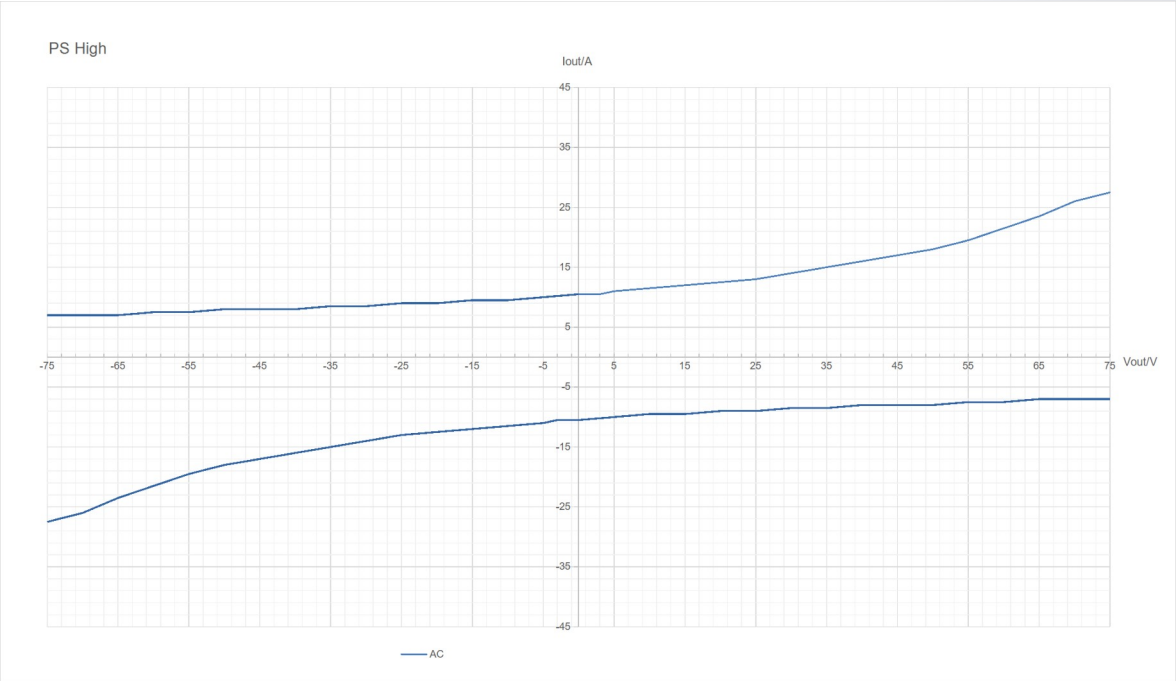
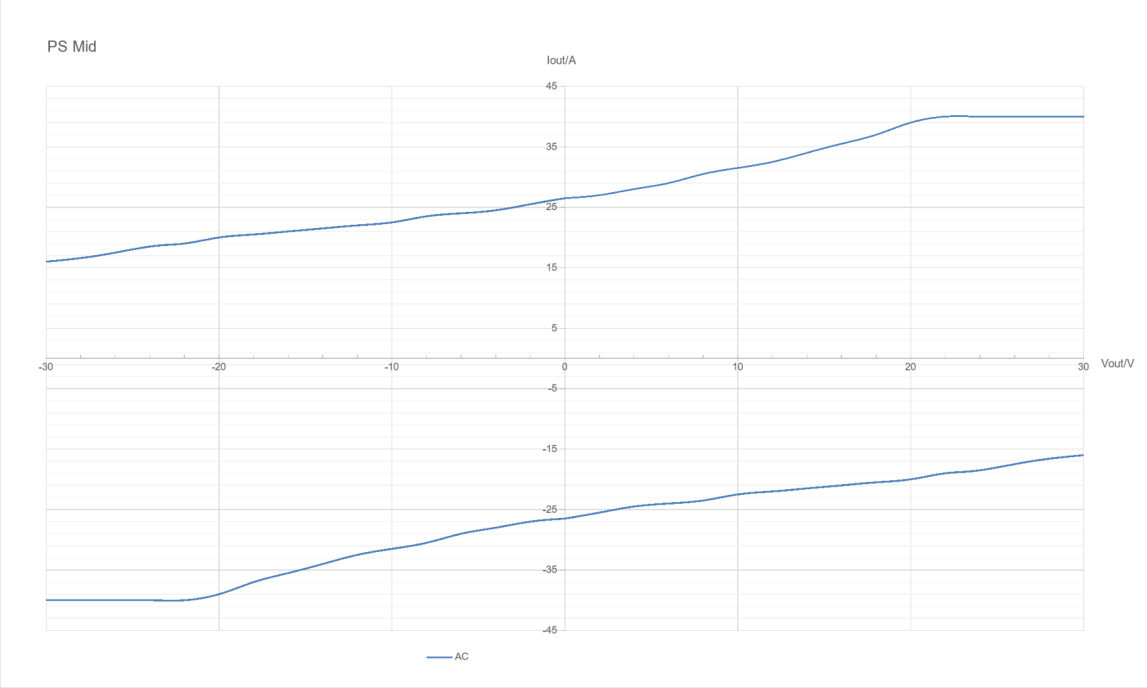


Figure 8: Two-quadrant operation; 1st and 3rd quadrant for example



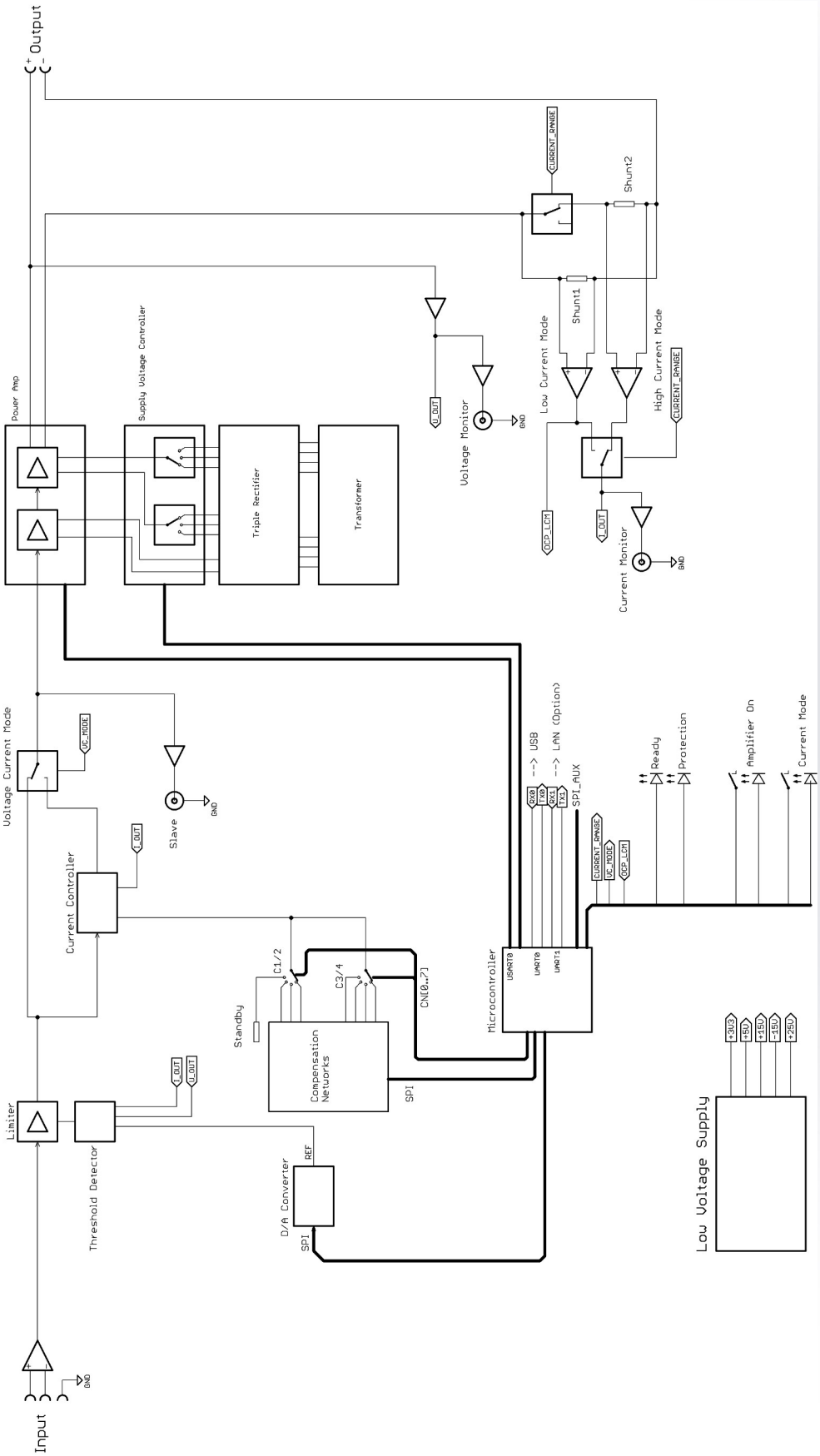


amp up your process



amp up your process

8 Block Diagram



amp up your process

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
Included: Sensing	Adjustable voltage drop: 500 mV / 1V / 2V
Included: Ethernet Interface	For connection to a computer (RJ45)
Included: Adjustable Output Resistance	R: 0 mΩ – 200 mΩ; Resolution 1 mΩ; Accuracy 0.5%
Option: Custom Current Amplifier	Additional compensation network for one specified load. The device is equipped with five general-purpose networks by default.
Option: Isolation Amplifier	For potential isolation of input and output
Option: Overvoltage Protection	For protection of amplifier outputs

10 Contact

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

www.drhubert.com
+49 234 970569-0

amp up your process

11 Document History

Version	Date	Changelog
1	June 205	First publication for Revision B