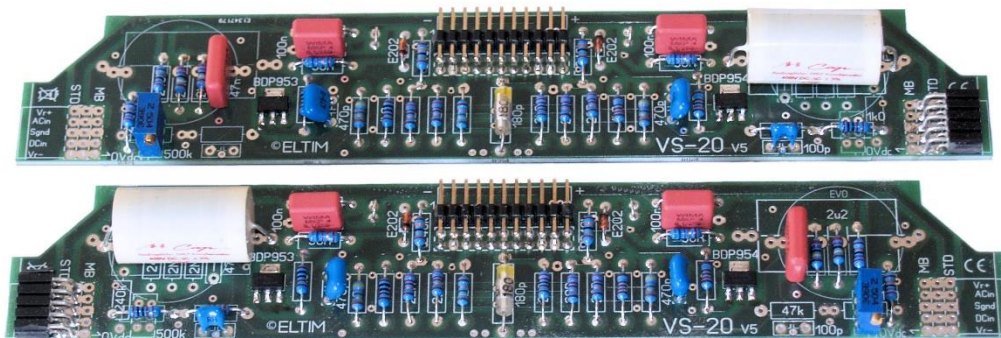


## VS-20 <sub>v6</sub> Voltage Stage module

Our amplifier module range is based on a quite basic, yet fully symmetrical and very reliable concept. Due to our completely different way of thinking when it comes to PCB design and layout, mechanical and thermal stress, magnetic interference, EMI, etc., an ELTIM amplifier built with these modules looks and acts a bit different as you are used. We made a special page where [comments](#) are written.

To make a true difference, the power amplifier schematics is split in a voltage- (input) and a current (output) stage board to meet the long list of demands. Instead of often used LED-circuits, we use special wide range Current Regulator Diodes in the mirror input circuit. Due to this our amplifier system is very stable over a wide supply range and more important: having way better sound compared to the original basic setup. You need at least a VS- as well as a CS-module to form a working ELTIM amplifier.

- Some of the highlights of this [VS-20](#) Voltage (input) Stage module:
  - Reference quality input stage module
  - Separate, fully symmetrical input (voltage) stage feeding any [CS-output module](#).
  - About 98% symmetrical PCB layout, even the used transistor array IC is (*not an opamp!*).
  - [Symmetrical, extremely fast, 500uV matched/trimmed SMD transistor array](#) in the input circuit.
  - Transistor array substrate grounded to input ground, avoiding any noise and EMI.
  - Very stable, wide range Current regulator diodes (CRD's) > wide supply voltage range.
  - DC input on left and right side. *Large High-End capacitor between this input and RCA-inlet possible.*
  - AC (>3Hz, other on request) input on left or right side (see picture below).
  - Input capacitor type/quality by choice in the order process. *You can even use other than we list.*
  - Mica 1% capacitors in frequency limiting (500kHz) and input filter circuit.
  - Best quality 1% MOX resistors, 0,1% in input mirror circuit.
  - Gold plated copper/beryllium copper header contacts.
  - Double sided, EU made FR4+ PCB with copper thickness of 35um.
  - Vr+ and Vr- available on left- and right side. *Regulated if a VR-xx mounted.*
  - Styroflex RF-capacitor in overall feedback circuit. *Fast impulse behaviour.*
  - Separated signal- and supply grounds. *Avoiding hum and noise.*
  - L- or Sandwich mounted to any CS-board. *Select desired connector in the order process.*
  - 2x 35um copper layers, where commonly 1x 12/18mm is used.
  - Dimensions: 200x35x8mm or 196mm for MB versions after cutting.



**VS-20 v5 module (one left and one right channel) with angled connector for L-mounting.**

**By soldering a straight connector instead, it can be sandwich mounted for lowest possible height purposes, f.e. on CS-40ps LP versions (see picture later).**

## Connector functions

The centre connector is where one of our Current Stage modules is connected, normally in vertical (L-mount) position. For low profile solutions f.e. mounting in MODU Galaxy 40mm or Slimline 1U cabinets, this VS module can be mounted horizontal (sandwiched) as well. You only need to use another type of connector and mount it at the bottom side. In that case, use a trimmer with the screw on the top side.



Besides the needed connections for basic amplifier function, there are also connections for the NTC and the centre contact leads to the idle current potmeter of any CS-module. In this VS-20 it has no function, nor is the NTC functioning here. With later VS-modules you could adjust idle current, f.e. switch to class A mode (makes no sense due to linear behaviour of EXICON's) automatically when only low power is used or to class B when NO power is used.

At the left or right connectors, the input signal is connected. Both have the same connections.

Connector signals: Vr+ and Vr- voltage, AC and DC input and signal ground. AC-input is only active at the side where the input capacitor is mounted!

At these side connectors you also can stack an input/output board where the RCA connectors are connected. You could also use a better-quality input capacitor on that board, connected to the DC-input of this VS-20 module and so **bypassing the on-board, small capacitor**. A Mundorf MCAP400-2,2uF will already fit though and with this new v5 version even MUNDORF EVO capacitors fit as well.

We also provide a board with [InGenius™](#) balanced XLR inputs with ultralow CMRR of 90dB. It's transformer like behaviour also allows the use of very long interlink cables, f.e. required for live performances.

At the same DC-input a DC-voltage can be fed by some electronics, monitoring the DC-level of the output of the amplifier. This servo system (in development) so always controls and regulates the DC-level to 0Vdc.

## Supply voltage

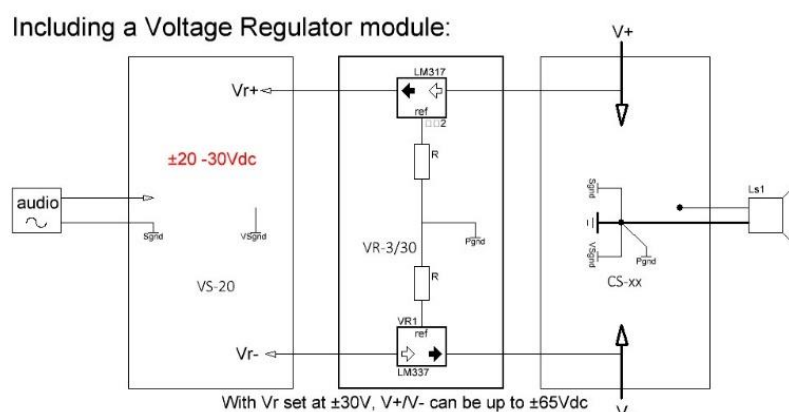
This VS-20 can handle  $\pm 20 - 35\text{Vdc}$  and is limited by the THAT340 transistor array physics.

For higher supply voltages, you need to use one of our Voltage Regulator modules, regulating the amps supply voltages down to say  $\pm 30\text{Vdc}$ , and is just used for the VS-module and possible preceding electronics.

While using an extra [VR-voltage regulator module](#) this VS-20 input module works on regulated, very stable supply voltages. We suggest using VR-3/30, providing  $\pm 30\text{V}$  regulated by linear LM317/337 SMD types.

This high-quality regulating will further increase stability and effects in a higher sound quality.

While adding a VR-xx module the max. supply voltage of the total pack can be increased to  $\pm 65\text{Vdc}$ .



You can mount it on every power supply module we provide. Remove the diodes on the CS-module then!

**NOTE:** As practise showed, the structure of the THAT340 transistor array limits the max. supplied voltages. If the voltage difference between the PNP and NPN types is higher than 65V it could start to oscillate on very high (1-5MHz) frequencies in an uncontrolled way! The [datasheet](#) shows a max. Vce of 36V on each transistor, but + 36V on the one and -36V (or more) on another will cause serious RF-oscillating, possibly resulting in damage to connected equipment or the amp itself! We lost a generator output due to this event! Make sure you don't feed to high supply voltages.

For this reason, we dropped v5 version immediately and replaced it with this v6 where besides some minor modifications the high voltage jumpers are removed because this appears to be not working as planned due to unlisted limitations of THAT340 IC.

## Availability

This module is available in different way of finish:

- [As a DIY kit](#) with bare, professional, through hole, double sided, tinned FR4+ PCB with solder masks and prints on both sides. About all necessary parts supplied except input capacitor. Order this separately. There are so many ideas about that.....  
Due to the high thermal conductive PCB you need to use at least a 60W regulated soldering iron!
- [Ready built and tested modules.](#)  
Type of connector and input capacitor selectable.

## Technical specifications:

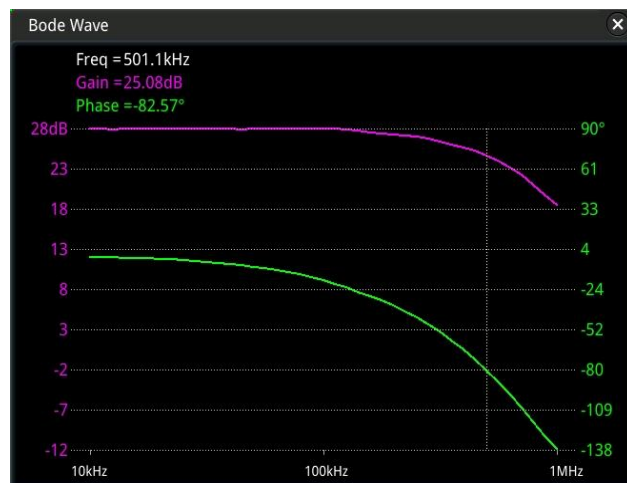
Frequency range:	DC - 170kHz within $\pm 0,2\text{dB}$
-3dB point:	> 500kHz (limited by us)
Audio band phase shift:	< $-3^\circ$ (20-20000Hz)
Distortion figure (THD):	< 0,005% (1W/1kHz/8ohm) < 0,01% (80W/1kHz/8ohm)
Slew rate:	> 65V/us (@ +/- 30V). <i>Limited by input filter (600kHz).</i>
Harmonics:	< -65dB, Nonspecific, see graph right below. <i>Well below noticeable.</i>
Recc. input voltage:	1 Volt
Input impedance:	47kOhm
Supply voltage:	<b><math>\pm 20 - 35\text{Vdc}</math></b> ( <i>While using higher V+/V-, use one of our Voltage Regulator modules!</i> )
Dimensions:	200(196)x35mm. 196mm i.c.w.CS-40ps MB only.

## Some measurement data

We ourselves prefer listening over measuring, since our ears and senses are way better instruments than any other equipment. Besides that, the idea is that you will listen to your amplifier and not staring blind on measuring equipment... However, since a lot of DIYers want to see figures (acknowledging our senses) instead, we show some measurements below. We also [made a video](#) while measuring a VS-20 / CS-150 setup. Since all our CS-current stages run way over 1MHz, the VS-input modules (except for the output power and "punch") define the sound character and data. The graphs below are valid, regardless of CS-module used:



Wide audio bandwidth graph 10-100.000Hz with the marker set at 20kHz. Freq. graph straight as a ruler  $\pm 0,1\text{dB}$ . At this 20kHz the input to output phase error is at a minor  $-3^\circ$ , meaning that the 3D staging (= phase!) is phenomenal.



Extended bandwidth graph 10kHz – 1MHz with the marker at the -3dB point. Nice and clean roll offs. This -3dB point as mostly given is just over 500kHz here. Also often listed -10dB point is over 800kHz actually.



1kHz square wave signal without any significant irregularities. Ye-in, Bl=out. It also shows a slew rate of >40V/us in this setup. VS-20 can do >65V/us with higher input signal.



Frequency domain (50kHz wide). Harmonics < -65dB (13+53). The irritating 3<sup>rd</sup> harmonics (3kHz) is at a low level of -66,7dB. Even more irritating 5<sup>th</sup> is below the scale.

#### Measurement setup:

VS-20 input + CS-35 LEX08 output stage with CADDOCK MP725 resistors in feedback and INTERTECHNIK Q6-1,0uF over the power lines. Supply voltage  $\pm 30Vdc$ , load 8ohms dummy. Idle current of CS-35 set at 50mA. Measurement date: 11 august 2021.

Measuring equipment: calibrated [RIGOL MSQ5074](#) all in one instrument, all available options included.

### Ready built, bespoke amplifiers

We are also able to build your bespoke amplifier completely, based on our modules and MODU cabinets. It will be soldered, assembled, and checked by Louis personally, by hand from start to end. Beside a high-quality amp, you also have one which is pretty exclusive that way, since we only build a few per year. If you are interested in an exclusive amplifier like this, please [send a mail](#) with your demands and requirements or simply start communicating with us. With first customers this worked fantastic.



#### #0001, our first bespoke, hand-built amplifier

VS-3XL, CS-80 RQ, PS-80 RQ, VS3-30, IO-80bal, 220VA transformers, about without wiring!

We now installed an independent website for our bespoke, hand-built amplifiers: [www.eltimaudio.com](http://www.eltimaudio.com)  
There we listed some example models with pricing.

More specific info of every separate module you can find at [our website](http://our website).

[www.eltim.eu](http://www.eltim.eu)

### Nice, but how does this concept sound?

Well, since it is difficult to judge your own stuff, [we let others speak](#).

After first comments received, we can compress the experiences as open, detailed and tube like, natural sound. Especially the rock solid deep bass and the fast, 3D, "airy, tube like" performance is mentioned mostly. If you wanted to experience it yourself, we offered to send our Demo amplifier and listen for a week (€200,- pledge). Due to several very peculiar events we stopped this service, sorry.



ELTIM demo amplifier

*We stopped our demo service by sending out because some people returned it badly packed resulting in damages (even cooling ribs bended, but still working....) and some even believed they needed to modify it, which we needed to remove/correct again, and again.....*



*Cooling fins bended and connectors pushed inside the cabinet.*

*Very strange, I borrow your car and change the tyres because I believe they drive better, then return it to you without changing back. As youngsters say, awkward.*

*Modifying other people's stuff is not done, sorry! Said the old guy.*

*But we were warned this would happen, pity.*

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PE1LTM

[www.eltim.eu](http://www.eltim.eu)

VS +/- is available at both sides for extra electronics like our IO-modules, etc. It is the same voltage as fed to the VS-module.

NOTE: if you decide to use a module in "reverse polarity mode" (see notes on infosheet) VS+ and VS- CHANGE polarity as well !

DC-input can be used if the received signal is free from DC, f.e. because the preceding equipment has an output capacitor already.

Input ground is connected to the neg. lead of the input signal. Via our CS-boards it leads to the centre tap of the transformer as it should be.

AC-input leads to the internal 2,2uF capacitor, mostly used. It's connected on the side where the 2,2uF cap is mounted ONLY !

On the other side, (DC-in) and (input ground) are available, meant for other purposes like DC-servo control unit, etc.

\* Input connector ground connection is recommended by a wide copper strip, directly to the Power grid Earth connection.

- CS-module +

