



CS-8 Series

Owners' manual VCF1E

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PREFACE

First of all, congratulations on the purchase of this 3U Eurorack synthesizer module. This manual contains a condensed description of the functionality and addresses users with a certain level of elementary technical knowledge.

The CS-8 VCF1E is a very versatile, fully analogue, programmable and voltage-controlled filter (VCF). It is capable of processing all sorts of audio signals. It is designed for mounting into a 3U Eurorack with an internal +/- 12V power supply.

Basically, **two modes** are possible. The **classical filter mode** with **12 selectable different functions** (low-, high-, band-passes) and the **phaser mode** with also **12 phaser-sounding combining modes** (4x phaser-, 2x low-, 2x high-, 4x band-passes).

For the classic filter mode **3 different resonance modes** are available, where each of these generate for each filter function again different sound impressions. So, there is no rule how to sound a certain selected resonance mode. It depends on the selected function.

With a further 4-pos. rotary switch the **resonance emphasize** is dialable, which provides further sound nuances. This is also equipollent to the amplitude of the self-oscillation. An illuminated tactile switch allows to add a unique **2nd harmonic distortion** to the resonance sound.

The frequency range (cutoff) goes from 2 Hz to 40 kHz. A gain controller allows input-to-output gains from -20 db to 0 db. A clip LED light up just before output clipping.

Design and implementation meet highest technical standards concerning usability, sound quality, and signal-to-noise ratio. The front panel is made from powdered and printed piece of aluminium sheet metal of 2 mm gauge. The entire design and production work was done in Germany.

Made in Germany

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1. WARRANTY

1.1 Limited Warranty

Schippmann electronic musical instruments warrants the mechanical and electronic components of this product for a period of two (2) years from the original date of purchase, according to the warranty regulations described below. If the product exhibits any faults within the specified warranty period that are not excluded from this warranty, *Schippmann electronic musical instruments* shall, at its discretion, either replace or repair the product. This warranty exists in addition to the general terms of business of the manufacturer *Schippmann electronic musical instruments*.

1.2 Terms of Warranty

Schippmann electronic musical instruments reserves the right to execute warranty services only if the product comes with a copy of the dealer's original invoice. Final discretion of warranty coverage lies solely with *Schippmann electronic musical instruments*. Any *Schippmann electronic musical instruments* product deemed eligible for repair or replacement under the terms of this warranty will be repaired or replaced within 30 days after receiving the product at *Schippmann electronic musical instruments*. Damages or defects caused by improper handling or opening of the unit by unauthorized personnel (user included) are not covered by this warranty. Products which do not meet the terms of this warranty will be repaired exclusively at the buyer's expense and returned C.O.D. with an invoice for labour, materials, return shipping, and insurance. Products repaired under warranty will be returned with shipping prepaid by *Schippmann electronic musical instruments*. **Outside Germany, products will be returned at the buyer's expense.**

1.3 Warranty transferability

This warranty is extended to the original purchaser and cannot be transferred. No other person (retail dealer, etc) shall be entitled to give any warranty promise on behalf of *Schippmann electronic musical instruments*.

1.4 Claim for damages

Schippmann electronic musical instruments does not accept claims for damages of any kind, especially consequential loss or damage, direct or indirect of any kind however caused. Liability is limited to the value of this product. The general terms of business drawn up by *Schippmann electronic musical instruments* apply at all times.

Please note: The controls and switches, especially the **Freq (cutoff-frequency)** or others are programming facilities, **no real-time controllers!** Tweak them carefully since we cannot be held liable for “abused” potentiometers and switches.

2. CE AND FCC COMPLIANCE STATEMENTS

This device has been tested and deemed to comply with the **DIN EN 60065** standards.

This device has been tested and deemed to comply with the requirements, listed in FCC Regulations, part 15. The device complies with **EN 55103-1** and **EN 55103-2** standards.

Because of the entirely analogue construction, this device does not generate radio frequencies and will not interfere with radio frequencies generated by other electronic devices.

3. DISPOSAL

This device has been manufactured to RoHS-standards, in compliance with the requirements of the European parliament and council and is thus free of lead, mercury, and cadmium.

!! Notice: This product is still special waste and is not to be disposed of through regular household waste !!

For disposal, please contact your local dealer or *Schippmann electronic musical instruments*

4. SAFETY INSTRUCTIONS

BEFORE USING THIS PRODUCT FOR THE FIRST TIME, PLEASE READ THE ENTIRE USER MANUAL THOROUGHLY.

- PLEASE AVOID SHARP BENDING OF ANY CORDS AND CABLES.
- CORDS SHOULD NOT BE INSTALLED WITHIN THE REACH OF CHILDREN OR PETS.
- DO NOT TREAD THE ENCLOSURE OF THE PRODUCT, DO NOT PLACE HEAVY OBJECTS ON IT.
- BEFORE REMOVING THE PRODUCT FROM THE RACK, PLEASE DISCONNECT THE POWER PLUG AND ALL OTHER CABLE CONNECTIONS.
- PLEASE DISCONNECT THE POWER PLUG FROM THE OUTLET IN CASE OF A THUNDERSTORM.
- NEVER OPEN THE ENCLOSURE OF THE PRODUCT! NEVER TRY TO MODIFY THE INTERNAL CIRCUITRY! ONLY QUALIFIED SERVICE PERSONNEL IS ALLOWED TO OPEN THE ENCLOSURE.
- DO NOT PLACE OPEN FIRE ON TOP OF THE PRODUCT (CANDLES, ASH TRAYS, HOT THAI CURRIES ETC).
- NEVER EXPOSE THE PRODUCT TO WATER, BEER, OR MOISTURE.
- ADULTS ARE TO MAKE SURE THAT CHILDREN FOLLOW ALL SAFETY INSTRUCTIONS. SAME THING GOES FOR PETS.
- AVOID MECHANICAL STRESS OR IMPACT. DO NOT DROP THE PRODUCT; EVEN IF THERE IS A CONTROL LABELLED "DROP!".
- DO NOT USE THE PRODUCT WITH TOO MANY OTHER ELECTRONIC DEVICES RUNNING FROM ONE SINGLE OUTLET, ESPECIALLY IN CONNECTION WITH EXTENSION CORDS. DO NOT ATTEMPT TO SAVE MONEY ON CHEAP SOLUTIONS. BUY PROPER HIGH-DUTY POWER DISTRIBUTORS AND CORDS!
- NEVER USE EXTENSION CORDS WITH LESS MAXIMUM LOAD THAN THE TOTAL POWER CONSUMPTION OF ALL DEVICES CONNECTED TO A SINGLE POWER OUTLET COMBINED. OVERLOADING EXTENSION CORDS CAN CAUSE FIRE.
- ***AVOID MECHANICAL STRESS ON JACKS AND KNOBS / SWITCHES.***
- ***PROTECT YOUR SPEAKERS AND EARS (!) AGAINST EXCESSIVE AUDIO LEVELS. THE CS-8 VCF1E UNIT IS CAPABLE OF GENERATING***

EXTREMELY LOW AS WELL AS EXTREMELY HIGH FREQUENCIES. BOTH MIGHT CAUSE SERIOUS DAMAGE TO AUDIO EQUIPMENT AND EAR-DRUMS!

5. MAINTAINANCE/ CLEANING

- BEFORE CLEANING THE PRODUCT, PLEASE DISCONNECT THE POWER PLUG FROM THE OUTLET OR DISCONNECT THE MODULE FROM ITS POWER CONNECTOR BY PULLING THE FLAT RIBBON CABLE.
- USE A DRY OR SLIGHTLY MOIST CLOTH OR COMPRESSED AIR FOR CLEANING. NEVER USE ANY CLEANER OR THINNER (E.G. PAINT THINNER OR ACETON). PRINTS AND PAINTWORK WILL IMMEDIATELY BE DESTROYED!! ALSO AVOID ALCOHOL (ISOPROPYLIC), GAS, SPIRITS (SCOTCH SINGLE MALTS, FOR A START) OR ABRASIVE HOUSEHOLD CLEANERS!

6. GETTING STARTET

6.1 Unpacking

The box should contain the following items:

- 1 x CS-8 Series VCF1E 3HU rack-mount module
- 1 x Ribbon cable (20 cm length with two 16 pole IDC-connectors)
- 4 x M3 screws
- 4 x polypropylene washers
- this owners' manual

If the content of the box turns out to be incomplete, please get in touch with your dealer or *Schippmann electronic musical instruments* immediately. In case of damage caused in transit, please get back to the responsible carrier and *Schippmann electronic musical instruments* immediately. We will support you in this case.

6.2 Installation

Place the unit on a clean, dry and sturdy surface, or use a suitable keyboard stand or 19" rack. For 19" rack mounting, a suitable rack (3U Eurorack with +/-

12V power supply rails) is required. The CS-8 VCF1E uses discrete all-analogue electronics. Thus certain parameters as **Freq** and other may be temperature-sensitive. We recommend placing the CS-08 VCF1E away from heat sources such as radiators, lamps or other units that produce heat (e.g. power amps or internal power supplies).

7. CONTROLS

7.1 Front panel

Fig. 1 shows the front panel with consecutively numbered controls and jacks.

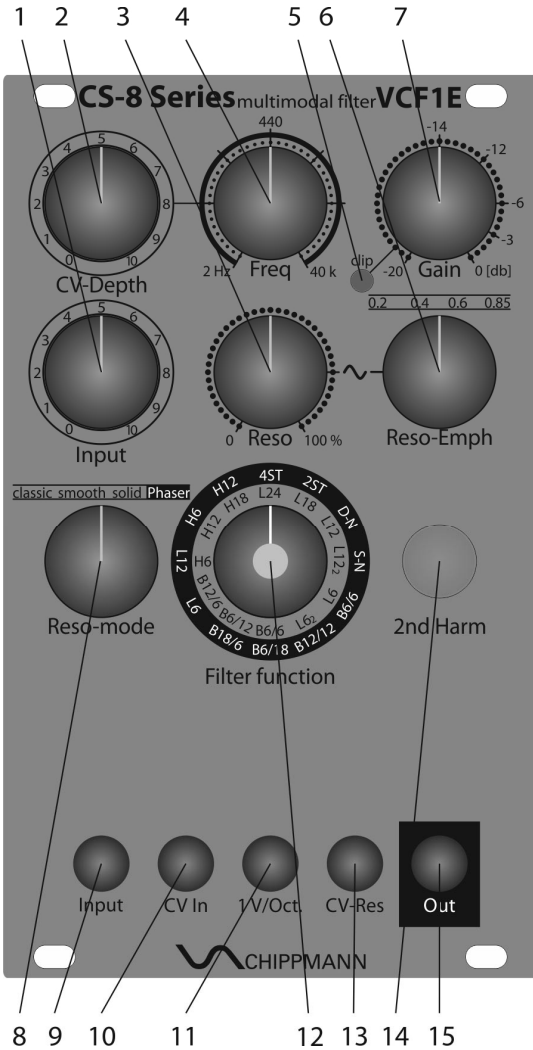


Fig. 1

1. **Input** Controller – attenuates the incoming audio signal at *jack 9* between 0 and 1
2. **CV-Depth** Controller – attenuates the frequency control voltage at *jack 10* between 0 and 1
3. **Reso** Controller – set the resonance of the filters between 0 and self-oscillation
4. **Freq** Controller – set the resonance frequency of the filters between ca. 2 Hz and 40 kHz (0.8 Hz to 100 kHz at mode "Phaser")
5. **clip** LED – illuminates "red" just before clipping of the audio output stage
6. **Reso-Emph** 4-pos. rotary switch – determines the strength of the emphasize of the resonance or the amplitude of the self-oscillation (0.2 = weak to 0.85 = strong)
7. **Gain** Controller – set the signal gain from *jack 9* to *jack 15* (at position "10" of *Cont. 1*) between -20 db and 0 db
8. **Reso-mode** 4-pos. rotary switch – selects one of three resonance modes and switches the filter to the Phaser mode
9. **Input** jack (input) – routes the applied signal via *Cont. 1* to the filter input
10. **CV In** jack (input) – routes the applied signal via *Cont. 2* to the frequency modulation input of the filters
11. **1V/Oct** jack (input) – an applied voltage shifts the resonance frequency of the filter by \pm one octave with every \pm one Volt input voltage
12. **Filter function** 12-pos. rotary switch (double assigned)– selects one of 12 different filter functions
13. **CV-Res** jack (input) – control of the resonance; a voltage of +5 V at this input corresponds the position "10" of the *Cont. 3*, negative input voltages are allowed
14. **2nd Harm** illuminated pushbutton – switch with alternating function activates a distortion, which adds even-numbered harmonics, especially to the resonance; "red" inactive, "green" active
15. **Out** jack (output) – provides the filter output signal

7.2 Back

Fig. 2 shows the back of the module with consecutively numbered elements.

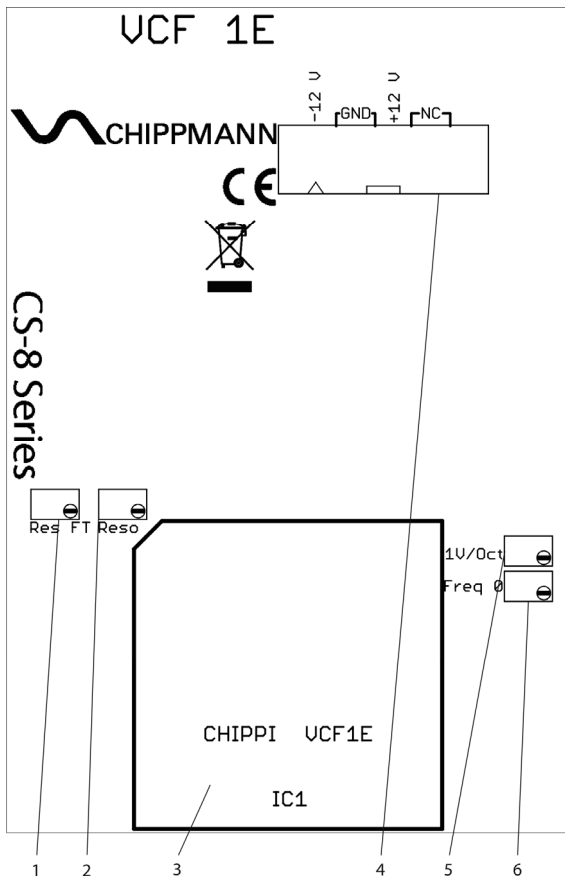


Fig. 2

1. **Res FT** 12-gauge-trimmer – Resonance control-feed-through
2. **Reso** 12-gauge-trimmer – starting point of resonance
3. **IC1** – pinned filtercore modul
4. **16 Pin power supply box-header**
5. **1V/Oct** 12-gauge-trimmer – sensitivity at jack 11
6. **Freq 0** 12-gauge-trimmer – offset resonance frequency

7.3 Initial operation

The power connector's (4) pin-out in top view (refer to fig. 2) is assigned as follows:

Bottom to top, left to right. Thus pin 1 is located at bottom left, pin 2 above pin 1 etc. Pin 15 is at bottom right, pin 16 at top right.

Pin 1, 2 = -12 V (labelled with a triangle)

Pin 3-8 = GND (ground, 0 V), located outward on all jacks

Pin 9, 10 = +12 V

Pin 11-16 = not in use

To hook up power to the module, connect one of the IDC-jacks of the included flat ribbon cable to the connector (refer to fig. 2). Observe guide key for the polarity of the connector in order to avoid pin reversal. The **red tag** of the cable **is to match the triangle-label**.

8. MODULE DESCRIPTION

Structure

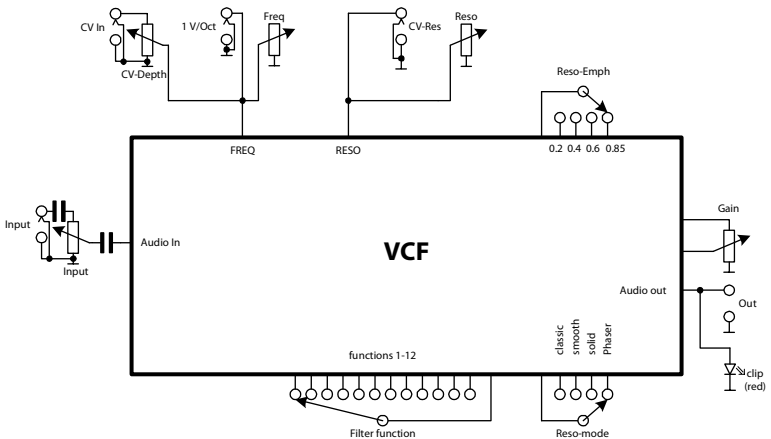


Fig. 3

Fig. 3 shows the structure of the filter. In the following piece by piece every parts will be described and as the case may be exemplified with graphics.

Input

This section includes the **jack 9 (Input)** and the **controller 1 (Input)**. The input signal to be processed by the VCF1E flows from **jack 9**, capacitively decoupled, to the **Cont. 1** where it is attenuated between 0 ($-\infty$ db) and 1 (0 db). To obtain a signal gain of 1 (without resonance) at the signal output **Out** (at **Gain = 0 db**), the **Cont. 1** has to be set to full CW.

Hint: This filter is, btw. as all CS-8 filters, constructed in that way, that it shows lowest harmonic distortions and cleanest sound at studio level input (0.775 V_{RMS} or ca. 1-2 V_{pp}). The input amplitude has a BIG influence of the sound, the resonance and the dynamic behavior of the filter.

Frequency

This section includes the **controller 4 (Freq)**, the **jack 10 (CV In)**, **11 (1V/Oct.)** and the **controller 2 (CV-Depth)**. Frequency means that one, where the filter at high resonance (see below) oscillates with. At same time this is the frequency where the roll-off starts at low-, or high-passes or center-frequency for band-passes, resp.. The controller **Freq** allows a range from 2 Hz to 40 kHz. A control voltage (CV) at **jack 10** will be attenuated between 0 - 1 via the controller **CV-Depth**. At full CW the sensitivity is about 1.9 octaves/Volt. A CV at **jack 10** is weighted with 1 octave/Volt. This input is calibrated.

Hint: In phaser mode (s. below) are existing two resonance frequencies, which are located left and right from the roll-off frequency in the classical filter mode.

Resonance

This includes the **controller 3 (Reso)** and the **jack 13 (CV-Res)**. The resonance is the self-resonance of the filter which comes into being when the filter output will be feed back to the filter input in a controlled way. The tendency to self-oscillation rises up from left to right of the controller **Reso** starting from none to self-oscillation at about 3 o'clock (sine symbol). A CV from 0 V to +5 V at **jack 13** causes the same effect as the controller **Reso** from left to right. At +4 V (**Reso**-position = 0) the filter starts to oscillate. Input signals will be amplified around the resonance frequency as illustrated in Fig. 4.

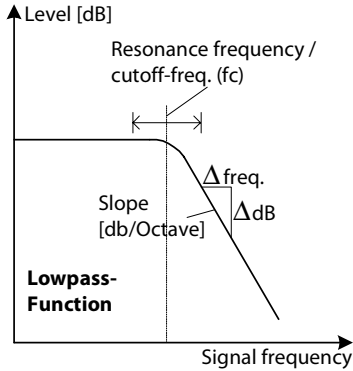


Fig. 4

Resonance-Emphasize

With the **4-Position-rotary switch 6 (Reso-Emph)** the emphasize of the resonance or amplitude of self-oscillation, resp., can be selected. This is expressed in numbers 0.2, 0.4, 0.6 and 0.85, where higher values mean more emphasize. Fig. 5 gives an illustration.

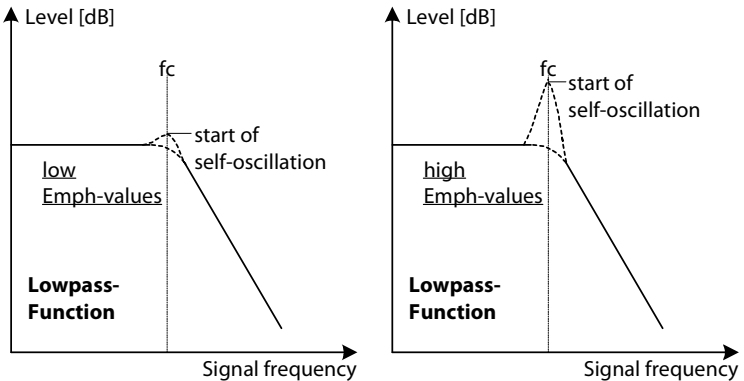


Fig. 5

Resonance-mode

With the **4-Position-rotary switch 8 (Reso-mode)** different ways of feed backs are selectable leading to different sound characters. Firstly, the three modes "classic", "smooth" and "solid" shall be described. These three modes refer to the filter operation (inner scale of "Filter function").

classic: This is the typical feedback mode commonly used in almost all 4-pole filter designs. For low-passes arises a so-called "drop" in the pass-band without any adopted measures, which means a signal gain drop of about -14 db as shown in Fig. 6. The **drop** here for the six selectable low-pass functions is adjusted to about **-2.1 db**. The other functions are not affected by this effect.

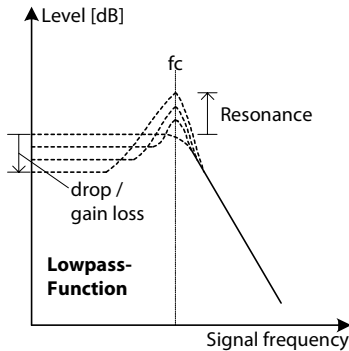


Fig. 6

smooth, solid: These are two further ways of feedback, offered by this filter design. Actually, there is no rule which describes homogeneous the sound character for all filter functions. Meaning, the "solid" mode for the 24 db low-pass could sound very smooth and restrained whereas it could sound in a high-pass mode very loud and rigorous. So, all filter functions are to compare with each resonance modes to find out the character. A drop doesn't exist in these modes.

Phaser: In this mode the complete filter will be switched into a real 4-stage-Phaser, meaning the total structure is no longer that one of a 4-pole-filter. For this mode the outer scale of the switch "Filter function" indicates the

selectable functions. As mentioned above two resonance peaks will be formed in phaser operation, meaning there are two frequencies where the phaser with increase of resonance tend to oscillate, shown further below.

Filter function

The double assigned **12-pos.-rotary switch (12)** allows the selection of 12 different functions.

Filter operation (*classic, smooth, solid*) - inner scale:

- L24:** 24 db low-pass
- L18:** 18 db low-pass
- L12:** 12 db low-pass
- L12₂:** 12 db low-pass
- L6:** 6 db low-pass
- L6₂:** 6 db low-pass
- B6/6:** 6 db / 6 db band-pass
- B6/12:** 6 db / 12 db band-pass
- B12/6:** 12 db / 6 db band-pass
- H6:** 6 db high-pass
- H12:** 12 db high-pass
- H18:** 18 db high-pass

The decibel values mean the slope of the roll-off range, commonly denoted in db per octave. For simplifying "octave" is omitted, because for typical filters the values implies that db/octave is meant. Fig. 7 shows this exemplarily for a low-pass. For band-passes two roll-off ranges exists, one with high-pass character before and one with low-pass character behind the center frequency.

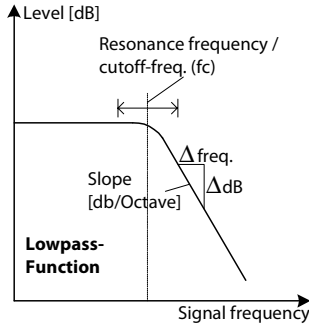
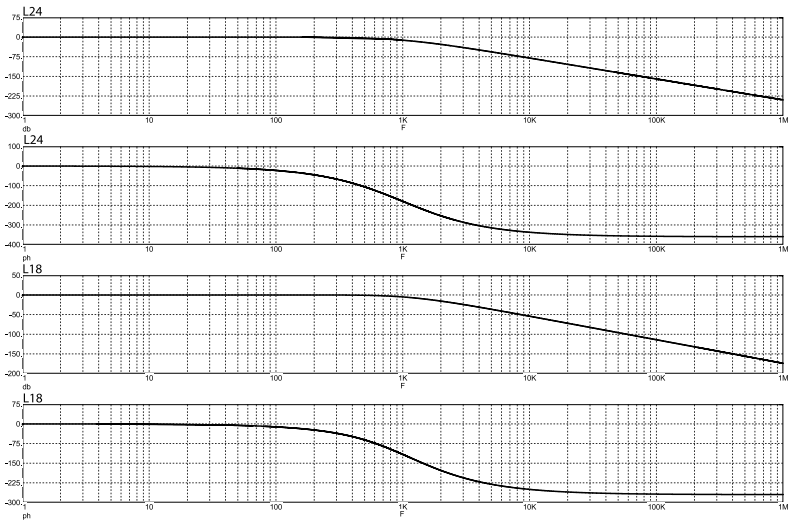
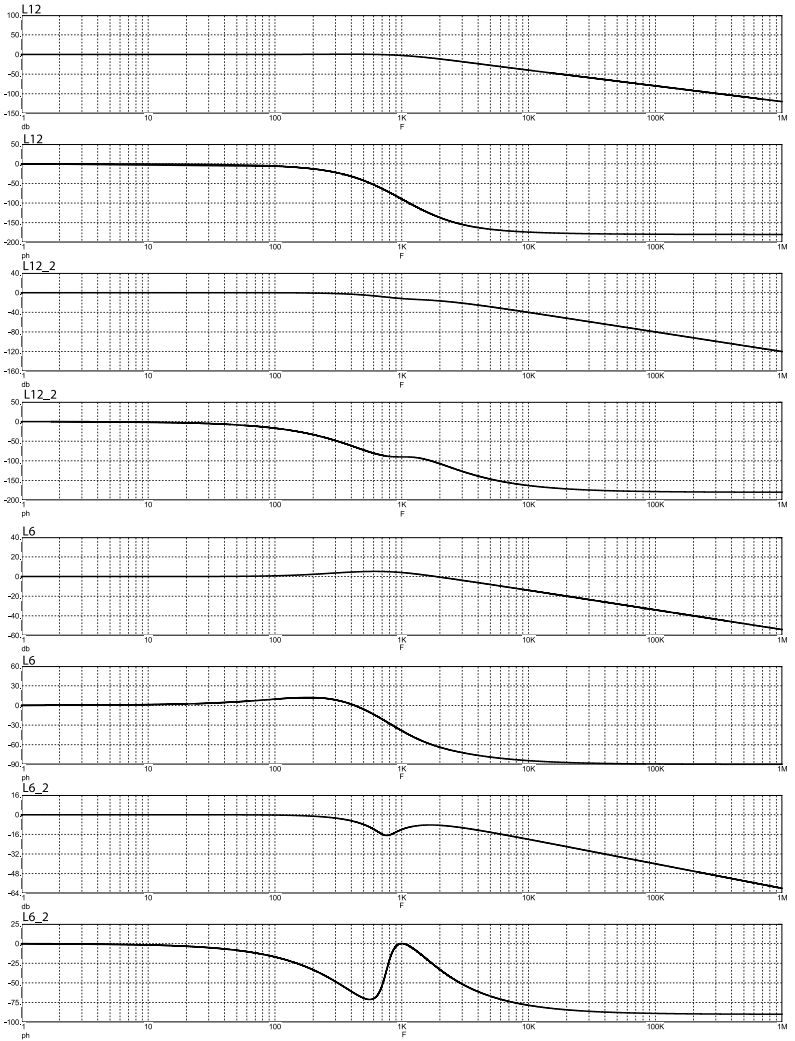
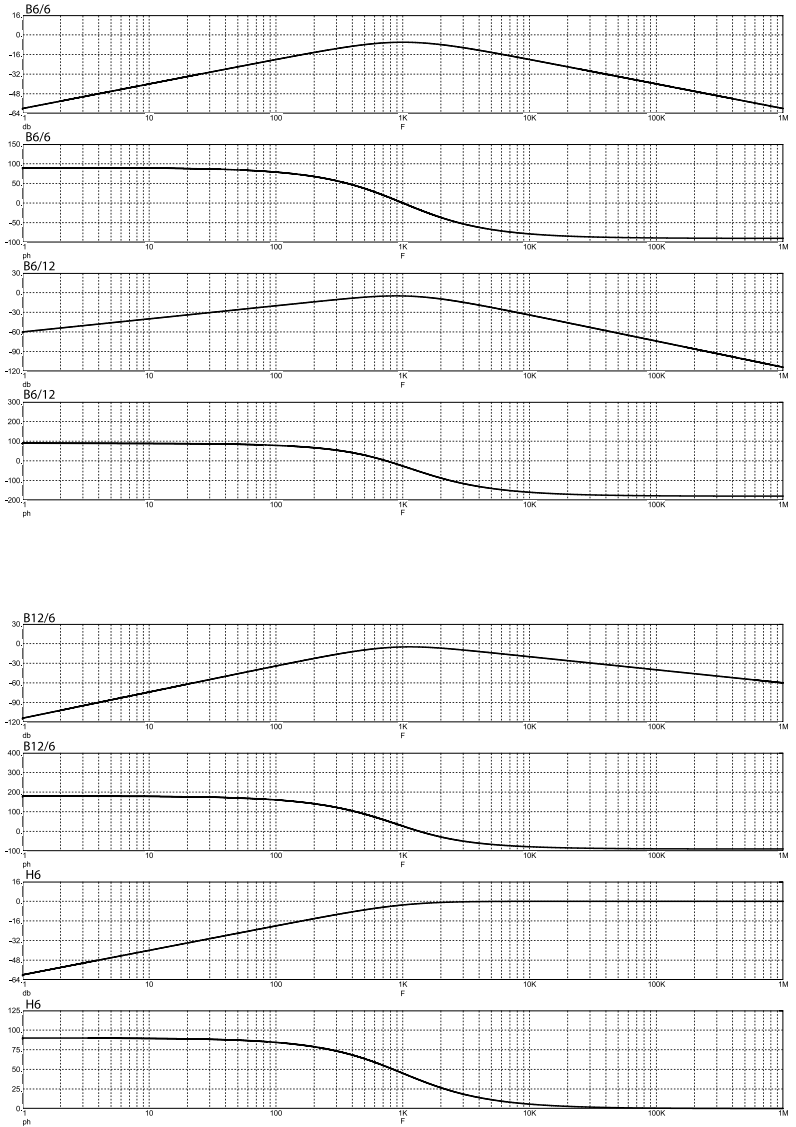


Fig. 7

Next follows a graphic illustration in Fig. 8 of all 12 filter functions and relating phase response (none resonance) in the order as above. The resonance frequency is always 1 kHz.







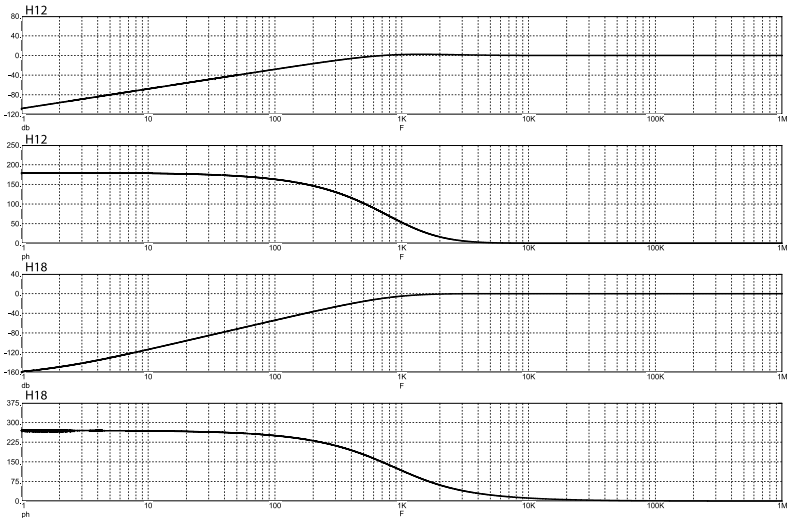


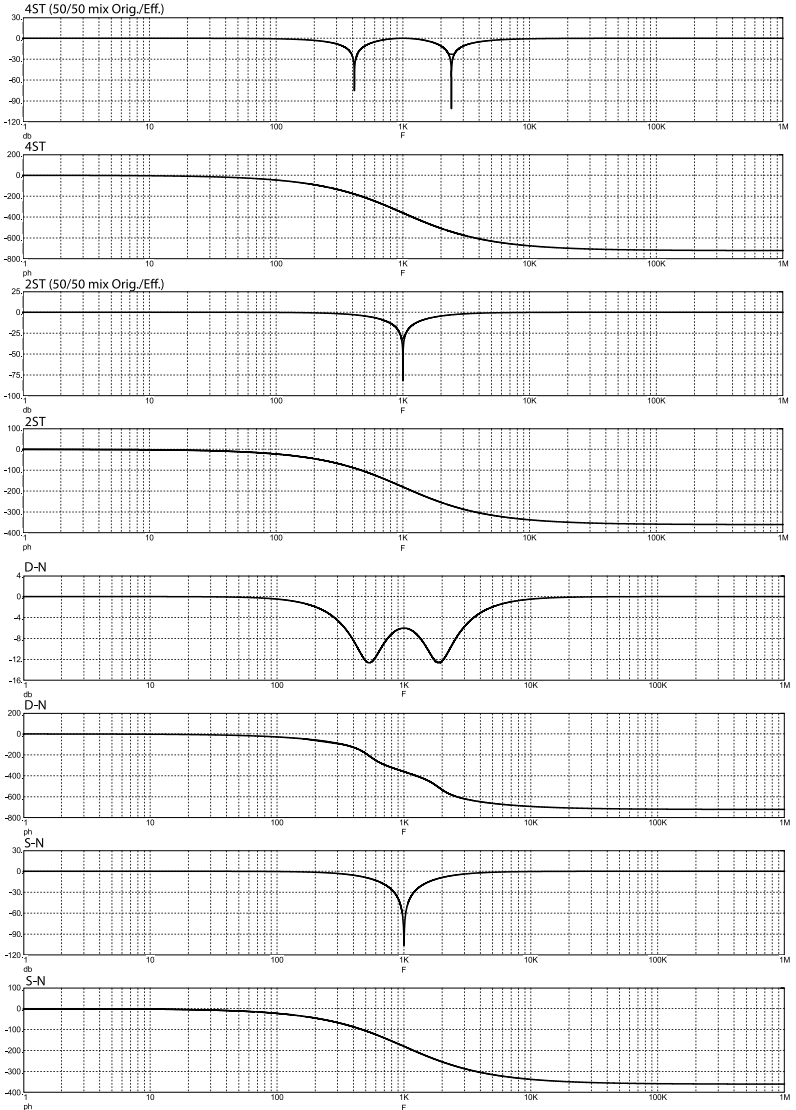
Fig. 8

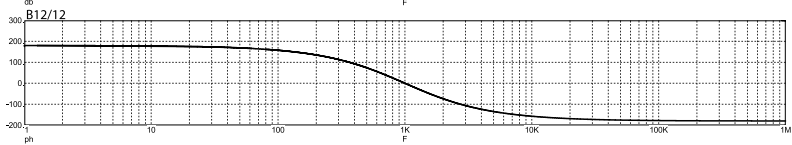
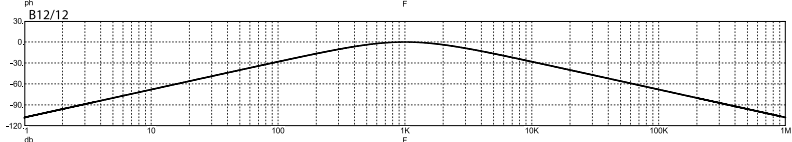
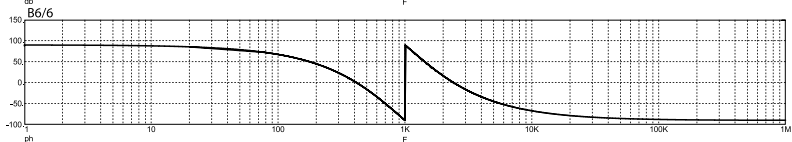
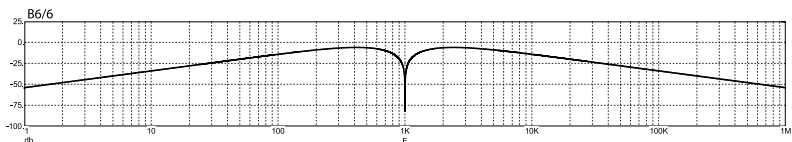
The functions in phaser mode - outer scale:

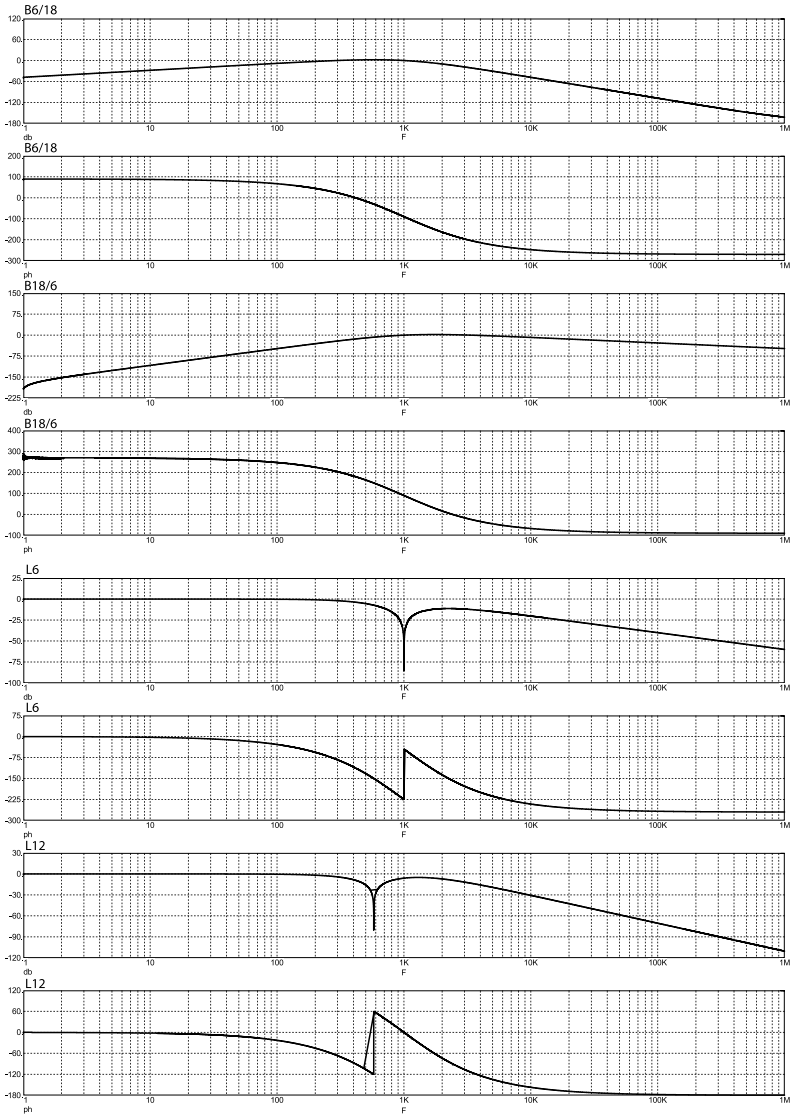
- 4ST:** 4-stage Phaser (output 4th stage)
- 2ST:** 4-stage Phaser (output 2nd stage)
- D-N:** Double Notch - **+6 db**
- S-N:** Single Notch - **+6 db**
- B6/6:** 6 db / 6 db band-pass - **+6 db**
- B12/12:** 12 db / 12 db band-pass - **+6 db**
- B6/18:** 6 db / 18 db band-pass - **+6 db**
- B18/6:** 18 db / 6 db band-pass - **+6 db**
- L6:** 6 db low-pass - **+6 db**
- L12:** 12 db low-pass - **+6 db**
- H6:** 6 db high-pass - **+6 db**
- H12:** 12 db high-pass - **+6 db**

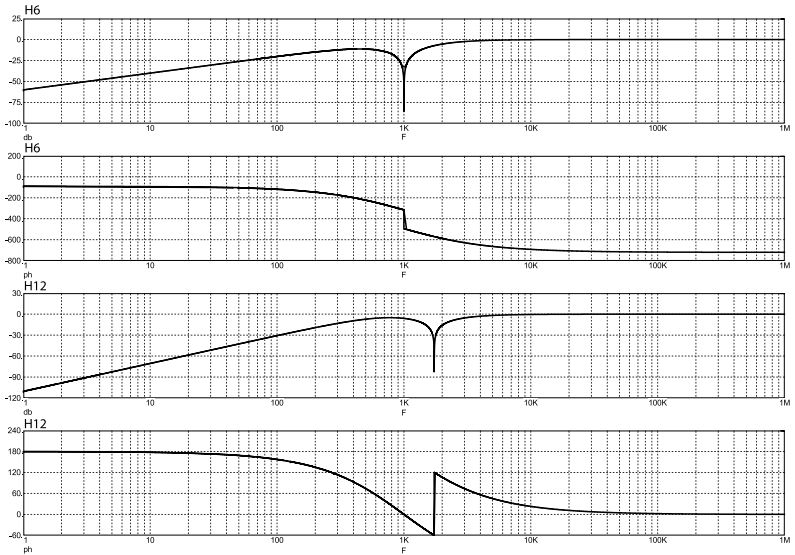
Note: Except for the phaser functions 4ST and 2ST all other functions have a output gain of 2 (+6 db)!

Fig. 9 shows all 12 functions in phaser mode (none resonance).








Fig. 9

The graphs 1 and 3 of Fig. 9 shows the amplitude frequency response of the 4-stage- and 2-stage-output, where the dry-wet mix is fifty-fifty. Otherwise it would result into a constant line without that notches at that places, where the phase rotation of the effect signal is 180° and further 540° relating to the original input signal. In the wet-dry mix arises the notches by full signal cancellation.

Independently of the 12 phaser functions the resonance frequencies are located always at the same position. And the resonance frequency (in filter mode) is 1 kHz. The actual two resonance frequencies in the phaser mode are located left and right of it by the factors 0.414 (414 Hz) and 2.414 (2.414 kHz). Fig. 10 showing once again the first four graphs of Fig. 9 at high resonance.

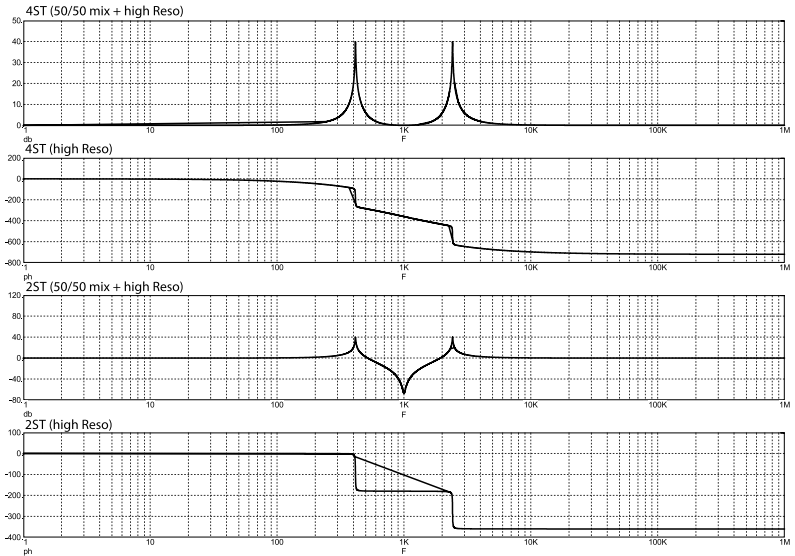


Fig. 10

2nd Harm

With the **pushbutton 14** a distortion can be added, which generates even harmonics, especially at high resonances. "green" means distortion "off", "red" means "on".

Output

Jack 15 provides the filter output signal. **Controller 7 (Gain)** allows to adjust the output gain from input to output between **-20 db - 0 db**, for the phaser functions above with **+6 db** output gain between **-14 db - +6 db**. The **Clip-LED 5** lights up red just before clipping of the filter output (at 20 Vpp).

9. TECHNICAL DATA AND SIGNAL VALUES

9.1 Technical Data (in general)

Input- and output-jacks:	mono jack jacks 3.5 mm (1/8")
Input jacks have grounded switch (0 V)	
Power:	-12 V / +12 V (polarity protection)
Power consumption:	max. 75 mA (for both supplies ± 12 V)
Proper ambient temperature:	0 °C – +55 °C / 32F – 131F
Net weight (module only):	approx. 200 g / 0,44 lbs
Dimensions (W x H x D):	15 PU (75.88 mm) x 3 HU (128.5 mm) x 47 mm
Installation depth (behind the panel)	<30 mm

9.2 Signals and ratings

Maximum input voltage at jacks (9, 10, 11, 13): ± 15 V

Output noise (worst case, filter fully open, no resonance):

L24: 100 μ Vrms \cong -80 dBV

4ST: 80 μ Vrms \cong -82 dBV