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# Voxengo VariSaturator User Guide



Version 1.11

<http://www.voxengo.com/product/varisaturator/>

## **Contents**

Introduction 3

    Features 3

    Compatibility 3

User Interface Elements 4

    Crossover 4

    Valve Saturator 5

    Digital Saturator 5

    Output 5

    Level Meters 6

Credits 7

    Beta-Testers 7

Questions and Answers 8

## Introduction

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VariSaturator is an audio effect plug-in designed to apply saturation effects to audio material. VariSaturator can be used both to boost the loudness of the audio tracks without increasing their peak levels proportionally, and to apply subtle harmonic coloration that makes tracks sound more pronounced and polished.

VariSaturator features two saturation modules which are applied in sequence, in two-band mode each. The tube/valve saturation module applies asymmetric valve processing that closely resembles sound of a high-quality valve amplifier cascade. Another saturation module VariSaturator features is a digital “waveshaping” saturator with feedback topology. This module applies smooth two-band saturation which can amplify signal level and apply desirable harmonic coloration. If you have some “muffled” track in the mix that needs to cut through the mix better, VariSaturator will help you in this case easily.

VariSaturator can be used in a variety of audio processing cases: you may apply it with good results over drum, bass and vocal tracks, over sub-mixes and of course over complete mixes.

## Features

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- Two-band processing
- Crossover steepness switch
- Tube/valve and digital saturation
- Stereo and multi-channel processing
- Internal channel routing
- Channel grouping
- Mid/side processing
- Up to 8x oversampling
- 64-bit floating point processing
- Preset manager
- Undo/redo history
- A/B comparisons
- Contextual hint messages
- All sample rates support
- Zero processing latency

## Compatibility

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This audio plug-in can be loaded into any audio host application that conforms to the AudioUnit, VST or VST3 plug-in specification.

This plug-in is compatible with Windows (32- and 64-bit Windows XP, Vista, 7, 8, 10 and later versions) and Mac OS X (10.6 and later versions, 32- and 64-bit, Intel processor-based) computers (2 GHz dual-core or faster processor with at least 2 GB of system RAM required). A separate binary distribution file is available for each target computer platform for each audio plug-in specification.

## User Interface Elements

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Note: Most interface elements (buttons, labels) located on the top of the user interface and on the bottom are standard among all Voxengo plug-ins and do not require much learning effort. For an in-depth description of these and other standard user interface elements and features please refer to the “Voxengo Primary User Guide”. Learned once it will allow you to feel comfortable with all pro audio plug-ins from Voxengo.

To get you started quicker with VariSaturator, you may study the “Valve Saturation” and “Digital Saturation” processing stages separately – and start using them together only after you are able to separately control both to your satisfaction. You may use individual “Bypass” switches to disable processing stages.

### Crossover

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Since VariSaturator is a two-band saturation module you can adjust the crossover point where the band splitting occurs. This allows you to have different saturation settings applied to the lower and the higher part of the spectrum. Two-band saturation is very important when saturation is performed since it minimizes intermodulation distortion which in turn produces far cleaner sound in comparison to a broadband saturation.

Even though two-band processing turns plug-in into a “monster” to control, it does offer substantial benefit to the user. For example, this allows you to have different saturation characteristics separately applied to bass-heavy instruments and high-frequency sounds: you may add a bit of roaring saturation to bass, and a bit of airy compression to high-hats at the same time. Or you may make highs sound more compressed and saturated while leaving bass sounds unaffected by saturation.

It should be also noted that two-band saturation is not able to produce “brick-wall” peak results since when two saturated bands are summed on the output, a linear interference between them may produce greater peak levels. However, on average, the output peak levels can be kept under control – just by tuning the output gain controls accordingly. Also note that since both the lower and higher spectral bands have their own “saturation” level points, when two saturated bands are summed the “saturation” point of the sum moves about 6 dB higher: this may require output gain adjustment to be done, especially at high “FX” and high “pre gain” settings.

Beside crossover frequency you can control the crossover gain which increases or decreases loudness of spectrum area that surrounds the crossover point. At high saturation amounts cutting this area can be necessary since two-band saturation followed by summing may produce a spectral bump around this point. On the other hand, you may use this gain control to impose additional coloration to the sound. The bandwidth of this filter is equal to 2.5 octaves between the filter bump’s side-lobes at half the filter’s gain.

Crossover filter’s steepness can be selected with the corresponding switch (-6, -12 or -24 dB/oct options are available). Higher crossover steepness values produce clearer saturation results, but at the expense of heavier phase-shift coloration.

## Valve Saturator

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Valve saturation stage applies an imitation of double-valve amplifier cascade, in two-band mode (that's like four vacuum tubes in total!), with a bit of asymmetry that produces even harmonics. The "pre gain" and the "FX" parameters available on this stage are closely related: while the "FX" parameter basically moves the tube grid bias point down and up (and thus closer or farther away from the cut-off point), the "pre gain" parameter adjusts the peak-to-peak voltage amplitude on the grid.

You may put this stage into saturation even on the low pre-gain settings just by turning "FX" setting up and thus moving the grid bias point very close to the valve's cut-off point. At the low pre-gain settings saturation curve is smoother while at the high pre-gain settings saturation curve scales in a way so that it becomes harder.

While the "FX" setting is low, you may "shave off" peaks by increasing the "pre gain" setting alone: that way you can get a valve limiting sound.

Please note that input level meter on the valve saturation stage is approximate: being in the "red" area it may not necessarily mean that a heavy saturation is occurring: saturation depends not only on the pre-gain parameter, but it also depends on the "FX" parameter which is not taken into account on the level meter display.

## Digital Saturator

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This stage offers a simple, but effective "digital waveshaper" saturation with feedback which produces odd harmonics due to symmetric waveshape adjustments it performs (a complex feedback topology is internally used to ensure that saturation sounds much cleaner than what would you expect from a "digital" saturator). This stage also features "pre gain" and "FX" parameters similar to the valve saturation stage. The "FX" parameter controls the curve of the saturation function. Please note that it is best to have pre-gain of this stage adjusted in a way so that the signal level shown on the level meter does not enter the red area, and only touches a bit of the yellow-orange area since this stage cut-offs all peaks above 0.0 dBFS signal level what may generate a non-pleasant distortion. If you have your signal loud after the valve saturation stage it is best to lower the pre-gain level at the digital saturation stage first.

If you have used a high "FX" value you may also need to lower the pre-gain value as well, for best sounding results.

Digital saturation stage features two operation modes: the "Hard" and "Soft" modes which offer a differing overall sonic coloration performance. The "Soft" mode usually delivers a smoother and less distorted sound in comparison the "Hard" mode. Note that at same "FX" and "pre gain" settings these modes produce a slightly different output signal level.

## Output

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This block controls output stage parameters. You may adjust the balance between lower and higher frequency bands, and even mute them – which can be useful for tuning them separately from each other.

The "Dry Mix" parameter specifies amount of original unprocessed signal being routed to the output before the final output gain is applied. This parameter affects

both low and high frequency bands. By increasing this parameter you may reduce the overall distortion: hence one of the tactics when using this plug-in can be getting a high distortion amount at first and then adjusting the “Dry Mix” parameter to achieve the required proportion between the clean and processed (distorted) signals.

Since VariSaturator does not provide a brick-wall limiting performance, when applied over full mixes, it is best used for the final loudness boost inserted before the finishing brick-wall limiter.

For your information, two related knobs can be linked together by dragging one of the knobs with the right mouse button. If you held the “Ctrl” key before dragging the knob with the right mouse button, an inverse linking will be engaged.

The “Sat” switch enables the post-output gain saturation stage which can be engaged to obtain a “console” like output saturation (clipping).

## Level Meters

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VariSaturator features three RMS level meters. The “Valve In” and “Dgtl In” meters show summed signal level of both bands entering the corresponding saturation stage despite the fact the actual processing is performed on these bands separately. To see the actual level of separate bands please use the output “Mute” switches. When a specific band is muted, all three meters will be showing level of the band opposite to the one which was muted.

## Credits

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DSP algorithms and internal signal routing code were created by Aleksey Vaneev.

Graphics user interface code and the “standard” graphics design were created by Vladimir Stolypko.

This plug-in is implemented in multi-platform C++ code form and uses “zlib” compression library (written by Jean-loup Gailly and Mark Adler), LibLZF by Marc Alexander Lehmann, filter design equations by Magnus Jonsson and Robert Bristow-Johnson, VST plug-in technology by Steinberg, AudioUnit plug-in SDK by Apple, Inc., Intel IPP and run-time library by Intel Corporation (used under the corresponding licenses granted by these parties).

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### Beta-Testers

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Ben Williams

Christopher Knapp

Edward Rendini

Hector Perkins

Immanuel Pasanec

Julien K/BIDI

Mads Ljungdahl

Matthew Fagg

Menno de Jong

Michael Anthony

Murray McDowall

Niklas Silen

Pavel Bazarov

Steffen Bluemm

## Questions and Answers

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**Q. How does the VariSaturator differ from the Lamphruster and Warmifier? They're all described as being tube warmth plugs.**

A. VariSaturator is a “strong” saturation effect plug-in whereas Lamphruster and Warmifier are subtle harmonic enhancers.

**Q. Which valve model VariSaturator simulates?**

A. VariSaturator simulates an “averaged” valve model – there are no plans to extend it to provide specific valve models.

**Q. How can I bypass just the low or high frequency band processing on any stage?**

A. While there are no switches to do just that, you may set the “pre gain” and “FX” controls to zero on frequency band you would like to bypass. This will be analogous to a bypass state.

**Q. I cannot seem to get higher frequencies sound airy. What should I do?**

A. The easiest way to preserve clarity of higher frequencies is to lower the “pre gain” or “FX” controls. Airy highs can be also achieved by moving the crossover frequency higher – above 3 kHz: this usually helps to overcome the “over-compression” or “hard” feeling you get when higher frequencies get saturated.

**Q. The “Dry Mix” parameter is pre “Out Gain Hi” and “Out Gain Lo” and also pre the “Mute Lo” and “Mute Hi” switches?**

A. Yes, it is. Since the original dry signal is band-split internally (at the Crossover frequency) it is also affected by the “Mute Lo” and “Mute Hi” switches.

**Q. If I used VariSaturator on every channel in my project, would that give better results than using only one instance on the master channel? Or would things sound exactly the same?**

A. It will sound a lot more musical since there will be less amount of intermodulation distortion happening which is easily produced when overdrive is applied to complete mixes. And you can usually push VariSaturator harder when applying it to individual instruments. To sum up, you will get stronger harmonics and less intermodulation distortion this way.

**Happy Mixing and Mastering!**