



# Golden Compressor | GCO-1

Professional Compressor & Expander Plugin

## Users Manual

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# 1. Introduction

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## 1. Introduction

Thank you for buying the Golden Compressor | GCO-1 by Kjaerhus Audio

### Foreword

Before making the specifications for the GCO-1, we decided to take a look at some of the most popular compressors of all time. We wanted to find out what specific qualities made them so popular. We did not want to model one specific piece of equipment, but rather analyze / study as many different high-end compressors as possible. We included these qualities in our own compressor, using the best of everything. At the same time, we wanted the compressor to be clean and simple to use.

### Combining lots of features and simplicity

We decided to make an “open” compressor where the parameters making up the main differences between analog compressors would be available for adjustment. To make the GUI clear and easy to operate, we ordered the controls on the GUI so that basic controls are placed at the top of the GUI, while the special parameters are placed lower.

### Getting started the easy way

To use this compressor you do not need to know all about its advanced features. We have included a selection of presets covering different compression jobs and different compressor emulations. Your first step would be to find a preset that fits your material; giving you the sound you want. After that, you can begin adjusting the threshold level until it sounds right, and then adjust the output level to make up for the compression. In many cases this is all you need to do to get a good sound. In fact, on several of the old leveling amplifiers, threshold and level are the only controls you get. If you are familiar with standard compressor controls like ratio, attack, and release, you might want to adjust those too.

### Designing your own compressor type

Using the advanced parameter controls you will be able to design almost any compressor you like. In the following pages, we will have a look at some of the techniques used in vintage gear and give you suggestions as to how these techniques can be emulated. To get the full use of the GCO-1, we advise you to read on.

Kjaerhus Audio.

# 1. Introduction

## General Description

The GCO-1 is a versatile quality compressor and expander plugin modeled after some of the best analog compressors. It has an open architecture with many means of adjustment, which ensures that almost any analog sound character can be obtained; from smooth and transparent, to warm and tubeish, or even pumping, if so preferred. It works well with all material for tracking, mixing and mastering. There is no latency, so it is the ideal choice for real time performance in the studio or on stage.



## Main Features

- High compression and expansion ratios
- Five envelope types including Opto-coupled
- Very short attack and release times
- Program dependency to avoid pumping
- Frequency dependent compression
- Adjustable knee and compression linearity
- Filters to eliminate low frequency disturbances
- A/B comparisons
- Silent knobs
- 64 Bit Internal Processing
- Supports sampling rates up to 192kHz
- Full VST automation
- Low CPU usage
- No latency

# 1. Introduction

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## Top Bar

On the top bar, you will find information about the product, together with links to the Users Manual, the about box, and the website.

### Overview and descriptions



- Logo:** Kjaerhus Audio logo. For your convenience, we have added a hyperlink to our web site allowing you to check for new products and updates (you will need an open Internet connection to use this).
- Manual:** Click here to open the Users Manual.
- About:** Click to get an info dialog with registration details and the product version number. If you have not yet registered you will see the remaining trial time, and be able to open a license key to register from this dialog.

## Knob operation

All knobs are operated with vertical mouse movement, holding down the left mouse key. It is possible to change the sensitivity adjustment of the mouse and reset the knobs using interaction from the keyboard.

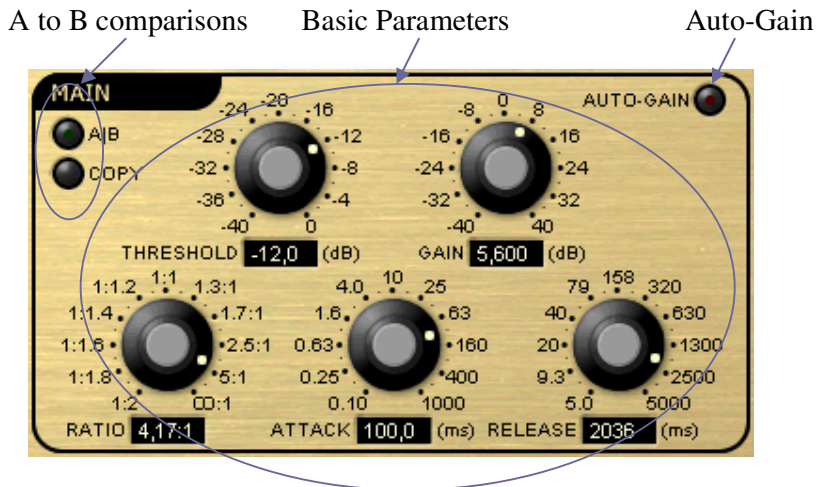
### Description

- No Key:** Under normal operation (no keyboard interaction) the knob will turn relatively fast and the parameter increase / decrease will be relative large (but fine enough for most purposes).
- Shift:** Hold down the Shift key while pushing the left mouse key to make fine adjustments.
- Ctrl:** Hold down the Ctrl key while pushing the left mouse key to reset the knob.

## 2. Main Section

## 2. Main Section

In the main section you will find the basic parameters for a standard compressor, together with a few other practical functions. In many cases this would be the only place you need to make adjustments after you have selected a preset that fits your material and taste.



### Basic Parameters

- Threshold:** Sets the level where the compression or expansion will begin. If the knee is soft the compression will start up to 10dB lower than the selected threshold level.
- Gain:** Adjustment of output gain is used to make up for the level lost during compression or to turn down the signal after expansion.
- Attack:** Time it takes for the input signal to go over the threshold level before the compression becomes effective.
- Release:** Time it takes for the compression to stop after the input is lower than threshold.
- Ratio:** How many extra dB you will get out for every extra dB on the input.

## 2. Main Section

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### A to B comparisons

You can have two sets of alternate parameters for a track and switch back and forth between the two to decide which sounds best. The parameters for this feature are:

- A/B:                                 Select either the A or B set of parameters.
- Copy:                                 Copy the current actual parameters to the other set of parameters.
- Recall:                                Will load the original factory parameter values for the current patch.

*Important! One patch can only hold one set of parameters. When closing the user interface of the equalizer or the Host, it will only remember the parameters that were last selected. When the user interface is opened after it has been closed, the last selected set of parameters will be shown as 'A' parameters, despite what it was before. The 'B' set will be empty. If you want to keep both 'A' and 'B' parameter sets, save them in one of the banks before closing the user interface.*

### Auto-Gain

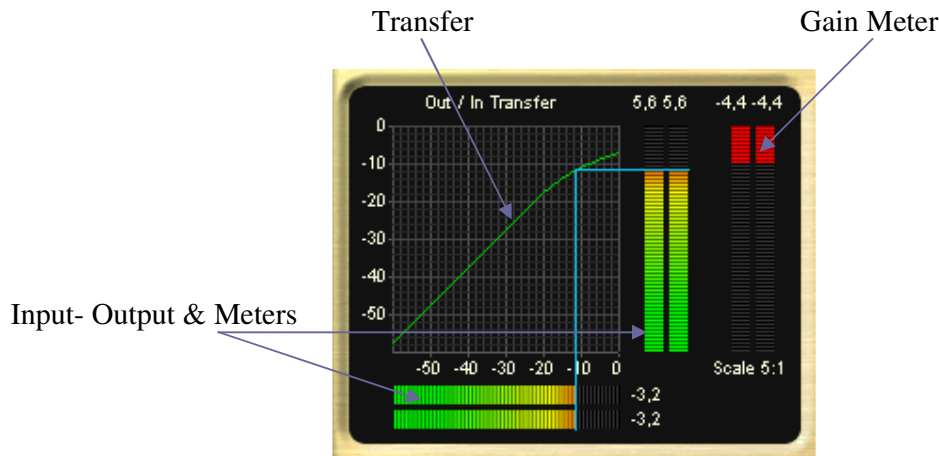
Auto-Gain will calculate a default makeup gain to ensure that the transfer ends up giving 0dB out for 0dB continuous input. Auto-Gain does not ensure that the output won't go over 0dB! First, the input signal might already be over 0dB, and peaks in the input material might be allowed to pass uncompressed, or less compressed by the chosen attack time. What auto-gain will do is give a better offset for the final makeup gain, which might have to be fine adjusted.

### 3. Display Section

### 3. Display Section

Three meters and a graph are included to visualize how the parameters are influencing the dynamic process. These can be helpful and complementary tools to adjust the compressor by ear. In this section we will discuss these tools.

#### Overview and descriptions



#### Transfer

The transfer will show how much signal there will be coming out compared to the signal coming in. We have added a blue line on the graph to indicate the relationship between input, transfer and output. It should be noted that the peak output might be higher than indicated by the graph due to the peaks allowed by the attack time. Also, if the internal equalizer is in use, the signal measured by the detector might be different from the input signal, and therefore resulting in another compression than shown in this example.

#### Gain Meter

The Gain Meter will indicate how much the gain is being changed. Under compression the meter bar will be red and coming from the top and down indicating a decrease in gain. When expanding the meter will be green and coming from the bottom and up indicating the increase in gain. The numbers over the top of the meter will show the biggest change in gain since it was reset. Reset the peak label by left clicking it. Below the meter is a label indicating the scale of this meter, left click on this label to toggle between different scales to make the meter more or less sensitive. This meter will follow the selected attack and release times (as much as allowed by the graphical update).

#### Input & Output Meters

The input meter (horizontal) will show the peak input after the input level and balance control. The output meter will show the peak output. Next to the input meter and above the output meter is a label that will show the highest signal since it was last reset. Reset the peak labels by a left click.

## 4. Input Section

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### 4. Input Section

The input section gives the user an opportunity to adjust the input level, balance and remove unwanted DC or sub frequencies from the signal before it moves on to the actual compressor sections. The input meter on the display section will show the signal level after this section.

#### Overview and descriptions

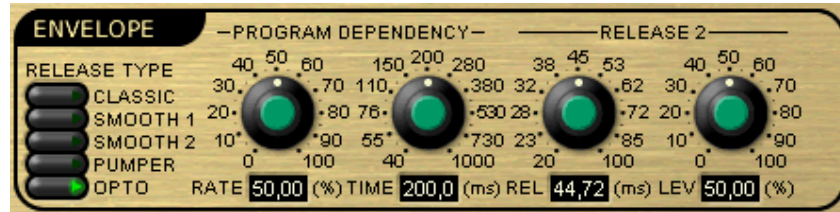


- Filter:** DC and sub-frequencies can be very disturbing for a compressor. Like in most analog compressors, we have added a filter to remove DC and attenuate sub-frequencies below 20Hz.
- Gain:** We recommend to adjust this to read about  $-3$  to  $0$ dB at the loudest passages in the music.
- Balance:** Can be used to correct unwanted level differences between the left and right channel.

## 5. Envelope Section

### 5. Envelope Section

In this chapter we will have a look at the five different envelope types included in the GCO-1, and discuss the program dependency controls' influence on the attack / release times and what that does for the sound.



### Envelope Types

The type of envelope used in a compressor is very important for its character and sound. We have included five different envelope types for different tasks and tastes. These are:

#### Classic

The classic type is emulating discrete RC envelope circuitry used on various analog compressors. Due to its exponential release curve it has minimum pumping effect and leaves a minimum “hole” in the sound after compression. It will add a great deal of harmonics to the low frequencies, especially on high compression with low release time.

This type can really “warm up” a signal and give maximum loudness!

#### Smooth 1

Smooth 1 has a soft initial release curve, giving it lower distortion while still maintaining a low pumping effect and little after compression sound “hole”.

Use this whenever you want a softer tone than the classic type can give you!

#### Smooth 2

This type is really smoothed out and will distort low frequencies minimally, even with very low release times.

The sound is round and punchy and works fine with every instrument and final mixes!

## 5. Envelope Section

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### Pumper

As the name suggests, this is the type of envelope to use if you are going for a pumping effect. It has a very slow initial release and then a faster release, which increases the pumping effect. For the best result, use an attack time below 10ms and set the program dependency rate to “0”.

Use this for music styles where a pumping effect is desired!

### Opto

This type emulates the two-stage release used especially in vintage gear where compression was done with a Light Dependent Resistor and an EI-panel as the active compression components. Fine adjustment for this type is done with the “Release 2” controls.

Use this for a nice “warm” vintage sound!

### Release 2

In some vintage gear a Light Dependent Resistor (LDR) was used as an electronic volume potentiometer. An EI-panel was lightening up the LDR when the input level was high, causing the LDR to turn the output signal down.

One of the characteristic behaviors of this set-up was the two-stage release where about half the release would be done in about 40 to 80ms, and the rest of the release could take several seconds, depending on how hard and how long the compression had been. We have included an additional release control giving you the ability to release a portion of the release relatively fast and the rest over a longer time, emulating the two-stage release.

### Overview and descriptions



**Release Time:** Secondary release control. Output from this will be mixed with the output from the main release control.

**Level:** Level of the secondary release in percents. When set to 0 only the primary release signal will be in the mix while 100 will only include the secondary release in the mix.

## 5. Envelope Section

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### Program Dependency

Program dependent envelope times are used to reduce the pumping effect and maximize loudness. Basically it will reduce the attack time if there is a short time of lower signal level, and reduce the release time if there is a short peak with a higher signal level (such as a kick drum). This behaviour is particularly desirable with mixed program material where it will apply fast and effective compression to peaks while giving a more natural sounding release phase with lower harmonic distortion after a harder or longer lasting compression. This effect was first discovered as a natural memory effect in the LDR / EI-panel set-up discussed earlier, and has since then been implemented in a lot of popular compressors.

### Overview and descriptions



**Rate:** The amount of program dependency.

**Time:** The duration of a peak before the release time is full.

*Do not use more program dependency than necessary to remove pumping as the sound might distort!*

## 6. Transfer Section

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### 6. Transfer Section

The transfer function is telling how the output to input signal relationship is, and is primarily controlled by the threshold and ratio. In this section you will find two extra controls to adjust the function into its final character.

#### Overview and descriptions



**Knee:** The knee control controls the transition between the non-compressed area below threshold and the compression area. Setting this control to hard means that signals below threshold level will not be “touched” by the compressor at all, if a softer knee is chosen the compression or expansion will start before the input has reached threshold level and will gradient move towards the selected compression ratio. For most compression / expansion the natural setting for the knee control would be soft or medium, but for maximum loudness a hard knee should be used.

**Linearity:** In theory, the compressed area should be seen as a straight line in the dynamic transfer plot, indicating how many dB the output will go up for every extra dB of input signal. However, in analog equipment, the compression ratio will never be constant, varying some amount depending on the input signal. This “un-linearity”, which is most distinct in vintage gear, is an important part of the compressors character. With the linearity control, you can adjust the compression curve away from its ideal curve, thereby adding more character to the compressor.

## 7. Detector Section

### 7. Detector Section

This section determines the level of the input and calculates the necessary gain or expansion of the input signal. It contains stereo link options, a filter to remove sub frequencies, and an equalizer to make frequency dependent compression.



### Stereo Link

Stereo Link will make the compression in the left and right channel depending on the signal in the other channel as well as its own. This is very useful to avoid strange panoramic effects if one channel is compressing more than the other. When one of the stereo link options is chosen, both channels will be equally compressed.

#### Overview and descriptions



- Off: No Stereo Link, the stereo signal will be processed as if each side went through its own mono compressor.
- Mix: The compression is based on a mix of the two channels. This makes it very sensitive to signal and phase differences between the channels. This type of linking is often used in vintage gear.
- Highest: Compression is based on the highest signal of the two channels.

### Equalizer

With the build in equalizer the compression can be made frequency dependent. It's important to notice that the signal going out of the compressor has not passed this equalizer, meaning you will not be able to change it's tone directly. It is inserted right before the circuit that determines the compression ratio, which means that by boosting a frequency area the compressor becomes more sensitive to that frequency area and compression will start at a lower threshold and be stronger.

## 7. Detector Section

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### Overview and descriptions



**On:** Turns the equalizer on and off. *Turn it off to save CPU when it is not in use.*

**Low:** Adjusts the gain in the low frequency area.

**Mid:** Adjusts the gain in the mid frequency area.

**High:** Adjusts the gain in the high frequency area.

### Filter

The filter will remove DC and attenuate sub frequencies that can be disturbing for the detector circuitry.

### Overview and descriptions



**On:** Turns the filter on and off.

**Filter:** Filter frequency.

## 8. Datasheet

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### 8. Datasheet

Main Section:

Threshold:	-40 – 0dBFS (full scale digital)
Gain:	-40 – 40dB
Ratio:	1:2 – ∞:1
Attack:	0.1ms – 1s <sup>1</sup>
Release:	5ms – 5s <sup>1</sup>

1) Attack and release times are defined as the time it takes to reach 63.2% of the destination level (natural RC time constant “tau”)

Input Section:

Gain:	-20 – 20dB
Balance:	Left to right with constant signal pan law
Filter:	20Hz 2.order Butterworth (maximal flat)

Envelope Section:

Release Types:	Classic, Smooth 1, Smooth 2, Pumper & Opto
Program Dependency:	0 – 100%, 40ms – 1s
Release 2:	20 – 100ms, 0 – 100%

Transfer Section:

Knee:	Hard to soft (soft knee will start to compress 10dB below threshold)
Linearity:	dB/dB - V/V scale.

Detector Section:

Stereo Link:	Off, Mix, Highest
Filter:	1 – 100Hz 1.st order
Equalizer:	+/-20dB @ 100Hz shelving / 1kHz peaking / 10kHz shelving.

Processing: 64 Bit Floating Point

Supported sampling rates: 44100, 48000, 88200, 96000, 176400 and 192000 Hz

Latency: 0

CPU usage on AMD Athlon XP2000+: 2% typical (may vary from 1.5% to 3.5% depending on parameter settings)