

LinearAmp signal conditioner amplifiers

In our choice there are three different amplifier systems. All of them are up-to-date, microprocessor-controlled constructions. **BioAmp** amplifiers are general purpose biological amplifiers. We have got a great choice of different preamplifiers compatible with **BioAmp** to support a number of biological applications. **LinearAmp** amplifiers are designed for conditioning, and processing of biological signals before the analogue to digital conversion in computer-based data acquisition systems. **MultiAmp** amplifiers are optimized for multichannel (8 to 256 channels in a modular system) recording applications.

LinearAmp is a programmable amplifier, but it has no sampling circuits in the signal path at all. In other words, it is controlled by a built-in microcontroller, or a remote computer, but it has got only analogue amplifier circuits. This feature is indispensable when you use averaging techniques for processing its output signal. The internal microcontroller, and the optional digital port (which offers remote control facility from a PC) are optically isolated from the amplifier stages. In this way we could connect all the advantages of high accuracy analogue amplifier circuits, and easy usage of digital control.

Although **LinearAmp** is a programmable equipment, it does not need a separate computer to work. According to this fact, it can be used as a stand-alone amplifier (while possessing an optional serial port to communicate with a PC). This stand-alone feature is very comfortable, because the computer is always given, but it should be used to collect, and processing the experimental data. **LinearAmp**'s microcontroller on the front panel has got a 3-button keypad, and menu-driven internal software, so it is very friendly to use.

The internal structure of **LinearAmp** is modular, so the number of the amplifier channels, and the number of the microcontrollers built in one equipment can be decided independently. Only the aspects of the application field should be considered when we decide, how many amplifier channels, and how many microcontrollers will be placed in the cage of the equipment (for example it is comfortable to use only one microcontroller to program all the EEG channels together, but another controller should be used, if there is a single unit channel in the system, and a third controller is necessary, if there are further channels for ECG).

Independently from the number of the microcontrollers, every amplifier channels have got their own DC offset correction circuits, even in a multi-channel system. The voltage range of the offset correction is ± 200 mV, with 0.1 mV of resolution. In our choice there are two different solutions for the offset correction circuit. One of them is the analogue version with a 10-turn helical potentiometer and a digital panelmeter on the front of the equipment. The other version is the digital realisation of the same task: a separated microcontroller, dealing with the numerical control of the offset voltage. The actual version should be specified in the order.

One of the most sophisticated features of **LinearAmp** is its Low Pass Filter. This circuit is an 8-pole, Bessel-type filter with linear phase response. This special, high quality Low Pass Filter is necessary to realise the anti-aliasing function, which is indispensable before the analogue to digital conversion.

In the **LinearAmp** the High Pass Filter, the Low Pass Filter, and the Gain have got 8 possible positions. The actual values, realised during the manufacturing process can be ordered with the default parameters, but they can be requested with special values, to meet any special requirements, as well. The default values for the Filter and Gain sections are listed below. Any combination of the parameters can be selected, even the invalid settings (for instance, if the High Pass Filter is set to higher frequency, than the Low Pass Filter). The invalid settings result no faults in the equipment, only the output voltage will be driven to zero.

High Pass Filter:	Low Pass Filter:	Gain:
DC (0 Hz)	100 Hz	0.5
0.16 Hz (1 s)	200 Hz	1
0.53 Hz (0.3 s)	500 Hz	2
1.6 Hz (0.1 s)	1 kHz	5
5.3 Hz (0.03 s)	2 kHz	10
10 Hz	5 kHz	20
30 Hz	10 kHz	50
100 Hz	20 kHz	100

The Notch Filter of the **LinearAmp** is tuned to 50 Hz (or optionally to 60 Hz). The Notch Filter can be switched on and off in the software running on the microcontrollers. The rejection ratio of the Notch Filter on its central frequency is 40 dB.

There is a possibility to select the full amplifier chain of **LinearAmp** as Inverting or Noninverting characteristics. This selection is also a menu point of the software running on the microcontrollers.

There is a general Bypass function in **LinearAmp**. It is also a programmable feature. The Bypass function is not a simple shortcut wire switched between the Input, and the Output connectors of **LinearAmp**. If the Bypass function is activated, the equipment behaves as a voltage follower, but provides voltage swing limitation for both polarities on the Output. This feature is useful to protect the analogue to digital converter connected to the Output against any faulty input signals appearing on the Input connector of **LinearAmp**.

If the **LinearAmp** is used in human experiments, an additional optical isolator circuit should be ordered for every channels with 4 kV of isolation voltage. The optical isolator does not modify any parameter of **LinearAmp**, because the isolator circuit has got unity gain, with noninverting characteristics.

LinearAmp family is especially powerful in multi-channel applications, since such a level of reliability and flexibility is unthinkable in a usual analogue amplifier. And the top of all that, our amplifier system offers a very reasonable price level in comparison to the number of channels.

The prices of the different multi-channel **LinearAmp** equipments are calculated according to the following algorithm. If the number of the channels in the system is increased according to the powers of 2, the price concerning one channel (the total price divided by the number of the channels) is always reduced by 16 %.

1-channel equipment	1,000.- EURO	(1,000.- EURO / channel)
2-channel equipment	1,680.- EURO	(840.- EURO / channel)
4-channel equipment	2,820.- EURO	(705.- EURO / channel)
8-channel equipment	4,736.- EURO	(592.- EURO / channel)
16-channel equipment	7,952.- EURO	(497.- EURO / channel)

We give you **3 years of full warranty** for **LinearAmp**.