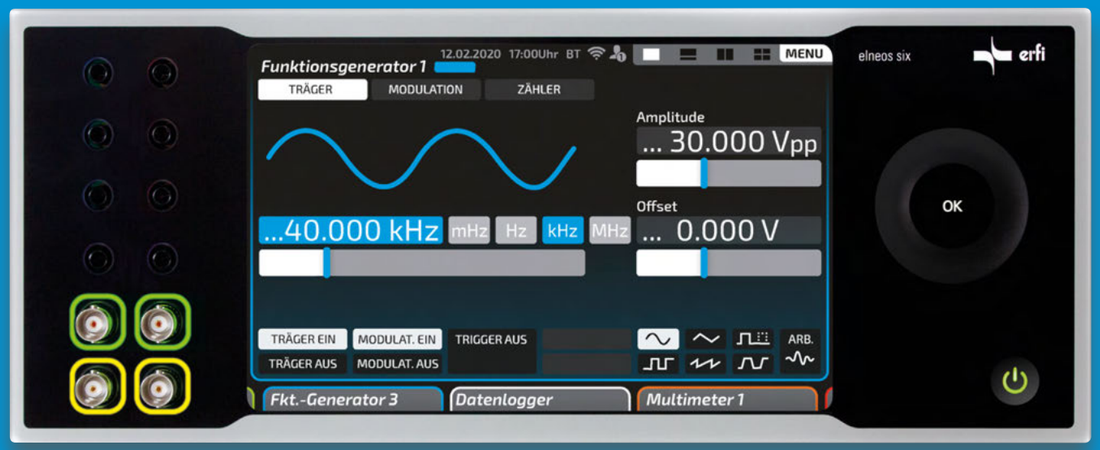
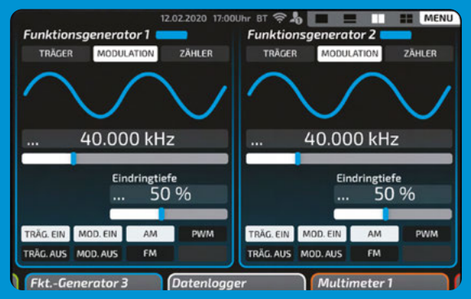
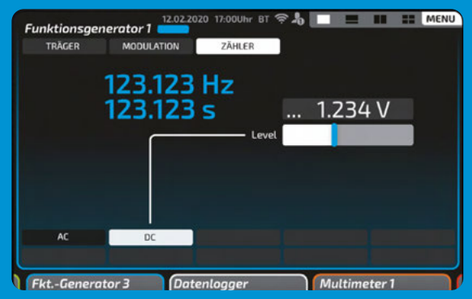


Clear representation: *The curve shapes are visualised generously. The waveform can be changed by tapping on it. Individual values can be entered via slider, wheel, airwheel, rotary encoder or keyboard.*



Modulation types: *By means of the second, internal function generator, high-frequency carrier signals can be modulated in modulated in AM, FM, PWM, ASK and FSK depending on the low-frequency wanted signals to be transmitted.*



Built-in counter: *Allows the acquisition of AC and DC signals as well as the setting of the trigger level in the DC range in the standard up to 150 MHz. Optional increase of the measuring range to 1.5 GHz.*

Comfortable access: *Even in the smallest screen, the 8-inch display allows values to be entered using the keyboard, wheel or rotary encoder.*

Splitscreen: *In the Quattro screen, too, input is implemented by means of a slider in the display. Compared to conventional 7-inch displays, the 8-inch display shows off its full size here and enables this convenience in every device.*

Dual-function Generator

Order no. EL6.F and **EL6.F1G**

Two function generators including counter

The device contains of two function generators and uses the functional principle of direct digital synthesis (DDS) with the associated advantages of frequency-stable and low-distortion signal generation. The first function generator serves as a basic function generator and feeds its signals to the outside. The second function generator is used exclusively for modulation. Its signals are modulated with the signals corresponding to the selected modulation type of the first function generator.

The maximum output frequency of up to 40 MHz and the amplitude level of 30 Vpp no-load are outstanding. In combination with an adjustable duty cycle of 0.1 to 99.9 %, *elneos six* is an all-rounder. Many functions such as sweep, an external and internal trigger for defined start conditions, programmable single and multiple pulses and much more make the function generator an all-rounder.

A standard counter up to 150 MHz (optionally up to 1.5 GHz: order no. EL6.F1G) guarantees the acquisition of fast signals. All device statuses can be read out at any time.

Note: The signal generation of the second function generator is only used for modulation and is not routed to the outside. *elneos six* can accommodate additional function generators via additional plug-in units, which operate simultaneously and independently of each other and provide a second independent hardware signal. The halfscreen allows both double generators to be operated and displayed simultaneously. These two hardware signals can be operated in a phase-stable manner via the trigger input.

Freely programmable modulation through two integrated function generators

elneos six offers special functionality with regard to modulation. The carrier signals and the useful signals (modulation signal) can be parameterised completely independently of each other due to the two function generators. The modulated signal is available at the output and a separate second external source or a second function generator is therefore no longer necessary. The device value for education and industry is enormously high, as any modulations can be realised very quickly and without additional external hardware.

The carrier signal and the useful signal can be conveniently generated in the device according to the respective ideas. The result of the modulation is immediately visible and the parameters of the signals can be adjusted very quickly to achieve the desired result.

All parameters of the carrier signals and the useful signal (modulation signal) such as signal shapes (sine, rectangle, triangle, etc.), amplitude, frequency, duty cycle are stored separately and modulated at the output. The depth of the modulation can be can be set from 0-100 %. With the freely programmable modulation, *elneos six* offers a productive tool for education and industry with a direct positive effect in the application.

Analogue and digital modulation types

In addition to the previous frequency modulation (FM), amplitude modulation (AM) and pulse width modulation (PWM), the new unit now also masters the digital modulation types amplitude shift keying (ASK), frequency shift keying (FSK).

Subject to technical and formal changes.

More detailed information in the Technical Compendium from page 154-155.

Technical data and features – Function generators (order data preferred types p. 88-89 | device p. 99)

Modulation
- Freely programmable modulation through two integrated function generators
- Freely programmable carrier signal – generator 1
- Freely programmable working signal (modulation) – generator 2
- All signal shapes, frequencies, amplitudes, etc. are freely available.

Modulation depth 0 to 100 %
0 % Modulation depth:
With AM, the modulated signal reaches the amplitude of the carrier signal at the maximum point. The amplitude level of the carrier signal is changed according to the required signal.

With FM, the modulated signal reaches the frequency of the carrier signal at the maximum point. The frequency spectrum of the carrier signal is changed according to the required signal.

With PWM, the modulated signal reaches the duty cycle 1 at the maximum point. The duty cycle is changed from 0 to 1 according to the useful signal.

x % Modulation depth:
With AM, the amplitude of the modulated signal is reduced in percentage. With FM, the frequency of the modulated signal is reduced by a percentage. With PWM, the duty cycle of the modulated signal is reduced as a percentage.

Pulse duty cycle: 0,1 to 99,9 %

Modulation types (carrier and working signal):
- Amplitude Modulation – AM
- Frequency Modulation – FM
- Pulse Width Modulation – PWM
- Amplitude Shift Keying – ASK
- Frequency Shift Keying – FSK
- Special form of FM

Setting ranges
Frequency: 100 mHz to 40 MHz!, Resolution 1 µHz
Amplitude: 0 to 30 Vss ± 0,5 dB + 1 mV from the entered value
Rectangle duty cycle: 0 to 100 % in 0,1 % steps
Offset: 0 to ± 15.000 V

Frequency characteristics
Sine: 1 µHz to 40 MHz!
Trapezoid: 1 µHz to 5 MHz
Ramp: 1 µHz to 5 MHz
Triangle: 1 µHz to 5 MHz
Sawtooth: 1 µHz to 5 MHz
Rectangle: 1 µHz to 5 MHz

Frequency counter
Measuring range: 150 MHz, optional up to 1,5 GHz
Input voltage: 100 mVeff to 5 Veff

Frequency sources
Two independently programmable function generators; one external source and one internal source for modulation.

Amplitude
Resolution for all waveforms: 14 Bit (16.384)
Output: 30 Vss, 50 Ω from 0-20 MHz, 1,8 mV resolution
Output: 20 Vss, 50 Ω from 0-40 MHz, 1,2 mV resolution

Trigger impulse
Extern: via BNC socket
Intern: via menu for defined signal start

Distortion factor
Sine: 0 MHz to 1 MHz < 0,04 %
Sine: 1 MHz to 20 MHz < 0,07 %
Sine: 20 MHz to 40 MHz < 0,5 %

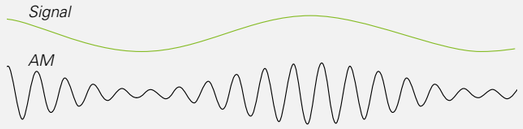
Impulse
Single pulse: Single and multiple pulses up to 999 s
Burst mode arbitrarily programmable by parameter:
Pulse and pause times: up to 999 s
Number of repetitions: 1 bis ∞

Input
Illuminated BNC lab jacks with disappearing effect
Input: counter input ext. input signals up to 150 MHz (optional up to 1,5 GHz: Order no. EL6.F1G)
Input: trigger input for defined signal start
Input sensitivity: 100 mVeff

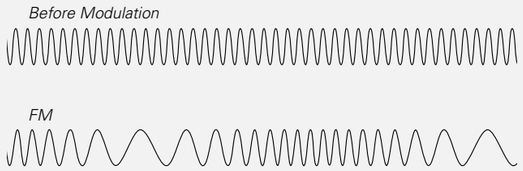
Output
Illuminated BNC lab jacks with disappearing effect
Output: up to 30 Vss idle
Output: 5 V TTL compatible

Modulation method

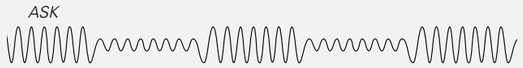
Amplitude Modulation (AM)
With amplitude modulation, the amplitude of a high-frequency carrier is modulated depending on the low-frequency useful signal to be transmitted.



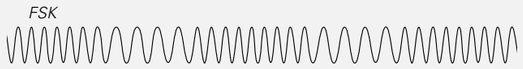
Frequency Modulation (FM)
With frequency modulation, the frequency of a high-frequency carrier is modulated depending on the low-frequency useful signal to be transmitted.



Amplitude-Shift Keying (ASK)
With the digital modulation type amplitude shift keying, the amplitude of the carriers is changed, to transmit different values.



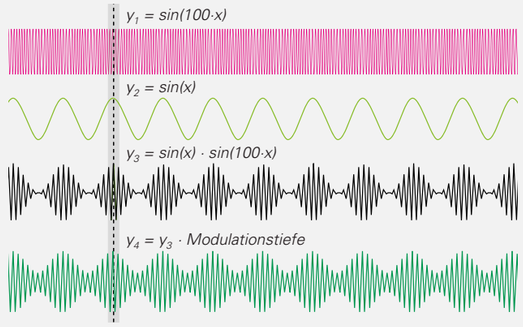
Frequency Shift Keying (FSK)
The digital modulation type frequency shift keying is used for the transmission of digital signals with, for example, a radio channel.



Analogue frequency modulation is related to it and similarly insensitive to interference. The carrier frequency of a sinusoidal oscillation is changed between a set of different frequencies. These different frequencies represent the individual transmit symbols.

During modulation, a specific transmit frequency is assigned to a transmit symbol. During demodulation, a defined frequency is detected and the symbol is output for further data processing. *elneos six* allows two transmission frequencies.

Example of amplitude modulation

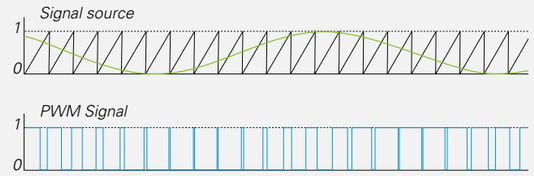


- Carrier signal (high-frequency)
- Working signal (modulating)
- Modulated signal with modulation depth 100 %
- Modulated signal with modulation depth 50 %

Pulse Width Modulation (PWM)
In pulse width modulation, a technical quantity (e.g. current) alternates between two values. The duty cycle of a rectangular pulse is modulated at a constant frequency.

Thus, the width (wideness) of the pulse is influenced. A PWM is realised by comparing a continuously rising and falling signal with the analogue input signal. The rising or falling signal is thus above or below the input signal for a certain time.

At the intersection points, the digital output signal is switched over, resulting in the PWM signal. This signal can be transported over long distances without high energy expenditure and the PWM voltage curve has the same effect as a sinusoidal voltage on inert loads.



A sinusoidal curve (■) can be converted into a PWM signal (■), for example, by comparing it with a sawtooth-shaped signal (■). For each PWM pulse, the sawtooth ramp runs through the entire value range. This means that on inert loads such as motors, the PWM voltage curve acts like a sinusoidal voltage.

More detailed information in the Technical Compendium from page 154-155.