

# Arbitrary function generator

## TOE 7761 – 40 MHz



TOE 7761

The TOE 7761 arbitrary function generator uses the direct digital synthesis (DDS) technique to create sine waves of high quality and accuracy. Square waveforms are provided with fast rise and fall times. The sampling rate of up to 80 MS/s can be controlled by an external clock.

Arbitrary signals can have up to 1 000 000 sampling points with a resolution of 14 bits, thus allowing a very good simulation of natural signals. A wide range of integral standard waveforms, such as sine, triangle, square, ramp, etc., simplifies the creation of new arbitrary waveforms.

The output amplitude can be set to a maximum of 20 V<sub>pp</sub> (10 V<sub>pp</sub> into 50 Ω) with offsets of up to ±10 V (±5 V into 50 Ω). Various triggered modes with an internal or external trigger source allow generation of an exact number of user-defined cycles. Various modulation and sweep options round off the instrument functions.

A 10 MHz external clock reference lets you synchronize the unit for precise phase adjustment.

Operation is easy and convenient with the graphic LCD and a multifunction spin-wheel. All functions can be configured with just a few inputs. It is additionally possible to save up to 50 instrument configurations in a non-volatile memory.

The included PC software Arbsoft allows easy creation, editing and downloading of complex waveforms. Multiple waveforms can be stored in the flash memory of the instrument ready for execution.

### Technical specifications

#### Frequency characteristics

Sine	1 μHz to 40 MHz
Square	1 μHz to 40 MHz
Triangle	1 μHz to 5 MHz
Pulse	0.5 MHz to 10 MHz
Accuracy	0.002 % (20 ppm)
Resolution	12 digits or 1 μHz

#### Waveform characteristics

<b>Sine</b>	
Harmonic distortion	DC to 20 kHz -65 dBc 20 kHz to 100 kHz -60 dBc 100 kHz to 5 MHz -45 dBc 5 MHz to 40 MHz -30 dBc
Signal distortion (non-harmonic)	DC to 1 MHz < -60 dBc
<b>Triangle</b>	
Variable symmetry	10 % to 90 %
<b>Square</b>	
Transition times	< 8 ns at full amplitude into 50 Ω
Duty cycle	< 10 MHz: 20 % to 80 %, ±1 % max. < 30 MHz: 40 % to 60 %, ±5 % max. < 40 MHz: 50 % fixed
Symmetry error	< 0.5 % at 50 % duty cycle
Overshoots	Typ. < 3% of output amplitude ± 50 mV
<b>Pulse</b>	
Pulse width	> 50 ns or 0.0001 % of repetition rate
Overshoots	Typ. < 3 % of output amplitude ± 50 mV

#### Arbitrary characteristics

<b>Resolution</b>	
Horizontal	Up to 1 000 000 points
Vertical	14 bits (-8191 to +8191)
Sampling	12.5 ns/point to 100 s/point (80 MS/s max.) with 4 digits or 0.1 ns resolution
Accuracy	0.002 % (20 ppm)
Predefined waveforms	Sine, triangle, square, noise, ramp up and down, Sin(x)/x, exponential rise and fall, Gaussian pulse

### Special features

- 1 μHz to 40 MHz sine and square waveforms
- Output amplitude up to 20 V<sub>pp</sub>
- 80 MS/s sampling rate with arbitrary waveforms with 14 bit resolution and up to 1 000 000 sampling points
- Flash memory for 1 000 000 sampling points
- Many standard waveforms assist in creating arbitrary waveforms
- Various modulation and sweep options
- 50 instrument configurations can be stored
- Remote control via USB<sup>1)</sup>, GPIB and RS-232 interface

<sup>1)</sup> USB via supplied RS-232 adapter



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#### Output characteristics

<b>Amplitude</b>	
Range	20 mV <sub>pp</sub> to 20 V <sub>pp</sub> max., 10 mV <sub>pp</sub> to 10 V <sub>pp</sub> into 50 Ω
Resolution	3 digits or 10 mV
Units	V <sub>pp</sub> , V <sub>rms</sub> , dBm
Accuracy	±1% ± 20 mV of the set value at 1 V to 10 V
Linearity	0.1 dB up to 1 MHz, 1 dB up to 40 MHz

<b>Offset</b>	
Range	Up to ±9.99 V max., up to ±4.99 V into 50 Ω, depending on the set amplitude
Resolution	3 digits or 10 mV
Accuracy	±1% ± 10 mV into 50 Ω

<b>Main output</b>	
Impedance	50 Ω
Filter	9 <sup>th</sup> order elliptic filter and 5 <sup>th</sup> order Bessel filter
Output protection	Short-circuit proof and resistant to external voltage up to ±15 V. The output is automatically disconnected in event of overload

<b>Operating modes</b>	
Continuous	Continuous output signal with the set parameters.
Trigger	Output retains last value of last waveform until a trigger event arrives, and exactly one complete waveform is subsequently output with the programmed parameters.
Gate	Like trigger mode except that the output signal is generated for the duration of the gate signal. The last started cycle is completed.
Burst	Like trigger mode except with a programmed number of 2 to 999 999 cycles.

<b>Trigger characteristics</b>	
Source	Internal, external, manual or remote-controlled interface
Start phase	-360° to +360° with 0.1° resolution
Repetition rate	0.01 Hz to 1 MHz, accuracy ± 0.002 %
External	< 10 MHz (DDS signal), < 20 MHz (arbitrary)
Pulse width	> 20 ns, (TTL)

#### Modulation characteristics

<b>Amplitude modulation</b>	
Internal	0.01 Hz to 20 kHz sine, square or triangle, variable modulation from 0 % to 100 %
External	5 V <sub>pp</sub> for 100 % modulation

<b>Frequency modulation</b>	
Internal	0.01 Hz to 20 kHz sine, square or triangle, variable modulation from 0 % to 100 %
External	5 V <sub>pp</sub> for 100 % change in frequency

<b>FSK</b>	
Clock rate	Internal: 0.01 Hz to 1 MHz External <sup>2)</sup> : TTL signal, max. 1 MHz

#### Sweep characteristics

Characteristic	Linear or logarithmic, up or down
Sweep time	10 ms to 500 s
Trigger	Internal or external, all trigger modes

<b>Inputs and outputs</b>	
Summing In Modulation In	The analog input signal can be added to the output signal 5 V <sub>pp</sub> for full-scale output, bandwidth: DC to > 10 MHz, impedance 500 Ω 5 V <sub>pp</sub> for 100 % modulation, bandwidth: DC to > 50 kHz, impedance 10 kΩ
Trigger In	TTL compatible, max. 20 MHz, pulse width > 20 ns, impedance 10 kΩ
Reference In	10 MHz square signal for device synchronization, TTL compatible, input impedance 1 kΩ
Reference Out	10 MHz square signal or arbitrary clock for device synchronization, TTL compatible, impedance 50 Ω
Marker Out	Positive TTL pulse as marker for arbitrary signals, freely-programmable, impedance 50 Ω
Sync Out	Positive TTL pulses synchronous with the output frequency, impedance 50 Ω

#### General data

<b>Configuration memory</b>	50 instrument settings, including last setting
<b>Arbitrary memory</b>	1 000 000 points in internal flash memory
<b>Remote-controlled interfaces</b>	IEEE 488.2 (GPIB), RS 232 (115 KB max.), USB <sup>1)</sup> , SCPI compatible
<b>Dimensions (W x H x D)</b>	224 x 88 x 357 mm
With feet	224 x 104 x 357 mm
<b>Weight</b>	3.2 kg
<b>Power supply</b>	90 V to 264 V, 47 to 63 Hz, < 40 VA max.
<b>Humidity</b>	Up to 95 %, 0 °C to 30 °C
<b>Operating temperature</b>	0 °C to +50 °C
<b>Storage temperature</b>	-20 °C to +70 °C
<b>Emitted noise</b>	In accordance with EN 55011, Class B
<b>Noise immunity</b>	In accordance with EN 55082-2
<b>Device safety</b>	In accordance with EN 61010-1, CE labeled

## Ordering data

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<sup>1)</sup> USB via supplied RS-232 adapter

<sup>2)</sup> External FSK modulation uses Trigger In. Specifications subject to change without notice