

## Data Sheet

# Dual Channel Function/Arbitrary Waveform Generators 4060 Series



The 4060 Series Dual Channel Function/Arbitrary Waveform Generators are capable of generating stable and precise sine, square, triangle, pulse, and arbitrary waveforms. With an easy-to-read color display and intuitive user interface with numeric keypad, these instruments offer plenty of features including linear/logarithmic sweep, built-in counter, extensive modulation and triggering capabilities, a continuously variable DC offset, and a high performance 14-bit, 500 MSa/s arbitrary waveform generator.

Easily create custom arbitrary waveforms using the included waveform editing software or use any of the 36 built-in predefined arbitrary waveforms. Up to 8 user-defined 512-kpt arbitrary waveforms and 24 user-defined 16-kpt arbitrary waveforms can be saved to the instrument. Additionally, the included LabVIEW™ drivers allow users to conveniently load and save .CSV or text file data directly into the arb memory without having to use waveform editing software.

Extensive modulation capabilities include amplitude and frequency modulation (AM/FM), double sideband amplitude modulation (DSB-AM), amplitude and frequency shift keying (ASK/FSK), phase modulation (PM), and pulse width modulation (PWM).

The standard external 10 MHz reference clock input and output allows users to synchronize their instrument with another generator. This feature is typically not found in function generators at this price point. Additionally, the phase of both output channels can be synchronized conveniently with the push of a button.

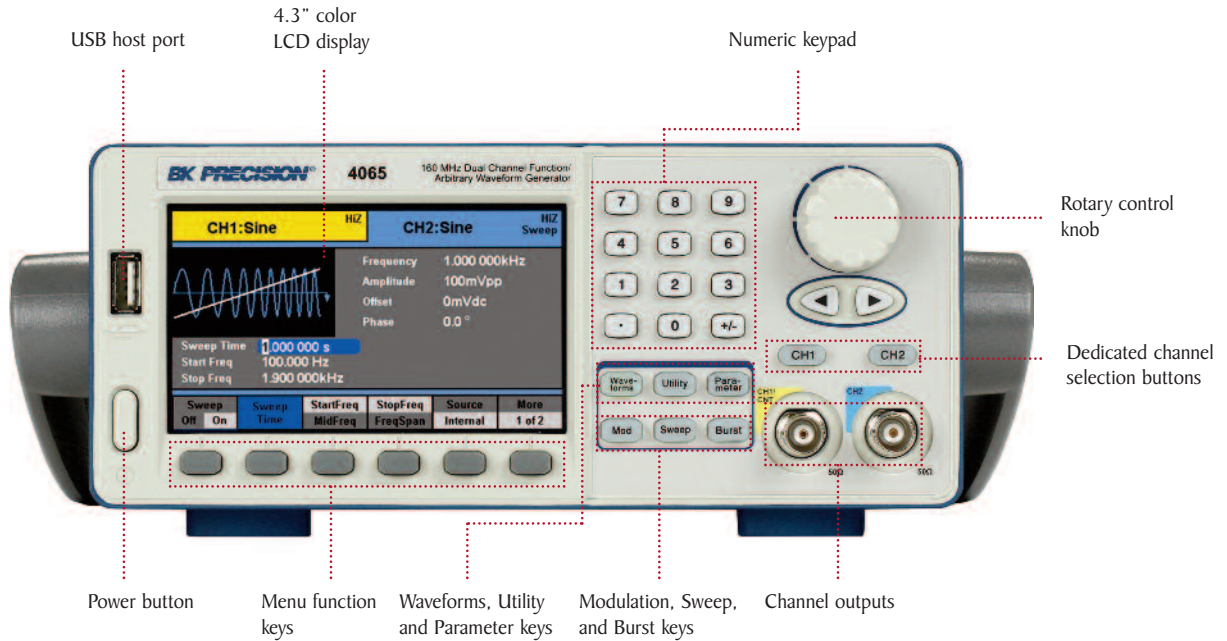
These versatile function/arbitrary waveform generators are suitable for education and other applications that require high signal fidelity, a variety of modulation schemes, or arbitrary waveform generation capabilities.

### Features & Benefits

- 14-bit, 500 MSa/s, 512k point (Ch2 only) arbitrary waveform generator
- Two independent channels with one-button synchronization
- Generate sine waves up to 160 MHz
- Large 4.3-inch LCD color display
- Linear and logarithmic sweep
- AM/DSB-AM/ASK/FM/FSK/PM/PWM modulation functions
- Variable DC offset
- Adjustable duty cycle
- Internal/external triggering
- Gate and burst mode
- 36 built-in predefined arbitrary waveforms
- Store/recall up to 10 instrument settings and 32 user-defined arbitrary waveforms (8 x 512 kpts, 24 x 16 kpts)
- Built-in counter
- USB device port (USBTMC-compliant) and front panel USB host port
- GPIB connectivity with optional USB-to-GPIB adapter
- Arbitrary waveform editing software included
- Short circuit output protection
- LabVIEW™ drivers available

| Model                  | 4063                | 4064                 | 4065                 |
|------------------------|---------------------|----------------------|----------------------|
| Sine frequency range   | 1 $\mu$ Hz – 80 MHz | 1 $\mu$ Hz – 120 MHz | 1 $\mu$ Hz – 160 MHz |
| Square frequency range | 1 $\mu$ Hz – 40 MHz | 1 $\mu$ Hz – 50 MHz  |                      |

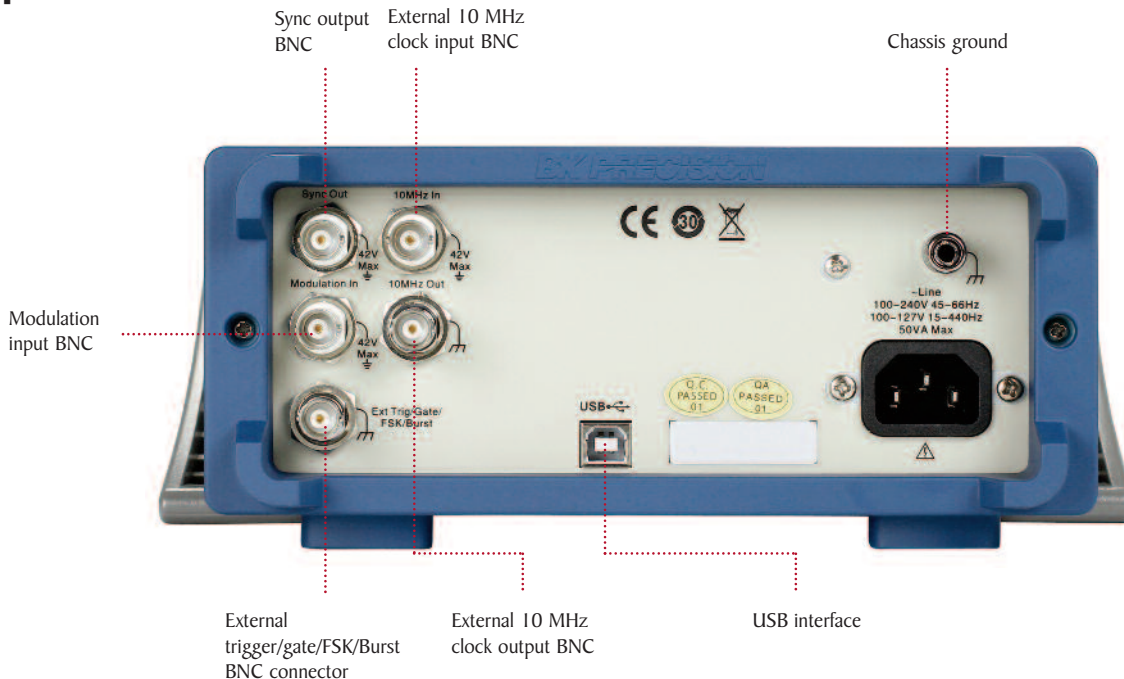
## Front panel



## Intuitive user interface

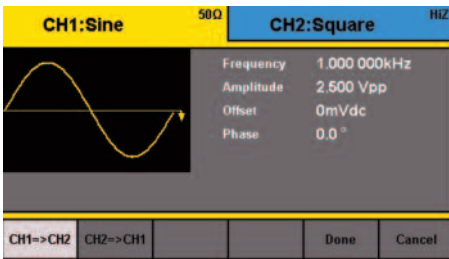
Easily adjust all waveform parameters using the intuitive menu-driven front panel keypad with dedicated channel selection keys, numeric keypad, and rotary control knob. Connect your USB flash drive to the USB host port to quickly save and recall instrument settings and waveforms.

## Rear panel



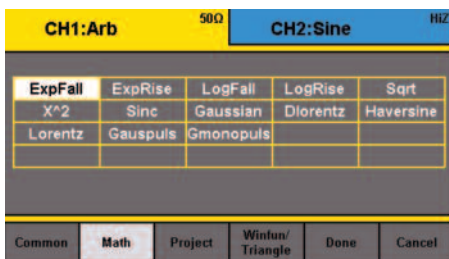
## Flexible operation

### Dual channel output



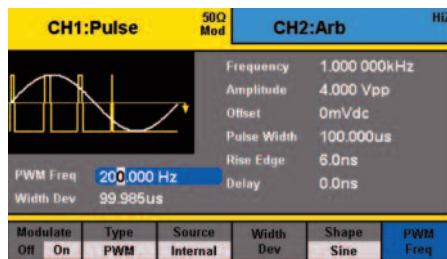
Save time with the 4060 Series' two independent channels to output synchronous signals. With a push of a button, all waveform parameters can be quickly copied between channels to set up identical output signals. Phase between channels can also be adjusted from the front panel.

### Arbitrary waveform generation



All models in the 4060 series provide non-volatile memory to create, store, and recall up to 24 different 16-kpt arbitrary waveforms and up to 8 different 512-kpt arbitrary waveforms. Users can also output any of the 36 built-in predefined arbitrary waveforms.

### Wide variety of modulation schemes



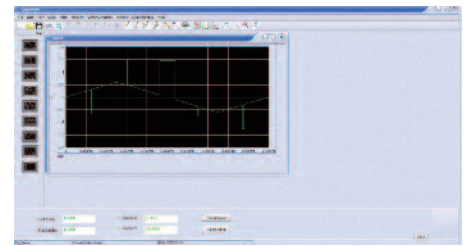
These instruments are capable of many different types of modulation for various applications. Modulate your waveforms with AM, DSB-AM, FM, PM, ASK, FSK, and PWM modulation schemes.

### Synchronization and external triggering



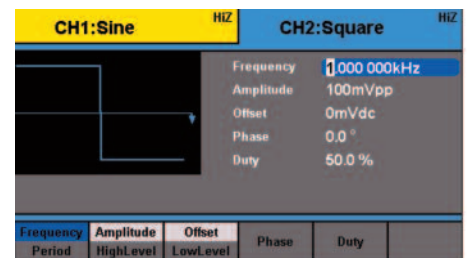
Use the external 10 MHz clock input and output to synchronize your signals to a master time base. The Sync output generates a TTL pulse for synchronization to a channel's frequency. An external trigger BNC connector is also available for inputting or generating a trigger signal.

### Generate waveforms with ease



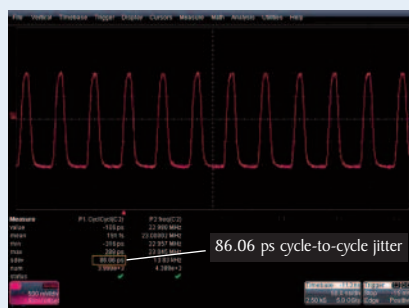
The provided waveform editing software can be used to create point-by-point arbitrary waveforms via freehand or waveform math functions. A standard USB interface on the rear panel allows users to easily interface with a PC to load these arbitrary waveforms into the instrument. The front panel also offers a convenient USB host port for connecting your USB flash drive to save/recall instrument settings and waveforms.

### Easy-to-read color display



Large 4.3" color display shows the currently selected channel and all relevant parameters.

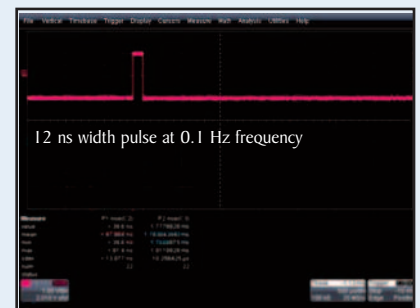
## Advanced pulse generator



For applications requiring high signal integrity and edge stability, the 4060 Series can generate pulses with a low cycle-to-cycle jitter of < 100 ps.



Capable of setting edge times within a large range, the 4060 Series can generate pulses with minimum rise/fall times of 6 ns and maximum rise/fall times of 6 seconds.



Unlike traditional DDS generators, the 4060 Series has the capability to output a rapid pulse at very low frequencies. Duty cycle can be set to as low as 0.0001%.

## Specifications

| Model                                                     | 4063                                                                                                              | 4064                 | 4065                 |
|-----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|----------------------|----------------------|
| Channels                                                  | 2                                                                                                                 |                      |                      |
| <b>Frequency Characteristics</b>                          |                                                                                                                   |                      |                      |
| Sine                                                      | 1 $\mu$ Hz – 80 MHz                                                                                               | 1 $\mu$ Hz – 120 MHz | 1 $\mu$ Hz – 160 MHz |
| Square                                                    | 1 $\mu$ Hz – 40 MHz                                                                                               | 1 $\mu$ Hz – 50 MHz  |                      |
| Triangle, Ramp                                            | 1 $\mu$ Hz – 4 MHz                                                                                                |                      |                      |
| Pulse                                                     | 1 $\mu$ Hz – 20 MHz                                                                                               | 1 $\mu$ Hz – 30 MHz  | 1 $\mu$ Hz – 40 MHz  |
| Gaussian Noise (-3 dB)                                    | 100 MHz                                                                                                           |                      |                      |
| Arbitrary                                                 | 1 $\mu$ Hz – 20 MHz                                                                                               | 1 $\mu$ Hz – 30 MHz  | 1 $\mu$ Hz – 40 MHz  |
| Accuracy                                                  | $\pm$ 2 ppm (1 year)                                                                                              |                      |                      |
| Resolution                                                | 1 $\mu$ Hz                                                                                                        |                      |                      |
| <b>Arbitrary Characteristics</b>                          |                                                                                                                   |                      |                      |
| Built-in Waveforms                                        | 36                                                                                                                |                      |                      |
| Waveform Length                                           | Ch1: 16,000 points, Ch2: 512,000 or 16,000 points                                                                 |                      |                      |
| Vertical Resolution                                       | 14 bits                                                                                                           |                      |                      |
| Sampling Rate                                             | 500 MSa/s                                                                                                         |                      |                      |
| Minimum Rise/Fall Time                                    | 6 ns (typical)                                                                                                    |                      |                      |
| Jitter (pk-pk)                                            | 2 ns (typical)                                                                                                    |                      |                      |
| Non-volatile Memory Storage                               | 8 x 512 kpts waveforms and 24 x 16 kpts waveforms                                                                 |                      |                      |
| <b>Output Characteristics</b>                             |                                                                                                                   |                      |                      |
| Amplitude Range (into 50 $\Omega$ )                       | 1 mVpp – 10 Vpp, $\leq$ 40 MHz<br>1 mVpp – 5 Vpp, $\leq$ 100 MHz<br>1 mVpp – 1.5 Vpp, $\leq$ 160 MHz              |                      |                      |
| Amplitude Resolution                                      | up to 4 digits                                                                                                    |                      |                      |
| Amplitude Accuracy (100 kHz)                              | $\pm$ (0.3 dBm + 1 mVpp)                                                                                          |                      |                      |
| Amplitude Flatness (relative to 100 kHz Sine, 1 Vpp)      | $\leq$ 10 MHz $\pm$ 0.2 dB<br>$\leq$ 80 MHz $\pm$ 0.5 dB<br>$\leq$ 160 MHz $\pm$ 0.8 dB                           |                      |                      |
| Cross Talk                                                | < -65 dBc                                                                                                         |                      |                      |
| Offset Range (DC)                                         | $\pm$ 5 V into 50 $\Omega$<br>$\pm$ 10 V into open circuit                                                        |                      |                      |
| Offset Resolution                                         | up to 4 digits                                                                                                    |                      |                      |
| Offset Accuracy                                           | $\pm$ (  offset setting value  x 1% + 1 mV)                                                                       |                      |                      |
| Output Impedance                                          | 50 $\Omega$ , high impedance                                                                                      |                      |                      |
| Output Protection                                         | short-circuit protection                                                                                          |                      |                      |
| <b>Waveform Characteristics</b>                           |                                                                                                                   |                      |                      |
| Harmonic Distortion (Sine)                                | DC – 1 MHz, < -54 dBc<br>1 MHz – 10 MHz, < -46 dBc<br>10 MHz – 100 MHz, < -35 dBc<br>100 MHz – 160 MHz, < -26 dBc |                      |                      |
| Total Harmonic Distortion (Sine)                          | DC – 20 kHz at 1 Vpp, < 0.2 %                                                                                     |                      |                      |
| Spurious (non-harmonic)                                   | DC – 1 MHz, < -70 dBc<br>1 MHz – 10 MHz, < -65 dBc                                                                |                      |                      |
| Phase Noise                                               | 100 kHz offset, -116 dBc/Hz (typical)                                                                             |                      |                      |
| Rise/Fall Time (Square)                                   | < 8 ns (10% - 90%) at full amplitude into 50 $\Omega$                                                             |                      |                      |
| Variable Duty Cycle (Square)                              | 20% - 80% to 10 MHz<br>40% - 60% to 40 MHz<br>50% > 50 MHz                                                        |                      |                      |
| Asymmetry (50% duty cycle)                                | 1% of period + 5 ns (typical, 1 kHz, 1 Vpp)                                                                       |                      |                      |
| Jitter (Square)                                           | 100 ps rms (typical)                                                                                              |                      |                      |
| Ramp Symmetry                                             | 0% - 100%                                                                                                         |                      |                      |
| Linearity (Triangle, Ramp at 1 kHz, 1 Vpp, 100% Symmetry) | < 0.1% of peak output (typical)                                                                                   |                      |                      |



Dual Channel Function/Arbitrary Waveform Generators  
4060 Series

| Model                                             | 4063, 4064 & 4065                                     |
|---------------------------------------------------|-------------------------------------------------------|
| <b>Pulse</b>                                      |                                                       |
| Pulse Width                                       | 12 ns minimum, 100 ps resolution, 1,000,000 s max     |
| Rise/Fall Time                                    | 6ns – 6s <sup>(1)</sup> , 100 ps resolution           |
| Duty Cycle Range                                  | 0.0001 % to 99.9999 %                                 |
| Overshoot                                         | < 3%                                                  |
| Jitter (pk-pk)                                    | < 100 ps rms (typical)                                |
| <b>Burst</b>                                      |                                                       |
| Waveform                                          | sine, square, ramp, pulse, arbitrary (except DC)      |
| Type                                              | cycle (1 – 1,000,000 cycles), infinite, gated         |
| Start/Stop Phase                                  | 0° – 360°                                             |
| Internal Period                                   | 1 μs – 1000 s ± 1%                                    |
| Gated Source                                      | external trigger                                      |
| Trigger Source                                    | internal, external, manual                            |
| <b>Phase Offset</b>                               |                                                       |
| Range                                             | -360° – 360°                                          |
| Resolution                                        | 0.1°                                                  |
| <b>Trigger Characteristics</b>                    |                                                       |
| Trigger Input                                     |                                                       |
| Input Level                                       | TTL compatible                                        |
| Slope                                             | rising or falling, selectable                         |
| Pulse Width                                       | > 50 ns                                               |
| Input Impedance                                   | > 5 kΩ, DC coupling                                   |
| Maximum Frequency                                 | 1 MHz                                                 |
| Input Latency                                     | < 380 ns                                              |
| Trigger Output                                    |                                                       |
| Voltage Level                                     | TTL compatible                                        |
| Pulse Width                                       | > 60 ns (typical)                                     |
| Output Impedance                                  | 50 Ω (typical)                                        |
| Maximum Frequency                                 | 1 MHz                                                 |
| <b>AM, FM &amp; PM Modulation Characteristics</b> |                                                       |
| Carrier                                           | sine, square, ramp, arbitrary (except DC)             |
| Source                                            | internal, external                                    |
| Modulation Waveform                               | sine, square, ramp, noise, arbitrary (1 MHz – 50 kHz) |
| AM Modulation Depth                               | 0% - 120%, 0.1% resolution                            |
| FM Frequency Deviation                            | 0 – 0.5 x bandwidth, 1 MHz resolution                 |
| PM Phase Deviation                                | 0 – 360°, 0.1° resolution                             |
| <b>ASK &amp; FSK Modulation Characteristics</b>   |                                                       |
| Carrier                                           | sine, square, ramp, arbitrary (except DC)             |
| Source                                            | internal, external                                    |
| Modulation Waveform                               | 50% duty cycle square waveform (1 MHz – 1 MHz)        |
| <b>DSB-AM Modulation Characteristics</b>          |                                                       |
| Carrier                                           | sine, square, ramp, arbitrary (except DC)             |
| Source                                            | internal, external                                    |
| Modulation Waveform                               | sine, square, ramp, noise, arbitrary (1 MHz – 50 kHz) |
| <b>PWM Modulation Characteristics</b>             |                                                       |
| Source                                            | internal, external                                    |
| Modulation Waveform                               | sine, square, ramp, arbitrary (except DC)             |
| External Modulation                               | - 5 V to + 5 V (max. width deviation)                 |
| Duty Cycle<br>Modulating Frequency                | 1 MHz – 50 kHz                                        |

(1) depending on pulse width

|                                         |                                                                                                                                    |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sweep Characteristics</b>            |                                                                                                                                    |
| Waveforms                               | sine, square, ramp, arbitrary (except DC)                                                                                          |
| Sweep Shape                             | linear or logarithmic, up or down                                                                                                  |
| Sweep Time                              | 1 ms – 500 s ± 0.1%                                                                                                                |
| Sweep Trigger                           | internal, external, manual                                                                                                         |
| <b>Inputs and Outputs</b>               |                                                                                                                                    |
| Output Impedance                        | 50 Ω, high impedance                                                                                                               |
| Sync Out                                | TTL compatible<br>> 50 ns width, not adjustable<br>50 Ω (typical) output impedance<br>10 MHz max. frequency                        |
| Modulation In                           | ± 5 V for 100% modulation<br>> 10 kΩ input impedance<br>max. voltage input: + 5 V                                                  |
| External Clock In                       | Frequency Range: 10 MHz ± 1 kHz<br>Min. Voltage Input: 2.3 V                                                                       |
| External Clock Out                      | Frequency: 10 MHz<br>Voltage Level: > 1 Vpp                                                                                        |
| Ext Trig/Gate/FSK/Burst                 | TTL compatible<br>max. voltage input: + 5 V                                                                                        |
| <b>Frequency Counter</b>                |                                                                                                                                    |
| Measurement                             | frequency, period, positive/negative pulse width, duty cycle                                                                       |
| Measurement Range                       | 100 mHz – 200 MHz                                                                                                                  |
| Frequency Resolution                    | 6 bits                                                                                                                             |
| Voltage Range (non-modulated signal)    |                                                                                                                                    |
| DC Coupling                             | DC offset range: ± 1.5 VDC<br>100 mHz – 100 MHz, 50 mVrms - ± 2.5 V<br>100 MHz – 200 MHz, 100 mVrms - ± 2.5 V                      |
| AC Coupling                             | 1 Hz – 200 MHz, 100 mVrms – 5 Vpp                                                                                                  |
| Pulse Width/Duty Cycle<br>Voltage Range | 50 mVrms – 5 Vpp                                                                                                                   |
| Input Impedance                         | 1 MΩ                                                                                                                               |
| Coupling                                | AC, DC                                                                                                                             |
| Trigger Level Range                     | -3 V to +1.8 V                                                                                                                     |
| <b>Environmental and Safety</b>         |                                                                                                                                    |
| Temperature                             | operating: 32 °F – 104 °F (0 °C – 40 °C)<br>storage: -4 °F – 140 °F (-20 °C – 60 °C)                                               |
| Humidity                                | < 95% F (< 35 °C), ≤ 90% RH<br>95 °F – 104 °F (35 °C – 40 °C), ≤ 60% RH                                                            |
| Altitude                                | operating: below 9,842 ft (3,000 m)<br>storage: below 49,212 ft (15,000 m)                                                         |
| Electromagnetic<br>Compatibility        | EMC Directive 2004/108/EC, EN61326:2006,<br>EN61000-3-2:2006+A2:2009, EN61000-3-3:2008                                             |
| Safety                                  | low voltage directive 2006/95/EC, EN61010-1:2001,<br>EN61010-031:2002+A1:2008                                                      |
| <b>General</b>                          |                                                                                                                                    |
| Display                                 | 4.3" TFT-LCD display, 480 x 272                                                                                                    |
| Interfaces                              | USB/TMC (standard), GPIB (optional), USB host port                                                                                 |
| Storage Memory                          | 10 instrument settings, 32 arbitrary waveforms                                                                                     |
| AC Input                                | 100 – 240 VAC ± 10%, 50 / 60 Hz ± 5%<br>100 – 120 VAC ± 10%, 45 – 440 Hz                                                           |
| Power Consumption                       | 30 W max.                                                                                                                          |
| Dimensions (W x H x D)                  | 10.3" x 4.1" x 13.5" (261 x 105 x 344 mm)                                                                                          |
| Weight                                  | 6.1 lbs (2.8 kg)                                                                                                                   |
| <b>Three-Year Warranty</b>              |                                                                                                                                    |
| Standard Accessories                    | Getting started manual, full instruction manual on CD,<br>AC power cord, USB type A-to-type B cable, certificate<br>of calibration |
| Optional Accessories                    | USB-to-GPIB adapter (model AK40G)                                                                                                  |



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- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

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- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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