Tektronix®

AFG31000 Series Generators Compliance and Safety Instructions

071-3606-00

Contacting Tektronix

Tektronix, Inc., 14150 SW Karl Braun Drive, P.O. Box 500, Beaverton, OR 97077, USA

For product information, sales, service, and technical support:
In North America, call 1-800-833-9200.
Worldwide, visit www.tektronix.com to find contacts in your area.

General safety summary

Use the product only as specified. Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. Carefully read all instructions. Retain these instructions for future reference.

Comply with local and national safety codes.

For correct and safe operation of the product, it is essential that you follow generally accepted safety procedures in addition to the safety precautions specified in this manual.

The product is designed to be used by trained personnel only.

Only qualified personnel who are aware of the hazards involved should remove the cover for repair, maintenance, or adjustment.

To avoid fire or personal injury

Use proper power cord. Use only the power cord specified for this product and certified for the country of use.

Do not use the provided power cord for other products.

Ground the product. This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded.

Do not disable the power cord grounding connection.

Observe all terminal ratings. To avoid fire or shock hazard, observe all ratings and markings on the product. Consult the product manual for further ratings information before making connections to the product.

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

Power disconnect. The power cord disconnects the product from the power source. See instructions for the location. Do not position equipment so that it is difficult to disconnect the power cord; it must remain accessible to the user at all times to allow for quick disconnection if needed.

Connect and disconnect properly. Do not connect or disconnect probes or test leads while they are connected to a voltage source.

Use only insulated voltage probes, test leads, and adapters supplied with the product, or indicated by Tektronix to be suitable for the product.

Do not float the common terminal above the rated voltage for that terminal.

Do not operate without covers. Do not operate this product with covers or panels removed.

Avoid exposed circuitry. Do not touch exposed connections and components when power is present.

Do not operate with suspected failures. If you suspect that there is damage to this product, have it inspected by qualified service personnel.

Disable the product if it is damaged. Do not use the product if it is damaged or operates incorrectly. If in doubt about safety of the product, turn it off and disconnect the power cord. Clearly mark the product to prevent its further operation.

Before use, inspect voltage probes, test leads, and accessories for mechanical damage and replace when damaged. Do not use probes or test leads if they are damaged, if there is exposed metal, or if a wear indicator shows.

Examine the exterior of the product before you use it. Look for cracks or missing pieces.

Use only specified replacement parts.

Do not operate in wet/damp conditions. Be aware that condensation may occur if a unit is moved from a cold to a warm environment.

Do not operate in an explosive atmosphere.

Provide proper ventilation. Refer to the installation instructions for details on installing the product so it has proper ventilation. Slots and openings are provided for ventilation and should never be covered or otherwise obstructed. Do not push objects into any of the openings.

Provide a safe working environment. Always place the product in a location convenient for viewing the display and indicators.

Use care when lifting and carrying the product. This product is provided with handles for lifting and carrying.

Use only the Tektronix rackmount hardware specified for this product.

Keep product surfaces clean and dry. Remove the input signals before you clean the product. Inspect the instrument as often as operating conditions require. To clean the exterior surface, perform the following steps:

1. Remove loose dust on the outside of the instrument with a lint-free cloth. Use care to avoid scratching the clear glass display filter.
2. Use a soft cloth dampened with water to clean the instrument. Use an aqueous solution of 75% isopropyl alcohol for more efficient cleaning.

⚠ *CAUTION. Avoid getting moisture inside the unit during external cleaning. Use only enough cleaning solution to dampen the cloth or swab. To avoid damage to the instrument, do not expose it to sprays, liquids, or solvents, and do not use any abrasive or chemical cleaning agents.*

Service safety summary

The *Service safety summary* section contains additional information required to safely perform service on the product. Only qualified personnel should perform service procedures. Read this *Service safety summary* and the *General safety summary* before performing any service procedures.

To avoid electric shock. Do not touch exposed connections.

Do not touch exposed connections.. Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.

Disconnect power. To avoid electric shock, switch off the product power and disconnect the power cord from the mains power before removing any covers or panels, or opening the case for servicing.

Use care when servicing with power on. Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.

Verify safety after repair. Always recheck ground continuity and mains dielectric strength after performing a repair.

Terms in this manual

These terms may appear in this manual:

⚠ *WARNING. Warning statements identify conditions or practices that could result in injury or loss of life.*

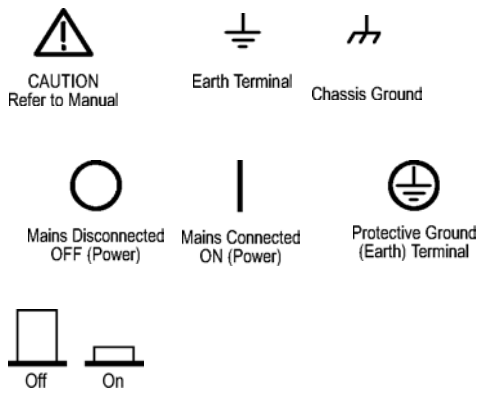
⚠ *CAUTION. Caution statements identify conditions or practices that could result in damage to this product or other property.*

Symbols and terms on the product

These terms may appear on the product:

- DANGER indicates an injury hazard immediately accessible as you read the marking.
- WARNING indicates an injury hazard not immediately accessible as you read the marking.
- CAUTION indicates a hazard to property including the product.

The following symbol(s) may appear on the product:



Compliance information

This section lists the EMC (electromagnetic compliance), safety, and environmental standards with which the instrument complies.

EMC compliance

EC Declaration of Conformity – EMC

Meets intent of Directive 2014/30/EC for Electromagnetic Compatibility. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

EN 61326-1:2013. EMC requirements for electrical equipment for measurement, control, and laboratory use. [1] [2] [3]

- CISPR 11:2009+A1 2010. Radiated and conducted emissions, Group 1, Class A
- IEC 61000-4-2:2008. Electrostatic discharge immunity
- IEC 61000-4-3:2006+A1:2007+A2:2010. RF electromagnetic field immunity
- IEC 61000-4-4:2012. Electrical fast transient/burst immunity
- IEC 61000-4-5:2014+A1:2017. Power line surge immunity
- IEC 61000-4-6:2013. Conducted RF immunity
- IEC 61000-4-11:2004+A1:2017. Voltage dips and interruptions immunity

EN 61000-3-2:2014. AC power line harmonic emissions

EN 61000-3-3:2013. Voltage changes, fluctuations, and flicker

European contact.
Tektronix UK, Ltd.
Western Peninsula
Western Road
Bracknell, RG12 1RF
United Kingdom

1 This product is intended for use in nonresidential areas only. Use in residential areas may cause electromagnetic interference.

2 Emissions which exceed the levels required by this standard may occur when this equipment is connected to a test object.

3 To ensure compliance with the EMC standards listed here, high quality shielded interface cables should be used.

Australia / New Zealand Declaration of Conformity – EMC

Complies with the EMC provision of the Radiocommunications Act per the following standard, in accordance with ACMA:

- CISPR 11+A1:2010 - Radiated and Conducted Emissions, Group 1, Class A in accordance with the Radiocommunications Labelling (Electromagnetic Compatibility) Notice 2008 made under section 182 of the Radiocommunications Act 1992.

Australia/New Zealand contact.
Baker & Mckenzie
Level 27, AMP Centre, 50 Bridge Street,
Sydney NSW 2000, Australia

Safety compliance

EU Declaration of Conformity – Low Voltage

Compliance was demonstrated to the following specification as listed in the Official Journal of the European Union:

Low Voltage Directive 2014/35/EU .

- EN 61010-1. Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General Requirements.

U.S. nationally recognized testing laboratory listing

- UL 61010-1. Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General Requirements.

Canadian certification

- CAN/CSA-C22.2 No. 61010-1. Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General Requirements.

Additional compliances

- IEC 61010-1. Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General Requirements.

Equipment type

Test and measuring equipment.

Safety class

Class 1 – grounded product.

Pollution degree description

A measure of the contaminants that could occur in the environment around and within a product. Typically the internal environment inside a product is considered to be the same as the external. Products should be used only in the environment for which they are rated.

- Pollution Degree 1. No pollution or only dry, nonconductive pollution occurs. Products in this category are generally encapsulated, hermetically sealed, or located in clean rooms.
- Pollution Degree 2. Normally only dry, nonconductive pollution occurs. Occasionally a temporary conductivity that is caused by condensation must be expected. This location is a typical office/home environment. Temporary condensation occurs only when the product is out of service.
- Pollution Degree 3. Conductive pollution, or dry, nonconductive pollution that becomes conductive due to condensation. These are sheltered locations where neither temperature nor humidity is controlled. The area is protected from direct sunshine, rain, or direct wind.
- Pollution Degree 4. Pollution that generates persistent conductivity through conductive dust, rain, or snow. Typical outdoor locations.

Pollution degree rating

Pollution Degree 2 (as defined in IEC 61010-1). Rated for indoor, dry location use only.

IP rating

IP20 (as defined in IEC 60529).

Measurement and overvoltage category descriptions

Measurement terminals on this product may be rated for measuring mains voltages from one or more of the following categories (see specific ratings marked on the product and in the manual).

- Category II. Circuits directly connected to the building wiring at utilization points (socket outlets and similar points).
- Category III. In the building wiring and distribution system.
- Category IV. At the source of the electrical supply to the building.

NOTE. Only mains power supply circuits have an overvoltage category rating. Only measurement circuits have a measurement category rating. Other circuits within the product do not have either rating.

Mains overvoltage category rating

Overvoltage Category II (as defined in IEC 61010-1).

Environmental considerations

Refer to the Quick Start User Manual for information about the environmental impact of the product.

Operating overview

This document contains information for the following AFG31000 Series Arbitrary Function Generator products.

AFG31021, AFG31022, AFG31051, AFG31052, AFG31101, AFG31102, AFG31151, AFG31152, AFG31251, AFG31252

Refer to the User Manual and Specifications and Performance Verification Technical Reference for complete operating information and product specifications.

Power source

This generator operates from a single-phase power source with the neutral conductor at or near earth ground. It is intended for only ground-referenced measurements. A protective ground connection through the grounding conductor in the power cord is essential for safe operation.

Power the unit on by connecting the supplied power cord to the rear-panel power connector. Push the power button on the front of the instrument to turn it on. To power the unit off, push the power button on the front of the instrument again. To remove power completely, disconnect the power cord from the rear panel of the instrument.

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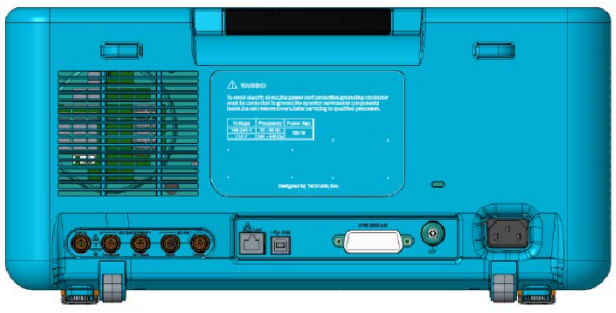
Power source (continued)

⚠ *WARNING. To reduce the risk of fire and shock, ensure that the mains supply voltage fluctuations do not exceed 10% of the operating voltage range.*



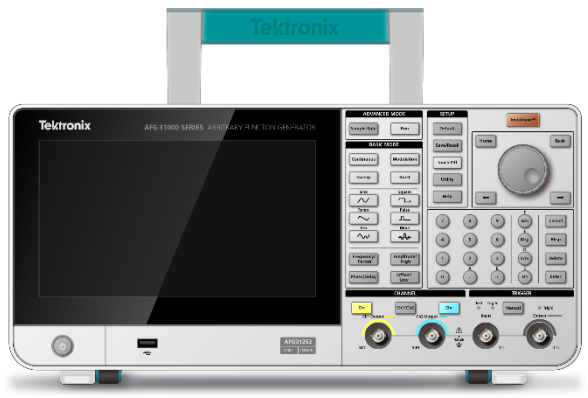
Power specifications and clearance requirements

Characteristic	Description
Source voltage and frequency	100 V to 240 V, 47Hz to 63 Hz 115 V, 360 to 440 Hz
Power consumption	Less than 120 W

Place the instrument on a cart or bench, observing the following clearance requirements.

- Sides: 50 mm (2 in)
- Rear: 50 mm (2 in)

⚠ *CAUTION. To ensure proper cooling, keep both sides of the instrument clear of obstructions.*



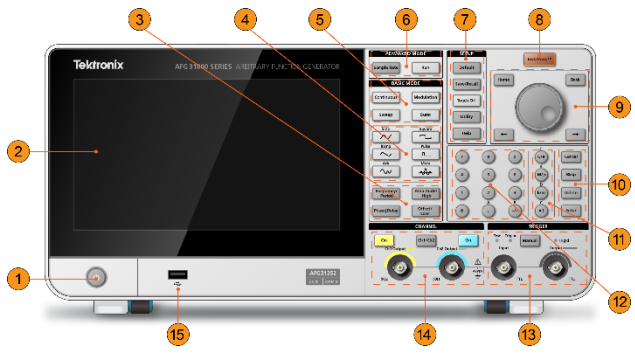
Environmental specifications

Characteristic		Description
Temperature range		
	Operating	0 °C to 50 °C
	Nonoperating	–30 °C to 70 °C
Humidity		
	Operating (non condensing)	0 °C to 40 °C: ≤80% 40 °C to 50 °C: ≤60%
	Nonoperating (non condensing)	<40 °C: 5% to 90% ≥40 °C to ≤60 °C: 5% to 80% >60 °C to ≤70 °C: 5% to 40%
Altitude		
	Operating	Up to 3,000 meters (9,843 feet)
	Non operating	Up to 12,000 meters (39,370 feet)

Front panel controls

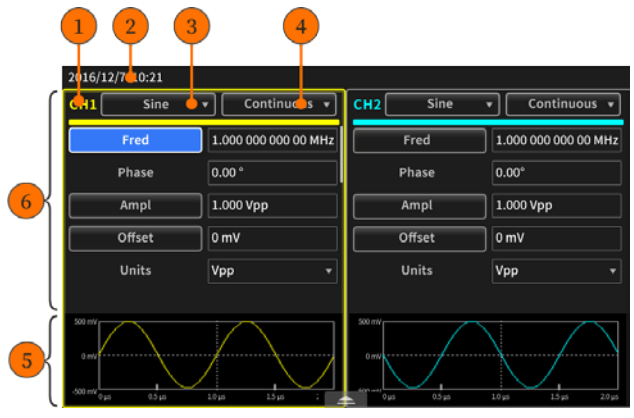
The front panel is divided into easy-to-use functional areas. The following figure shows a dual-channel model.

Front panel controls (continued)



1. Power button.
2. Touch screen.
3. Shortcut buttons: Frequency/Period, Amplitude/High, Phase/Delay, Offset/Low.
4. Waveform function buttons: Sine, Ramp, Arb, Square, Pulse, and More.
5. Basic Mode buttons: Continuous, Sweep, Modulation, and Burst.
6. Advanced Mode buttons: Sample, Rate, and Run.
7. Setup buttons: Default, Save/Recall, Touch Off, Utility, and Help.
8. InstaView (real-time waveform measurement) button.
9. Navigation area: Navigation control, Home button, Back button, and left and right arrow buttons.
10. Cancel, Bksp, Delete, and Enter buttons.
11. Settings edit buttons: G/n, M/µ, k/m, and x1 buttons.
12. Numeric keypad.
13. Trigger button, LEDs, and connectors.
14. Channel buttons and connectors.
15. USB input (Type A connector).

Screen interface



1. CH1: Displayed channel.
2. System time: Current system time.
3. Function: You can select functions by selecting from the touch screen or the shortcut button on front panel. Functions can be either a standard or an arbitrary waveform.
4. Run modes: Continuous, Modulation, Sweep, and Burst. You can select the run mode by selecting from the touch screen or the shortcut button on front panel.
5. Waveform display area: Shows waveform shape
6. Main display area: Main parameters can be shown and set here.

1. Waveform List Item: Lists waveforms that can be added to sequence, both waveform name and length.
2. Waveform List: Provides a list of available waveforms. You can open and edit these waveforms.
3. Sequence: When Sequence is selected, you can create, save, open or save as a waveform.
4. Sequence table: Waveforms can be inserted into a loop or branch (wait, jump, or go-to)that is triggered by a specific event. The sequencer can include up to 256 steps, and up-to 16 Mpts of waveforms for each channel (128 Mpts with optional license).
5. Waveform display area: The waveform selected in the sequence table is shown here.
6. Open: Opens a waveform and add it to waveforms list table
7. Remove: Remove the waveform from the waveform list.

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