

T3AFG30 / T3AFG60

Function / Arbitrary Waveform Generators

Quick Start Guide



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Specifications are subject to change without notice.

General Safety Summary

Read the following precautions carefully to avoid any personal injuries, or damage to the instrument or products connected to it. Use the instrument only as specified.

Use only the power cord supplied for the instrument.

Ground the instrument. The instrument is grounded through the ground conductor of the power cord. To avoid electric shock, always connect to grounded outlets. Make sure the instrument is grounded correctly before connecting its input or output terminals.

Do not connect external signals. The BNC connector is used to output the generated waveforms only. No external signals should be connected to the BNC, or the instrument may be damaged.

Observe all terminal ratings and signs on the instrument to avoid fire or electric shock. Before connecting to the instrument, read the manual to understand the input/output ratings.

Do not operate with suspected failures. If you suspect that the instrument is damaged, contact the Teledyne LeCroy service department immediately.

Do not operate in wet/damp conditions.

Do not operate in an explosive atmosphere.

Keep the surface of the instrument clean and dry.

Avoid touching exposed circuits or wires. Do not touch exposed contacts or components when the power is on.

Do not operate without covers. Do not operate the instrument with covers or panels removed.

Use proper overvoltage protection.

Observe ventilation requirements. Ensure good ventilation. Check the vent and fan regularly to prevent overheating.

Safety Terms and Symbols

The following terms may appear on the instrument:

DANGER: Direct injury or hazard may occur.

WARNING: Potential injury or hazard may occur.

CAUTION: Potential damage to instrument/property may occur.

The following symbols may appear on the instrument:



CAUTION
Risk of
injury or
damage.
Refer to
manual.



WARNING
Risk of
electric
shock or
burn



Earth
Ground
Terminal



Protective
Conductor
Terminal



Frame or
Chassis
Terminal



ON/
Standby
Power



Alternating
Current

Operating Environment

Temperature: 0 °C to 40 °C

Relative Humidity: 5 to 90% RH at ≤ 30 °C

Altitude: ≤ 3048 m at ≤ 30 °C

Use indoors only.

Pollution degree 2. Use in an operating environment where normally only dry, non-conductive pollution occurs. Temporary conductivity caused by condensation should be expected.

AC Power

Input Voltage & Frequency: 100-120 V at 400 Hz or
100-240 V at 50/60 Hz

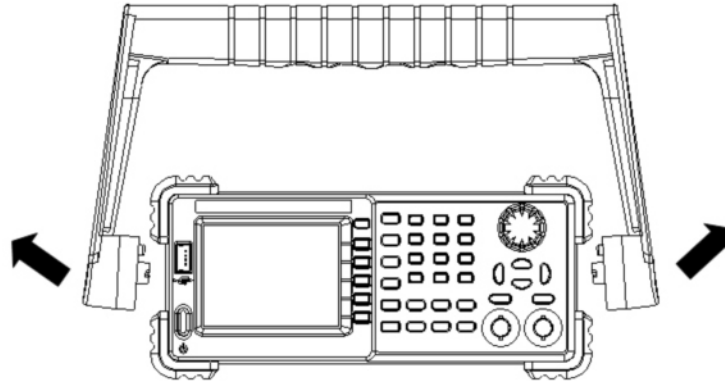
Automatic AC selection.

Power Consumption: 50 W maximum

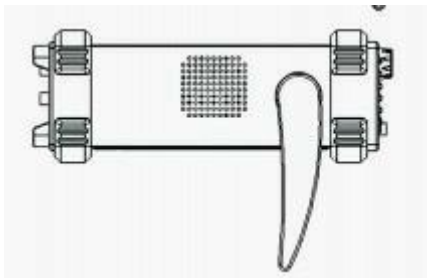
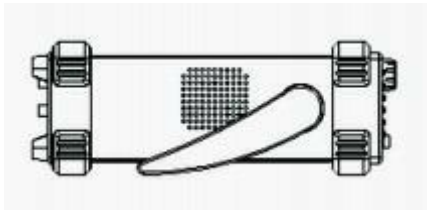
Mains Supply Connector: CAT II per IEC/EN 61010-1:2010,
instrument intended to be supplied from the building wiring at
utilization points (socket outlets and similar).

Handle Adjustment

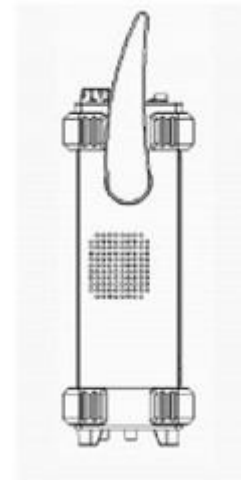
Users can adjust the handle to the required position by pulling the mounting points outward and adjusting the handle position.



Handle Adjustment



Horizontal Position



Carrying Position

Front Panel



- | | |
|------------------|-------------------------------|
| 1 Power Button | 7 CH1/CH2 Control/Output Port |
| 2 USB Host Port | 8 Channel Select Key |
| 3 TFT Display | 9 Function Keys |
| 4 Numeric Keypad | 10 Waveform Selection Key |
| 5 Adjust Knob | 11 Menu Keys |
| 6 Arrow Keys | |

1. Power Button

Used to turn on/off the waveform generator. When the power button is off, the generator is under power off state.

2. USB Host Port

Used to read waveforms or status files from a USB drive or save current instrument status to a USB drive. Firmware can be updated through the USB port. The waveform generator supports a FAT formatted USB drive.

3. TFT Display

The waveform generator has a 4.3 inch TFT color LCD display, which can display the current function menu, parameter settings, system state, and help.

4. Numeric Keypad

Consists of numbers from 0 to 9, radix points “.” and symbol keys “+/-”, which are used to input parameters.

Note : To enter a negative number enter a “-” symbol before the numbers.

5. Adjust Knob

- Used to increase (clockwise) or decrease (anticlockwise) the current numerical value when setting parameters.
- Also used to change characters when inputting a file name.
- When saving or reading files, rotate the knob to choose a position to save a file or choose a file to be read; press the knob to open a selected folder or file.

6. Arrow Keys

- Used to adjust digits in numeric values when using the knob to set parameters.
- Also used to position the cursor when inputting a file name.
- When saving or reading files, the arrow keys are used to choose a position to save a file or choose a file to be read.

7. CH1 Control Port/Output Button

- The **Output** button on the left is used to turn on/off CH1 output.
- The nominal output impedance of the BNC connector is 50 Ω .
- When pressing **Output** the key backlight turns on, and the connector outputs waveforms according to the current configuration of CH1.

CH2 Control Port/Output Button

- The **Output** button on the right is used to turn on/off CH2 output.
- The nominal output impedance of the BNC connector is 50 Ω .
- When pressing **Output**, the backlight turns on, and the connector outputs waveforms according to the current configuration of CH2.



CAUTION:

Over voltage protection of CH1 and CH2 will take effect once any of the following conditions is met. When over voltage protection occurs, a message will be displayed and the output is disabled.

- The absolute value of input voltage is higher than 11 V $\pm$ 0.5 V when the amplitude of the generator is higher than or equal to 2Vpp or the DC offset is higher than or equal to |3VDC| under HighZ load.

- The absolute value of input voltage is higher than 4 V $\pm$ 0.5 V when the amplitude of the generator is lower than 2 Vpp and the DC offset is lower than |3 VDC| under HighZ load.

Choose **Utility** → Page 1/2 → OverVoltage Protection to turn on/off the function.

8. Channel Select Key

Used to switch the current selected channel between CH1 and CH2.

9. Function Keys

Mod ----Modulation

Used to enable the modulation screen and allow for modulation selection. The selection is AM, DSB-AM, FM, PM, ASK, FSK, PSK and PWM modulated signals.

- It supports “Internal” and “External” modulation sources.
- The corresponding backlight will turn on when this function is selected.

Sweep ----Sweep

Used to generate sweeping frequency signals of Sine, Square, Ramp and Arbitrary.

- It supports “Linear” and “Log” sweep profiles.
- It supports “Internal”, “External” and “Manual” trigger sources.
- The corresponding backlight will turn on when this function is selected.

Burst ----Burst

Used to generate burst signals of Sine, Square, Ramp, Noise and Arbitrary.

- It supports “NCycle”, “Gated” and “Infinite” burst modes.
- Noise can only be used to generate gated burst.
- It supports “Internal”, “External” and “Manual” trigger sources.
- The corresponding backlight will turn on when this function is selected.

Parameter ----Parameter Setting

Used to switch directly to the parameter setting interface.

- The corresponding backlight will turn on when this function is selected.

Utility ----Utility Functions and System Settings

Used to set system parameters and check version information.

- Press this key and then press the help key to obtain built-in help information about the product.
- The corresponding backlight will turn on when this function is selected.

Store/Recall ----Store and Recall

Used to store/recall the instrument's setup or arbitrary waveform data edited by users.

- Can be used to perform general file operations.
- In addition to the built-in nonvolatile memory (C disk), an external USB drive (D disk) can be used to store data.
- The corresponding backlight will turn on when this function is selected.

10.Waveform Selection Key

Waveforms ---- Sine

Provides sine wave output which ranges from 1 μ Hz to 30 MHz or 60 MHz, depending on the model.

- The **Waveforms** backlight will turn on when this function is selected.
- The sine wave "Frequency/Period", "Amplitude/High level", "Offset/Low level" and "Phase" can be adjusted.

Waveforms ---- Square

Provides square wave output which ranges from 1 μ Hz to 30 MHz or 60 MHz, depending on the model.

- The Waveforms backlight will turn on when this function is selected.
- The square wave "Frequency/Period", "Amplitude/High level", "Offset/Low level", "Phase" and "Duty" can be adjusted.

Waveforms ---- Ramp

Provides ramp waveform output which ranges from 1 μ Hz to 500 kHz.

- The Waveforms backlight will turn on when this function is selected.
- The ramp waveform "Frequency/Period", "Amplitude/High level", "Offset/Low level", "Phase" and "Symmetry" can be adjusted.

Waveforms ---- Pulse

Provides pulse waveform output which ranges from 1 μ Hz to 12.5 MHz.

- The Waveforms backlight will turn on when this function is selected.
- The pulse waveform "Frequency/Period", "Amplitude/High level", "Offset/Low level", "Pulse width/Duty", "Rise/Fall" and "Delay" can be adjusted.

Waveforms ---- Noise

Provides White Gauss Noise output with a bandwidth of the waveform generator model.

- The Waveforms backlight will turn on when this function is selected.
- “Stdev” and “Mean” of the noise signal can be adjusted.

Waveforms ---- Arb

Provides arbitrary waveform output which ranges from 1μHz to 6 MHz.

- The Waveforms backlight will turn on when this function is selected.
- Supports two output modes: “DDS” and “TrueArb”.
- Built-in **waveforms** include Cardiac, Gausspuls, ExpRise and ExpFall, etc. In addition, it can output waveforms stored on a USB drive.
- Users can edit arbitrary waveforms through PC software and download them to the instrument.
- Arbitrary waveforms can be adjusted for “Frequency/Period”, “Amplitude/High level”, “Offset/Low level” and “Phase”.

11. Menu Keys

These keys correspond to the menu displayed above them on the display. Press any button to activate the corresponding menu.

Back Panel



1. Counter

BNC connector. The input impedance is $1\text{M}\Omega$. This connector is used to accept the signal measured by the frequency counter.

2. Aux In/Out

BNC connector. The function of this connector is determined by the mode of the instrument.

- Sweep/Burst trigger signal input port of external trigger.
- Sweep/Burst trigger signal output port of internal/manual trigger.
- Burst gating trigger input port.
- ASK/FSK external modulation signal input port.
- Synchronization output port. When synchronization is on, the port can output a CMOS signal with the same frequency as basic waveforms (except Noise and DC), arbitrary waveforms, and modulated waveforms (except external modulation).
- AM, DSB-AM, FM, PM, ASK, FSK, PSK and PWM external modulation signal input port.

3. 10 MHz Clock Input/Output Port

BNC connector. The function of this connector is determined by the type of the clock source.

- If the instrument uses internal clock source, the connector outputs the 10 MHz clock signal generated by the crystal oscillator inside the generator.
- If the instrument uses an external clock source, the connector accepts an external 10 MHz clock source.

4. Earth Terminal

Used to ground the instrument.

5. AC Power Supply Input

The generator can accept two different types of AC input power:
100-240 V at 50/60 Hz, or 100-120 V at 400 Hz

6. USB Device

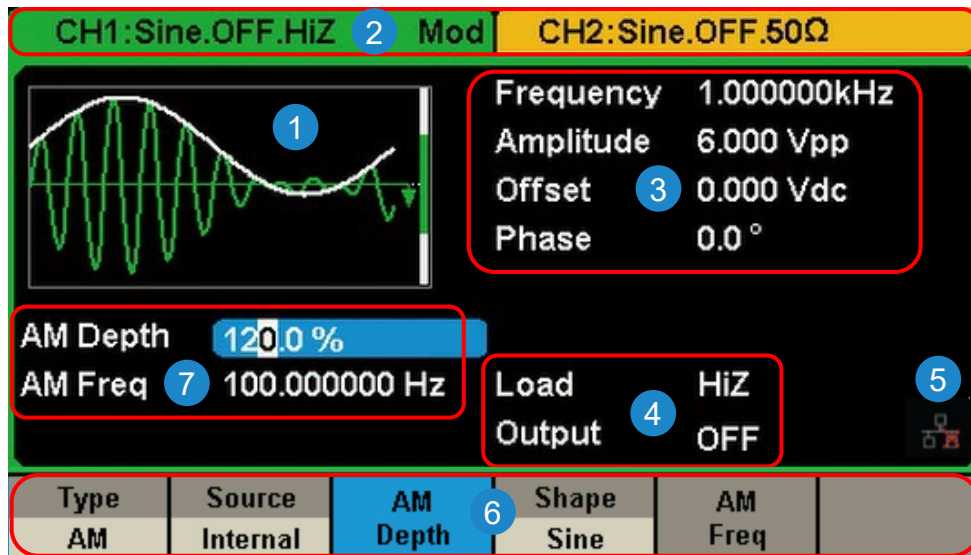
Used when connecting the instrument to an external computer to allow waveform editing and remote control.

7. LAN Interface

Through this interface, the generator can be connected to your computer or network for remote control. An integrated testing system may be built, as the generator conforms to the VXI-11 class standard of LAN-based instrument control.

TFT Color Display

The generator can only display parameters and waveform of one channel at a time. The picture below shows the interface when CH1 chooses AM modulation of sine waveform. The information displayed may vary depending on the function selected.



1.Waveform Display Area

Shows the currently selected waveform of each channel. The key backlight will turn on when this area of the touch screen is clicked.

2.Channel Status Bar

Indicates the selected status and output configuration of the channels. This area of the screen is switch to the corresponding channel when the channel select key is pressed. The display will then show the channels and the shortcut menus for the function keys: Mod, Sweep, Burst, Parameter, Utility and Store/Recall.

3.Basic Waveform Parameters Area

Shows the current waveform's parameters of each channel. Press Parameter and select the corresponding softkey to highlight the parameter you want to configure, use number keys or knob to change the parameter value.

4. Channel Parameters Area

Displays the current selected channel's load and output settings.

Load ----Value of the output load, as selected by the user.

- After choosing the parameter to highlight it, use the softkeys, number keys or knob to change the parameter value.
- High Impedance: display HiZ.
- Load: display impedance value (the default is 50 Ω and the range is 50 Ω to 100 k Ω).

Note: This setting does not actually change the instrument's output load impedance of 50 Ω but rather is used to maintain amplitude accuracy into different load values.

Output ----Channel output state.

After pressing corresponding channel output control port, you can turn on/off the current channel.

5. LAN Status Icon

The generator will show different prompt messages based on the current network status.



This diagram indicates LAN connection is successful.



This diagram indicates there is no LAN connection or LAN connection is unsuccessful.

6. Menu

Touch here for the menu corresponding to the displayed function. For example, the screen image shows the parameters of "AM modulation". After touching the menu on the touch screen to choose the corresponding parameter, use number keys or knob to change the parameter value.

7. Modulation Parameters Area

Shows the parameters of the current modulation function. After selecting the corresponding menu, use number keys or the knob to change the parameter value.

Using the Built-In Help System

To access the built-in help system of the product, first press the **Utility** key, then press **Page 1/2** and **Help**. Use the Adjust knob to choose the help item you want, and finally press **Select** to obtain help.

The help listings are as follows:

1. System information
2. Generating a standard waveform
3. Generating an arbitrary waveform
4. Generating a modulated waveform
5. Sweep function
6. Burst function
7. Store/Recall
8. Synchronizing multiple instruments
9. Restoring factory settings
10. Technical support

Introduction to EasyWaveX

The T3AFG30 and T3AFG60 series includes arbitrary waveform editing software called EasyWaveX. This software is a platform for easily creating, editing, and transferring waveforms to the generator. It provides 11 standard waveforms such as Sine, Square, Ramp, Pulse, Noise and DC, which meets most engineers' basic needs. In addition, it provides several ways of manual drawing, point-to-point line drawing and arbitrary point drawing. EasyWaveX allows for fast and easy creation of complex waveforms. The main interface of EasyWaveX is shown in the following figure:



Certifications

Teledyne LeCroy certifies compliance to the following standards as of the time of publication. Please see the EC Declaration of Conformity document shipped with your product for current certifications.

EMC Compliance

EC DECLARATION OF CONFORMITY - EMC

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

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

Electromagnetic Emissions:

EN 55011:2016+A1:2017, Radiated and Conducted Emissions Group 1, Class A^{2, 3}

EN 61000-3-2:2014 Harmonic Current Emissions, Class A

EN 61000-3-3:2013 Voltage Fluctuations and Flickers, Pst = 1

Electromagnetic Immunity:

EN 61000-4-2:2009 Electrostatic Discharge, 4 kV contact, 8 kV air, 4 kV vertical/horizontal coupling planes⁴

EN 61000-4-3:2006+ A2:2010 RF Radiated Electromagnetic Field,
3 V/m, 80-1000 MHz; 3 V/m, 1400 MHz - 2 GHz; 1 V/m, 2 GHz - 2.7 GHz

EN 61000-4-4:2012 Electrical Fast Transient/Burst, 1 kV on power supply lines, 0.5 kV on I/O signal data and control lines⁴

EN 61000-4-5:2014+A1:2017 Power Line Surge, 1 kV AC Mains, L-N, L-PE, N-PE⁴

EN 61000-4-6:2014 RF Conducted Electromagnetic Field, 3 Vrms, 0.15 MHz - 80 MHz

EN 61000-4-11:2004+A1:2017 Mains Dips and Interruptions, 0%/1 cycle, 70%/25 cycles, 0%/250 cycles^{4, 5}

¹ To ensure compliance with all applicable EMC standards, use high-quality shielded interface cables.

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

³ This product is intended for use in nonresidential areas only. Use in residential areas may cause electromagnetic interference.

⁴ Meets Performance Criteria "B" limits of the respective standard: during the disturbance, product undergoes a temporary degradation or loss of function or performance which is self-recoverable.

⁵ Performance Criteria "C" applied for 70%/25 cycle voltage dips and for 0%/250 cycle voltage interruption test levels per EN61000-4-11.

European Contact:*

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Im Breitspiel 11c
D-69126 Heidelberg
Germany
Tel: + 49 6221 82700

AUSTRALIA & NEW ZEALAND DECLARATION OF CONFORMITY – EMC

The instrument complies with the EMC provision of the Radio Communications Act per the following standards, in accordance with requirements imposed by Australian Communication and Media Authority (ACMA):

AS/NZS CISPR 11:2015 Radiated and Conducted Emissions, Group 1, Class A.

Australia / New Zealand Contacts:*

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Suite 326 The Parade West

Kent Town, South Australia 5067

RS Components Ltd.

Units 30 & 31 Warehouse World

761 Great South Road

Penrose, Auckland, New Zealand

* Visit teledynelecroy.com/support/contact for the latest contact information.

Safety Compliance

EC DECLARATION OF CONFORMITY – LOW VOLTAGE

The instrument meets intent of EC Directive 2014/35/EU for Product Safety. Compliance was demonstrated to the following specifications as listed in the Official Journal of the European Communities:

EN 61010-1:2010 Safety requirements for electrical equipment for measurement, control, and laboratory use –

Part 1: General requirements

EN 61010-2:030:2010 Safety requirements for electrical equipment for measurement, control, and laboratory use –

Part 2-030: Particular requirements for testing and measuring circuits

The design of the instrument has been verified to conform to the following limits put forth by these standards:

- Mains Supply Connector: Overvoltage Category II, instrument intended to be supplied from the building wiring at utilization points (socket outlets and similar).
- Measuring Circuit Terminals: No rated measurement category. Terminals not intended to be connected directly to the mains supply.
- Unit: Pollution Degree 2, operating environment where normally only dry, non-conductive pollution occurs. Temporary conductivity caused by condensation should be expected.

Environmental Compliance

END-OF-LIFE HANDLING



The instrument is marked with this symbol to indicate that it complies with the applicable European Union requirements of Directives 2012/19/EU and 2006/66/EC on Waste Electrical and Electronic Equipment (WEEE) and Batteries.

The instrument is subject to disposal and recycling regulations that vary by country and region. Many countries prohibit the disposal of waste electronic equipment in standard waste receptacles. For more information about proper disposal and recycling of your Teledyne LeCroy product, please visit teledynelecroy.com/recycle.

RESTRICTION OF HAZARDOUS SUBSTANCES (RoHS)

EC DECLARATION OF CONFORMITY – RoHS

Unless otherwise specified, all the materials and processes are compliant with RoHS Directive 2011/65/EU in its entirety, inclusive of any further amendments or modifications of said Directive.

CHINA RoHS 2

Unless otherwise specified, all the materials and processes are compliant with the latest requirements of China RoHS 2. The hazardous substances contained in the instrument are disclosed in accordance with the standards SJ/T 11364-2014 (Marking for the restricted use of hazardous substances in electronic and electrical products) and GB/T 26572-2011 (Requirements on concentration limits for certain restricted substances in electrical and electronic products). The instrument is marked with an appropriate Environmental Friendly Use Period (EFUP) symbol. The packaging materials include the appropriate recycling labels. The below substance disclosure tables (in Chinese and English languages) provide the required compliance information.

部件名称	有毒有害物质和元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr 6+)	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
PCBAs	X	0	0	0	0	0
机械硬件	0	0	0	0	0	0
金属片	0	0	0	0	0	0
塑料部件	0	0	0	0	0	0
电缆组件	0	0	0	0	0	0
显示器	0	0	0	0	0	0
电源	0	0	0	0	0	0
风扇	0	0	0	0	0	0
电池	0	0	0	0	0	0
电源线	0	0	0	0	0	0
外部电源(如有)	0	0	0	0	0	0
探头(如有)	0	0	0	0	0	0
熔丝(如有)	0	0	0	0	0	0
产品外壳(如有)	0	0	0	0	0	0
适配器/模块(如有)	0	0	0	0	0	0
鼠标(如有)	0	0	0	0	0	0
0: 表明该有毒有害物质在该部件所有均质材料中的含量均在SJ/T11364-2014标准规定的限量要求之下。						
X: 表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T11364-2014标准规定的限量要求。						

EFUP (对环境友好的使用时间): 30年。

使用条件: 参阅用户手册“环境条件”部分的规定。

探头EFUP: 10年。

Part Name	Toxic or Hazardous Substances and Elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr6+)	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)
PCBAs	X	O	O	O	O	O
Mechanical Hardware	O	O	O	O	O	O
Sheet Metal	O	O	O	O	O	O
Plastic Parts	O	O	O	O	O	O
Cable Assemblies	O	O	O	O	O	O
Display	O	O	O	O	O	O
Power Supply	O	O	O	O	O	O
Fans	O	O	O	O	O	O
Batteries	O	O	O	O	O	O
Power Cord	O	O	O	O	O	O
Ext Power Supply (if present)	O	O	O	O	O	O
Probes (if present)	O	O	O	O	O	O
Fuse (if present)	O	O	O	O	O	O
Product Case (if present)	O	O	O	O	O	O
Adapters/Modules (if present)	O	O	O	O	O	O
Mouse (if present)	O	O	O	O	O	O
O: Indicates that this toxic or hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement specified in SJ/T 11364-2014.						
X: Indicates that this toxic or hazardous substance contained in at least one of the homogenous materials used for this part is above the limit requirement specified in SJ/T 11364-2014.						

EFUP (Environmental Friendly Use Period): 30 years.

Use Conditions: Refer to the environmental conditions stated in the User Manual.

EFUP for Probes: 10 years.



TELEDYNE TEST TOOLS
Everywhereyoulook™

ABOUT TELEDYNE TEST TOOLS

Company Profile

Teledyne LeCroy is a leading provider of oscilloscopes, protocol analyzers and related test and measurement solutions that enable companies across a wide range of industries to design and test electronic devices of all types. Since our founding in 1964, we have focused on creating products that improve productivity by helping engineers resolve design issues faster and more effectively. Oscilloscopes are tools used by designers and engineers to measure and analyze complex electronic signals in order to develop high-performance systems and to validate electronic designs in order to improve time to market.

The Teledyne Test Tools brand expands on the Teledyne LeCroy product portfolio by adding a comprehensive range of test equipment solutions for its customers. The new range of product solutions deliver engineers with a broad range of quality test solutions that enables speed to market product validation and design. More and more designers, engineers and lecturers are relying on Teledyne Test Tools to meet their testing, education and electronics validation needs with confidence and within budget.

Location and Facilities

Headquartered in Chestnut Ridge, New York, Teledyne Test Tools and Teledyne LeCroy have sales, service and development subsidiaries in the US and throughout Europe and Asia. Teledyne Test Tools and Teledyne LeCroy products are employed across a wide variety of industries, including semiconductor, computer, consumer electronics, education, military/aerospace, automotive/industrial, and telecommunications.

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