



THURLBY THANDAR INSTRUMENTS

TG300 Series



3MHz function and sweep/function generators

*simultaneous display of frequency & amplitude*

*seven digit 120MHz external frequency counter*

*internal sweep generator, amplitude modulation*

# TG315, TG320, TG330 function generators

## *A state-of-the-art instrument*

The function generator is one of the most versatile pieces of test & measurement instrumentation available.

It can generate a variety of precision waveshapes over a range of frequencies from mHz to MHz. It can provide a wide range of controlled amplitudes from a low-impedance source, and maintain constant amplitude as the frequency is varied.

Voltage control of frequency enables a source of swept frequency to be generated for frequency response testing. Modulation can also be added.

The TG300 series represents the state-of-the-art in low-cost analogue function generators.

## *Exceptional waveform quality*

The TG300 series provides very high waveform quality under all conditions.

That means low sinewave distortion, low aberration triangle waves and fast-edged square waves with low overshoot.

Unlike many competitive products good waveform quality is maintained throughout the frequency range and at low output levels.

## *Variable symmetry for pulse and ramp waveforms*

The TG300 series provides bi-directional variable symmetry from 1:9 to 9:1. Unlike some products, frequency is independent of symmetry setting.

## *Wide range level control*

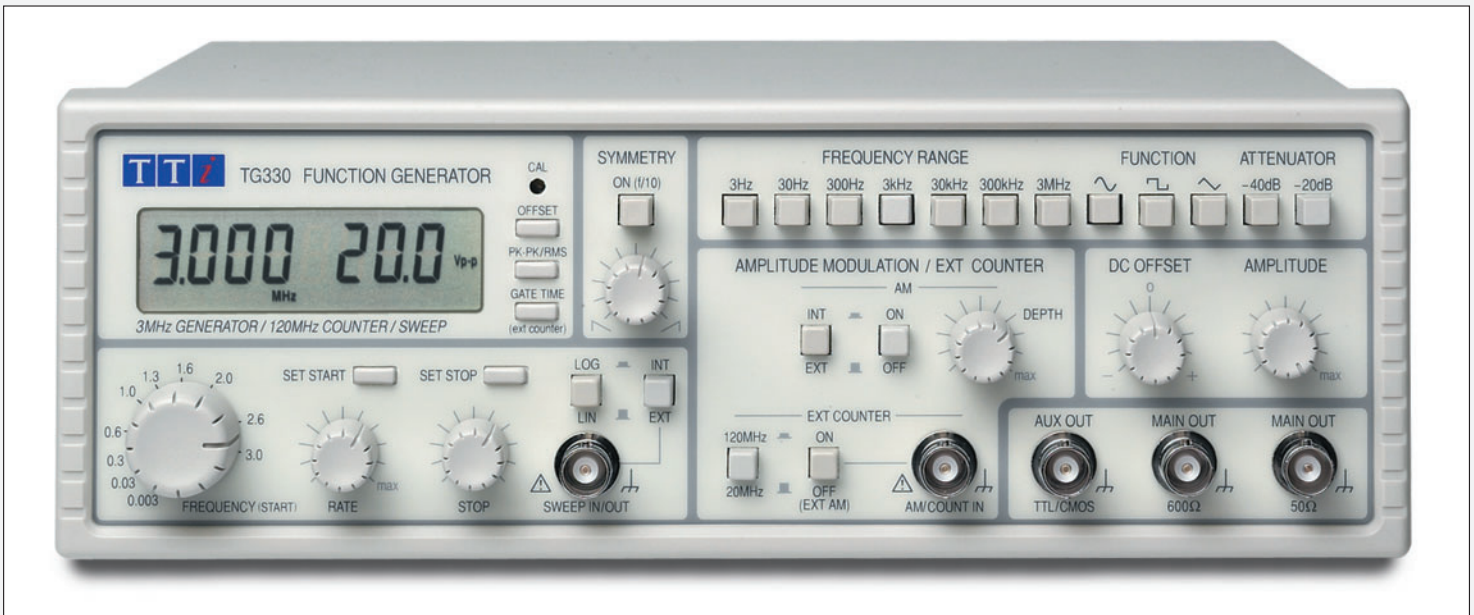
The TG300 series provides a main output with a maximum emf of 20V pk-pk from a 50Ω or 600Ω source.

An amplitude vernier with a range of 20dB is combined with two switched attenuators of -20dB and -40dB to provide levels down to 2mV pk-pk unterminated.

Variable DC offset of ±10V is available via a centre detent control. An auxiliary output provides a fixed 0V to +5V level suitable for driving both TTL and CMOS loads.

## *Wide sweep range*

Each range can be swept by at least 1000:1 either manually or via the external sweep input.



- ▶ *0.03Hz to 3MHz frequency range*
- ▶ *Simultaneous display of frequency & amplitude*
- ▶ *External 7 digit 120MHz frequency counter (not TG315)*
- ▶ *Very high waveform quality at all frequencies & levels*
- ▶ *2mV to 20V pk-pk from 50 Ω or 600 Ω*
- ▶ *Auxiliary TTL/CMOS output*
- ▶ *Variable symmetry with constant frequency*
- ▶ *Variable DC offset with zero detent*
- ▶ *1000:1 frequency change by vernier or sweep voltage*
- ▶ *Precision internal linear or logarithmic sweep (TG330)*
- ▶ *Internal or external amplitude modulation (TG330)*

## *A choice of three models*

### **TG315**

The TG315 includes dual digital display of frequency and amplitude, along with the basic generator functions of sine, square & triangle waveforms, variable DC offset, variable symmetry and an external sweep input.

### **TG320**

The TG320 adds an external frequency counter with up to 7 digits of resolution covering 5Hz to 120MHz.

### **TG330**

The TG330 has all the features of the TG320 plus an internal sweep generator with linear or log sweep, variable sweep rate and a sweep output socket.

It also offers internal or external amplitude modulation.

*the highest waveform quality*

*the widest range of facilities*

### *Dual digital displays for precision & convenience*

The TG300 series generators incorporate a large dual-section digital display.

Unlike competitive products the display provides a readout not just of frequency, but of amplitude or offset simultaneously.

### *Fast and accurate frequency measurement*

Auto-ranging reciprocal measurement gives 4-digit resolution with rapid update right down to Hz levels. Accuracy is within  $\pm 1$  digit.

To maintain a fast update at sub-Hz frequencies, the measurement mode is changed resulting in 3-digit resolution and reduced accuracy.

However, when compared to the normal fixed gate-time meters used in other products it provides both higher accuracy and faster display update across the whole frequency range.



### *RMS or peak to peak amplitude display*

The output level display can be selected to show any of three values:

1. The peak to peak amplitude
2. The RMS amplitude
3. The DC offset

RMS values are calculated correctly for each waveform shape.



The decimal point and units are changed automatically resulting in a display of the true amplitude regardless of the attenuator setting.

A display indicator warns against illegal combinations of offset and amplitude setting that would create clipping in the output stage.

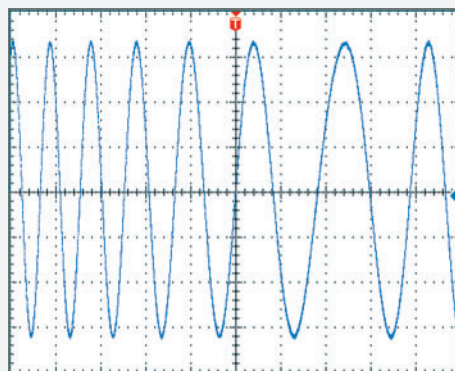
### *Advanced internal sweep*

The TG330 incorporates a versatile internal sweep generator capable of providing linear or logarithmic frequency sweeps.

Start and stop frequencies can be set with precision using the digital display. Sweep ranges of over 1000:1 are possible.

The sweep rate is adjustable over a wide range with good setability between limits of 20ms and 20s.

A sweep output socket is provided for use with an oscilloscope or an X-Y recorder. Unlike many other sweep generators, the sweep ramp is triangular which gives a superior display when using an oscilloscope to display swept frequencies.

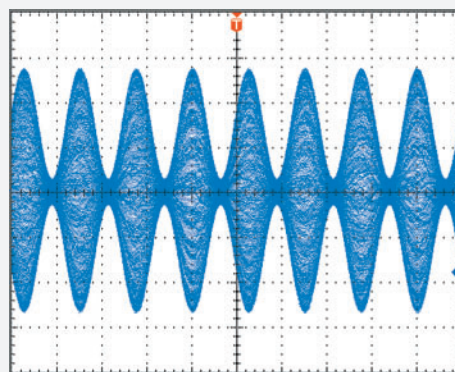


TG330 in swept frequency mode.

### *Amplitude modulation for extra versatility*

The TG330 also incorporates comprehensive AM facilities.

The modulation can be external or internal (via a 400Hz internal generator) with modulation levels fully variable between 0% and 100%.



### *External counter with seven digit resolution*

The TG320 and TG330 have an external counter mode which utilises the full width of the display to provide up to seven digits of resolution.

The frequency range is from 5Hz up to 120MHz in two ranges, and the input sensitivity is better than 50mV rms.



A measurement period of 0.5 or 5 seconds can be selected. A reciprocal counting measurement system is used which ensures high resolution regardless of input frequency.

Thus, for example, mains frequency can be measured to a resolution of better than 1mHz.

Accuracy is better than 10ppm (0.001%) and an external adjustment point allows for closed case re-calibration.

### *Built for the bench or rack*

All three models are housed in the TTI mid-size bench instrument case.

This heavy duty ABS case features an integral tilt stand and is 2U high for optional rack mounting using an RM50 rack mount kit.

### *Part of a wider range*

TTi offers a wide choice of function generators both analogue and digital, from a simple 2MHz model up to a highly sophisticated 40MHz unit.

The following two models share the case style of the TG300 series while offering features sets above and below them.

#### **TG210**

The TG210 is a 2MHz generator offering the same high waveform quality and features as the TG315, but without the digital display.

#### **TG550**

The TG550 is a 5MHz generator offering a similar feature set to the TG330, but with the added benefit of digital frequency locking.

# Technical Specifications

## FREQUENCY

Frequency Range: 0.03Hz to 3MHz in 7 overlapping decade ranges with fine adjustment by a vernier.  
Vernier Range: 1000:1 on each range.

## OPERATING MODES

Specifications apply for the top decade of each frequency range and maximum output into 50Ω termination.

### SINE

Distortion: <0.5% on 300, 3k and 30k ranges; <1% on 3, 30 and 300k ranges; all harmonics >25dB below fundamental on 3M range.  
Amplitude Flatness: ±0.2dB to 200kHz; ±2dB to 3MHz.

### TRIANGLE

Linearity: Better than 99% to 200kHz

### SQUARE WAVE

Rise/Fall Times: <100ns  
Mark - Space Ratio: 1:1 ± 1% to 100kHz

### DC

Range: ±10V unterminated

### SYMMETRY

Symmetry Range: Variable typically 1:9 to 9:1 (on top decade of each range), frequency divided by 10.

## METER FUNCTIONS (generator mode)

Frequency: Auto-ranging reciprocal measurement giving 4 digit resolution for frequencies down to 1Hz; maximum resolution is 0.001Hz. Accuracy ±1 digit for 0.2Hz to 3MHz. Below 0.2Hz accuracy is ±1% of range full scale (symmetry off).  
Amplitude: Display shows peak-to-peak amplitude or rms value. Display corrected for attenuator setting. 3-digit resolution, accuracy typically 5% of range. Clipping indicator on display.  
DC Offset: 3-digit resolution; accuracy typically ±2% of setting ±1 digit. Display corrected for attenuator setting. Clipping indicator on display.

## OUTPUTS

### MAIN - 50 Ohm

Amplitude: 2mV to 20V peak-peak open circuit (1mV to 10V peak-peak into 50Ω) in four switch-selectable ranges with 20dB vernier control within each range  
Attenuator Ranges: 0dB, -20dB, -40dB, -60dB  
DC Offset Range: ±10V from 50Ω. DC offset plus signal peak limited to ±10V (±5V into 50Ω). DC offset plus waveform attenuated proportionally by the attenuator.

### MAIN - 600 Ohm

Alternative output socket offering the same facilities as the 50Ω socket.

### AUX OUT

0 to 5V TTL/CMOS logic levels capable of driving 2 standard TTL loads. Frequency, symmetry and phase as main outputs

### SWEEP OUT

3V ramp from 600Ω (TG330 only)

## EXTERNAL COUNTER (TG320 and TG330 only)

Frequency Ranges: 5Hz to 25MHz and 20MHz to 120MHz, fully autoranging to maximum resolution  
Input Sensitivity: 50mV rms (sinewave)  
Input Impedance: 1MΩ/25pF  
Measurement Time: Selectable 0.5s or 5s  
Resolution: 6 digits in 0.5s; 7 digits in 5s  
Accuracy: ±1 digit ± timebase accuracy  
Timebase Accuracy: ±10ppm initial error; ±5ppm/year ageing rate; typically less than 0.5ppm/C. Adjustment point for closed-case recalibration

## SWEEP MODES

### EXTERNAL

Input Impedance: 10kΩ  
Input Sensitivity: 0 to 3V for 1000:1 sweep  
Max. Input Voltage: ±10V  
Sweep Linearity: Better than 1%  
Max. Slew Rate: 0.1V/μs

### INTERNAL (TG330 only)

Sweep Range: 1000:1 within each range.  
Sweep Rate: Adjustable, typically 20ms to 20 secs.  
Sweep Mode: Linear or logarithmic. Sweep start and stop frequencies displayed at the press of a button.  
Sweep Output: 3V ramp from 600Ω.

## AMPLITUDE MODULATION (TG330 only)

Depth: Variable 0 to 100% typical.  
Frequency: 400Hz (internal). DC to 20kHz (external).  
External Sensitivity: Approximately 2V peak-to-peak for 50% modulation. Input impedance 40kΩ.

## GENERAL

### CASING

Moulded ABS case with tilt stand.

### POWER REQUIREMENTS

Input Voltage: 220 to 240 volts AC nominal 50/60Hz or 110 to 120 volts AC nominal 50/60Hz by rear panel adjustment. Installation category II.  
Power Consumption: 25VA max.

### TEMPERATURE & ENVIRONMENTAL

Operating Temp. Range: +5C to +40C, 20% to 80% RH.  
Storage Temp. Range: -10C to +65C  
Environmental: Indoor use at altitudes up to 2000m. Pollution degree 2.

### SIZE

260(W) x 88(H) x 235(D)mm (10.2 x 3.4 x 9.2"), excluding handle and feet.

### WEIGHT

1.9kg (4.2lb)

### SAFETY

Complies with EN61010-1.

### EMC

Complies with EN61326.

Thurlby Thandar Instruments Ltd. operates a policy of continuous development and reserves the right to alter specifications without prior notice.

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