



# USG3000M Series RF Signal Generators

## Data Sheet

V 1.0

September 2024

## USG3000M Series RF Signal Generators



### Main Features

- Maximum frequency: 4.5 GHz/6.5 GHz
- Output frequency resolution: 0.001 Hz
- Level range: -135 dBm to 25 dBm
- High signal purity, phase noise: < -122 dBc/Hz @ 1 GHz, offset 20 kHz (Typ.)
- Amplitude accuracy:  $\leq 0.7$  dB (Typ.)
- Supports analog modulation: AM, FM, and  $\Phi$ M  
Various modulation modes: Internal, external, and internal + external
- Equipped with a highly stable clock source
- Built-in 50 MHz function/arbitrary waveform generator
- Power meter kit: Power measurement, power output control, and line loss calibration (Option)
- Pulse modulation: On-off ratio of up to 80 dB and customizable pulse trains (Option)
- Narrow pulse modulation: Minimum pulse width of 20 ns with resolution of 10 ns (Option)



USG3000M series RF signal generators deliver high-quality signals, precise signal levels, and an ultra-wide output power range, meeting the demanding testing needs of wireless communication, aerospace, automotive electronics, industrial manufacturing, semiconductor, and research and education industries.



Wireless Communication



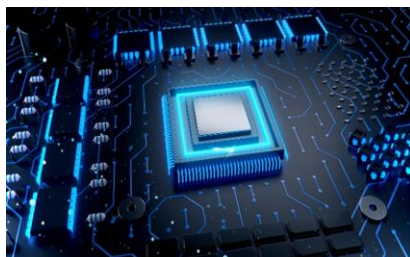
Aerospace



Industrial Manufacturing



Automotive Electronics



Semiconductor

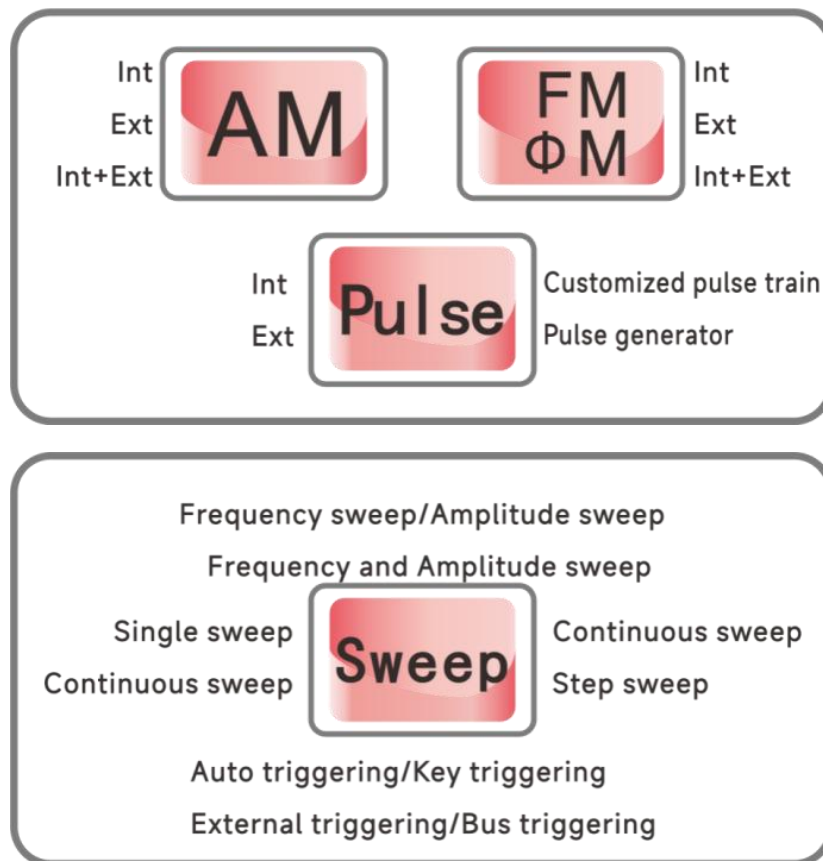


Research and Education

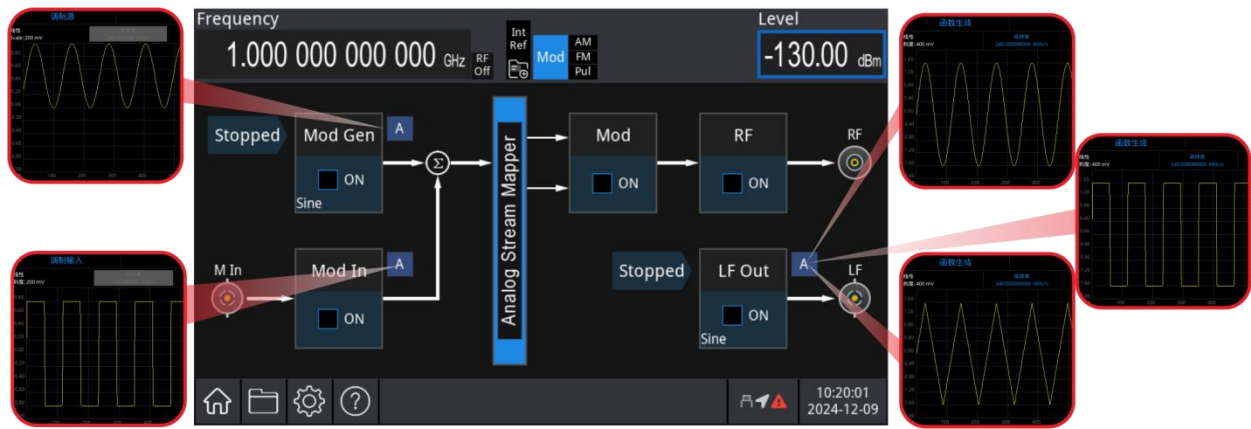
## Technical Advantages

### High Performance

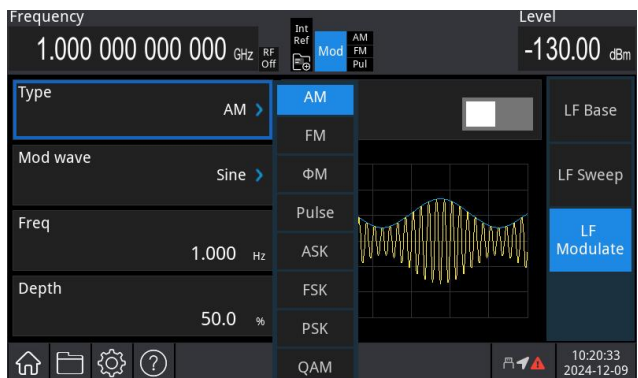
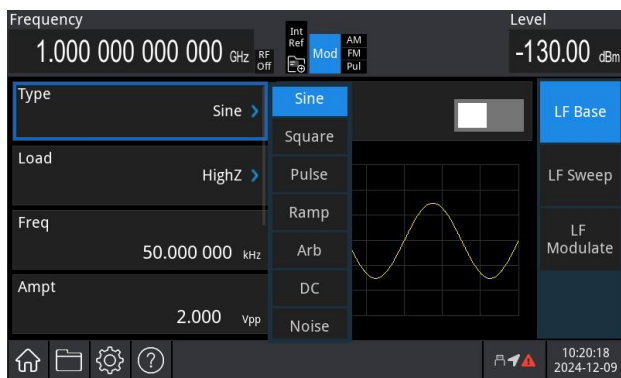
- **Precision Signal Output:** Delivering ultra-low phase noise and high-power output, the USG3000M series ensures consistent, reliable performance for advanced testing scenarios.
- **Flexible Modulation Capability:** Support for AM, FM,  $\Phi$ M, and pulse modulation enables seamless integration into varied applications. Researchers can design and deploy custom pulse trains to meet specific experimental requirements.
- **Comprehensive Sweep Modes:** Frequency, amplitude, and list sweeps, with user-defined configurations, streamline testing processes for complex and dynamic environments.



USG3000M features an easy human-computer interface with a flat design. It allows intuitive display of both input and output waveforms, and users can switch between time-domain and frequency-domain waveforms seamlessly.

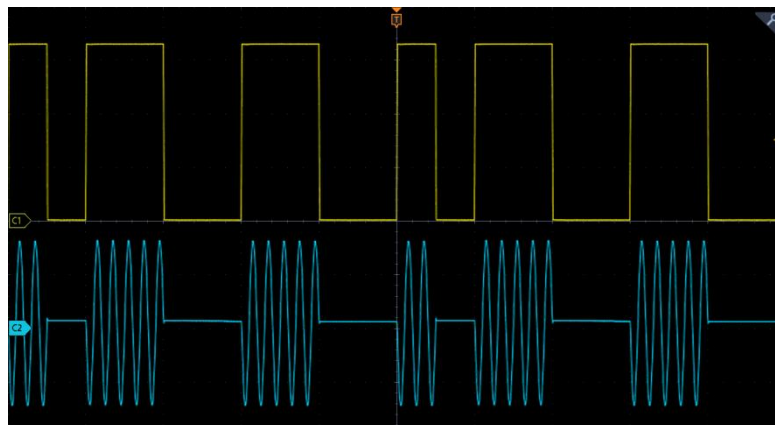


USG3000M is equipped with a function signal generator that supports standard waves, sweep, and modulation.



### High-precision Pulse Generator (Option)

USG3000M series features a stable clock source and offers optional pulse modulation and a narrow pulse generator. It delivers a minimum pulse width of 20 ns with a resolution of 10 ns, meeting the requirements of automotive millimeter-wave radar systems.



## Convenient Operation

USG3000M series features a touch screen and supports control via LAN, USB, and GPIB ports. Users can also remotely log in and control the instrument using Web Control software or send SCPI commands for automated control.

### 1. Touch Screen

USG3000M offers a human-computer interaction system with full touch control. All functions, except for the power switch, can be operated via the touch interface.

### 2. Power Meter Kit

The power meter kit connects to the instrument via the front panel USB port, enabling power measurement, power output control, and line loss calibration.

### 3. LAN and USB Port (Option GPIB)

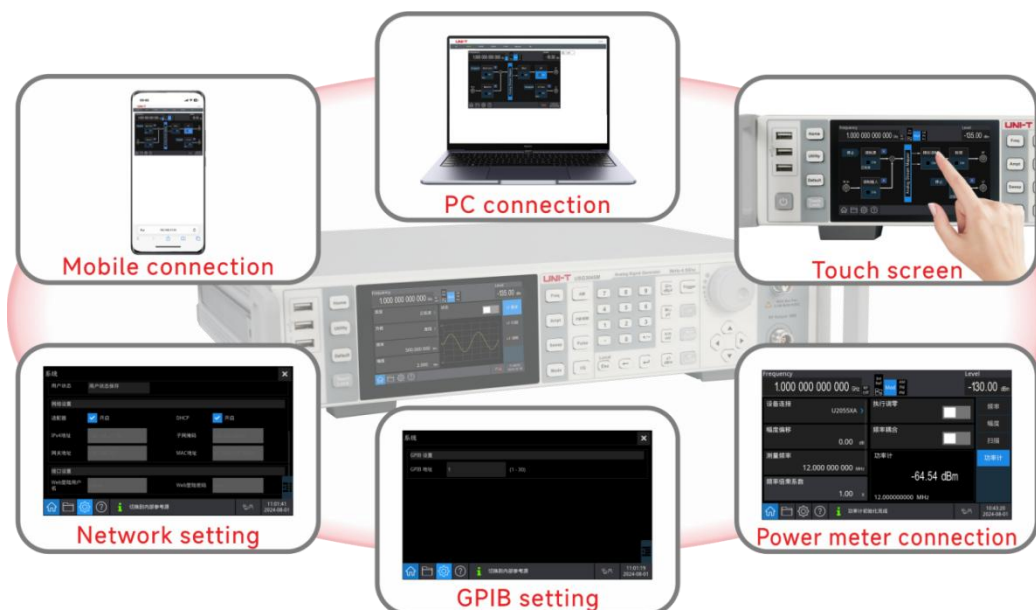
USG3000M can be controlled via the LAN, USB, and GPIB ports on the rear panel, either by sending commands directly or through host computer control. It supports the standard SCPI command set, enabling remote operation through these ports. Additionally, users can employ programming tools like Excel and LabVIEW to automate batch command execution, meeting diverse automated testing requirements.

### 4. Web Control

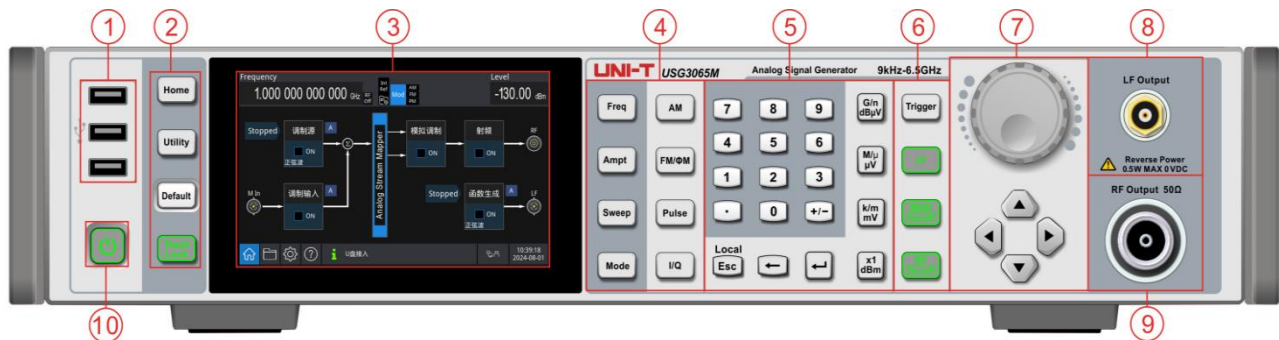
Users can access the Web Control page by entering the IP address of the USG3000M into a web browser's address bar. The page supports connections from both PC and mobile devices.

### 5. Device Manager (V2.5.0 and higher)

UNI-T offers free instrument management software for device control. By installing device manager on a PC, users can manage the instrument via LAN (VXI-11, Socket), USB Device (USB-TMC), or GPIB.

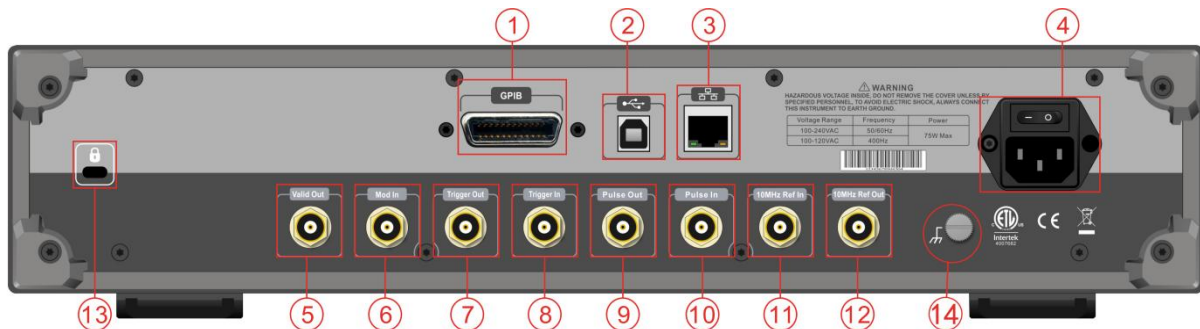


# USG3000M Panel Overview



**Front Panel**

| No. | Description                           | No. | Description            |
|-----|---------------------------------------|-----|------------------------|
| 1   | USB Host                              | 2   | Auxiliary function key |
| 3   | Touch display                         | 4   | Function menu keys     |
| 5   | Numeric keypad                        | 6   | Output control key     |
| 7   | Multi-function rotary knob Arrow keys | 8   | LF output terminal     |
| 9   | RF output terminal                    | 10  | Power switch           |



**Rear Panel**

| No. | Description                     | No. | Description                       |
|-----|---------------------------------|-----|-----------------------------------|
| 1   | GPIB port (Option)              | 2   | USB port                          |
| 3   | LAN port                        | 4   | Main power switch AC power supply |
| 5   | Signal Out                      | 6   | Mod In (Analog modulation input)  |
| 7   | Trigger Out                     | 8   | Trigger In                        |
| 9   | Pulse Out (Pulse signal output) | 10  | Pulse In (Pulse signal input)     |
| 11  | 10MHz Ref In (Reference input)  | 12  | 10MHz Ref Out (Reference output)  |
| 13  | Safety lock                     | 14  | Ground terminal                   |

## Technical Specification

Definitions:

- **"Technical Specification"** provides a detailed description of the parametric performance that is covered by the product warranty. Unless otherwise stated, these specifications are valid within a temperature range of 20°C to 30°C.
- **"Typical Value (Typ.)"** refers to performance data that is not covered in the product warranty. It represents the usual performance under standard conditions but does not guarantee adherence to specific performance metrics. When performance exceeds these typical values, 80% of the units are expected to demonstrate the specified performance with a 95% confidence level, within the 20°C to 30°C temperature range. It is important to note that measurement uncertainties are not included in the typical performance values.
- **"Nominal Value (Nom.)"** describes the expected mean or average performance of the product, which is useful in product applications but is not covered under the product warranty.

Conditions:

To meet these specifications, the instrument should first meet the following conditions.

- The instrument must be warmed up for at least 30min within the calibration period.
- If the instrument is stored in an environment that is within the allowable storage temperature range but outside the allowable operating temperature range, it must be allowed to acclimate to the allowable operating temperature range for at least two hours before being powered on.

Product Function and Model Comparison Table

|                             | USG3045M | USG3045M-P | USG3065M | USG3065M-P |
|-----------------------------|----------|------------|----------|------------|
| RF output                   | ●        | ●          | ●        | ●          |
| LF output                   | ●        | ●          | ●        | ●          |
| High stability clock source | ●        | ●          | ●        | ●          |
| Pulse modulation            | ○        | ○          | ○        | ○          |
| Narrow pulse generator      | ○        | ○          | ○        | ○          |
| Mechanical attenuator       | ×        | ●          | ×        | ●          |
| Power meter kit             | ○        | ○          | ○        | ○          |
| GPIO port                   | ○        | ○          | ○        | ○          |
| I/Q Mode                    | ×        | ×          | ×        | ×          |

Note: ● standard ○ option × Not Available

# Frequency Specifications

| Frequency Range                                                                    |                                                          |                     |
|------------------------------------------------------------------------------------|----------------------------------------------------------|---------------------|
| Model                                                                              | USG3045M/USG3045M-P                                      | USG3065M/USG3065M-P |
| Frequency range                                                                    | 9 kHz to 4.5 GHz                                         | 9 kHz to 6.5 GHz    |
| Resolution                                                                         | 0.001 Hz                                                 |                     |
| Phase Offset                                                                       | Step of 0.1°                                             |                     |
| Frequency Band                                                                     |                                                          |                     |
| Band                                                                               | Frequency range                                          | N                   |
| 1                                                                                  | 9 kHz ≤ f ≤ 5 MHz                                        | Digital synthesis   |
| 2                                                                                  | 5 MHz < f ≤ 137.5 MHz                                    | 0.0625              |
| 3                                                                                  | 137.5 MHz < f ≤ 250 MHz                                  | 0.125               |
| 4                                                                                  | 250 MHz < f ≤ 468.75 MHz                                 | 0.03125             |
| 5                                                                                  | 468.75 MHz < f < 937.5 MHz                               | 0.0625              |
| 6                                                                                  | 937.5 MHz ≤ f < 1875 MHz                                 | 0.125               |
| 7                                                                                  | 1875 MHz ≤ f ≤ 3750 MHz                                  | 0.25                |
| 8                                                                                  | 3750 MHz < f ≤ 6500 MHz                                  | 0.5                 |
| Note: N indicates a factor used to define certain specifications in this document. |                                                          |                     |
| Internal Reference Frequency                                                       |                                                          |                     |
| Accuracy                                                                           | ± (Time since last adjustment x Aging rate)              |                     |
|                                                                                    | ± Temperature effects                                    |                     |
|                                                                                    | ± Line voltage effects                                   |                     |
|                                                                                    | ± Calibration accuracy                                   |                     |
| Oscillator aging rate                                                              | ≤ ± 0.2 ppm/year                                         |                     |
| Initial calibration accuracy                                                       | ≤ ± 40 ppb                                               |                     |
| Adjustment resolution                                                              | ± 1 ppb                                                  |                     |
| Temperature effects                                                                | ≤ ± 10 ppb                                               |                     |
| Line voltage effects                                                               | ≤ ± 10.0 ppb                                             |                     |
| Reference Output                                                                   |                                                          |                     |
| Frequency                                                                          | 10 MHz                                                   |                     |
| Amplitude                                                                          | ≥ 0 dBm (Nom.), 50 Ω                                     |                     |
| External Reference Input                                                           |                                                          |                     |
| Input frequency                                                                    | 10 MHz                                                   |                     |
| Stability                                                                          | Follows the stability of external reference input signal |                     |
| Sync range                                                                         | ± 10 ppm                                                 |                     |
| Amplitude                                                                          | 0 dBm to +20 dBm (Nom.)                                  |                     |

|                                                                                                                              |                                                   |
|------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| Impedance                                                                                                                    | 50 $\Omega$ (Nom.)                                |
| Waveform                                                                                                                     | Sine wave, square wave                            |
| <b>Sweep Mode (Frequency and Amplitude)</b>                                                                                  |                                                   |
| Operating mode                                                                                                               | Step sweep, list sweep                            |
| Sweep range                                                                                                                  | Within instrument frequency range                 |
| Dwell time                                                                                                                   | 100 $\mu$ s to 100 s                              |
| Number of points                                                                                                             | 2 to 65535 (Step sweep)                           |
|                                                                                                                              | 1 to 500 (List sweep)                             |
| Step change                                                                                                                  | Linear or logarithmic                             |
| Triggering mode                                                                                                              | Free-running, external, key, bus (LAN, USB, GPIB) |
| <b>Frequency Switching Speed</b>                                                                                             |                                                   |
| <b>The time elapsed from the receipt of the SCPI command or trigger signal until the amplitude stabilizes within 0.2 dB.</b> |                                                   |
|                                                                                                                              | Continuous Wave (CW) Mode                         |
| SCPI mode                                                                                                                    | $\leq$ 40 ms                                      |
| List/step sweep mode                                                                                                         | $\leq$ 40 ms                                      |

## Level Specification

### ALC (Automatic Level Control) Mode

USG3000M series includes three ALC operating modes.

ALC Auto: Automatically sets the optimum ALC mode based on the current operating state.

ALC On: When level control is in a closed-loop state, it is suitable for continuous wave (CW), frequency modulation (FM), and phase modulation ( $\Phi$ M).

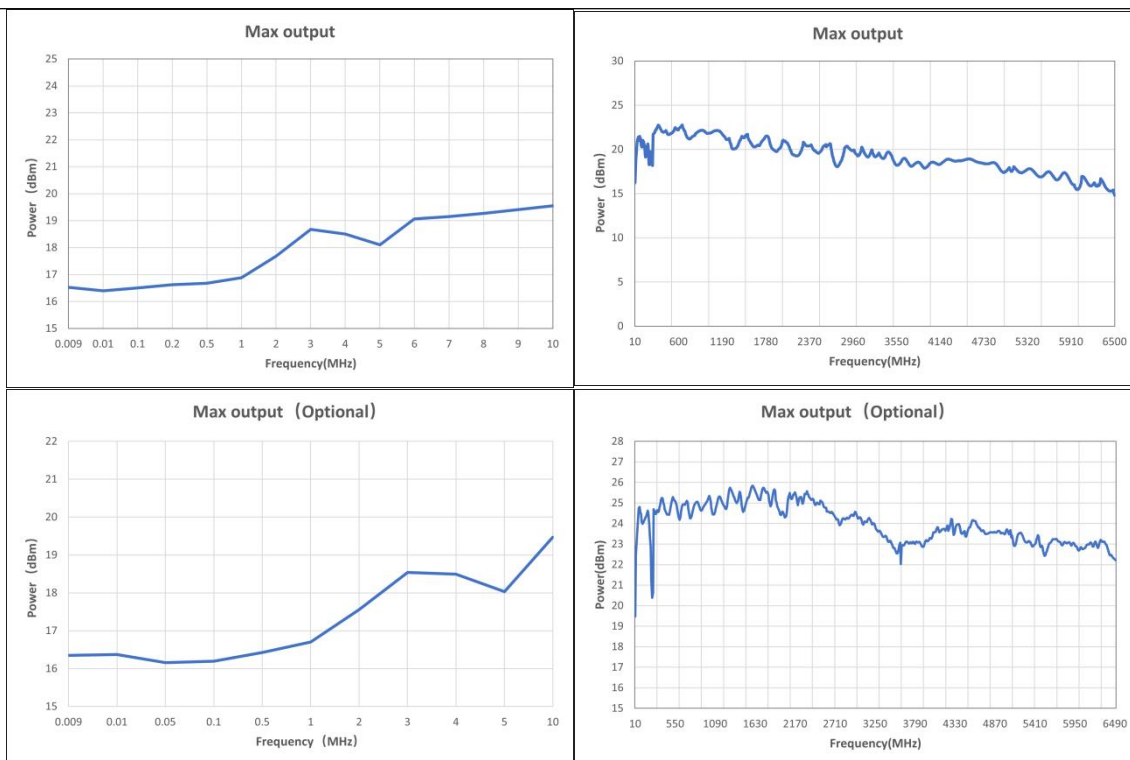
ALC S&H (Off): When frequency or amplitude changes, the level control is initially set to closed-loop. Then, the sampling control voltage is applied to retain the control voltage. When ALC is automatic, amplitude modulation, or pulse modulation can be operated in this state.

#### Output Parameter

|                          |                            |
|--------------------------|----------------------------|
| Settable range           | -135 dBm to + 25 dBm       |
| Resolution               | 0.01 dB                    |
| Step attenuator (Option) | 0 to 110 dB, step of 10 dB |

#### Maximum Output Power

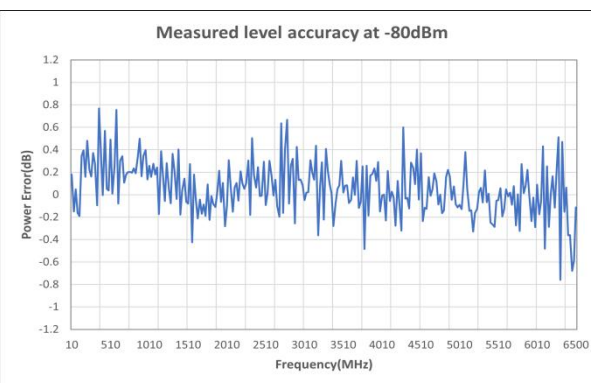
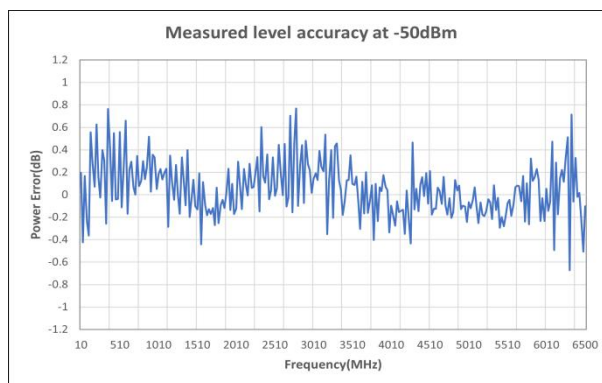
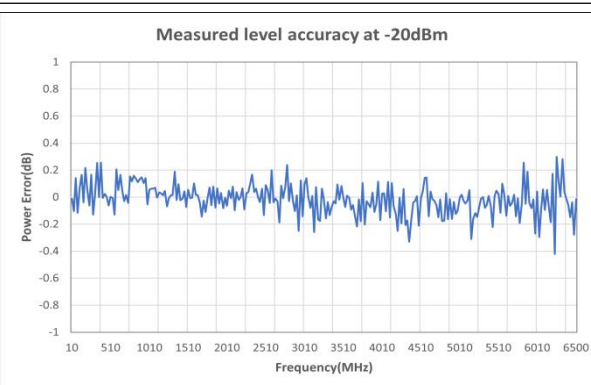
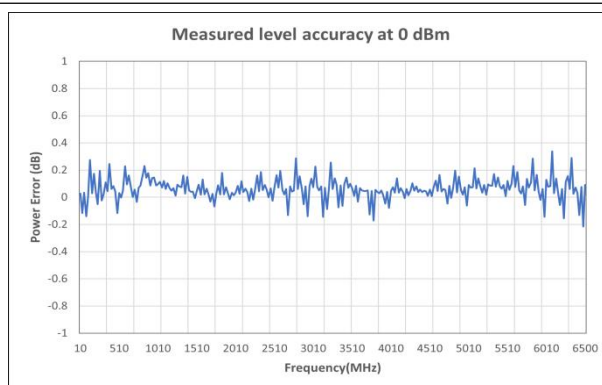
| Frequency            | Electronic attenuator | Mechanical attenuator |
|----------------------|-----------------------|-----------------------|
| 9 kHz to 5MHz        | + 13 dBm              | + 15 dBm              |
| > 5 MHz to 250 MHz   | + 14 dBm              | + 20 dBm              |
| > 250 MHz to 1.2 GHz | + 20 dBm              | + 24 dBm              |
| > 1.2 GHz to 3.6 GHz | + 18 dBm              | + 22 dBm              |
| > 3.6 GHz to 6.5 GHz | + 15 dBm              | + 20 dBm              |



**Absolute Level Accuracy in CW Mode (ALC on, Typ.)**

1. Quoted specifications between 20 °C and 30 °C. For temperatures outside this range, absolute level accuracy decreased by 0.01 dB/°C.
2. Output power may drift up to 0.10 dB < 3 GHz and 0.15 dB > 3 GHz per g/kg change in absolute humidity (Nom.).

| Range              | +10 dBm to -20 dBm | < -20 to -110 dBm | <-110 to -130 dBm |
|--------------------|--------------------|-------------------|-------------------|
| 9 kHz to 100 kHz   | ± 0.7 dB           | ± 0.7 dB          | ± 1.0 dB          |
| > 100 kHz to 5MHz  | ± 0.7 dB           | ± 0.7 dB          | ± 1.0 dB          |
| > 5 MHz to 3 GHz   | ± 0.7 dB           | ± 0.9 dB          | ± 1.2 dB          |
| > 3 GHz to 6.5 GHz | ± 0.7 dB           | ± 1.1 dB          | ± 1.5 dB          |

**SWR (Standing-wave Ratio) in CW Mode**

| Range            | Attenuator State |           |             |
|------------------|------------------|-----------|-------------|
|                  | Undamped         | 0 to 10dB | Above 15 dB |
| ≤1.0GHz          | <1.8: 1          | <1.6: 1   | <1.5: 1     |
| > 1.0 to 6.5 GHz | <1.8: 1          | <1.6: 1   | <1.5: 1     |

**Maximum Reverse Power (Nom.)**

|                    |        |
|--------------------|--------|
| < 1 GHz            | 0 dBm  |
| > 1 GHz to 2 GHz   | 25 dBm |
| > 2 GHz to 6.5 GHz | 25 dBm |
| Maximum DC voltage | 0 VDC  |

|            |        |
|------------|--------|
| Trip level | 25 dBm |
|------------|--------|

**Amplitude Switching Speed**

The time elapsed from the receipt of the SCPI command or trigger signal until the amplitude stabilizes within 0.2 dB.

|         |  |
|---------|--|
| CW Mode |  |
|---------|--|

|           |         |
|-----------|---------|
| SCPI mode | ≤ 40 ms |
|-----------|---------|

|                      |         |
|----------------------|---------|
| List/step sweep mode | ≤ 40 ms |
|----------------------|---------|

## Spectral Purity Specifications

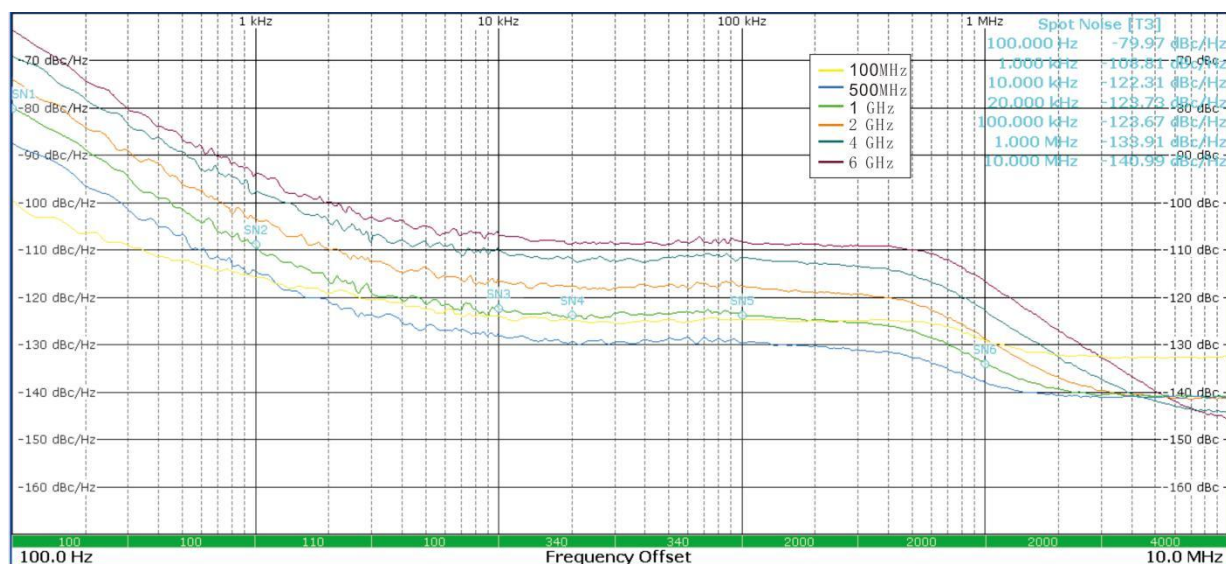
### SSB (Single Side Band) Phase Noise [dBc/Hz, CW, at 20 kHz offset (Typ.)]

|                    |             |
|--------------------|-------------|
| 5 MHz to < 250 MHz | -125 dBc/Hz |
|--------------------|-------------|

|         |             |
|---------|-------------|
| 500 MHz | -128 dBc/Hz |
|---------|-------------|

|       |             |
|-------|-------------|
| 1 GHz | -122 dBc/Hz |
|-------|-------------|

|       |             |
|-------|-------------|
| 4 GHz | -112 dBc/Hz |
|-------|-------------|



### Residual FM (CW mode, 300 Hz to 3 kHz BW, CCITT, rms)

|                  |                                                             |
|------------------|-------------------------------------------------------------|
| 5 MHz to 6.5 GHz | < N × 3 Hz (measured value), see N value in frequency table |
|------------------|-------------------------------------------------------------|

### Residual AM (CW mode, 300 Hz to 3 kHz BW, rms, 0 dBm)

|                    |                          |
|--------------------|--------------------------|
| 100 kHz to 6.5 GHz | < 0.01% (measured value) |
|--------------------|--------------------------|

### Harmonics (CW Mode)

|       |                        |
|-------|------------------------|
| Range | Output Amplitude 0 dBm |
|-------|------------------------|

|                 |           |
|-----------------|-----------|
| 9 kHz to 10 MHz | ≤ -40 dBc |
|-----------------|-----------|

|                   |           |
|-------------------|-----------|
| > 10 MHz to 1 GHz | ≤ -50 dBc |
|-------------------|-----------|

|                    |           |
|--------------------|-----------|
| > 1 GHz to 4.5 GHz | ≤ -40 dBc |
|--------------------|-----------|

|                      |           |
|----------------------|-----------|
| > 4.5 GHz to 6.5 GHz | ≤ -35 dBc |
|----------------------|-----------|

### Non-harmonics (CW Mode)

|       |                 |
|-------|-----------------|
| Range | > 10 kHz offset |
|-------|-----------------|

|                                |                |
|--------------------------------|----------------|
| 9 kHz to < 5 MHz               | -75 dBc (Nom.) |
| 5 MHz to < 250 MHz             | -60 dBc        |
| 250 MHz to < 6.5 GHz           | -65 dBc        |
| <b>Sub-harmonics (CW Mode)</b> |                |
| 9 kHz to 6.5 GHz               | None           |

## Analog Modulation Specifications

| Frequency Band                  |                                                              |                                               |
|---------------------------------|--------------------------------------------------------------|-----------------------------------------------|
| Band No.                        | Frequency range                                              | N                                             |
| 1                               | 9 kHz $\leq$ f $\leq$ 5 MHz                                  | Digital synthesis                             |
| 2                               | 5 MHz < f $\leq$ 137.5 MHz                                   | 0.0625                                        |
| 3                               | 137.5 MHz < f $\leq$ 250 MHz                                 | 0.125                                         |
| 4                               | 250 MHz < f $\leq$ 468.75 MHz                                | 0.03125                                       |
| 5                               | 468.75 MHz < f < 937.5 MHz                                   | 0.0625                                        |
| 6                               | 937.5 MHz $\leq$ f < 1875 MHz                                | 0.125                                         |
| 7                               | 1875 MHz $\leq$ f $\leq$ 3750 MHz                            | 0.25                                          |
| 8                               | 3750 MHz < f $\leq$ 6500 MHz                                 | 0.5                                           |
| FM (Frequency Modulation)       |                                                              |                                               |
| Modulation source               | Internal, external, internal + external                      |                                               |
| Maximum offset                  | N $\times$ 10 MHz (Nom.), see N value mentioned above        |                                               |
| Resolution                      | 0.001 Hz                                                     |                                               |
| Offset accuracy                 | < $\pm$ 2% + 20 Hz (1 kHz rate, offset is N $\times$ 50 kHz) |                                               |
| Modulation frequency respond    | < 3 dB                                                       | 0.001 Hz to 50 kHz (Nom.)                     |
| Carrier frequency accuracy      | < $\pm$ 0.2% $\times$ set offset + (N $\times$ 1 Hz)         |                                               |
| THD (Total harmonic distortion) | < 0.4% (1 kHz rate, offset is N $\times$ 50 kHz)             |                                               |
| FM external modulation input    | Sensitivity                                                  | + 1 V peak for offset indication (Nom.)       |
|                                 | Input impedance                                              | 50 $\Omega$                                   |
|                                 | Path                                                         | FM summed internally for composite modulation |
| $\Phi$ M (Phase Modulation)     |                                                              |                                               |
| Modulation source               | Internal, external, internal + external                      |                                               |
| Maximum offset                  | N $\times$ 5 rad (Nom.)                                      |                                               |
| Modulation frequency            | 3 dB bandwidth                                               | 0.001 Hz to 50 kHz (Nom.)                     |

|                              |                                         |                                               |
|------------------------------|-----------------------------------------|-----------------------------------------------|
| respond                      |                                         |                                               |
| Resolution                   | 0.01 rad/0.1 deg                        |                                               |
| Offset accuracy              | < + 0.5% + 0.01 rad [1 kHz rate (Typ.)] |                                               |
| THD                          | < 0.2% [1 kHz rate (Typ.)]              |                                               |
| ΦM external modulation input | Sensitivity                             | + 1 V peak for offset indication (Nom.)       |
|                              | Input impedance                         | 50 Ω (Nom.)                                   |
|                              | Path                                    | ΦM summed internally for composite modulation |

### AM (Amplitude Modulation)

|                                                                 |                                         |                                                          |
|-----------------------------------------------------------------|-----------------------------------------|----------------------------------------------------------|
| Modulation source                                               | Internal, external, internal + external |                                                          |
| Modulation depth                                                | 0% to 99%                               |                                                          |
| Resolution                                                      | 0.1%                                    |                                                          |
| AM depth error<br>1 kHz frequency sum <<br>80% modulation depth | f < 5 MHz                               | < 1.5% of set value+1%<br>(Typ., 0.5% + 1% of set value) |
|                                                                 | 5 MHz ≤ f ≤ 2 GHz                       | < 3%+1% of set value                                     |
|                                                                 | 2 GHz < f < 3 GHz                       | < 5%+1% of set value<br>(Typ., 3%+1% of set value)       |
|                                                                 | 3 GHz < f < 6.5 GHz                     | (Typ., 4%+1% of set value)                               |
| THD<br>(1 kHz frequency)                                        | f < 5 MHz                               | 30% depth, < 0.25% (Typ.)<br>80% depth, < 0.5% (Typ.)    |
|                                                                 | 5 MHz ≤ f < 2 GHz                       | 30% depth, < 2%                                          |
|                                                                 | (Typ., 2 GHz to 3 GHz)                  | 80% depth, < 2%                                          |
|                                                                 |                                         |                                                          |
| Modulation frequency<br>respond                                 | 30% depth, 3 dB bandwidth               | 0.001 Hz to 50 kHz                                       |
| AM external modulation input                                    | Sensitivity                             | + 1 V peak for offset indication (Nom.)                  |
|                                                                 | Input impedance                         | 50 Ω (Nom.)                                              |
|                                                                 | Path                                    | AM summed internally for composite modulation            |

### Pulse Modulation (Option)

|                                  |                                                                                                         |                 |
|----------------------------------|---------------------------------------------------------------------------------------------------------|-----------------|
| Mode                             | Free-Run, Square, Ext Triggered, Adjustable Doublet, Ext Trigger Doublet, Gated, Ext Pulse, Pulse Train |                 |
| Modulation source                | Internal, external                                                                                      |                 |
| On-off ratio                     | 1 MHz < f ≤ 6.5 GHz                                                                                     | ≥ 80 dBc (Typ.) |
| Rising/falling time<br>(10%/90%) | < 20 ns (Typ.)                                                                                          |                 |
| Minimum pulse width              | 100 μs to (Pulse period -1 μs)                                                                          |                 |
| Pulse period                     | Pulse width +1 μs to 42 s                                                                               |                 |

|                            |                                                        |
|----------------------------|--------------------------------------------------------|
| Resolution                 | 1 $\mu$ s                                              |
| Adjustable delay           | Free-run: 0 to (Period – Pulse width -1 $\mu$ s)       |
|                            | Trigger: 1 $\mu$ s to (Maximum pulse period-1 $\mu$ s) |
| Level accuracy             | $< \pm 0.5$ dB (Relative to CW)                        |
| Width compression          | $\leq 10$ ns (Relative to RF width of pulse output)    |
| Video feed-through         | $\leq 50$ mV                                           |
| External pulse input delay | 500 ns (Nom.), external input to pulse output terminal |
| Radio-frequency delay      | 50 ns (Nom.), pulse input to RF output                 |
| Pulse overshoot            | $\leq 20\%$                                            |
| Input level                | + 1 V <sub>peak</sub> = RF on 50 $\Omega$ (Nom.)       |

T<sub>d</sub>: Video delay  
(variable)

T<sub>w</sub>: Video pulse width  
(variable)

T<sub>p</sub>: Pulse period  
(variable)

T<sub>m</sub>: RF delay

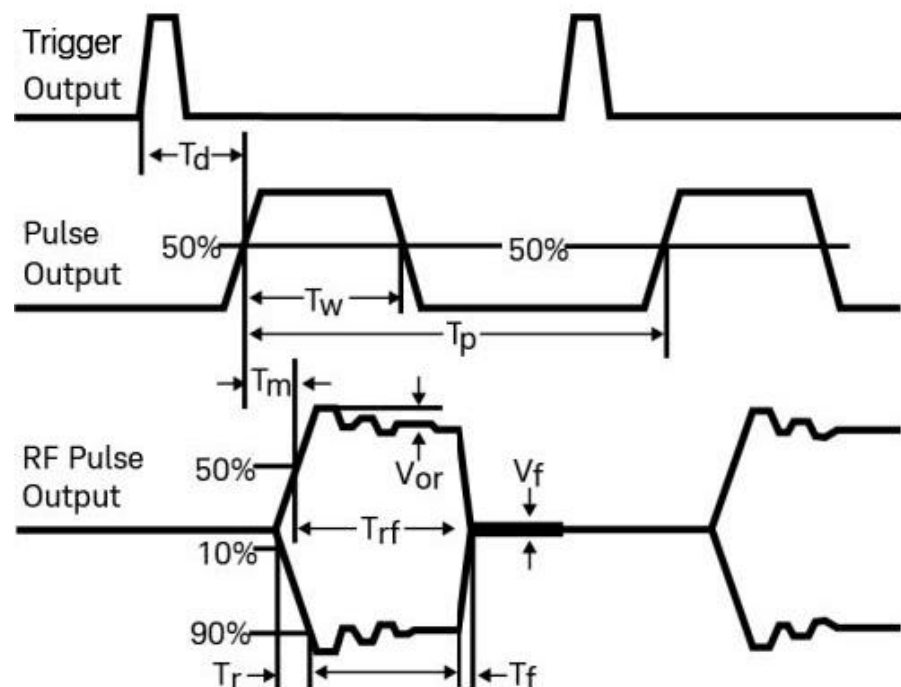
T<sub>rf</sub>: RF pulse width

T<sub>f</sub>: RF pulse falling time

T<sub>r</sub>: RF pulse rising time

V<sub>or</sub>: Pulse overshoot

V<sub>f</sub>: Video feed-through



### Narrow Pulse Generator (Option)

|                  |                                                  |
|------------------|--------------------------------------------------|
| Pulse period     | 40 ns to 42 s                                    |
| Pulse width      | 20 ns to (Pulse period -20 ns)                   |
| Resolution       | 10 ns                                            |
| Adjustable delay | Free-running: 0 to (Period – Pulse width -20 ns) |
|                  | Trigger: 20 ns to (Maximum pulse period -20 ns)  |

### Simultaneous and Composite Modulation

|                         |                                                                                                                                                                                                                                                |
|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Simultaneous modulation | All modulation types (FM, AM, $\Phi$ M, and PM) may be simultaneously enabled, except that FM and phase modulation cannot be combined. Additionally, two modulation types cannot be simultaneously generated using the same modulation source. |
| Composite modulation    | AM, FM, and $\Phi$ M each consist of two modulation paths which are                                                                                                                                                                            |

summed internally for composite modulation; modulation can be any combination of internal or external sources.

| Modulation Type | AM  | FM  | ΦM  | PM  |
|-----------------|-----|-----|-----|-----|
| AM              | --- | ●   | ●   | ●   |
| FM              | ●   | --- | ×   | ●   |
| ΦM              | ●   | ×   | --- | ●   |
| PM              | ●   | ●   | ●   | --- |

● Compatible; × Incompatible

#### External Modulation Input

|              |                  |
|--------------|------------------|
| Mod In       | AM, FM, ΦM (50Ω) |
| Pulse Out/In | PM (50Ω)         |

#### Internal Function Generator (LF)

|                      |                                                                               |                     |
|----------------------|-------------------------------------------------------------------------------|---------------------|
| Waveform             | Sine, Square, Pulse, Triangular, Arbitrary, DC, Noise                         |                     |
| Frequency range      | Sine wave                                                                     | 0.001 Hz to 50 MHz  |
|                      | Square, pulse, arbitrary waves                                                | 0.001 Hz to 15 MHz  |
|                      | Triangular wave                                                               | 0.001 Hz to 3 MHz   |
| Frequency resolution | 0.001 Hz (Nom.)                                                               |                     |
| Frequency accuracy   | Same as RF reference source (Nom.)                                            |                     |
| LF output amplitude  | 1 mVpp to 2 Vpp, 50 Ω                                                         |                     |
| Accuracy             | Typ.<br>(1 kHz sine wave, 0 V offset, > 10 ± (1% of set value +1 mVpp ) mVpp) |                     |
| DC offset accuracy   | ± 1% of offset set value ± 0.5% ± 2 mV of amplitude set value                 |                     |
| Flatness             | Typ.<br>(1 kHz sine wave, 1 Vpp)                                              | ≤ 100 kHz: ± 0.2 dB |
|                      |                                                                               | ≤ 20 MHz: ± 0.4 dB  |
|                      |                                                                               | ≤ 40 MHz: ± 0.6 dB  |
|                      |                                                                               | ≤ 50 MHz: ± 0.8 dB  |

#### LF Frequency Sweep

|                       |                                                          |
|-----------------------|----------------------------------------------------------|
| Sweep mode            | Linear, logarithmic, step                                |
| Sweep shape           | Positive/negative sawtooth, positive/negative triangular |
| Sweep time            | 1 ms to 500 s                                            |
| Sweep frequency range | 0.001 Hz to 50 MHz                                       |
| Trigger input         | Auto, key trigger, external trigger, bus trigger         |
| Trigger output        | Off, rising edge, falling edge                           |

#### LF Modulation

|                 |                                       |
|-----------------|---------------------------------------|
| Modulation mode | AM, FM, ΦM, Pulse, ASK, FSK, PSK, QAM |
|-----------------|---------------------------------------|

|                      |                                                  |
|----------------------|--------------------------------------------------|
| Modulation frequency | 0.002 Hz to 5 MHz                                |
| Modulation wave      | Sine, square, triangular, arbitrary waves        |
| Carrier type         | Sine, square, pulse, triangular, arbitrary waves |
| AM depth             | 0.00% to 120.00%                                 |
| FM frequency offset  | DC to 25 MHz                                     |
| ΦM phase Offset      | 0.00° to 360.00°                                 |
| Pulse duty ratio     | 0.00 to 100.00%                                  |
| ASK data pattern     | PN7, PN9, PN11, PN17, PN19, PN21, PN23, PN25     |
| FSK mode             | 2FSK, 4FSK                                       |
| PSK mode             | 2PSK, 4PSK                                       |
| QAM mode             | QAM4, QAM8, QAM16, QAM32, QAM64, QAM128, QAM256  |

## Input and Output Terminal

### Connector on Front Panel

|                                          |                            |
|------------------------------------------|----------------------------|
| RF output                                | N-type female header, 50 Ω |
| Internal function generator<br>LF output | BNC female header, 50 Ω    |

### Connector on Rear Panel

|                                  |                                                                                |
|----------------------------------|--------------------------------------------------------------------------------|
| Trigger In                       | BNC female header, high resistance (Nom.), TTL (Supports multiple level input) |
| Trigger Out                      | BNC female header, LVTTTL                                                      |
| Mod In (Analog modulation input) | BNC female header, 50 Ω (Nom.), ± 1 V                                          |
| Pulse input                      | BNC female header, 50 Ω (Nom.), (Input amplitude > 1 V)                        |
| Pulse output                     | BNC female header, 50 Ω (Nom.), (Input amplitude > 1 V)                        |
| 10MHz Ref In                     | BNC female header, 50 Ω (Nom.), 0 dBm to +20 dBm                               |
| 10MHz Ref Out                    | BNC female header, 50 Ω (Nom.), > 0 dBm                                        |
| Signal Out                       | BNC female header, LVTTTL                                                      |

### Communication Port

|            |                                      |
|------------|--------------------------------------|
| USB-HOST   | USB-A 2.0                            |
| USB-DEVICE | USB-B 2.0                            |
| LAN        | LAN (VXI-11,10/100/1000 Base, RJ-45) |
| GPIOB      | GPIOB IEEE-488.2                     |

## General Specifications

### Power Supply

|                   |                                                                                                             |
|-------------------|-------------------------------------------------------------------------------------------------------------|
| Power voltage     | 100 to 240 VAC (Fluctuation: $\pm 10\%$ ), 50 Hz/60 Hz<br>100 to 120 VAC (Fluctuation: $\pm 10\%$ ), 400 Hz |
| Power consumption | Less than 50 W                                                                                              |

### Display screen

|                    |                                     |
|--------------------|-------------------------------------|
| Display type       | 5-inch capacitive multi-touch panel |
| Display resolution | 800×480                             |

### Environmental Requirements

|                       |                                                                     |
|-----------------------|---------------------------------------------------------------------|
| Temperature range     | Operating: +10°C to +40°C<br>Non-operating: -20°C to +60°C          |
| Cooling               | Fan-forced cooling                                                  |
| Humidity              | Below +35°C: $\leq 90\%$ RH.<br>+35°C to +40°C: $\leq 60\%$ RH.     |
| Altitude              | Operating: Below 2,000 meters<br>Non-operating: Below 15,000 meters |
| Pollution degree      | 2                                                                   |
| Operating environment | For indoor use only                                                 |

### Machine Specifications

|                    |                                                         |
|--------------------|---------------------------------------------------------|
| Dimension          | 426mm×88mm×400mm (H×W×L), not including protective part |
| Weight             | < 20 kg                                                 |
| Calibration period | One year                                                |

### Regulatory Requirement

|                                                |                                                                                                                                     |                                                                                   |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| Electromagnetic compatibility                  | Compliant with EMC (2014/30/EU); compliant with or superior to IEC 61326-1:2021/EN61326-1:2021, IEC 61326-2-1:2021/EN61326-2-1:2021 |                                                                                   |
| Conducted emission                             | CISPR 11/EN 55011                                                                                                                   | CLASS B group 1, 150 kHz-30 MHz                                                   |
| radiation disturbance                          | CISPR 11/EN 55011                                                                                                                   | CLASS B group 1, 30 MHz-1 GHz                                                     |
| Electro-static discharge (ESD)                 | IEC 61000-4-2/EN 61000-4-2                                                                                                          | 4.0 kV (Contact), 8.0 kV (Air)                                                    |
| Radio frequency electromagnetic field immunity | IEC 61000-4-3/EN 61000-4-3                                                                                                          | 0 V/m (80 MHz to 1 GHz)<br>3 V/m (1.4 GHz to 2 GHz)<br>1 V/m (2.0 GHz to 2.7 GHz) |
| Electrical fast transient (EFT)                | IEC 61000-4-4/EN 61000-4-4                                                                                                          | 2 kV (AC input port)                                                              |
| Surge                                          | IEC 61000-4-5/EN 61000-4-5                                                                                                          | 1 kV (Live line to zero line)<br>2 kV (Live/zero line to ground)                  |

|                                      |                              |                                                                                                                                                       |
|--------------------------------------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| RF continuous conduction immunity    | IEC 61000-4-6/EN 61000-4-6   | 3 V, 0.15-80 MHz                                                                                                                                      |
| Voltage dips and short interruptions | IEC 61000-4-11/EN 61000-4-11 | Voltage dips:<br>0% UT during 1 cycle<br>40% UT during 10/12 cycles<br>70% UT during 25/30 cycles<br>Short interruptions: 0% UT during 250/300 cycles |

### Safety Regulation

EN 61010-1:2010+A1:2019  
 EN IEC61010-2-030:2021+A11:2021  
 UL 61010-1:2012 Ed.3+ R:19 Jul2019  
 UL 61010-2-030:2018 Ed.2  
 CSA C22.2#61010-1:2012 Ed.3+U1; U2; A1  
 CSA C22.2#61010-2-030:2018 Ed.2

## Order Information and Warranty Period

|                        | Description                                               |                  | Order No.        |
|------------------------|-----------------------------------------------------------|------------------|------------------|
| Model                  | RF signal generator, frequency 9 kHz to 4.5 GHz           |                  | USG3045M         |
|                        | RF signal generator, frequency 9 kHz to 4.5 GHz           |                  | USG3045M-P       |
|                        | Mechanical attenuator                                     |                  |                  |
|                        | RF signal generator, frequency 9 kHz to 6.5 GHz           |                  | USG3065M         |
|                        | RF signal generator, frequency 9 kHz to 6.5 GHz           |                  | USG3065M-P       |
|                        | Mechanical attenuator                                     |                  |                  |
| Accessory              | Compliant with the host country’s standards Power cord x1 |                  |                  |
|                        | USB data cable x1                                         |                  | UT-D14           |
| Accessory<br>(Option)  | SMAJ-NJ-0.7M DC-6G cord x1                                |                  | UT-W02-6GHz      |
|                        | NJ-NJ-0.7M DC-6G cord x1                                  |                  | UT-W01-6GHz      |
|                        | Adapter SMA-N-KJ-T DC-6GHz x2                             |                  | UT-C01-6GHz      |
|                        | Adapter N-BNC-JK DC-4GHz x2                               |                  | UT-C02-4GHz      |
|                        | Accessories pouch                                         |                  | UT-CK01          |
|                        | Option                                                    | Pulse modulation | Pulse modulation |
| Narrow pulse generator |                                                           |                  | USG3000M-PG      |
| Power meter kit        |                                                           | USG3000M-PK      |                  |
| GPIB port              |                                                           | USG3000M-GPIB    |                  |

## Options ordering and installation

1. Purchase options: Based on your requirements, please purchase the specified function options from UNI-T Sales Personnel and provide the serial number of the instrument that needs the option installed.
2. Receive certificate: You will receive the license certificate based on the address provided in the order.
3. Register and obtain license: Visit the UNI-T official website license activation session for registration. Use the license key and instrument serial number provided in the certificate to obtain the option license code and license file.
4. Install the option: Download the option license file to the root directory of a USB storage device and connect the USB storage device to the instrument. Once the USB storage device is recognized, the Option Install menu will be activated. Press this menu key to begin installing the option.