EN: This Datasheet is presented by the manufacturer.

Please visit our website for pricing and availability at www.hestore.hu.

AX-DG1000AF

1. Use of Operation Manual

Please read through and understand this Operation Manual before operating the product. After reading, always keep the manual nearby so that you may refer to it as needed. When moving the product to another location, be sure to bring the manual as well.

2. Safety instructions

2.1. Safety Terms and Symbols

This chapter contains important safety instructions that you must follow when operating the instrument and when keeping it in storage. Read the following before any operation to insure your safety and to keep the best condition for the instrument.

The following safety symbols may appear in this manual or on the instrument:

⚠ WARNING

WARNING - Identifies conditions or practices that could result in injury or loss of life.

⚠ CAUTION

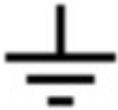CAUTION - Identifies conditions or practices that could result in damage to the instrument or to other properties.

DANGER - High voltage

ATTENTION - Refer to the manual

Earth (ground) terminal

2.2. Safety Guidelines

CAUTION

- Before plugging into local AC mains, check and make sure that the output voltage is compatible to the load. (It is suggested to disconnect a load before plugging into local AC mains.
- Do not use this instrument near water.
- Do not operate or touch this instrument with wet hands.
- Do not open the casing of the instrument when it is connected to AC mains.
- Do not use the instrument in an atmosphere which contains sulfuric acid mist or other substances which cause corrosion to metal.
- Do not use the instrument in a dusty place or a highly humid place as such will cause instrument reliability degradation and instrument failures.
- Install the instrument in a place where is free from vibration.
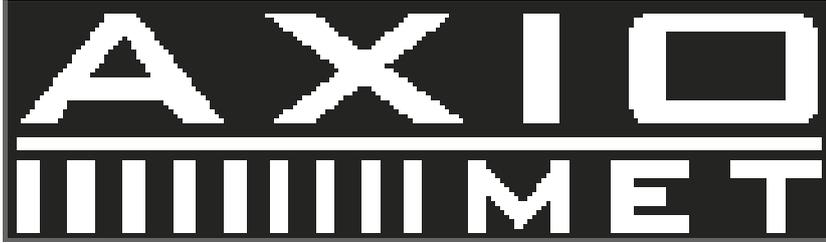
- Install the instrument in a place where the ambient temperature is in range of 10~70°C. Note that the instrument operation may become unstable if it is operated in an ambient temperature exceeding the range of 0~40°C

2.3. Power Supply

⚠ WARNING

AC Input voltage: 110V~120V/220~240V ±10%, 50/60Hz.
Connect the protective grounding conductor of the AC power cord to an earth ground to avoid electrical shock.

2.4. Fuse

⚠ WARNING

- Fuse type: 110~120V: T2A /250V, or 220~240V: T1A/250V.
- Make sure the correct type of fuse is installed before power up.
- Replace the AC fuse with the same type and rating as the original fuse.
- Disconnect the power cord before fuse replacement.
- Make sure the cause of fuse blowout is fixed before fuse replacement.

2.5. Maintenance Inspection
- Inspect the instrument at regular intervals so that it maintains its initial performance for a long time.
- Check the input power cord for damage of the vinyl cover and overheating of the plug and cord stopper. Check the terminal screws and binding posts for loosening.
- Remove dust from the inside of the casing and ventilation holes of the cover by using a compressed air of the exhaust air of a vacuum cleaner.

2.6. Cleaning
- Before cleaning, disconnect the AC mains.

- To clean the power supply, use a soft cloth dampened in a solution of mild detergent and water. Do not spray cleaner directly onto the instrument, since it may leak into the cabinet and cause damage.
- Do not use chemicals containing benzene, benzene, toluene, xylene, acetone, or similar solvents.
- Do not use abrasive cleaners on any portion of the instrument.

3. Introduction

This user's guide is used for all models of this series of arbitrary waveform DDS function generator. The last two digits in the model number represent the maximum frequency of the channel A. There are two models to choose from this series, with max.frequency range of 5MHz and 15MHz. This series of arbitrary waveform DDS function generator uses Direct Digital Synthesis (DDS) technology. Its outstanding performance and system features make this function generator a perfect solution for your testing requirement. The simplified and optimized design of the front panel and dual-language (English/Chinese) TFT diplay interface make your testing much easier for operation and observation. Additionally, the extendable optional functions can also improve your system characteristics.

Technical characteristics and system features:
- High-accurate Frequency: up to the 10-5 order of magnitude
- High Frequency Resolution: full-range resolution is 1µHz
- No Range Limitation: no frequency level switch, frequency set directly by digit keypad
- No Frequency Transition: momentarily switch to the stable value on phase and amplitude without transition and distortion
- Precise Output Waveform: output waveform is synthesized by the preset function calculation values, very accurate and less distortion
- Multiple Waveforms: output 32 kinds of the pre-stored waveforms, and 8 user defined arbitrary waveforms
- Pulse Characteristics: set accurate pulse duty cycle
- Harmonic Wave Characteristics: output the fundamental and harmonic waves with adjustable phase
- Sweep Characteristics: frequency sweep and amplitude sweep, free to set the start and stop points
- Modulation Characteristics: output FM signals
- Shift Keying Characteristics: output FSK, ASK, and PSK signals
- Burst Characteristics: output pulse waveform with burst count
- Store Characteristics: store 40 sets of the user parameters and recall
- Counter Characteristics: count the frequency, period, amplitude RMS value or peak-to-peak value
- Operation Mode: key operation for all functions, English/Chinese menu selectable, parameters settings by numeric keypad or rotary dial
- High Reliability: use VLSI components and surface mount technology
- Protection: over voltage protection, over current protection, output short circuit protection (for a few minutes), reverse voltage protection
- Remote Control: standard RS232 interface

4. Quick Starting

4.1.

This chapter describes the front and rear panels of the arbitrary waveform DDS function generator. The brief introduction of the function generator helps you get familiar with the fundamental operations and functions. The main contents in this chapter are as following.

4.2. Preparation

4.2.1. Check the Function Generator and Accessories

Check the function generator and accessory parts and verify all items in the good shape. If the box is broken, please keep the box until the function generator passes function test.

4.2.2. Connect the Function Generator to Power

Only under the conditions below, users can connect power cable and turn on the power switch. Voltage: AC220V (1±10%), AC110V (1±10%) (Pay attention to the position of voltage selection switch), Frequency: 50Hz (1±5%), Watts: <45VA, Temperature: 0~40°C, Humidity: <80%.

Plug the power cord into an 110V or 220V power outlet with ground connection and turn on the function generator. The function generator starts to initialize - display the instrument name, load the default parameters, display menu of Channel A frequency, start channel A and B output signal. After initialization, the function generator is in the normal working mode.

WARNING: For protection from electrical shock, the three-hole power cord with protective earth ground has to be used.
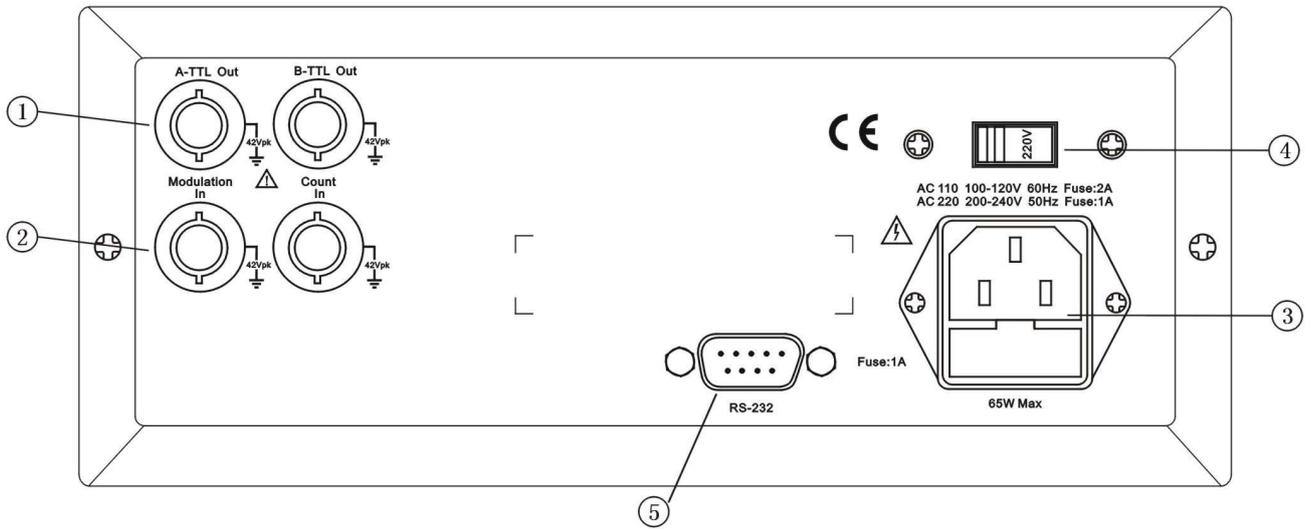
## 4.3. Front Panel and Rear Panel

Front Panel
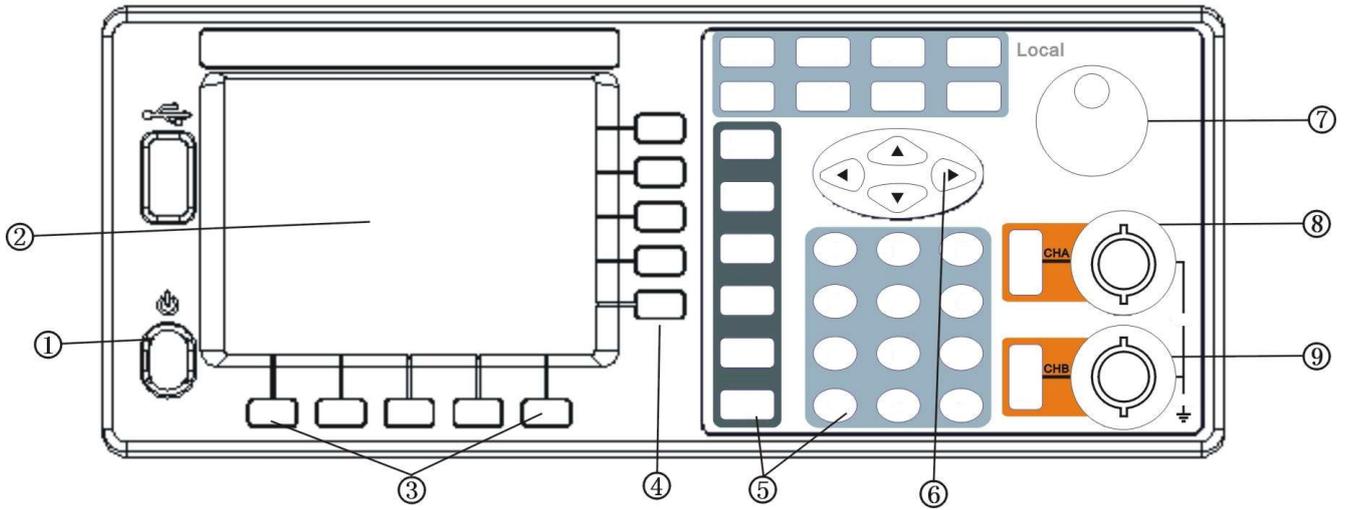
1. Power switch
2. TFT display
3. Unit soft key
4. Software option
5. Function key and Numeric keypad
6. Direction key
7. Rotary knob
8. Channel A output/trigger
9. Channel B output/trigger

Rear Panel

1. A-TTL/B-TTL output (BNC)
2. Modulation/External signal input (BNC)
3. Power connector with fuse
4. AC110V/220V power selection switch
5. RS232 connector

4.4. Description of TFT Display
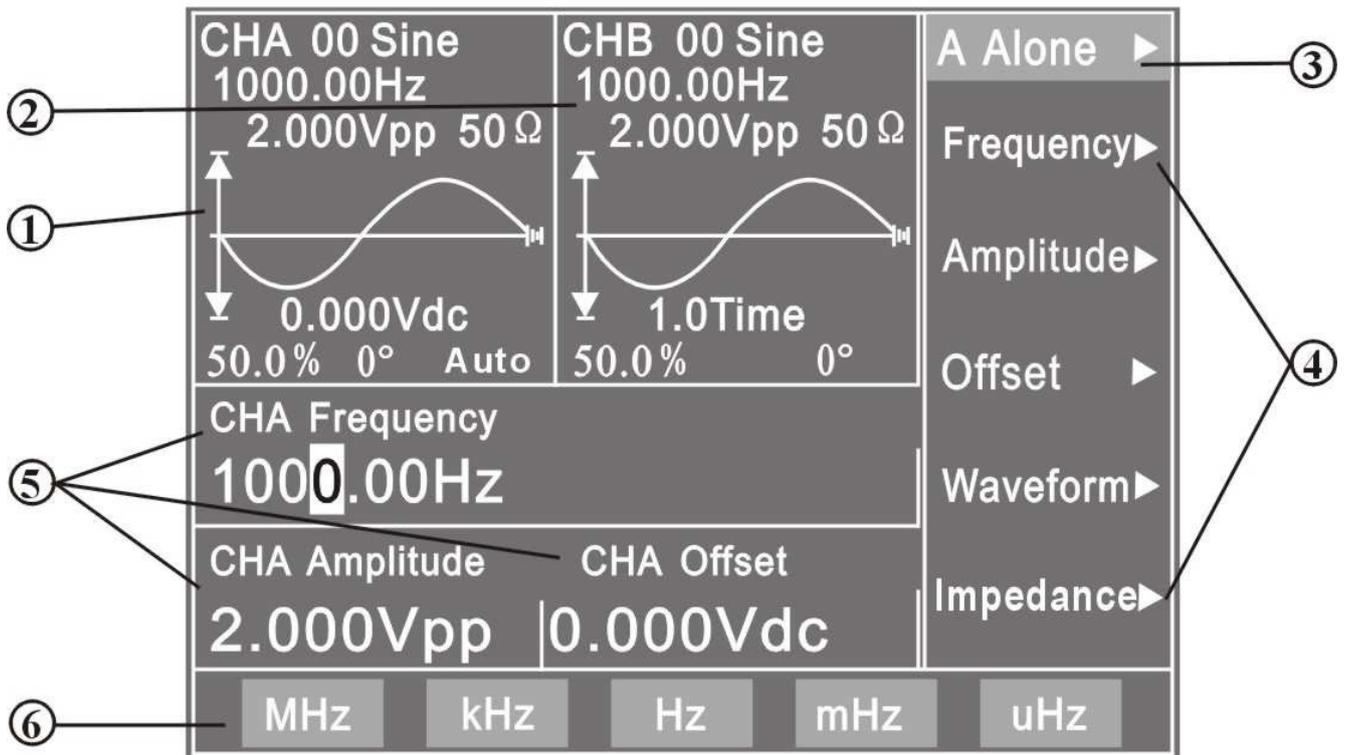
1. Channel A waveform display: the waveform of channel A and preset parameters are displayed at the upper-left portion.
2. Channel B waveform display: the waveform of channel B and preset parameters are displayed at the upper-middle portion.
3. Function menu: The first line on the right of the TFT displays the function menu.
4. Option menu: The second to the sixth lines display the option menu.
5. Parameter menu: Three of the waveform parameters of channel A are displayed at the middle of the lower-left portion.
6. Unit menu: The bottom line displays the unit menu.

4.5. Key Description

4.5.1.

On the front panel, there are 38 keys which are divided into five categories.

4.5.2. Function Key

Key [Channel] [Sweep] [MOD] [BURST] [SK] [TTL]: selects the ten functions of the instrument.

Key [COUNT]: selects the function of frequency counter.

Key [Utility]: sets the system parameters and exits remote control.

Key [Sine] [Square] [Ramp] [Pulse] [Noise] [Arb]: selects waveforms.

Key [CHA Output/Trigger] [CHB Output/Trigger]: Turns on or off the signal output of channel A & channel B and the trigger output of channel A & channel B.

4.5.3. Soft Key

There are five blank soft keys at the right side of TFT display. They are used to select the various options under each function.

4.5.4. Numeric Keypad

Key [0] [1] [2] [3] [4] [5] [6] [7] [8] [9]: for numeric input.

Key [.]: decimal point.

Key [-]: negative sign.

4.5.5. Unit Soft Key

There are five blank keys at the bottom side of TFT display. The definitions of these soft keys change according to the characteristics of data. The input value has to be validated by pressing the unit soft key at the end of data input.

4.5.6. Direction Key

Key [LEFT] and [RIGHT]: cursor keys, used to add or subtract the digit on the cursor when tuning the rotary knob.

Key [UP] and [DOWN]: used to increase or decrease the frequency or amplitude of channel A.

4.6. Fundamental Operation

4.6.1. Function of Channel A

- Press key [Channel] to select "CHA Alone" function.
- Set the frequency of channel A: set frequency at 3.5kHz
- Select "Frequency" by the corresponding soft key, then press keys [3] [.] [5] and the soft key corresponding to [kHz].
- Adjust the frequency of channel A: press key [LEFT] or [RIGHT] to move the cursor left or right, and rotate the knob left or right to decrease or increase the digits continuously for the coarse or fine adjustment of frequency. Apply the same procedures for adjustments of other parameters.
- Set period of channel A: set a period of 25ms. Into the frequency menu, select "Period" by the corresponding soft key, then press keys [2] [5] and the soft key corresponding to [ms].
- Set amplitude of channel A: set amplitude peak value at 3.2Vpp Into the frequency menu, select "Amplitude" by the corresponding soft key, then press keys [3] [.] [2] and the soft key corresponding to [Vpp].
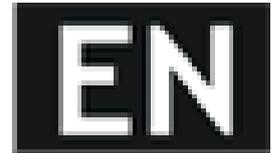
- Set amplitude of channel A: set amplitude value at 1.5Vrms Select "Amplitude" by the corresponding soft key, then press keys [1] [.] [5] and the soft key corresponding to [Vrms].
- Set offset of channel A: set DC offset at -1Vdc. Select "Offset" by the corresponding soft key, then press keys [-] [1] and the soft key corresponding to [Vdc] .
- Select waveform of channel A: select arbitrary waveform
- Press key [Arb].
- Select waveform of channel A: select square waveform
- Press key [Square].
- Set duty ratio of channel A: set pulse duty ratio at 25%. Into the impedance menu, select "Duty" by the corresponding soft key, then press the soft key corresponding to "duty ratio", next press keys [2] [5] and the soft key corresponding to [%].

4.6.2. Function of Channel B
- Press key [Channel] to select "CHB Alone".
- Set frequency and amplitude of channel B: apply the same procedure of setting frequency and amplitude of channel B as explained earlier.
- Select waveforms of channel B: select triangle wave Press the soft key corresponding to [Ramp].
- Set harmonic wave of channel B: set frequency of channel B as a triple harmonic wave of channel A Into the wave menu, select "Phase" by the corresponding soft key, press the soft key corresponding to "Harmonic", then press key [3] and the soft key corresponding to [Time].
- Set phase of channel B: set phase of channel B at 90°
- Into the wave menu, select "Phase" by the corresponding soft key, then press keys [9] [0] and the soft key corresponding to [°].

4.6.3. Frequency Sweep
- Select "A SweepF" by the corresponding soft key.
- Set start frequency: set start frequency at 10kHz. Select "Start Freq" by the corresponding soft key, then press keys [1] [0] [kHz].
- Set stop frequency: set stop frequency at 50kHz. Select "Stop Freq" by the corresponding soft key, then press keys [5] [0] [kHz].
- Set sweep direction: set sweep direction at down sweep Select "Down Swe" by the corresponding soft key.
- Set the sweep mode: set the logarithmic sweep mode. select "Logarithmic" by the corresponding soft key
- Set sweep time: set sweep time at 25s Select "Sweep Time" by the corresponding soft key, then press keys [2] [5] [s].
- Set manual sweep: set the sweep at manual mode. Select "Manual Sweep" by the corresponding soft key. This operation ceases the continuous sweep mode. Press key [CHA Output/Trigger] for one time, the frequency of channel A will step up or down by one step.

4.6.4. Amplitude Sweep
Press key [Sweep] to select "A SweepA". Apply the same setting procedure as described in section above.

4.6.5. Frequency Modulation (FM)

- Press key [MOD] to select "CHA FM".
- Set carrier frequency: set carrier frequency at 100kHz. Select "Carrier Freq" by the corresponding soft key, then press keys [1] [0] [0] and the key corresponding to [kHz].
- Set carrier amplitude: set carrier amplitude at 2Vpp. Select "Carrier Amp" by the corresponding soft key, then press key [2] and the key corresponding to [Vpp].
- Set frequency modulation: set frequency modulation at 10kHz. Select "MOD Freq" by the corresponding soft key, then press keys [1] [0] and the key corresponding to [kHz].
- Set modulation deviation: set modulation deviation at 5.2%. Select "FM Deviation" by the corresponding soft key, then press keys [5] [.] [2] and the key corresponding to [%].
- Set modulation waveform: set modulation waveform (actually it is waveforms of channel B) as triangle wave. Select "Mod Wav" by the corresponding soft key, then press key [2] and the key corresponding to [No.].
- Set external modulation: Select "Mod Wav" by the corresponding soft key, press the same key again to select "External".

4.6.6. Burst Output of Channel A

- Press key [Channel] to select "CHA Alone". Next press key [Burst] to go to "CHA Burst". Apply the same setting procedures as described in section "Function of Channel A" for frequency and amplitude setup.
- Set burst count: set burst count as 5 cycles. Select "Cycles" by the corresponding soft key, then press key [5] and the key corresponding to [CYCL].
- Set burst frequency: set burst frequency at 50Hz. Select "Carrier Freq" by the corresponding soft key, then press keys [5] [0] and the key corresponding to [Hz].
- Set single burst mode: Press the soft key corresponding to "TTL_A Trig". Press this soft key twice to step down to "Single" to select the single bust mode. This operation stops the continuous burst mode. Press key [CHA Output/Trigger] for one time will output burst for one time. If the single bust mode is not selected, pressing on key [CHA Output/Trigger] starts a continuous burst.
- Set internal burst: Select "TTL_A Trig" by the corresponding soft key. The signal of TTL_A will be used as burst source for continuous burst.
- Set external TTL burst: Press the soft key corresponding to "TTL_A Trig". Press this soft key once more to step down to "EXT Trigge" to select the external TTL burst. Input external signal from "Count In" terminal on the rear panel. The input external signal will be used as a burst source.
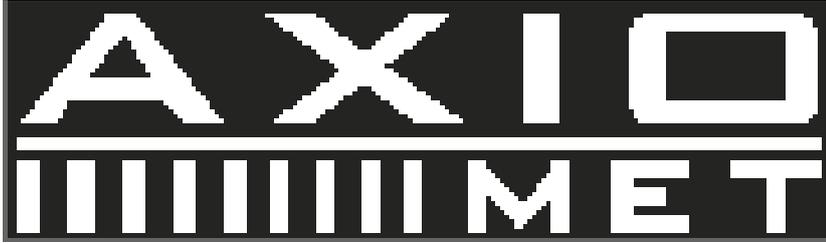
4.6.7. Burst Output of Channel B

Press key [Channel] to select "CHB Alone". Next press key [Burst] to go to "CHB Burst". Apply the same setting procedure as explained in section above for setting burst of channel B.

4.6.8. Frequency Shift Keying (FSK)

- Press key [SK] to select "CHA FSK".

- Set carrier frequency: set carrier frequency at 15kHz. Select "Carrier Freq" by the corresponding soft key, then press the key corresponding to [1] [5] [kHz].
- Set carrier amplitude: set carrier amplitude at 2Vpp. Select "Carrier Amp" by the corresponding soft key, then press the key corresponding to [2] [Vpp].
- Set hop frequency: set hop frequency at 2kHz. Select "Hop Freq" by the corresponding soft key, then press the key corresponding to [2] [kHz].
- Set interval time: set interval time at 20ms. Select "Interval" by the corresponding soft key, then press the key corresponding to [2] [0] [ms].

4.6.9. Amplitude Shift Keying (ASK)

Press key [SK] to step down to "CHA ASK". The setups of carrier frequency, carrier amplitude and interval time here apply the same setting procedure of explained in the above section (FSK).
- Set hop frequency: set hop amplitude at 0.5Vpp. Select "Hop Amp" by the corresponding soft key, then press the key corresponding to [0] [.] [5] [Vpp].

4.6.10. Phase Shift Keying (PSK)

Press key [SK] to step down to "CHA PSK" function. The setups of carrier frequency, carrier amplitude and interval time here apply the same setting procedure of explained in the above section (FSK).
- Select "Hop Phase" by the corresponding soft key, then press the key corresponding to [1] [8] [0] [°].

4.6.11. System Initialization

After power on, the system initialization of the instrument displays the following parameters:

CHA and CHB waveform: Sine
CHA and CHB frequency: 1kHz
CHA and CHB amplitude: 2Vpp
CHA and CHB duty cycle: 50%
CHA attenuation: AUTO
CHA offset: 0V
CHB harmonic: 1.0 Time
CHB phase offset: 0°
Sweep time: 10s
Gate time: 100ms
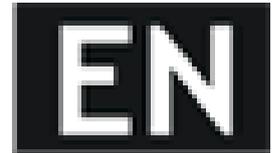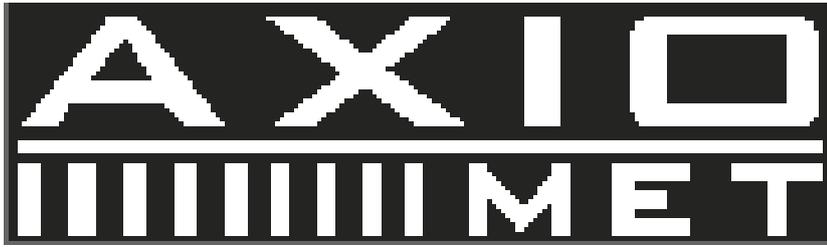Start frequency: 500Hz
Stop frequency: 5kHz
Interval time: 10ms
Sweep direction: UP
Carrier frequency: 50kHz
Carrier amplitude: 2Vpp
Modulation frequency: 1kHz

Modulation waveform: Sine
Modulation deviation: 5%

5. Technical specifications

5.1. Output Characteristics of Channel A
5.1.1. Waveform Characteristics
Waveform type: 32 pre-stored waveforms and 8 user defined arbitrary waveforms including: Sine, Square, Triangle, Ramp, Pulse etc.
Waveform length: 1024 points Sample rate: 100MSa/s
Waveform amplitude resolution: 8bits
Sinusoidal harmonic rejection: ≥40dBc (<1MHz), ≥35dBc (1MHz~20MHz)
Sine wave total distortion: ≤1% (20Hz~200kHz)
Square rise/fall edge time: ≤35 ns Overshoot: ≤10%
Square wave duty cycle: 1%~99%

5.1.2. Frequency Characteristics
Frequency range: Sine: 1µHz~Max.frequency (MHz); Square : 1µHz~5MHz;
Other waveforms: 1µHz~1MHz
Frequency resolution: 1µHz
Frequency accuracy: $\pm(5\times10\text{-}5)$
Frequency stability: $\pm5\times10\text{-}6/3$ hours

5.1.3. Amplitude Characteristics
Amplitude range: 2mVpp~20Vpp 1µHz~10MHz (high impedance)
2mVpp~15Vpp 10MHz~15MHz (high impedance)
2mVpp~8Vpp 15MHz~20MHz (high impedance)
Resolution: 20mVpp (amplitude>2Vpp), 2mVpp (amplitude<2Vpp)
Amplitude accuracy: $\pm(1\%+2mVrms)$ (high impedance, true RMS, frequency at 1kHz)
Amplitude stability: ±0.5%/3 hours
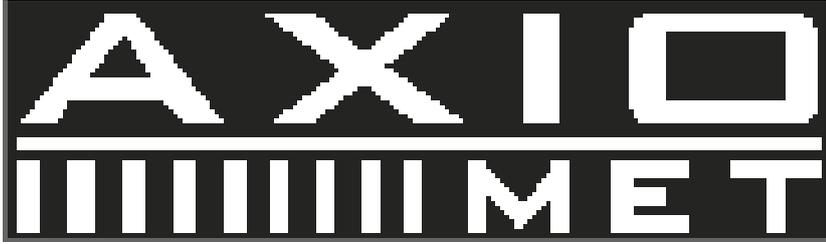Amplitude flatness: ±5% (frequency<10MHz), ±10% (frequency >10MHz)
Output impedance: 50

5.1.4. DC Offset Characteristics
Offset range: ±10V (high impedance, attenuation 0dB) Resolution: 20mVdc
Offset accuracy: $\pm(1\%+20mVdc)$

5.1.5. Sweep Characteristics

Sweep type: frequency sweep, amplitude sweep
Sweep range: free to set the start and stop points
Sweep time: 100ms ~ 900s
Sweep direction: Up, Down, Up-down
Sweep mode: linear, logarithmic
Control mode: auto sweep or manual sweep

5.1.6. Modulation Characteristics

Carrier signal: channel A signal
Modulation signal: internal signal of channel B or external signal
FM deviation: 0%~20%

5.1.7. Shift Keying Characteristics

FSK: free to set carrier frequency and hop frequency
ASK: free to set carrier amplitude and hop amplitude
PSK: hop phase 0~360°, max.resolution 1°
Alternative rate: 10ms~60s

5.1.8. Burst Characteristics

Carrier signal: channel A signal
Trigger signal: TTL_A signal
Burst count: 1~65000 cycles
Burst mode: Internal TTL, External, Single

5.2. Output Characteristics of Channel B

5.2.1. Waveform Characteristics

Waveform type: 32 pre-stored waveforms and 8 user defined arbitrary waveforms including: Sine, Square, Triangle, Ramp, Pulse etc.
Waveform length: 1024 points Sample rate: 12.5MSa/s
Waveform amplitude resolution: 8bits
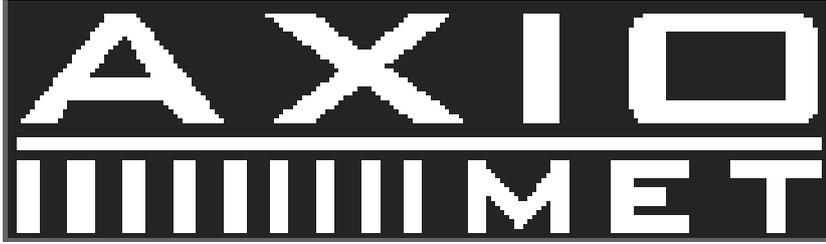Square duty cycle: 1%~99%

5.2.2. Frequency Characteristics

Frequency range: Sine: 1μHz~1MHz Other waveforms: 1μHz~100kHz
Frequency resolution: 1μHz
Frequency accuracy: ±(1×10-5)

5.2.3. Amplitude Characteristics

Amplitude range: 50mVpp~20Vpp (high impedance) Resolution: 20mVpp

Output impedance: 50

5.2.4. Burst Characteristics

Carrier signal: channel B signal

Trigger signal: TTL_B signal

Burst count: 1~65000 cycles

Burst mode: Internal TTL, External, Single

5.3. TTL Output Characteristics

Waveform Characteristics: Square, rise/fall time≤20ns

Frequency Characteristics: 10mHz~1MHz

Amplitude Characteristics: TTL, CMOS compatible, low level<0.3V, high level>4V

5.4. Common characteristics

5.4.1. Power Source

Voltage: AC220V (1±10%)

AC110V (1±10%) (Pay attention to the position of voltage selection switch)

Frequency: 50Hz (1±5%)

Power: <45VA

5.4.2. Environment

Temperature: 0~40°C

Humidity: <80%

5.4.3. Operation Characteristics

Keypad operation and rotary knob operation

5.4.4. Display

TFT display, 320*240, English, Chinese (simplified), Chinese (traditional)

5.4.5. Dimension and Weight

Chassis dimensions: 415(D)×295(W)×195(H)mm

Weight: 3.5kg