GW INSTEK ASR-2000 Series Programmable AC or DC Power Source User Guide

Contents

GW INSTEK ASR-2000 Series Programmable AC or DC Power Source

Product Information

- **Product Name:** Programmable AC/DC Power Source
- **Model:** ASR-2000 Series
- **Quick Start Guide:** EFNR

Safety Instructions

This section contains the basic safety symbols that may appear on the accompanying User Manual CD or on the instrument. For detailed safety instructions and precautions, please see the Safety Instructions chapter in the user

manual CD.

- Warning: Identifies conditions or practices that could result in injury or loss of life.
- 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
- Do not dispose electronic equipment as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased.

Power Cord for the United Kingdom
When using the instrument in the United Kingdom, make sure the power cord meets the following safety instructions.

NOTE: This lead/appliance must only be wired by competent persons.

WARNING: THIS APPLIANCE MUST BE EARTHED

The wires in this lead are coloured in accordance with the following code:

- **Green**/ **Yellow:** Earth
- **Blue:** Neutral
- **Brown:** Live (Phase)

Main Features
The ASR-2000 Series Programmable AC/DC Power Source offers the following main features:

- Feature 1
- Feature 2
- Feature 3

Interface
The ASR-2000 Series Programmable AC/DC Power Source has a user-friendly interface for easy operation and control.

Appearance
Front Panel Overview:

Front Panel Overview

Rear Panel Overview:

Rear Panel Overview

Product Usage Instructions

Power up

1. Connect the power cord to the socket on the rear panel.
2. Turn on the power switch on the front panel.

Note: The power supply takes around 15 seconds to fully turn on and shutdown. Do not turn the power on and off quickly.

How to Use the Instrument
Background: The ASR-2000 AC power supplies generally use the scroll wheel, Arrow keys, and Enter keys to edit numerical values or to select menu options. Menu navigation is performed using the menu keys and function keys on the front panel.

Selecting Menu Items:

1. Turn the scroll wheel to select parameters in menus and lists. The selected parameter will be highlighted in orange. The scroll wheel is also used to increment/decrement setting values.
2. Press the Enter key to edit the parameter or to enter the selected menu.

Example: The following is an example of the menu list that appears when the Menu key is pressed.

Selected parameter
Using the Arrow keys: Use the Arrow keys to select a digit power and then use…

SAFETY INSTRUCTIONS

This section contains the basic safety symbols that may appear on the accompanying User Manual CD or on the instrument. For detailed safety instructions and precautions, please see the Safety Instructions chapter in the user manual CD.

Safety Symbols
These safety symbols may appear in the user manual or on the instrument.

- **Warning:** Identifies conditions or practices that could result in injury or loss of life.
- **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
- Do not dispose electronic equipment as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased.

Power Cord for the United Kingdom
When using the instrument in the United Kingdom, make sure the power cord meets the following safety instructions.
NOTE: This lead/appliance must only be wired by competent persons.

WARNING: THIS APPLIANCE MUST BE EARTHED IMPORTANT:
The wires in this lead are coloured in accordance with the following code:

- **Green**/ **Yellow:** Earth
- **Blue:** Neutral

- **Brown:** Live (Phase)

As the colours of the wires in main leads may not correspond with the cultured marking identified in your plug/appliance, proceed as follows:

- The wire which is coloured Green & Yellow must be connected to the Earth terminal marked with either the letter E, the earth symbol or coloured Green/Green & Yellow.
- The wire which is coloured Blue must be connected to the terminal which is marked with the letter N or cultured Blue or Black.
- The wire which is coloured Brown must be connected to the terminal marked with the letter L or P or coloured Brown or Red.
- If in doubt, consult the instructions provided with the equipment or contact the supplier. This cable/appliance should be protected by a suitably rated and approved HBC mains fuse: refer to the rating information on the equipment and/or user instructions for details. As a guide, a cable of 0.75mm2 should be protected by a 3A or 5A fuse. Larger conductors would normally require 13A types, depending on the connection method used.
- Any exposed wiring from a cable, plug or connection that is engaged in a live socket is extremely hazardous. If a cable or plug is deemed hazardous, turn off the mains power and remove the cable, any fuses and fuse assemblies. All hazardous wiring must be immediately destroyed and replaced in accordance to the above standard.

Main Features

Main Features

Performance

- Maximum AC output voltage is 350 Vrms
- Maximum DC output voltage is 500 Vdc
- Maximum output frequency is 999.9 Hz in AC mode
- Supported AC+DC waveform application
- DC full capacity output ability
- Output voltage total harmonic distortion is less than 0.5% at all frequency.
- Crest factor reached 4 times high

Features

- Include sine, square, triangle, arbitrary and DC output waveforms
- Variable voltage, frequency and current limiter
- Harmonic voltage and current analysis ability
- Excellent and feature-rich measurement capacity
- Sequence and simulate function
- External input amplification
- AC line synchronized output
- Preset memory function
- USB memory support

Interface

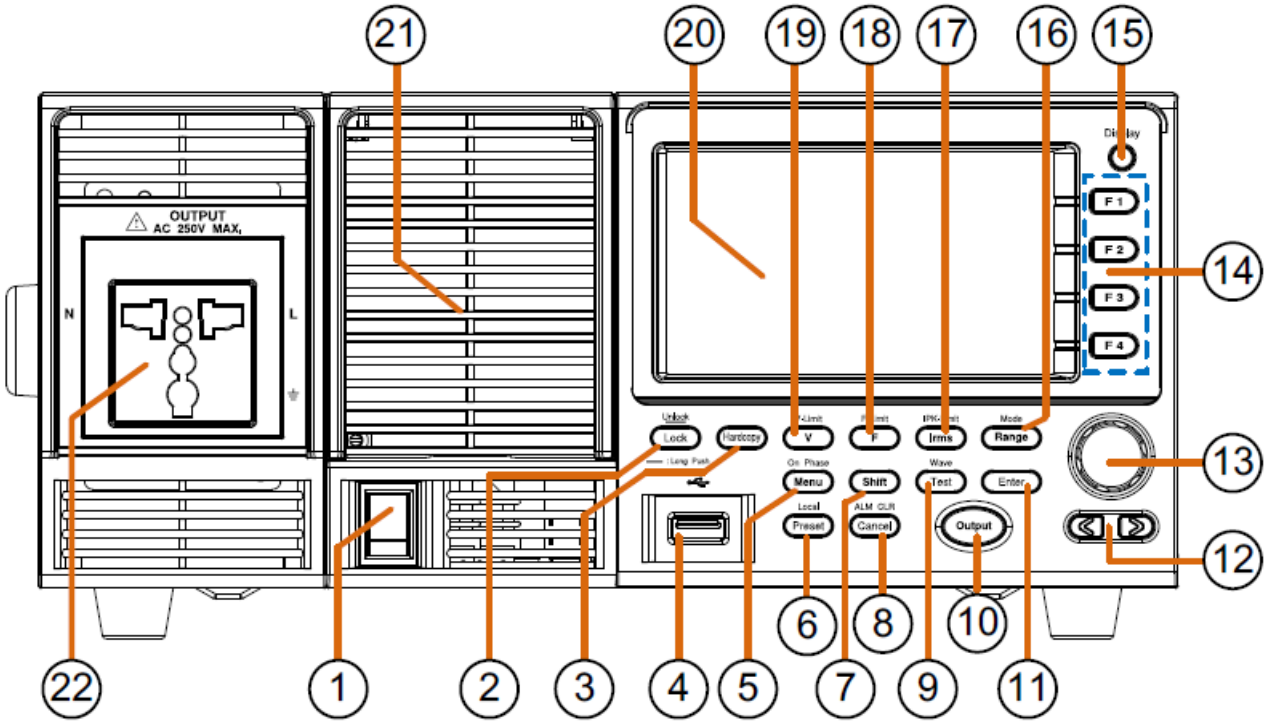
- Built-in LAN, USB host and USB device interface

- External control I/O

- External signal input
- Factory option RS232 and GPIB interface

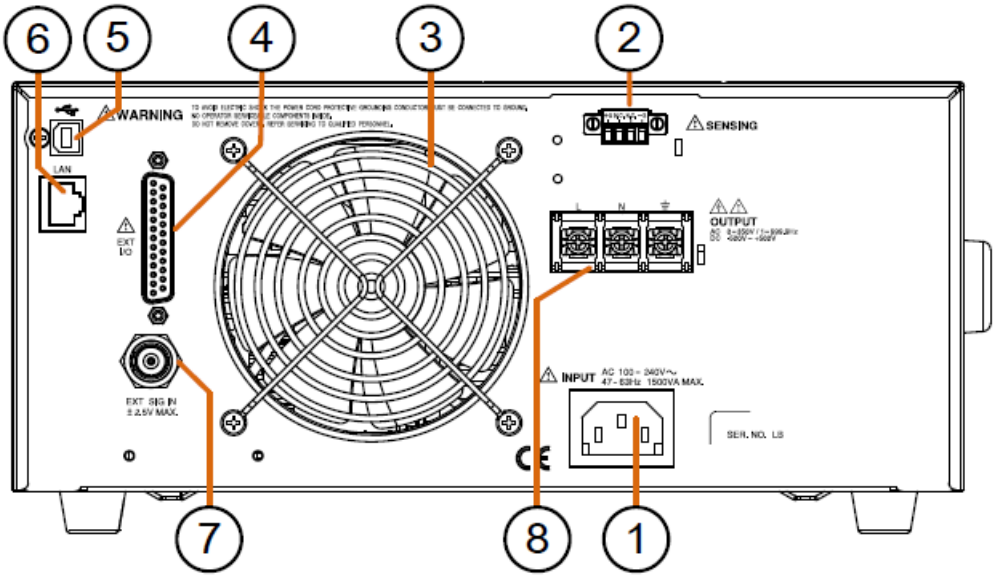
Appearance

Front Panel Overview



Description	
1. Power switch button	2. Lock/Unlock button
3. Hardcopy key	4. USB interface connector (A Type)
5. Menu key/On phase key	6. Preset key/Local mode key
7. Shift key	8. Cancel key/ALM CLR key
9. Test key/Output waveform key	10. Output key
11. Enter key	12. Arrow keys
13. Scroll wheel	14. Function keys (blue zone)
15. Display mode select key	16. Range key/Output mode key
17. Irms/IPK-Limit button	18. F/F-Limit button
19. V/V-Limit button	20. LCD screen
21. Air inlet	22. Output socket

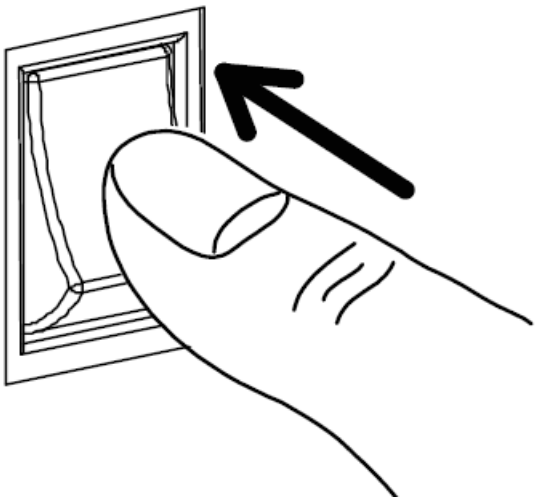
Rear Panel Overview



Description	
1. Line input	2. Remote sensing input terminal
3. Exhaust fan	4. External I/O connector
5. USB interface connector (B Type)	6. Ethernet (LAN) connector
7. External signal input/ External synchronized signal input	8. Output terminal

Power up

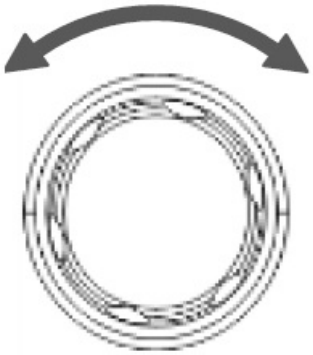
1. Connect the power cord to the socket on the rear panel.
2. Turn on the power switch on the front panel.



Note
The power supply takes around 15 seconds to fully turn on and shutdown.
Do not turn the power on and off quickly.

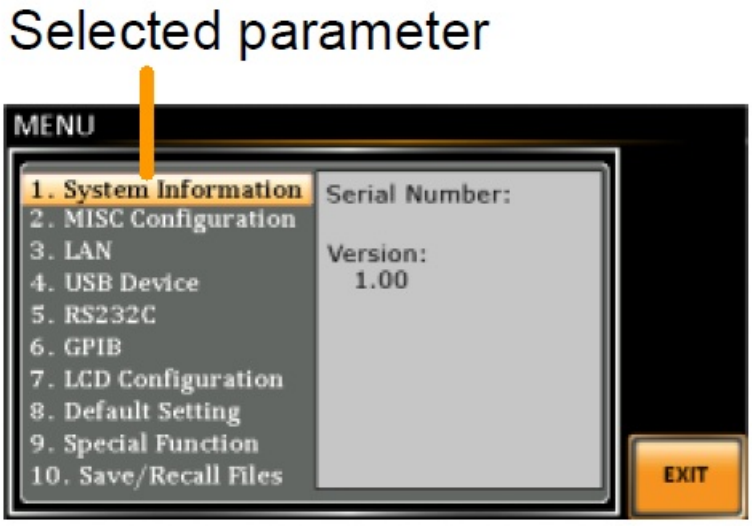
How to Use the Instrument

- **Background**
  - The ASR-2000 AC power supplies generally use the scroll wheel, Arrow keys and Enter keys to edit numerical or to select menu options. Menu navigation is performed using the menu keys and function keys on the front panel.
- **Selecting Menu Items**
  - Turn the scroll wheel to select parameters in menus and lists. The selected parameter will be highlighted in orange. The scroll wheel is also used to increment/decrement setting values.
  - Press the Enter key to edit the parameter or to enter the selected menu.



- **Example**

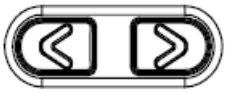
  The following is an example of the menu list that appears when the Menu key is pressed.



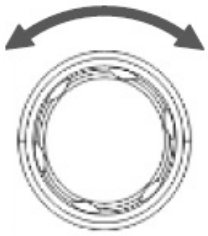
Using the Arrow Keys and Scroll Wheel

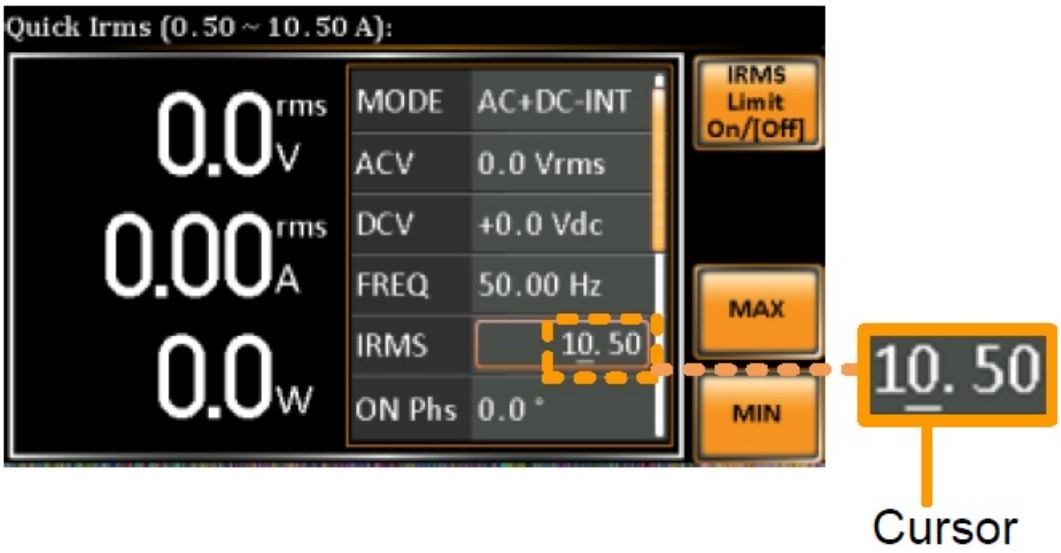
Use the Arrow keys to select a digit power and then use the scroll wheel to edit the value by that power.

1. Use the Arrow keys to move the cursor to the digit of the desired value.



2. Turn the scroll wheel to edit the value by the resolution of the selected digit.





3. Press the Enter key to edit the parameter or to enter the selected menu. Repeat the steps above for all the relevant digits.
4. Press the Enter key to confirm the edit.

By default the cursor starts at the lowest digit of value.

SPECIFICATIONS

The specifications apply when the ASR-2000 series is powered on for more than 30 minutes.

Electrical specifications

	Model			ASR-2050 ASR-2050R	ASR-2100 ASR-2100R
	Input ratings (AC rms)				
	Nominal input voltage			100 Vac to 240 Vac	
	Input voltage range			90 Vac to 264 Vac	
	Phase			Single phase, Two-wire	
	Nominal input Frequency			50 Hz to 60 Hz	

Input frequency range			47 Hz to 63 Hz		
Max. power consumption			800 VA or less		1500 VA or less
Power factor*1	100Vac		0.95 (typ.)		
	200Vac		0.90 (typ.)		
Max. input current	100Vac		8 A		15 A
	200Vac		4 A		7.5 A
*1	For an output voltage of 100 V/200 V (100V / 200V range), maximum current, and a load power factor of 1.				
Model			ASR-2050 ASR-2050R		ASR-2100 ASR-2100R
AC mode output ratings (AC rms)					
	Setting Range*1		0.0 V to 175.0 V / 0.0 V to 350.0 V		
Voltage	Setting Resolution		0.1 V		
			Accuracy*2		±(0.5 % of set + 0.6 V / 1.2 V)
Output phase		Single phase, Two-wire			
Maximum current*3	100 V	5 A		10 A	
	200 V	2.5 A		5 A	
Maximum peak current*4	100 V	20 A		40 A	
	200 V	10 A		20 A	
Load power factor		0 to 1 (leading phase or lagging phase)			
Power capacity		500 VA		1000 VA	
Frequency	Setting range	AC Mode: 40.00 Hz to 999.9 Hz, AC+DC Mode: 1.00 Hz to 999.9 Hz			
	Setting resolution	0.01 Hz (1.00 to 99.99 Hz), 0.1 Hz (100.0 to 999.9 Hz)			
	Accuracy	For 45 Hz to 65 Hz: 0.01% of set For 1 Hz to 999.9 Hz: 0.02% of set			
	Stability*5	± 0.005%			
Output on/off phase		0.0° to 359.9° variable (setting resolution 0.1°)			
DC offset *6		Within ± 20 mV (TYP)			

	*1	100 V / 200 V range		
	*2	For an output voltage of 17.5 V to 175 V / 35 V to 350 V, sine wave, an output frequency of 45 Hz to 65 Hz , no load, DC voltage setting 0V (AC+DC mode) and 23°C ± 5°C		
	*3	For an output voltage of 1 V to 100 V / 2 V to 200 V. Limited by the power capacity when the output voltag e is 100 V to 175 V / 200 V to 350. If there is the DC superimposition, the current of AC+DC mode satisfie s the maximum current. In the case of lower than 40 Hz, and the ambient temperature is 40°C or higher, t he maximum current will be decrease.		
	*4	With respect to the capacitor-input rectifying load. Limited by the maximum current.		
	*5	For 45 Hz to 65 Hz, the rated output voltage, no load and the resistance load for the maximum current, an d the operating temperature.		
	*6	In the case of the AC mode and output voltage setting to 0 V.		

Model		ASR-2050 ASR-2050R		ASR-2100 A SR-2100R
Output rating for DC mode				
Voltage		Setting Range*1	-250.0 V to +250.0 V / -500.0 V to +500.0 V	
		Setting Resolution	0.1 V	
		Accuracy*2	±(|0.5 % of set| + 0.6 V / 1.2 V)	
Maximum current*3		100 V	5 A	10 A
		200 V	2.5 A	5 A
Maximum peak cur rent*4		100 V	20 A	40 A
		200 V	10 A	20 A
Power capacity		500 W		1000 W
*1	100 V / 200 V range			
*2	For an output voltage of -250 V to -25 V, +25 V to +250 V / -500 V to -50 V, +50 V to +500 V, no load, AC v oltage setting 0V (AC+DC mode) and 23°C ± 5°C			
*3	For an output voltage of 1.4 V to 100 V / 2.8 V to 200 V. Limited by the power capacity when the output vo ltage is 100 V to 250 V / 200 V to 500 V.			
*4	Within 5 ms, Limited by the maximum current.			

Model	ASR-2050 ASR-2050R	ASR-2100 ASR-2100R
Output voltage stability		
Line regulation*1	±0.2% or less	

Load regulation*2	±0.15% @45 - 65Hz ±0.5% @DC, all other frequencies (0 to 100%, via output terminal)
Ripple noise*3	0.7 Vrms / 1.4 Vrms (TYP)

1. Power source input voltage is 100 V, 120 V, or 230 V, no load, rated output.
2. For an output voltage of 75 V to 175 V / 150 V to 350 V, a load power factor of 1, stepwise change from an output current of 0 A to maximum current (or its reverse), using the output terminal on the rear panel.
3. For 5 Hz to 1 MHz components in DC mode using the output terminal on the rear panel.

Model	ASR-2050 ASR-2050R	ASR-2100 ASR-2100R
Output voltage waveform distortion ratio, Output voltage response time, Efficiency		
Total harmonic distortion (THD) *1	<0.2 % @50/60 Hz <0.3 % @<500 Hz <0.5 % @500.1 Hz to 999.9 Hz	
Output voltage response time *2	100 µs (TYP)	
Efficiency *3	70 % or more	

1. At an output voltage of 50 V to 175 V / 100 V to 350 V, a load power factor of 1, and in AC and AC+DC mode.
2. For an output voltage of 100 V / 200 V, a load power factor of 1, with respect to stepwise change from an output current of 0 A to the maximum current (or its reverse). 10% ~ 90% of output voltage
3. For AC mode, at an output voltage of 100 V / 200 V, maximum current, and load power factor of 1 and sine wave only.

Model			ASR-2050 ASR-2050R	ASR-2100 ASR-2100R
Measured value display				
Note: All accuracy of the measurement function is indicated for 23 °C±5 °C.				
Voltage	RMS, AVG value *1	Resolution	0.1 V	
		Accuracy *2	For 45 Hz to 65 Hz and DC: ±(0.5 % of reading + 0.3 V / 0.6 V) For 40 Hz to 999.9 Hz: ±(0.7 % of reading + 0.9 V / 1.8 V)	
	PEAK value	Resolution	0.1 V	
		Accuracy	For 45 Hz to 65 Hz and DC: ±(|2 % of reading| + 1 V / 2 V)	
Current	RMS, AVG value	Resolution	0.01 A	
		Accuracy *3	For 45 Hz to 65 Hz and DC: ±(0.5 % of reading + 0.02 A / 0.02 A) For 40 Hz to 999.9 Hz: ±(0.7 % of reading + 0.04 A / 0.04 A)	For 45 Hz to 65 Hz and DC: ±(0.5 % of reading + 0.04 A / 0.02 A) For 40 Hz to 999.9 Hz: ±(0.7 % of reading + 0.08 A / 0.04 A)

	PEAK value	Resolution	0.01 A	
		Accuracy[*4]	For 45 Hz to 65 Hz and DC: ±(|2 % of reading| + 0.2 A / 0.1 A)	For 45 Hz to 65 Hz and DC: ±(|2 % of reading| + 0.2 A / 0.1 A)
Power	Active (W)	Resolution	0.1 / 1 W	
		Accuracy[*5]	±(2 % of reading + 0.5 W)	±(2 % of reading + 1 W)
	Apparent (VA)	Resolution	0.1 / 1 VA	
		Accuracy[*5*6]	±(2 % of reading + 0.5 VA)	±(2 % of reading + 1 VA)
	Reactive (VAR)	Resolution	0.1 / 1 VAR	
		Accuracy[*5*7]	±(2 % of reading + 0.5 VAR)	±(2 % of reading + 1 VAR)
Load power factor		Range	0.000 to 1.000	
		Resolution	0.001	
Load crest factor		Range	0.00 to 50.00	
		Resolution	0.01	
Harmonic voltage Effective value (rms) Percent (%) (AC-INT and 50/60 Hz only)		Range	Up to 100th order of the fundamental wave	
		Full Scale	175 V / 350 V, 100%	
		Resolution	0.1 V, 0.1%	
		Accuracy[*8]	Up to 20th ±(0.2 % of reading + 0.5 V / 1 V) 20th to 100th ± (0.3 % of reading + 0.5 V / 1 V)	
Harmonic current Effective value (rms) Percent (%) (AC-INT and 50/60 Hz only)		Range	Up to 100th order of the fundamental wave	
		Full Scale	5 A / 2.5 A, 100%	10 A / 5 A, 100%
		Resolution	0.01 A, 0.1%	
		Accuracy[*3]	Up to 20th ±(1 % of reading + 0.1 A / 0.05 A) 20th to 100th ±(1.5 % of reading + 0.1 A / 0.05 A)	Up to 20th ±(1 % of reading + 0.2 A / 0.1 A) 20th to 100th ±(1.5 % of reading + 0.2 A / 0.1 A)

1. The voltage display is set to RMS in AC/AC+DC mode and AVG in DC mode.
2. AC mode: For an output voltage of 17.5 V to 175 V / 35 V to 350 V and 23 °C ± 5 °C. DC mode: For an output voltage of 25 V to 250 V / 50 V to 500 V and 23 °C ± 5. An output current in the range of 5 % to 100 % of the maximum current, and 23 °C ± 5 °C.
3. An output current in the range of 5 % to 100 % of the maximum peak current in AC mode, an output current in the range of 5 % to 100 % of the maximum instantaneous current in
4. DC mode, and 23 °C ± 5 °C. The accuracy of the peak value is for a waveform of DC or sine wave
5. For an output voltage of 50 V or greater, an output current in the range of 10 % to 100 % of the maximum current, DC or an output frequency of 45 Hz to 65 Hz, and 23 °C ± 5 °C.
6. The apparent and reactive powers are not displayed in the DC mode.

7. The reactive power is for the load with the power factor 0.5 or lower.
8. An output voltage in the range of 17.5 V to 175 V / 35 V to 350 V and 23 °C ± 5 °C.

Note

- Product specifications are subject to change without notice.
- The spec aforementioned applies to when slew rate mode is the Time mode.

General Specifications

Interface	Standard	USB	Type A: Host, Type B: Device, Speed: 1.1/2.0, USB-CDC
		LAN	MAC Address, DNS IP Address, User Password, Gateway IP Address, Instrument IP Address, Subnet Mask
		EXT Control	External Signal Input External Control I/O

Optional 1		GPIB	SCPI-1993, IEEE 488.2 compliant interface
		RS-232C	Complies with the EIA-RS-232 specifications
Insulation resistance	Between input and chassis, output and chassis, input and output		500 Vdc, 30 MΩ or more
Withstand voltage	Between input and chassis, output and chassis, input and output		1500 Vac, 1 minute
EMC			EN 61326-1 (Class A) EN 61326-2-1/-2-2 (Class A) EN 61000-3-2 (Class A, Group 1) EN 61000-3-3 (Class A, Group 1) EN 61000-4-2/ -4-3/ -4-4/ -4-5/ -4-6/ -4-8/-4-11 (Class A, Group 1) EN 55011 (Class A, Group1)
Safety			EN 61010-1
Environment	Operating environment		Indoor use, Overvoltage Category II

	Operating temperature range	0 °C to 40 °C
	Storage temperature range	-10 °C to 70 °C
	Operating humidity range	20 % RH to 80 % RH (no condensation)

Storage humidity range	90 % RH or less (no condensation)	
Altitude	Up to 2000 m	
Dimensions (mm)	ASR-2000	ASR-2000R
	285(W)×124(H)×480(D) (not including protrusions)	213(W)×124(H)×480(D) (not including protrusions)
Weight	ASR-2000	ASR-2000R
	Approx. 11.5 kg	Approx. 10.5 kg

Other

Protections	OCP, OTP, OPP, FAN Fail
Display	TFT-LCD, 4.3 inch
Memory Function	Store and recall settings, Basic settings: 10
Arbitrary Wave	16 (nonvolatile)
	4096 words
A value with the accuracy is the guaranteed value of the specification. However, an accuracy noted as reference value shows the supplemental data for reference when the product is used, and is not under the guarantee. A value without the accuracy is the nominal value or representative value (shown as type).	

A value with the accuracy is the guaranteed value of the specification. However, an accuracy noted as reference value shows the supplemental data for reference when the product is used, and is not under the guarantee. A value without the accuracy is the nominal value or representative value (shown as type).

External Signal Input (AC+DC-EXT, AC-EXT Mode)

		Specification	Factory Default
	Gain setting range	100 V range: 0.0 to 250.0 times	100
		200 V range: 0.0 to 500.0 times	200
	Input terminal	BNC connector	
	Input impedance	1 MΩ	
	Input voltage range	±2.5 V (A/D resolution 12 bit)	
Nondestructive maximum input voltage		±10 V	
Gain resolution		0.1 times	
Accuracy		±5 % (DC, or 45Hz ~ 65 Hz, gain is at initial value, with rate voltage output, no load)	
EXT: Output voltage (V) = External signal input (V) x Gain (V/V)			

Voltage Setting Signal Input (AC-VCA Mode)

	Specification	Factory Default
Gain setting range	100 V range: 0.0 to 250.0 times	100
	200 V range: 0.0 to 500.0 times	200
Input terminal	BNC connector	
Input impedance	1 MΩ	
Input voltage range	DC 0 ~ 2.5 V	
Nondestructive maximum input voltage	±10 V	
Accuracy	±5 %	

External Signal Input (AC+DC-ADD, AC-ADD Mode)

	Specification	Factory Default
Gain setting range	100 V range: 0.0 to 250.0 times	100
	200 V range: 0.0 to 500.0 times	200
Input terminal	BNC connector	
Input impedance	1 MΩ	
Input voltage range	±2.5 V (A/D resolution 12 bit)	
Nondestructive maximum input voltage	±10 V	
Input frequency range	DC to 999.9 Hz (sine wave) DC to 100 Hz (other than sine wave)	

Gain resolution	0.1 times
Accuracy	±5 % (DC, or 45Hz ~ 65 Hz, gain is at initial value, with rate voltage output, no load)
ADD: Output voltage (V) = External signal input (V) x Gain (V/V) + Internal signal source setting (V)	

External Synchronous Signal or Line (AC+DC-SYNC, AC-SYNC)

	Specification	Factory Default
Synchronization signal source	External synchronization signal (EXT) or Power input (LINE)	LINE
Synchronization frequency range	40.00 Hz to 999.9 Hz	
Input terminal	BNC connector	
Input impedance	1 MΩ	
Threshold of input voltage	TTL level	
Minimum pulse width	500 us	
Nondestructive maximum input voltage	±10 V	
Resolution	0.01 / 0.1 Hz	
Accuracy	±0.2 Hz	

EC Declaration of Conformity

We declare that the below mentioned product ASR-2050, ASR-21 00, ASR-2050R, ASR-21 00R satisfies all the technical relations application to the product within the scope of council:
Directive: 2014/30/EU; 2014/35/EU; 2011/65/EU; 2012/19/EU. The above product is in conformity with the following standards or other normative documents:

EMC

EN 61326-1 : EN 61326-2-1: EN 61326-2-2:	Electrical equipment for measurement, control and laboratory use — EMC requirements (2013)

Conducted & Radiated Emission EN 55011: 2016+A1: 2017 Class A	Electrical Fast Transients EN 61000-4-4: 2012
Current Harmonics EN 61000-3-2: 2014	Surge Immunity EN 61000-4-5: 2014+A1: 2017
Voltage Fluctuations EN 61000-3-3: 2013	Conducted Susceptibility EN 61000-4-6: 2014
Electrostatic Discharge EN 61000-4-2: 2009	Power Frequency Magnetic Field EN 61000-4-8: 2010
Radiated Immunity EN 61000-4-3: 2006+A2: 2010	Voltage Dip/ Interruption EN 61000-4-11: 2004+A1: 2017

Safety

Low Voltage Equipment Directive 2014/35/EU	
Safety Requirements	EN 61010-1: 2010

Documents / Resources

	GW INSTEK ASR-2000 Series Programmable AC or DC Power Source [pdf] User Guide ASR-2050, ASR-2000 Series Programmable AC or DC Power Source, ASR-2000 Series, Programmable AC or DC Power Source, AC or DC Power Source, Power Source