PROGRAMMABLE AC POWER SOURCE

DP020AS NEW

Single phase 2 kVA

High performance & Scalable configuration

NF Corporation

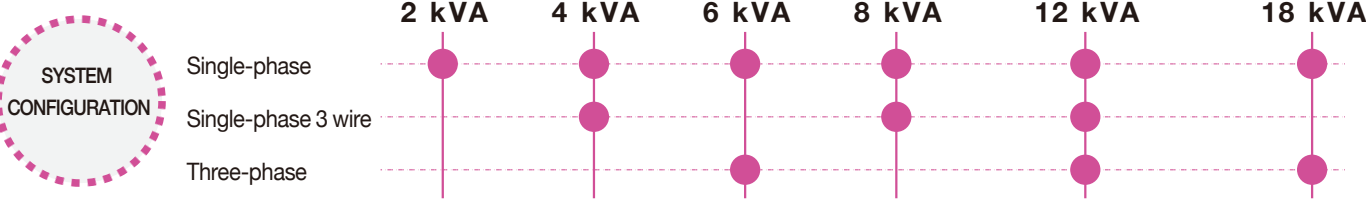# EXPANSION OF CAPACITY, AND MULTIPHASE SYSTEM BY SEAMLESSLY COMBINING MULTIPLE UNITS.

Can be used with either master unit or booster unit

In addition to the stable output performance of the DP series, it supports expansion of capacity and building multiphase by combining multiple units.
DP020AS, single-phase 2 kVA, 3U model can be the power supply system by just connecting a system cable.

● **Various systems can be composed.**
Single-phase 2kVA to 18kVA / single-phase 3 wire 4kVA to 12kVA / Three-phase 6kVA to 18kVA
● **Wide frequency range : DC, 1 Hz to 5 kHz**
● **AC output : 0 V to 350 Vrms**
DC output : 0 V to ±454 V

DP020AS Single-phase 2 kVA

SYSTEM CONFIGURATION

	2 kVA	4 kVA	6 kVA	8 kVA	12 kVA	18 kVA
Single-phase	●	●	●	●	●	●
Single-phase 3 wire		●		●	●	
Three-phase			●		●	●

CAN BE SELECTED ACCORDING TO THE PURPOSE

EXAMPLE OF SYSTEM CONFIGURATION

DP020AS × 9 units
MAXIMUM CONFIGURATION

Multi-phase
● Up to two booster units can be connected to one master unit.
● Each phase has the same number of units.

Three-phase 18 kVA

Master | Slave | Slave

L1 | L2 | L3
System Master | Phase Master | Phase Master
Booster | Booster | Booster
Booster | Booster | Booster

Capable of building Multi-phase system

No need to reconnect cables when changing output phase configuration.
Phase selection can be controlled at the master unit.

In-phase operation of L1, L2, and L3 phase
▶▶ Single-phase 18 kVA system
Only L1 and L2 phase are operated.
▶▶ Single-phase 3 wire 12 kVA system

System Master
System master unit
Master unit for the entire system
(L1 phase master)

Phase Master
Phase master unit
Operates with control signals from the system master unit. Master of each L2 phase and L3 phase

Booster
Booster unit
Expand the power capacity of the master unit.

SYSTEM OUT L3 L2 — IN
SYSTEM I/O (rear)

DP020AS × 6 units

Three-phase 12 kVA

L1 | L2 | L3
System Master | Phase Master | Phase Master
Booster | Booster | Booster

In-phase operation ▶ Single-phase 12 kVA
Only L1 and L2 phase are operated. ▶ Single-phase 3 wire 8 kVA

Single-phase 3 wire 12 kVA

L1 | L2
System Master | Phase Master
Booster | Booster
Booster | Booster

In-phase operation ▶ Single-phase 12 kVA

DP020AS × 3 units

Multi-phase

Three-phase 6 kVA

L1 System Master
L2 Phase Master
L3 Phase Master

In-phase operation
▼
Single-phase 6 kVA

Only L1 and L2 phase are operated.
▼
Single-phase 3 wire 4 kVA

Single-phase 6 kVA

System Master
Booster
Booster

Parallel operation
(Booster connection)

Single-phase 2 kVA
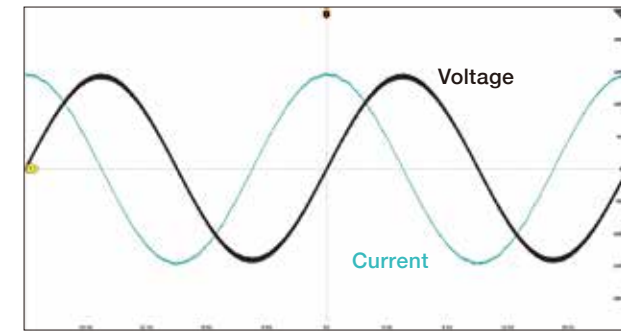
Each 2 kVA unit

Three phase 6 kVA

HIGH QUALITY OUTPUT

High quality waveform | High robustness | Low noise

High-quality waveform output has been further improved, with, output stability, low distortion and fast response.

■ **Capacitive load output wave example** (636 μF)

Voltage
Current

100 V range, 100 V / 50 Hz, sine wave

A sample of oscillated waveform

The output is stable even when connected to a large capacitive load that tends to cause abnormal oscillation or distortion.
DP020AS outputs stable under various loads.

■ **Rising / Falling waveform**

DC mode, 0 V to 100 Vdc
Resistive load 5 Ω

Rise time 34.3μs

X-axis: 40μs/div. Y-axis: 20V/div.
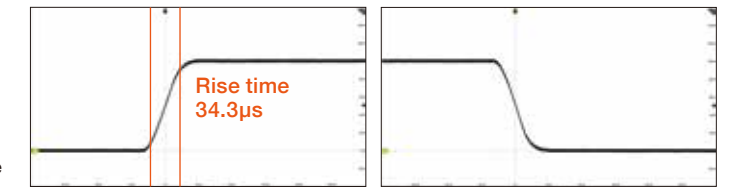
The rise time is shorter than that of a typical AC power supply, so it is possible to output rapidly changing waveforms with high reproducibility. Suitable for reproducing transient response.

ENHANCED USABILITY

Large, easy-to-read color display
Measured values and set values can be displayed on same screen

V-LIMIT | I-LIMIT | F-LIMIT
V | I | F

Voltage, current, and frequency can be set with one-key

SEQ/SIM/MEM FIRST LAST
PREV | NEXT

Keys for step movement in the sequence/power fluctuation test function and memory number in the memory function.

Measured value
Setting value

RECALL | SHIFT

AC/DC | SOURCE | BRIGHTNESS
7 | 8 | 9
KEY LOCK | AGC/Agc | USB EJECT
4 | 5 | 6

Direct recall function
Read basic setting in combination with numeric keypad

USB memory interface
Basic setting, sequence data, power fluctuation test data and arbitrary waveform writing/reading possible

(Rear panel)

SHUT DOWN function
Forced output off/operation stop by external signal

Waveform monitor output
For observing the output voltage or current waveforms with an oscilloscope.

External signal input

Voltage sensing Input terminal

THE FAN NOISE IS QUIET!!
Reduced noise compared to previous products. Improved the environment where AC power supply is using.

GPIB | RS232 LAN USB | SYSTEM I/O | CONTROL I/O

External interface

4 types of interfaces as standard

Increase power capacity and building multiphase by connecting system cable

CONTROL I/O
External control input/output

DP SERIES RESPOUND TO VARIOUS TESTING NEEDS

Output characteristics

The DP series has a variety of output modes and a wide output range.

		100 V range	200 V range	Resolution
AC	Voltage	AC : 0 V to 175 V ACHF : 0.0 V to 160 V ACDC : 0.0 V to 160 V	AC : 0 V to 350 V ACHF : 0.0 V to 320 V ACDC : 0.0 V to 320 V	0.1 V
	Frequency	AC : 40 Hz to 1500 Hz , ACHF : 1 Hz to 5000 Hz ACDC : 1 Hz to 1500 Hz		0.01 Hz*
DC	Voltage	-227 V to +227 V	-454 V to +454 V	0.1 V

* Varies depending on the frequency.

- AC/DC modes : AC, ACHF, ACDC, DC
- Load regulation : ±0.1 V (50 V to 160 V) /±0.2 V (100 V to 320 V)
  (DC, 10 Hz to 100 Hz, when output current is varied from 0% to 100% of maximum current)
- Waveform harmonic distortion : 0.3% max. (40 Hz to 550 Hz)
- Efficiency : 80% or more

■ AC mode
Mode for outputting 40 Hz to 1500 Hz. Because the DC component of the output is canceled, DP020AS can also handle transformer testing where the core causes magnetic saturation due to the DC component.

■ ACHF mode
Outputs from 40 Hz to 5000 Hz. The DC component of the output is canceled. Valid only for sine waves.

■ ACDC mode
This mode is used to superimpose an AC component onto DC, superimpose (offset) a DC component onto AC. This mode is used in AC line simulation where DC components, such as sudden voltage or phase changes, arise temporarily.
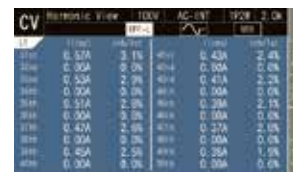
■ DC mode
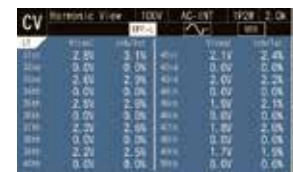Mode for outputting DC only. A high SN ratio is attained even with comparatively low voltage.

Measurement functions

In addition to voltage, current and power, the DP020AS supports measurement of load power factor, crest factor, and up to 50th-order harmonic current.

Measured items
- Voltage: RMS value, average DC value, peak value
- Current: RMS value, average DC value, peak value, peak hold value
- Power: active power and apparent power
- Harmonic analysis* : up to 50th order
- Load power factor
- Crest factor
- Sync frequency

* Not conforming to IEC standards

RMS

Peak

Harmonic analysis current (31th to 50th)

Harmonic analysis voitage (31th to 50th)

Current limiter function

Output current limits can be set with positive/negative peak value and RMS value. When evaluating a prototype, this can provide protection in case there is an large current due to abnormal operation of the load. It is possible to continue output current after limit operation using a setting, or to turn output off after continuing the limited state for a specified time.

- Setting
Positive/negative current peak value and current RMS value
- Limiter operation
– Self-recovery (continuous) or output off
– Possible to designate the time to continue the limited state until output off (1 s to 10 s, resolution 1 s)

Example of peak current limiting

Load : Simulated rectification load

Combination of diode bridge, electrolytic capacitor and resistive load

Limit setting value: +90 A

Limit setting value: +30 A

90 A

30 A

Voltage
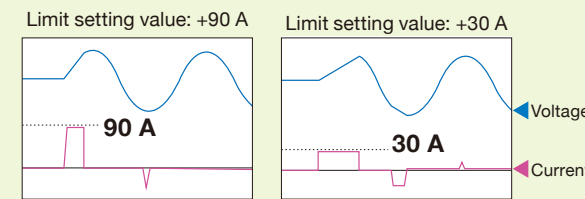
Current

Effective at limiting inrush current of motors and large-capacity capacitors!

MODIFICATION

Constant current output (CC mode)

CC mode can be added with the standard CV mode.
For verification of magnetic field generation or operating current breakers and current transformers.

- Maximum current 20 A / 10 A (up to 180 A with expansion)
- Maximum voltage 227V / 454V
- Wide frequency band, DC and 1Hz to 1.5kHz
- Can be used as an external signal amplifier

Sequences

Parameters such as frequency, voltage and time can be programmed and sequentially output. Settings are made using the panel or control software. Long and complex output patterns can be easily programmed using control software.

- Number of steps : max. 255 (in 1 sequence)
- Setting items :
  step time, output range, AC/DC mode, DC voltage, AC voltage, frequency, waveform, start phase, stop phase, phase angle, step termination, jump count, and so on.
- Sequence control : start, stop, hold, resume, branch 1, branch 2
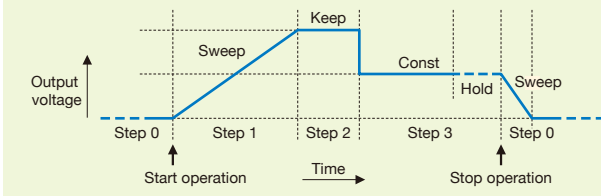- Number of memories : 5 (nonvolatile)

Edit

Execution

Example of output pattern

Keep
Sweep
Const
Hold   Sweep
Output voltage
Step 0   Step 1   Step 2   Step 3   Step 0
Start operation   Time   Stop operation

Simulation

Simulates a problem in the power AC line such as blackout, voltage rise, voltage drop, abrupt phase changes, or abrupt frequency change, thereby enabling all types of AC line simulation such as prototype evaluation and product inspection.
Settings are made with the panel or control software.

Note: This function does not support the main test of standard test such as IEC.

- Number of steps : 6 (Initial, Normal 1, Trans 1, Abnormal, Trans 2, Normal 2)
- Setting items : step time, output range, AC voltage, frequency, start phase, stop phase, trigger output, and so on.
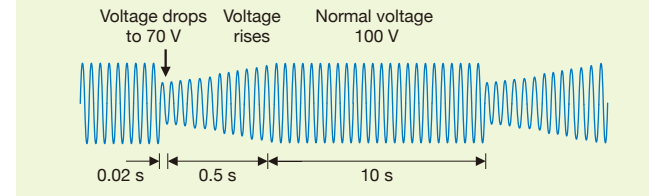- Waveform : sine wave
- Number of memories : 5 (nonvolatile)

Edit

Execution

Example of AC line simulation

Voltage drops to 70 V   Voltage rises   Normal voltage 100 V
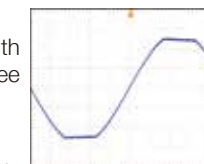
0.02 s   0.5 s   10 s

Clipped sine wave / Arbitrary waveform

The waveforms other than sine waves can be output.

■ Clipped sine wave
It is possible to output a waveform with the peak of the sine wave clipped. Three types can be saved in memory.
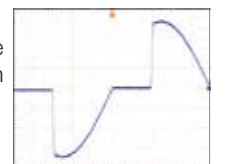- CF setting range : 1.10 to 1.41
- Clip rate setting range : 40.0% to 100.0%

■ Arbitrary waveform
16 types of arbitrary waveforms can be saved in memory. Arbitrary waveforms can be easily created using the control software.
- Amplitude resolution : 16 bit
- Waveform length : 16K words

VARIOUS FUNCTIONS

■ Remote Sensing
Switches the detection point used for measurement and output voltage correction to either output terminal or sensing input terminal.

■ AGC (Automatic Gain Control)
This function performs continuous correction to ensure equality between the RMS values of the detection point voltage and the output voltage setting value.

■ Auto Cal (Auto Calibration)
Each time Auto Cal is turned on, this function measures the detection point voltage and performs correction to ensure that the output voltage RMS value is equal to the voltage setting.

■ USB memory
Settings and waveform data can be written/read using USB memory. The same settings can be made for multiple power supplies, and data created with control software can be transferred via USB memory.

■ External signal input
SYNC : synchronizes the frequency of internal signal source with external signal
VCA : controls output voltage with DC signal
EXT : amplifies external signal, used as power amplifier
ADD : adds external signal source to internal signal source

■ Setting range limit function
Limits the setting range of the output voltage and frequency to prevent load failures due to incorrect operation.

■ Output on setting when power is turned on
Output can be set to turn on automatically when power is turned on (default is output off for safety)

■ High impedance output off function
Turn off output in high impedance state. For a capacitor or battery, the output can be turned off without discharging.

■ Output relay control
Select either on/off by output relay or output off at 0V without using relay.

■ Output on/off phase setting
The phase when output is turned on/off can be set from 0° to 359°. For inrush current measurement.

■ Control software *Downloadable from our website
It is possible to control basic output parameters, acquire measured value data, perform sequence and power fluctuation tests, and create and edit arbitrary waveforms.

DP020AS

■SPECIFICATION

● The following settings and conditions are provided unless otherwise noted.
  ・Load: resistance load for power factor 1 ・Signal source: INT (internal signal source) ・Output voltage waveform: sine wave
  ・Remote sensing/AGC/Auto Cal: OFF ・Current limiter: factory default setting
● [set] indicates a setting value. When two values are indicated with a slash, this means that specifications vary depending on the output range. The value before the slash is for
  100 V specifications, and the value after the slash is for 200 V specifications.
● A value with the accuracy is the guaranteed value of the specification. However an accuracy noted as reference value shows the supplement 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 (show as typ.).

1P2W : Single-phase 2-wire, 1P3W : Single-phase 3-wire, 3P4W : Three-phase 4-wire

■ AC/DC Mode, Signal Source

AC/DCMode		Signal Source				
		INT	VCA	SYNC	EXT	ADD
single unit / 1P2W system	AC	yes	yes	yes	yes	yes
	ACHF	yes	yes	—	—	—
	ACDC	yes	–	yes	yes	yes
	DC	yes	yes	—	—	—
Polyphase system	1P3W	AC	yes	yes[2]	yes		
		ACHF	yes	yes[2]	—		
		ACDC	yes	–	yes		
		DC	yes	yes[2]	—		
	3P4W	AC	yes	yes[2]	yes		
		ACHF	yes	yes[2]	—		
		ACDC[1]	yes	–	yes		

[1] Valid for only AC output [2] Common for all phases

DP020AS is equipped with system master/phase master/booster switching function

System master unit		Master unit of the entire system (L1 phase master unit)
Slave	Phase master	Operates with control signals from the system master unit (L2 / L3 phase master unit)
	Booster	Expands the output power capacity of the master unit

● Add one phase master unit to system master unit to configure 1P3W, or add two units to configure 3P4W.
● Up to two boosters can be connected to each system master unit / phase master unit.
● 1P2W systems (up to 18 kVA) configured with each phase in the same phase.
● N and B represent the following.
  N : Total number of units (N = 2, 3, 4, 6, 9)
  B : Number of booster units for each phase (B = 0, 1, 2)

■ Power Output

System configuration		Single unit	1P2W system	Polyphase system	
		1P2W		1P3W	3P4W
		2 kVA	4 kVA, 6 kVA, 8 kVA, 12 kVA, 18 kVA	4 kVA, 8 kVA, 12 kVA	6 kVA, 12 kVA, 18 kVA
Mode		—		Balanced	
AC output [V] = Vrms, [A] = Arms, unless otherwise specified.					
Rated output voltage		100 V / 200 V			
Voltage setting [3]	range	AC : 0.0 V to 175.0 V / 0.0 V to 350.0 V, ACHF, ACDC : 0.0 V to 160.0 V / 0.0 V to 320.0 V, Arbitrary waveform : 0.0 Vp-p to 454.0 Vp-p / 0.0 Vp-p to 908.0 Vp-p			
	Resolution	0.1 V			
	Accuracy [4]	± (0.3 % of set + 0.3 V / 0.6 V)			
Line voltage [5]	range	—	AC : 0.0 V to 350.0 V / 0.0 V to 700.0 V ACHF, ACDC : 0.0 V to 320.0 V / 0.0 V to 640.0 V	AC : 0.0 V to 303.0 V / 0.0 V to 606.0 V ACHF, ACDC : 0.0 V to 277.2 V / 0.0 V to 554.2 V	
	Resolution	—	0.2 V		
Max. current [6]		20 A / 10 A	20 A × N / 10 A × N	20 A × (1+B) / 10 A × (1+B)	
Max. peak current [7]		4 times value of maximum current.	3.5 times value of maximum current.		
Output power		2 kVA	2 kVA × N	4 kVA × (1+B)	6 kVA × (1+B)
Load power factor range		Lead or lag, at 45 Hz to 65 Hz			
Frequency setting	Range	AC : 40.00 Hz to 1500 Hz, ACHF : 40.00 Hz to 5000 Hz, ACDC : 1.00 Hz to 1500 Hz			
	Resolution	0.01 Hz(set < 100 Hz), 0.1 Hz(set < 1000 Hz), 1 Hz(set ≦ 5000 Hz)			
	Accuracy	±0.01% of set(23 °C ± 5 °C)			
Frequency stability [8]		±0.005 %			
Voltage frequency response [9]		45 Hz to 65 Hz : ±0.3 %, 40 Hz to 999.9 Hz : ±0.5 %, 1000 Hz to 5000 Hz : ±(2.0×fo)% fo : output frequency [kHz]			
Voltage distortion factor [10]		40 Hz to 550 Hz : 0.3 %, 550.1 Hz to 1500 Hz : 0.6×fo %, fo : output frequency [kHz]			
Output waveform		Sine, arbitrary (16 types), clipped sine (3 types)			
DC offset [11]		±20 mV (typ., fine adjustment available)			
Output on phase [12][13]		0.0° to 359.9°Variable Resolution : 0.1°			
Output off phase [12][13]		0.0° to 359.9°Variable（selectable between active or inactive） Resolution : 0.1°			
Phase angle setting (unbalanced mode)	Range	—		L1 and L2 phase : 0.0° to 359.9°	L1, L2 and L3 phase : 0.0° to 359.9°
	Resolution	—		0.1°	
Phase angle accuracy [14]		—		45 Hz to 65 Hz : ±0.5° 65 Hz to 5000 Hz : ±(0.44+0.9×fo)° fo : output frequency [kHz]	
DC output [V] = Vdc, [A] = Adc, unless otherwise specified.					
Rated		100 V / 200 V			
Output setting [15]		-227.0 V to +227.0 V / -454.0 V to +454.0 V Resolution : 0.1 V			
Voltage accuracy [16]		±(∣0.05 % of set∣ + 0.1 V / 0.2 V)			
Max. current [17]		20 A / 10 A	20 A × N / 10 A × N	20 A×(1+B) / 10 A×(1+B)	
Max. instantaneous current [18]		4 times value of maximum current.	3.5 times value of maximum current.		
Output power		2 kW	2 kW × N	4 kW×(1+B)	

[3] Specifications for phase voltage settings for 1P3W and 3P4W. In balanced mode, set all phases at once, and in unbalanced mode, set each phase individually. See [15] for DC voltage settings for 1P3W and ACDC modes.
[4] 10 V to 175 V / 20 V to 350 V, sine wave, no load, 45 Hz to 65 Hz, DC voltage setting. 0 V, 23 °C ± 5 °C : Specifications for phase voltage settings in multiphase systems. Accuracy of the system master unit or the phase master unit.
[5] Only 1P3W and 3P4W balanced mode and sine wave are possible.
[6] If the output voltage exceeds the rated output voltage, it will be limited (reduced) to below the power capacity. If there is DC superposition, the effective current value of AC + DC is within the maximum current. The maximum current may decrease at frequencies below 40 Hz or above 1500 Hz, and at ambient temperatures above 40 °C.
[7] Capacitor input type rectifier load, at rated output voltage, 45 Hz to 65 Hz.
[8] Rated output voltage, no load, and resistive load resulting in maximum current. 45 Hz to 65 Hz, over operating temperature range.
[9] Based on sine wave, rated output voltage, 55 Hz. At resistive load with maximum current.
[10] 80% or more of rated output voltage, maximum current or less (resistive load), AC, ACHF and ACDC, THD. Specifications for phase voltage settings for 1P3W and 3P4W.
[11] AC and ACHF, 23 °C ± 5 °C.
[12] For 1P3W and 3P4W, set to L1 phase.
[13] Cannot be set if the soft start or the soft stop is enabled.
[14] 50 V or more, same load conditions for all phases, and same voltage settings for all phases.
[15] For 1P3W, the voltage is set to L1 phase. The L2 phase outputs the same voltage as the L1 phase with the opposite polarity based on the Lo terminal.
  For example, if the voltage setting is +100 V, +100 V is output between the Hi-Lo terminals of the L1 phase, -100 V is output between the Hi-Lo terminals of the L2 phase, and the line between the Hi terminals of L1 and L2 is output. +200 V is output based on the Hi terminal of the L2 phase.
[16] -227 V to -10 V, +10 V to +227 V / -454 V to -20 V, +20 V to +454 V, no load, When AC setting is 0 V, 23 °C ± 5 °C.
[17] If the output voltage exceeds the rated output voltage, it will be limited (reduced) to below the power capacity. If there is AC superposition, the effective current value of DC + AC is within the maximum current. The maximum current may decrease if the ambient temperature is 40 °C or higher.
[18] Instantaneous means within 2ms, at rated output voltage.

■ Output voltage stability

	Single unit	1P2W system	1P3W system	3P4W system
Fluctuation with input voltage [19]	±0.15% (typ.)			
Fluctuation with output current [20]	DC, 10 Hz to 100 Hz : ±0.1 V / ±0.2 V, 100.1 Hz to 550 Hz : ±0.3 V / ±0.6 V, 550.1 Hz to 1500 Hz : ±1.0 V / ±2.0 V			
Fluctuation with ambient temperature [21]	±0.01%/°C (typ.)			

[19] Power input is 90 V to 250 V, based on power input of 200 V, rated output voltage, maximum current, DC or 45 Hz to 65 Hz, with resistive load. Does not include transient conditions immediately after input power supply voltage fluctuations. For 1P3W and 3P4W, these are specifications for phase voltage settings.
[20] When the output current is changed from 0% to 100% of the maximum current. Output voltage 50V to 160V/100V to 320V, standard at no load. However, when the output voltage is higher than the rated output voltage, the maximum current is limited by the power capacity. For 1P3W and 3P4W, these are specifications for phase voltage settings. From 10 Hz to 40 Hz, the peak value of the output current is within the maximum current.
[21] Power input 200 V, no load, rated output voltage, DC or 45 Hz to 65 Hz. For 1P3W and 3P4W, these are specifications for phase voltage settings.

■ Measurement Function

	Single unit	1P2W system	1P3W system	3P4W system
Voltage [22] (Full scale)				
RMS value	250.0 V / 500.0 V			
DC average	±250.0 V / ±500.0 V			
Peak value	±250.0 V / ±500.0 V			
Line Voltage RMS value [23]	–		500.0 V / 1000.0 V	433.0 V / 866.0 V
Line Voltage DC average [24]	–		500.0 V / 1000.0 V	–
Resolution	0.1 V			
Current [25] (Full scale)				
RMS value	24 A / 12 A	24 A×N / 12 A×N	24 A×(1+B) / 12 A×(1+B)	
RMS value Resolution	0.01 A (rdg < 100 A),0.1 A (rdg < 1000 A)			
DC average	±24 A / ±12 A	±24 A×N / ±12 A×N	±24 A×(1+B) / ±12 A×(1+B)	–
DC average Resolution	0.01 A (∣rdg∣< 100 A),0.1 A (∣rdg∣< 1000 A)			
Peak value	±96 A / ±48 A	±96 A×N / ±48A× N	±96 A×(1+B) / ±48 A×(1+B)	
Peak value Resolution	0.01 A (∣rdg∣< 100 A),0.1 A (∣rdg∣< 1000 A)			
Hold	Hold the maximum values of I max I and I min I with the polarity (with the clear function)			
Power [26][27] (Full scale)				
Active (W)	±2.4 kW	±2.4 kW×N		
Active (W) Resolution	1 W			
Apparent (VA) [28]	3.0 kVA	3.0 kVA×N		
Apparent (VA) Resolution	1 VA			
Load power factor [28]	-1.00 to +1.00 Resolution : 0.01			
Load crest factor	0.00 to 50.00 Resolution : 0.01			
Synchronization frequency (SYNC only)	38.0 Hz to 1575 Hz			
(SYNC only) Resolution	0.1 Hz(38.0 Hz to 999.9 Hz),1 Hz(1000 Hz to 1575 Hz)			
Harmonic analysis [29]				
Measurement target	output current, output voltage and sensing voltage			
Measurement item	effective value and percentage of effective value to fundamental wave			
Frequency range(fundamental wave)	40 Hz to 1000 Hz			
Measurement range [30]	1st to 50th order of fundamental wave			
Current (full scale)	24 A / 12A	24 A×N / 12A×N	24 A×(1+B) / 12 A×(1+B)	
Current (full scale) Resolution	0.01 A (rdg < 100 A), 0.1 A (rdg < 1000 A), 0.1 %			
Voltage (full scale)	250.0 V / 500.0 V			
Voltage (full scale) Resolution	0.1 V, 0.1%			

[22] Specifications for phase voltage for 1P3W and 3P4W. Measures the voltage of the system master unit or phase master unit.
[23] Displays the result calculated from the phase voltage measurement value and phase angle setting value assuming the output voltage waveform is a sine wave.
[24] Display calculated from phase voltage measurement results
[25] 1P3W and 3P4W are phase current specifications.
[26] When sine wave, output voltage is 50 V or more, and output current is 10% or more of the maximum current. For multi phase systems, the power value is calculated from the voltage of the system master unit or phase master unit.
[27] For 1P3W and 3P4W, the total of all phases can be displayed.
[28] DC mode is not displayed.
[29] For phase voltage or phase current in AC-INT mode (measurement does not comply with IEC standards)
[30] The maximum frequency that can be analyzed is 5000 Hz. The upper limit of the analysis order changes depending on the frequency of the fundamental wave.

■ Current Limiter

		Single unit	1P2W system	1P3W system	3P4W system
Peak current limiter					
Positive current	Setting range (peak value)	+10.0 A to +84.0 A / +5.0 A to +42.0 A	+10.0 A×N to +84.0 A×N / +5.0 A×N to +42.0 A×N	+10.0 A×(1+B) to +84.0 A×(1+B) / +5.0 A×(1+B) to +42.0 A×(1+B)	
Negative current	Setting range (peak value)	-84.0 A to -10.0 A / -42.0 A to -5.0 A	-84.0 A×N to -10.0 A×N / -42.0 A×N to -5.0 A×N	-84.0 A×(1+B) to -10.0 A×(1+B) / -42.0 A×(1+B) to -5.0 A×(1+B)	
Resolution [31]		0.1 A（∣set∣< 100 A),1 A（∣set∣< 1000 A)			
Limiter operation		Automatic recovery (continuous) or output turn-off when the limited state continues over the specified time (1 s to 10 s, resolution 1 s)			
RMS current limiter					
Setting range (RMS)		1.0 A to 21.0 A / 1.0 A to 10.5 A	1.0 A×N to 21.0 A×N / 1.0 A×N to 10.5 A×N	1.0 A×(1+B) to 21.0 A×(1+B) / 1.0 A×(1+B) to 10.5 A×(1+B)	
Resolution [31]		0.1 A (set < 100 A),1 A (set < 1000 A)			
Limiter operation		Automatic recovery (continuous) or output turn-off when the limited state continues over the specified time (1 s to 10 s, resolution 1 s)			

[31] When configuring 1P2W system and polyphase systems, the output resolution is N times or (1+B) times the setting resolution.

■ SPECIFICATION （continued）

■ Sequence Function

Number of memories	5 (nonvolatile)
Number of steps	255 max. (for each sequence)
Setting range of step time	0.0010 s to 999.9999 s
Operation within step	Constant, keep, linear sweep
Parameters	Output range , AC/DC mode, AC phase voltage, frequency, waveform, DC voltage, start phase, stop phase, phase angle, step termination, jump count (1 to 9999, or infinite), specification of the jump-to step, synchronous step output (2 bit), specification of the branch step, trigger output
Sequence control	Start, stop, hold, resume, branch 1, branch 2
Others	1) Sequence function works with AC-INT, ACDC-INT and DC-INT. 2) AC voltage, frequency, waveform, start phase and stop phase cannot be set with DC-INT. 3) Phase angle setting is only for the polyphase system.

■ Simulation

Number of memories	5 (nonvolatile).
Number of steps	6 (initial, normal 1, transition 1, abnormal, transition 2, normal 2).
Step time setting range	0.0010 s to 999.9999 s (0 s can be set for transition steps only).
Parameters	Output range, AC voltage, frequency, waveform (sine wave only), start phase (excluding transition steps), stop phase (excluding transition steps), synchronous step output (2 bit), trigger output, repeat count (1-9999 times or infinite).
Simulation control	Start, stop
Others	In simulation function, only AC and sine wave, only for ACDC-INT.

■ Control Software

Functions	Remote control	Parameter setting, saving, loading, and others.
	Status monitor	Monitors and displays status of connected equipment.
	Logging	Reads and saves measured values.
	Arbitrary waveform	Waveform creation and edit, transfer, display and file operations
	Sequence / simulation	Sequence data creation, edit, save, transfer, preview, execution control, monitor/display during execution, and others.
Environment	OS	Windows 10 / 11 (64bit)
	Interface	USB 2.0
	Software component	Microsoft .NET Framework 4.8

■ Other Functions

Setting limitation	Voltage (RMS)	Phase voltage, line to line voltage (1P3W, 3P4W)
	Frequency	Upper limit or lower limit.
Remote sensing		Voltage detection point is output terminal or sensing input terminal. (switchable)
AGC		Function for continuously performing automatic correction so that the RMS value of the detection point is equal to the voltage setting value. Response time less than 100 ms (typ.) (At DC/50 Hz/60 Hz, rated output voltage)
Autocal (Automatic calibration)		When the Autocal is on, the detection point is always measured, and the output voltage is continuously corrected so that its RMS value is equal to the output setting value.
Clipped sine wave	Number of memories	3 (nonvolatile)
	CF	Variable range: 1.10 to 1.41, setting resolution: 0.01, RMS value correction: yes
	Clipping rate	Variable range 40.0% to 100.0%, setting resolution: 0.1%, RMS value correction: no
Arbitrary wave	Number of memories	16 (nonvolatile)
	Waveform length	16K words
	Amplitude resolution	16-bit

（Continued）

External signal input	External sync input	Sync signal source switching: external sync signal (EXT) or power input (LINE), 40 Hz to 1500 Hz
	VCA input	Gain setting range: 0.0 to 227.0 times / 0.0 to 454.0 times Resolution: 0.1
	External signal input (EXT / ADD)	Gain setting range: 0.0 to 227.0 times / 0.0 to 454.0 times Resolution: 0.1 Input frequency range: DC to 1500 Hz (sine wave), DC to 550 Hz (not sine wave).
Memory function		Store and recall settings from nonvolatile memory
	Number of memories	Basic settings: 30, sequences: 5, simulations: 5, clipped sine waves: 3, arbitrary waves: 16
Protections		Protective operation for abnormal output (output over voltage, output over current, etc.), power unit error, and internal control error (internal communication error, etc.)
External control I/O		Enables control of the system using external signals (or no-voltage contacts) and state output.
Interface		USB [USB2.0, USBTMC-USB488] RS232 (not capable of binary transfer) GPIB (IEEE 488.1 std 1987, IEEE std.488.2-1992) LAN (IEEE 802.3, not capable of binary transfer)
USB memory		Usable memory: conforms to USB 2.0 Connector: USB-A (front panel) Readable/writable content: basic setting memory, sequence, AC line simulation, and arbitrary wave.
Soft start / soft stop		Gradually increase and decrease the output over a set time (0.1s to 30s).
High-impedance output off function		Turn off the output in high-impedance mode. Only applicable output relay control disabled
Output relay control		Selects either ON/OFF using output relay, or high-impedance without using output relay.
SHUTDOWN input		Forcefully turn off the output and initiate a shutdown through an external signal or contact
Output waveform monitor		Monitors waveform of output voltage or output current. (switchable)
LCD display		Contrast 0 to 99.
Others		Beep, key lock, output setting at power-on, trigger output setting, time unit setting (for sequence and simulation), reset function.

■ General

Power Input	Voltage	AC100 V to 230 V±10% (Max. voltage 250 V), 1P2W Overvoltage category II
	Frquency	50 Hz ±2 Hz or 60 Hz ±2 Hz
	Power factor[32]	0.95 or more (typ.)
	Efficiency[32]	80% or more (typ.)
	Power consumption	2.65 kVA or less
Withstanding voltage		AC 1500 V or DC 2130 V
Insulation resistance		30 MΩ or more (DC 500 V)
Operating environment		Indoor use, pollution 2
Altitude		2000 m or less
Operating conditions		0˚C to + 50˚C, 5% to 85% RH, (Absolute humidity 1 to 25 g/m³, no condensation)
Storage conditions		-10˚C to + 60˚C , 5% to 95% RH, (Absolute humidity 1 to 29 g/m³, no condensation)
Dimensions (mm)		430 (W) × 130 (H) × 650 (D), no protrusion
Weight		approx. 20 kg
Input / output terminal		Power input (M5), Output (M5), Sensing input (AWG 24 to 16)
Accessories		Instruction Manual, ferrite core, Cable tie, SHUT DOWN connector

＊32 AC-INT, rated output voltage, resistive load at max. current, 45 Hz to 65 Hz output

■ Option

- System Cable (Approx. 0.5 m)
- System Cable (Approx. 1 m)
- System Cable (Approx. 2 m)
- Rack Mount Adapter (inch)
- Rack Mount Adapter (mm)
- Replacement Air Filter
- Power cable (Approx. 3 m)