

# Genesis™

**Programmable DC Power Supplies  
5KW in 2U  
Built in RS-232 & RS-485 Interface  
Advanced Parallel Standard**

**Optional Interfaces:  
IEEE488.2 SCPI (GPIB)  
Isolated Analog Programming  
LXI Compliant LAN**



Schulz-Electronic GmbH  
Dr.-Rudolf-Eberle-Straße 2  
D-76534 Baden-Baden

Fon +49.7223.9636.0  
Fax +49.7223.9636.90

vertrieb@schulz-electronic.de  
www.schulz-electronic.de

**Schulz Electronic**  
Professional Power Supplies

The Genesys™ family of programmable power supplies sets a new standard for flexible, reliable, AC/DC power systems in OEM, Industrial and Laboratory applications.

## Features include:

- High Power Density 5kW in 2U
- Wide Range of popular worldwide AC inputs, 3 $\phi$  (208VAC, 400VAC)
- Active Power Factor Correction (Three-Phase AC Input)
- Output Voltage up to 600V, Current up to 600A
- Built-in RS-232/RS-485 Interface Standard
- Global Commands for Serial RS-232/RS-485 Interface
- Auto-Re-Start / Safe-Start: user selectable
- Last-Setting Memory
- High Resolution 16 bit ADCs & DACs
- Low Ripple & Noise
- Front Panel Lock selectable from Front Panel or Software
- Reliable Encoders for Voltage and Current Adjustment
- Constant Voltage/Constant Current auto-crossover
- Parallel Operation with Active Current Sharing; up to four identical units.
- Advanced Parallel Master / Slave. Total Current is Programmed and Measured via the Master.
- Independent Remote ON/OFF and Remote Enable/Disable
- External Analog Programming and Monitoring (user selectable 0-5V & 0-10V)
- Reliable Modular and SMT Design
- 19" Rack Mount capability for ATE and OEM applications
- Optional Interfaces
  - Isolated Analog Programming and Monitoring Interface (0-5V/0-10V & 4-20mA)
  - IEEE 488.2 SCPI (GPIB) Multi-Drop
  - LXI** Compliant LAN
- LabView® and LabWindows® drivers
- Five Year Warranty

Worldwide Safety Agency Approvals; CE Mark for LVD and EMC Regulation



## Applications

Genesys™ power supplies have been designed to meet the demands of a wide variety of applications. System Designers will appreciate new, standard, remote programming features such as Global commands. Also, new high-speed status monitoring is available for the RS-485 bus.

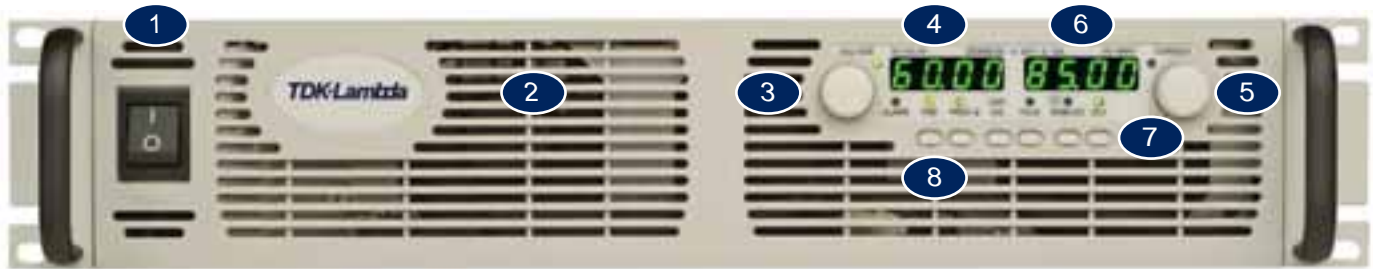
Test Systems using the IEEE-488 bus may achieve significant cost savings by incorporating the Optional IEEE Multi-Drop Interface for a Master and up to 30 RS-485 Multi-Drop Slaves.

Higher power systems can be configured with up to four 5kW modules. Each module is 2U with zero space between them (zero stack).

Flexible configuration is provided by the complete Genesys™ Family: 1U 750W Half-Rack, 1U 750W/1500W 2U 3.3kW/5kW Full-Rack. All are identical in Front Panel, Rear Panel Analog, and all Digital Interface Commands.

OEM Designers have a wide variety of Inputs and Outputs from which to select depending on application and location.

## Front Panel Description



1. ON/OFF Switch
2. Air Intake allows zero stacking for maximum system flexibility and power density.
3. Reliable encoder controls Output Voltage, Address, OVP and UVL settings.
4. Volt Display shows Output Voltage and directly displays OVP, UVL and Address settings.
5. Reliable encoder controls Output Current, sets baudrate and Advanced Parallel mode.
6. Current Display shows Output Current and displays Baud rate. Displays total current in Parallel Master/Slave Mode
7. Function/Status LEDs:
  - Alarm
  - Foldback Mode
  - Fine Control
  - Remote Mode
  - Preview Settings
  - Output On
8. Pushbuttons allow flexible user configuration
  - Coarse and Fine adjustment of Output Voltage/Current and Advanced Parallel Master or Slave
  - Preview settings and set Voltage/Current with Output OFF, Front Panel Lock
  - Parallel Master/Slave
  - Set OVP and UVL Limits
  - Set Current Foldback Protection
  - Go to Local Mode and select Address and Baud rate
  - Output ON/OFF and Auto-Re-Start/Safe-Start Mode

## Rear Panel Description



1. Remote/Local Output Voltage Sense Connections.
2. DIP Switches select 0-5V or 0-10V Programming and other functions.
3. DB25 (Female) connector allows (Non-isolated) Analog Program and Monitor and other functions.
4. RS-485 OUT to other Genesys™ Power Supplies.
5. RS-232/RS-485 IN Remote Serial Programming.
6. Output Connections: Rugged busbars (shown) for up to 100V Output; wire clamp connector for Outputs >100V.
7. Exit air assures reliable operation when zero stacked.
8. Input: 208 & 400VAC Three Phase, 50/60 Hz  
AC Input Connector: PHOENIX CONTACT Power Combicon PC 6/... Series with strain relief.
9. Optional Interface Position for IEEE 488.2 SCPI (shown) or Isolated Analog Interface or LAN Interface.

# Genesys™ 5kW Specifications

1.0 MODEL	GEN	8-600	10-500	16-310	20-250	30-170	40-125	60-85	80-65	100-50	150-34	300-17	600-8.5
1. Rated output voltage(*1)	V	8	10	16	20	30	40	60	80	100	150	300	600
2. Rated Output Current(*2)	A	600	500	310	250	170	125	85	65	50	34	17	8.5
3. Rated Output Power	W	4800	5000	4960	5000	5100	5000	5100	5200	5000	5100	5100	5100
4. Development Priority	---	A	C	B	C	B	B	A	C	C	A	B	A

## 1.1 CONSTANT VOLTAGE MODE

1. Max. line regulation (0.01% of rated Vo+ 2mV)(*6)	mV	0.8	1.0	1.6	2	3	4	6	8	10	15	30	60	
2. Max. load regulation (0.015% of rated Vo+5mV)(*7)	mV	6.2	6.5	7.4	8	9.5	11	14	17	20	27.5	50	95	
3. Ripple and noise p-p 20MHz(*8)	mV	70	70	70	70	70	70	70	80	100	120	200	500	
4. Ripple r.m.s 5Hz~1MHz	mV	10	10	10	10	10	10	10	12	15	25	35	120	
5. Remote sense compensation/wire	V	2	2	2	2	5	5	5	5	5	5	5	5	
6. Temp. coefficient	PPM/°C	100PPM/°C of rated output voltage, following 30 minutes warm-up												
7. Temp. stability		0.05% of rated Vout over 8hrs interval following 30 minutes warm-up. Constant line, load & temp.												
8. Warm-up drift		Less than 0.05% of rated output voltage+2mV over 30 minutes following power On.												
9. Up-prog. response time, 0~Vo Rated(*9)	mS	80mS						150mS						250
10. Down-prog response time	Full-load(*9)	mS	20	100			160			300			500	
	No-load(*10)	mS	500	600	700	800	900	1000	1100	1200	1500	2000	3500	4000
11. Transient response time	mS	Time for output voltage to recover within 0.5% of its rated output for a load change 10-90% of rated output current. Output set-point: 10-100%, local sense. Less than 1mSec for models up to and including 100V. 2msec for models above 100V												

## 1.2 CONSTANT CURRENT MODE

1. Max. line regulation (0.01% of rated Io+ 2mA)(*6)	mA	300	250	155	125	85	62.5	42.5	32.5	25	17	8.5	4.25
2. Max. load regulation (0.02% of rated Io+5mA)(*11)	mA	600	500	310	250	170	125	85	65	50	34	17	8.5
3. Ripple r.m.s 5Hz~1MHz. (*12)	mA	1950	1800	1400	1000	460	300	150	120	100	90	30	15
5. Temp. coefficient	PPM/°C	200PPM/°C from rated output current, following 30 minutes warm-up.											
6. Temp. stability		0.05% of rated Iout over 8hrs. interval following 30minutes warm-up. Constant line, load & temperature.											
7. Warm-up drift		8V~40V models: Less than 0.5% of rated output current over 30 minutes following power On. 60V~600V models: Less than 0.25% of rated output current over 30 minutes following power On.											

## 1.3 PROTECTIVE FUNCTIONS

1. OCP	0~105% Constant Current
2. OCP Foldback	Output shut down when power supply change from CV to CC. User selectable.
3. OVP type	Inverter shut-down, manual reset by AC input recycle or by OUI button or by communication port command.
4. OVP trip point	0.5~10V   0.5~12V   1~19V   1~24V   2~36V   2~44.1V   5~66.15V   5~88.2V   5~110.25V   5~165.3V   5~330.7V   5~661.5V
5. Output Under Voltage Limit	Preset by front panel or communication port. Prevents from adjusting Vout below limit.
6. Over Temp. Protection	User selectable, latched or non-latched.

## 1.4 ANALOG PROGRAMMING AND MONITORING

1. Vout Voltage Programming	0~100%, 0~5V or 0~10V, user select. Accuracy and linearity: ±0.5% of rated Vout.
2. Iout Voltage Programming(*13)	0~100%, 0~5V or 0~10V, user select. Accuracy and linearity: ±1% of rated Iout.
3. Vout Resistor Programming	0~100%, 0~5/10Kohm full scale, user select. Accuracy and linearity: ±1% of rated Vout.
4. Iout Resistor Programming(*13)	0~100%, 0~5/10Kohm full scale, user select. Accuracy and linearity: ±1.5% of rated Iout.
5. On/Off control (rear panel)	By electrical. Voltage: 0~0.6V/2~15V, or dry contact, user selectable logic.
6. Output Current monitor(*13)	0~5V or 0~10V, Accuracy: ±1%, user selectable.
7. Output Voltage monitor	0~5V or 0~10V, Accuracy: ±1%, user selectable.
8. Power Supply OK signal	TTL high (4~5V) -OK, 0V-Fail 500ohm series resistance.
9. CV/CC Indicator	CV: TTL high (4~5V) source: 10mA, CC: TTL low (0~0.6V), sink current: 10mA.
10. Enable/Disable	Dry contact. Open: off, Short: on. Max. voltage at Enable/Disable in: 6V.
11. Local/Remote analog control	By electrical signal or Open/Short: 0~0.6V or short; Remote, 4~5V or open; Local.
12. Local/Remote analog control Indicator	Open collector, Local: Off, Remote: On. Maximum voltage: 30V, maximum sink current: 10mA.

## 1.5 FRONT PANEL

1. Control functions	Vout/ Iout manual adjust by separate encoders (coarse and fine adjustment selectable).
	OVP/UVL manual adjust by Volt. Adjust encoder.
	On/Off, Output on/off, Re-start modes (auto, safe), Foldback control (CV to CC), Go to local control.
	Address selection by Voltage (or current) adjust encoder. Number of addresses: 31.
	Re-start modes (automatic restart, safe mode).
2. Display	Baud rate selection: 1200, 2400, 4800, 9600 and 19200.
	Voltage: 4 digits, Accuracy: 0.5% of rated output Voltage ±1 count. Current: 4 digits, Accuracy: 0.5% of rated output current ±1 count.
3. Indications	Voltage, Current, Alarm, Fine, Preview, Foldback, Local, Output On, Front Panel Lock, CVCC.

## 1.6 Interface RS-232&RS-485 or Optional GPIB / LAN Interface

Model	V	8	10	16	20	30	40	60	80	100	150	300	600
1. Remote Voltage Programming (16 bit)													
Resolution (0.012% of Vo Rated)	mV	0.96	1.2	1.92	2.4	3.6	4.8	7.2	9.6	12	18	36	72
Accuracy (0.05%Vo Rated+0.05% of Vo Actual Output)	mV	8	10	15	20	30	40	60	80	100	150	300	600
2. Remote Current Programming (16 bit)													
Resolution (0.012% of Io Rated)	mA	72	60	37.2	30	20.4	15	10.2	7.8	6.0	4.08	2.04	1.02
Accuracy (0.2% of Io Rated+0.1% of Io Actual Output)(*13)	mA	2400	2000	1240	1000	680	500	340	260	200	136	68	34
3. Readback Voltage													
Resolution (0.012% of Vo Rated)	mV	0.96	1.2	1.92	2.40	3.60	4.80	7.2	9.6	12	18	36	72
Accuracy (0.1%Vo Rated+0.1% of Vo Actual Output)	mV	16	15	24	30	45	60	90	120	150	225	450	900
4. Readback Current													
Resolution (0.012% of Io Rated)	mA	72	60	37.2	30	20.4	15	10.2	7.8	6.0	4.08	2.04	1.02
Accuracy (0.3% of Io Rated+0.1% of Io Actual Output)(*13)	mA	2400	2000	1240	1000	680	500	340	260	200	136	68	34
5. OVP/UVL Programming													
Resolution (0.1% of Vo Rated)	mV	8	10	16	20	30	40	60	80	100	150	300	600
Accuracy (1% of Vo Rated)	mV	80	100	160	200	300	400	600	800	1000	1500	3000	6000

\*1: Minimum voltage is guaranteed to maximum 0.2% of rated output voltage.

\*2: Minimum current is guaranteed to maximum 0.4% of rated output current.

\*3: For cases where conformance to various safety standards (UL, IEC, etc) is required, to be described as 190-240Vac (50/60Hz) for 3-Phase 208V models, and 380~415Vac (50/60Hz) for 3-Phase 400V models.

\*4: 3-Phase 208V models: At 208Vac input voltage, 3-Phase 400V: At 380Vac input voltage. With rated output power.

\*5: Not including EMI filter inrush current, less than 0.2mSec.

\*6: 3-Phase 208V models: 170~265Vac, constant load. 3-Phase 400V models: 342~460Vac, constant load.

\*7: From No-Load to Full-Load, constant input voltage. Maximum drop in Remote Sense.

\*8: For 8V~300V models: Measured with JEITA RC-9131A (1:1) probe. For 600V model: Measured with 10:1 probe.

\*9: From 10% to 90% or 90% to 10% of Rated Output Voltage, with rated, resistive load.

\*10: From 90% to 10% of Rated Output Voltage.

\*11: For load voltage change, equal to the unit voltage rating, constant input voltage.

\*12: For 8V~16V models the ripple is measured from 2V to rated output voltage and rated output current. For other models, the ripple is measured at 10~100% of rated output voltage and rated output current.

\*13: The Constant Current programming readback and monitoring accuracy does not include the warm-up and Load regulation thermal drift.

# General Specifications Genesys™ 5kW

2.1 INPUT CHARACTERISTICS		GEN	8-600	10-500	16-310	20-250	30-170	40-125	60-85	80-65	100-50	150-34	300-17	600-8.5
1. Input voltage/freq. (*3)		VAC	3-Phase 200Vac , 208Vac and 230Vac Models : 170-265Vrms , 47-63Hz 3-Phase, 400V models: 342-460Vac, 47-63Hz											
2. Maximum Input current at 100% load	3-Phase, 170V models:		21.4	22.1	21.9	21.5	22.0	21.0	21.5	21.9	21.0	21.2	21.5	21.5
	3-Phase, 342V models:		10.7	11.0	10.9	10.7	10.9	10.5	10.7	10.9	10.5	10.5	10.7	10.7
3. Power Factor (Typ)			0.94 AT 100% LOAD AND 208V/380V/400V/415V											
4. INRUSH PEAK CURRENT		A	3-Phase 200V: 50A, 3-Phase 400V: 20A. Not including the EMI filter inrush current, less than 0.2mSec.											
5. EFFICIENCY AT 200V AND 380V			28	84	84	86	86	88	88	88	88	88	88	87
6. EFFICIENCY AT 170V AND 342V			18	82	82	84	84	86	86	86	86	87	86	86
7. HOLD UP TIME (CV MODE)		mS	5mS Typical											
8. PHASE IMBALANCE		%	≤5%											
9. LEAKAGE CURRENT			LESS THAN 3mA											

## 2.2 POWER SUPPLY CONFIGURATION

1. Parallel Operation	Up to 4 identical units in master/slave mode
2. Series Operation	Up to 2 identical units. with external diodes. 600V Max to Chassis ground

## 2.3 ENVIRONMENTAL CONDITIONS

1. Operating temp	0-50°C, 100% load.
2. Storage temp	-30-85°C
3. Operating humidity	20-90% RH (non-condensing).
4. Storage humidity	10-95% RH (non-condensing).
5. Vibration	MIL-810F, method 514.5 , The EUT is fixed to the vibrating surface.
6. Shock	Less than 20G , half sine , 11mSec. Unit is unpacked.
7. Altitude	Operating: 10000ft (3000m), Derate output current by 2%/100m above 2000m, Alternatively, derate maximum ambient temp. by 1°C/100m above 2000m. Non operating: 40000ft (12000m).
8. RoHS Compliance	Complies with the requirements of RoHS directive.

## 2.4 EMC

1. Applicable Standards:	
2. ESD	IEC1000-4-2. Air-disch.-8KV, contact disch.-4KV
3. Fast transients	IEC1000-4-4, 2KV
4. Surge immunity	IEC1000-4-5. 1KV line to line, 2KV line to ground
5. Conducted immunity	IEC1000-4-6, 3V
6. Radiated immunity	IEC1000-4-3, 3V/m
7. Magnetic field immunity	EN61000-4-8, 1A/m
8. Voltage dips	EN61000-4-11
9. Conducted emission	EN55022A, FCC part 15-A, VCCI-A.
10. Radiated emission	EN55022A, FCC part 15-A, VCCI-A.

## 2.5 SAFETY

1. Applicable standards:	CE Mark, UL60950, EN60950 listed. Vout≤40V: Output is SELV , IEEE/Isolated analog are SELV. 40<Vout≤400V: Output is hazardous, IEEE/Isolated analog are SELV. 400<Vout≤600V: Output is hazardous, IEEE/Isolated analog are not SELV.
2. Withstand voltage	Vout≤40V models : Input-Outputs (SELV): 4242VDC 1min, Input-Ground: 2828VDC 1min. 40<Vout≤100V models: Input-Haz. Output: 2600VDC 1min, Input-SELV: 4242VDC 1min. Hazardous Output.-SELV: 1900VDC 1min, Hazardous Output-Ground:1200VDC 1min. Input-Ground: 2828VDC 1min. 100<Vout≤600V models: Input-Haz. Output: 4000VDC 1min, Input-SELV: 4242VDC 1min. Hazardous Output.-SELV: 3550VDC 1min. Hazardous Output-Ground:2670VDC 1min. Input-Ground: 2828VDC 1min.
3. Insulation resistance	More than 100Mohm at 25°C , 70% RH.

## 2.6 MECHANICAL CONSTRUCTION

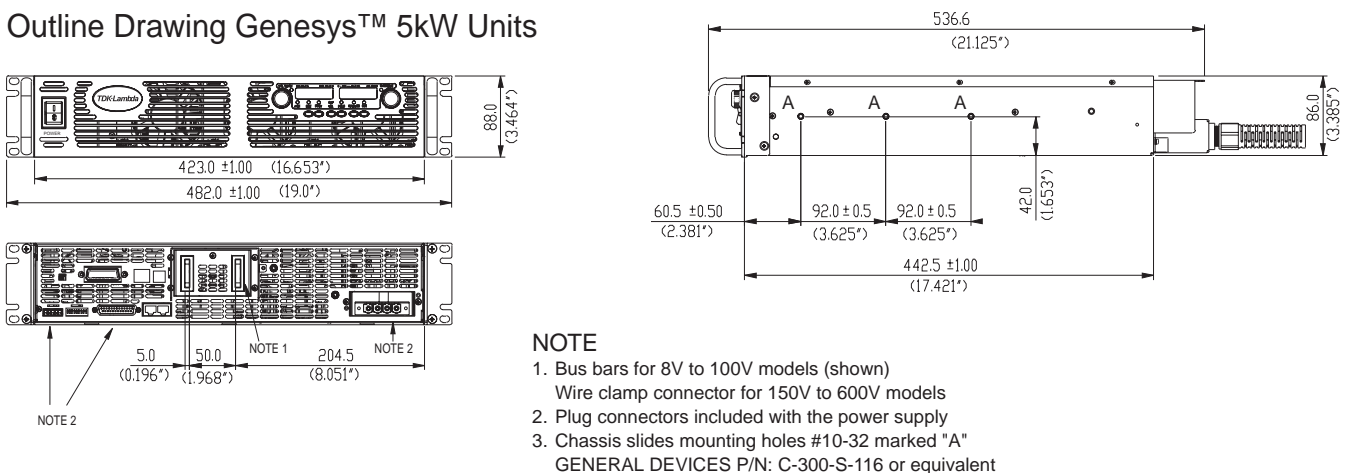
1. Cooling	Forced air flow: from front to rear. No ventilation holes at the top or bottom of the chassis; Variable fan speed.
2. Dimensions (WxHxD)	W: 423mm, H: 88mm, D: 442.5mm (excluding connectors, encoders, handles, etc.)
3. Weight	13 kg.
4. AC Input connector (with Protective Cover)	3-Phase, 208V & 400V models, Power Combicon PC 6-16/4-GF-10,16 series, with Strain relief.
5. Output connectors	8V to 100V models: Bus-bars (hole Ø 10.5mm). 150V to 600V models: wire clamp connector, Phoenix P/N: FRONT-4-H-7.62

## 2.7 RELIABILITY SPECS

1. Warranty	5 years.
-------------	----------

All specifications subject to change without notice.

## Outline Drawing Genesys™ 5kW Units



### NOTE

1. Bus bars for 8V to 100V models (shown)  
Wire clamp connector for 150V to 600V models
2. Plug connectors included with the power supply
3. Chassis slides mounting holes #10-32 marked "A"  
GENERAL DEVICES P/N: C-300-S-116 or equivalent

## Genesys™ Power Parallel and Series Configurations

### Parallel operation - Master/Slave:

Active current sharing allows up to four identical units to be connected in an auto-parallel configuration for four times the output power.

In Advanced Parallel Master/Slave Mode, total current is programmed and reported by the Master, Up to four supplies act as one.

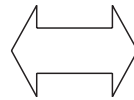


### Series operation

Up to two units may be connected in series to increase the output voltage or to provide bipolar output. (Max 600V to Chassis Ground).

## Remote Programming via RS-232 & RS-485 Interface

Standard Serial Interface allows daisy-chain control of up to 31 power supplies on the same communication bus with built-in RS-232 & RS-485 Interface.



## Programming Options (Factory installed)

### Digital Programming via IEEE Interface

P/N: IEEE

- IEEE 488.2 SCPI Compliant
- Program Voltage
- Measure Voltage
- Over Voltage setting and shutdown
- Error and Status Messages
- **New!** Multi-Drop
  - Allows IEEE Master to control up to 31 slaves over RS-485 daisy-chain
  - Only the Master needs be equipped with IEEE Interface
- Program Current
- Measure Current
- Current Foldback shutdown

### Isolated Analog Programming

Four Channels to Program and Monitor Voltage and Current.

Isolation allows operation with floating references in harsh electrical environments.

Choose between programming with Voltage or Current.

Connection via removable terminal block: Phoenix MC1,5/8-ST-3.81.

- Voltage Programming, user-selectable 0-5V or 0-10V signal. P/N: IS510  
 Power supply Voltage and Current Programming Accuracy  $\pm 1\%$   
 Power supply Voltage and Current Monitoring Accuracy  $\pm 1.5\%$
- Current Programming with 4-20mA signal. P/N: IS420  
 Power supply Voltage and Current Programming Accuracy  $\pm 1\%$   
 Power supply Voltage and Current Monitoring Accuracy  $\pm 1.5\%$

### LAN Interface

**LXI** Compliant to Class C

P/N: LAN

- Meets all LXI-C Requirements
- Address Viewable on Front Panel
- Fixed and Dynamic Addressing
- Compatible with most standard Networks
- VISA & SCPI Compatible
- LAN Fault Indicators
- Auto-detects LAN Cross-over Cable
- Fast Startup

# Power Supply Identification / Accessories

## How to order

<u>GEN</u>	<u>8</u>	-	<u>600</u>	-		
Series Name	Output Voltage (0~8V)		Output Current (0~600A)		Factory Options: Option: IEEE IS510 IS420 LAN	Factory AC Input Options: 3P208 (Three Phase 170~265VAC) 3P400 (Three Phase 342~460VAC)

## Models 5kW

Model	Output Voltage VDC	Output Current (A)	Output Power (W)
GEN 8-600	0~8V	0~600	4800
GEN 10-500	0~10V	0~500	5000
GEN 16-310	0~16V	0~310	4960
GEN 20-250	0~20V	0~250	5000
GEN 30-170	0~30V	0~170	5100
GEN 40-125	0~40V	0~125	5000

Model	Output Voltage VDC	Output Current (A)	Output Power (W)
GEN 60-85	0~60V	0~85	5100
GEN 80-65	0~80V	0~65	5200
GEN 100-50	0~100V	0~50	5000
GEN 150-34	0~150V	0~34	5100
GEN 300-17	0~300V	0~17	5100
GEN 600-8.5	0~600V	0~8.5	5100

## Factory option

RS-232/RS-485 Interface built-in Standard	P/N
GPIB Interface	-
Voltage Programming Isolated Analog Interface	IEEE
Current Programming Isolated Analog Interface	IS510
LAN Interface (Complies with <b>LXI</b> Class C)	IS420
	LAN

## Accessories

### 1. Serial Communication cable

RS-232/RS-485 cable is used to connect the power supply to the Host PC.

Mode	RS-485	RS-232	RS-232
PC Connector	DB-9F	DB-9F	DB-25F
Communication Cable	Shield Ground L=2m	Shield Ground L=2m	Shield Ground L=2m
Power Supply Connector	EIA/TIA-568A (RJ-45)	EIA/TIA-568A (RJ-45)	EIA/TIA-568A (RJ-45)
P/N	GEN/485-9	GEN/232-9	GEN/232-25

### 2. Serial link cable\*

Daisy-chain up to 31 Genesys™ power supplies.

Mode	Power Supply Connector	Communication Cable	P/N
RS-485	EIA/TIA-568A (RJ-45)	Shield Ground L=50cm	GEN/RJ45

\* Included with power supply

**Also available, Genesys™  
1U full Rack 750W/1500W  
& Half Rack 750W  
2U full Rack 3300W**

