# Genesys

**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



Genesys™ Family

750W Half Rack GEN H

GEN 1U 750/1500W Full Rack

GEN 2U 3.3/5kW

**GEN 3U 10/15kW** 

TDK·Lambda

www.us.tdk-lambda.com/hp

The Genesys<sup>TM</sup> 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, 3Ø (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

**USB** Interface

- LabView and LabWindow™ drivers
- Five Year Warranty

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





## **Applications**

**Genesys<sup>TM</sup>** 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. Then up to 30 Slaves may be equipped with the less expensive Optional RS-485 Multi-Drop (MD) interface.

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 GenesysTM 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.

1 | Genesys™ 5kW 2U

## 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 Baud rate 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
- Fine Control
- Preview Settings

- Foldback Mode
- Remote Mode
- 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/Safe Re-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.
- 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, LAN or USB 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
.Rated Output Current(*2)		Α	600	500	310	250	170	125	85	65	50	34	17	8.5
B.Rated Output Power		W	4800	5000	4960	5000	5100	5000	5100	5200	5000	5100	5100	5100
1.1 CONSTANT VOLTAGE MODE														
1.Max.line regulation (0.01% of rate		mV	0.8	1	1.6	2	3	4	6	8	10	15	30	60
2.Max load regulation (0.015% of r		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	75	75	75	75	75	75	75	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/wir 6.Temperature coefficient	re	V DDM/°C	2 100PPM/°0	2 C of rotad or	2	2 a following	5 20 minutos	5	5	5	5	5	5	5
7.Temperature stability		FFIVI/ C		ated Vout ov					Constant	line load &	temn			
8.Warm-up drift				0.05% of ra							тепір.			
9.Up-prog. response time, 0~Vo Ra	ated (*9)	mS	LCGG triair	0.00 /0 01 14	3		¥ 0401 00 11	illiates ione	ling power	O11.	50			100
10.Down-prog response time	Full-load (*9)	mS	15		50			80				00		200
	No-load (*10)	mS	400	500	600	700	800	900	1000	1200	1500	2000	2500	3000
11.Transient response time	•	mS		utput voltage									t. Output se	t-point:
			10-100%, I	ocal sense.	Less than	1mSec for	models up t	to and inclu	ding 100V.	2msec for i	models abo	ve 100V		
1.2 CONSTANT CURRENT MODE	≣													
1.Max.line regulation (0.05% of lo		mA	300	250	155	125	85	62.5	42.5	32.5	25	17	8.5	4.25
2.Max.load regulation (0.1% of lo r		mA	600	500	310	250	170	125	58	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
4.Temperature coefficient		PPM/°C		C from rated										
5.Temperature stability				ated lout ov								э.		
6.Warm-up drift				odels: Less models: Le										
		l	20V~600V	models: Le	SS than ±0.	25% OI Tale	a output cu	irrent over 3	o minutes i	ollowing po	wer On.			
1.3 PROTECTIVE FUNCTIONS														
1. OCP			<del></del>	onstant Cur		<del> </del>	,	00.11						
2. OCP Foldback				ut down whe										
3. OVP type				ut-down, ma									L . 000 71/	T = 004 EV
4. OVP trip point				0.5~12V	1~19V	1~24V	2~36V	2~44.1V	5~66.15V	5~88.2V	5~110.25V	5~165.34	5~330.7V	5~66 I.5V
Over Temperature Protection     Output Under Voltage Limit			User selectable , latched or non-latched.  Preset by front panel or communication port. Prevents from adjusting Vout below limit.											
•			I leadt by i	Torre parior c	7 0011111111111	battori port.	1 TOVOITED III	om aajaoan	g vour boio	·				
1.4 ANALOG PROGRAMMING AN	ND MONITORING		In 1000/ 0	51/ 0 /	2) /									
1. Vout Voltage Programming (*12)			0~100%, 0	~5V or 0~10 ~5V or 0~10	OV, user sel	ect. Accura	cy and lines	arity:±0.5%	of rated Vol	Jt.				
2.lout Voltage Programming (*13) 3.Vout Resistor Programming				~5/10Kohm						ad Vout				
4.lout Resistor Programming (*13)			<del></del>	~5/10Kohm										
5.On/Off control (rear panel)				al. Voltage:						ed lout.	-			
6.Output Current monitor (*13)				-10V , Accu				COICCIADIC	iogio:					
7.Output Voltage monitor				-10V ,Accur										
8.Power Supply OK signal				4~5V) -OK,				9.						
9. CV/CC Indicator			Open Colle	ector. CC Mo	ode: ON, C	V Mode: OF	F. Maximur	m Voltage: 3	30V, Maximu	ım sink cur	rent: 10mA.			
10. Enable/Disable				t. Open:off										
11. Local/Remote analog control				al signal or										
12. Local/Remote analog control Ir	ndicator		Open colle	ctor, Local:	Off, Remote	e: On. Maxii	mum voltag	e: 30V, max	imum sink	current: 10r	mA.			
1.5 FRONT PANEL														
1.Control functions			Vout/ lout r	manual adju	st by separ	ate encode	rs (coarse a	and fine adj	ustment sel	ectable).				
				manual adju										
				tput ON/OF							ocal control			
			1	election by \	0 (	, ,		r. Number of	f addresses	:31.				
			I	odes (autor										
2.Display				selection: 12 digits , Accu				1 1 00·····						
2.Diopiay				digits, Accu	,									
3.Indications				urrent, Alarr					Front Pane	LLock CV/	'CC			
	0-4		Tronage, O	anoni, Alan	,, . 16	, 1 0100	aon, Loudi,	Juiput OII,	. Tork Faile	. 2001, 0 1/	<del></del>			
1.6 Interface RS-232&RS-485 or	Optional GPIB / LAN I	nterface					20	- 10			100	150	200	
Model	(1C his)	V	8	10	16	20	30	40	60	80	100	150	300	600
1. Remote Voltage Programming Resolution (0.012% of Vo Rated)	( וט טונ)	mV	0.96	1.2	1.92	2.4	3.6	4.8	7.2	9.6	12	18	36	72
Accuracy (0.1% of Vo Rated)		mV	8	10	16	20	30	4.0	60	80	100	150	300	600
, ,	(40.1 !!)													
2. Remote Current Programming	g (16 bit)	^			070		00 1		10.0			4.00		100
Resolution (0.012% of lo Rated) Accuracy(0.3% of loRated+0.1% of	f InActual Output\*10	mA mA	72 2400	2000	37.2 1240	30 1000	20.4 680	15 500	10.2 340	7.8 260	6 200	4.08 136	2.04 68	1.02 34
	i ionuluai Oulpul) 13	IIIA	2400	2000	1240	1000	000	500	340	200	200	130	00	- 34
3. Readback Voltage														
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 (0.15% of Vo Rated)		mV	12	15	24	30	45	60	90	120	150	225	450	900
4. Readback Current														
Resolution (0.012% of lo Rated)		mA	72	60	37.2	30	20.4	15	10.2	7.8	6	4.08	2.04	1.02
Accuracy (0.4% of lo Rated)(*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

- 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. At 208Vac input voltage, 3-Phase 400V: At 380Vac input voltage. With rated output power.
- Not including EMI filter inrush current, less than 0.2mSec.

Accuracy (1% of Vo Rated)

- \*6: 3-Phase 208V models: 170~265Vac, constant load. 3-Phase 400V models: 342~460Vac, constant load
- 300 1500 From No-Load to Full-Load, constant input voltage. Maximum drop in Remote Sense
- 800 For 8V~300V models: Measured with JEITA RC-9131A (1:1) probe. For 600V model: Measured with 10:1 probe.

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

## Genesys<sup>™</sup> 5kW Specifications

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, 2 3-Phase, 4											
2. Maximum Input 3-Phase, 208V models:	Arms	20.7	21.5	21.4	21	21.5	20.6	20.5	21.4	20.6	21	21	21
current at 100% load 3-Phase, 400V models:	Arms	10.3	10.7	10.6	10.5	10.2	10.2	10.2	10.6	10.2	10.4	10.4	10.4
3.Power Factor (Typ)		0.94 at 100	% load an	d 208V/380	V/400V/415	V							
4. Inrush Current	Α	3-Phase 20	00V: 50A,	3-Phase 40	0V: 20A. No	t including t	he EMI filte	r inrush cur	rent, less th	nan 0.2mSe	c.		
5. Efficiency at 200V and 380V	%	84	84	84	86	86	88	90	88	88	88	88	88
6. Efficiency at 170V and 342V	%	84	84	84	86	86	88	90	88	88	88	88	88
7. Hold up time (CV Mode)	mS	5mS typica	ıl										
8. Phase Imbalance		≤5%											
9. Leakage Current		lees than 3	mA										

2.2 POWER SUPPLY CONFIGURATION

	Up to Four (4) identical units may be connected in Master/Slave Mode with two wire connection. In Advanced parallel feature, the current of Master Unit, multiplied by number of units connected in parallel, is made available on digital interface and displayed on front panel of Master unit. Remote analog current monitor of the Master is scaled to output current of the Master unit (only).
2. Series Operation	Possible (with external diodes), up to identical 2 units with total output not to exceed +/-600V from chassis ground.

2.3 ENVIRONMENTAL CONDITIONS

Operating temp	0~50°C, 100% load.
2. Storage temp	-20~85°C
3. Operating humidity	20~90% RH (non-condensing).
Storage humidity	10~95% RH (non-condensing).
	MIL-STD-810F, method 514.5, The EUT is fixed to the vibrating surface.  Less than 20G, half sine, 11mSec. Unit is unpacked.  ASTM D4169, Standard Practice for Performance Testing of Shipping Containers and Systems, Shipping Unit: Single Package  Assurance Level: Level II; Acceptance Criteria: Criterion 1 - No product damage Criterion 2 - Packaging is intact, Distribution Cycle: 12 -  Air (intercity) and motor freight (local), unitized is used
6. Altitude	Operating: 10000ft (3000m), Derate output current by 2%/100m above 2000m, Non operating: 40000ft (12000m).

2.4 EMC

1. Applicable Standards:	
2. ESD	IEC1000-4-2. Air-disch8kV, contact disch4kV
3. Fast transients	IEC1000-4-4. 2kV
Surge immunity	IEC1000-4-5. 1kV line to line, 2kV line to ground
5. Conducted immunity	IEC1000-4-6, 3V
Radiated immunity	IEC1000-4-3, 3V/m
7. Magnetic field immunity	EN61000-4-8, 1A/m
8. Voltage dips	EN61000-4-11
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: analog="" are="" hazardous,="" ieee="" is="" isolated="" output="" selv.<="" td=""><td></td></vout≤400v:>	
	400 <vout≤600v:output analog="" are="" hazardous,="" ieee="" is="" isolated="" not="" selv.<="" td=""><td></td></vout≤600v:output>	
2.Withstand voltage	Vout≤40V models :Input-Outputs (SELV): 4242VDC 1min, Input-Ground: 2828VDC 1min.	
	40 <vout≤100v 1min,="" 1min.<="" 2600vdc="" 4242vdc="" input-haz.="" input-selv:="" models:="" output:="" td=""><td></td></vout≤100v>	
	Hazardous OutputSELV: 1900VDC 1min, Hazardous Output-Ground:1200VDC 1min. Input-Ground: 2828VDC 1min.	
	100 <vout≤600v 1min,="" 1min.<="" 4000vdc="" 4242vdc="" input-haz.="" input-selv:="" models:="" output:="" td=""><td></td></vout≤600v>	
	Hazardous OutputSELV: 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

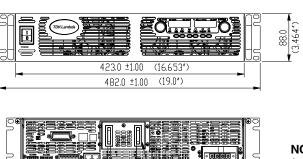
1. Cooling	Forced air flow: from front to rear. No ventilation holes at the top or bottom of the chassis; Variable fan speed.
2. Dimensions (WxHxD)	W: 423mm / 16.65" H: 88mm / 3.46", D: 442.5mm / 17.42" (excluding connectors, encoders, handles, etc.)
3. Weight	16 kg. / 35.2lbs
4. AC Input connector (with 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

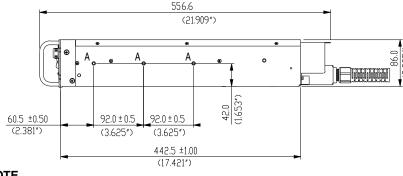
2.7 Warranty

1. Warranty

5 year

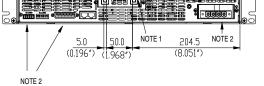
## Outline Drawing Genesys™ 5kW Units





#### NOTE

- Bus bars for 8V to 100V models (shown)
   Wire clamp connector for 150V to 600V models
- 2. Plug connectors included with the power supply
- 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

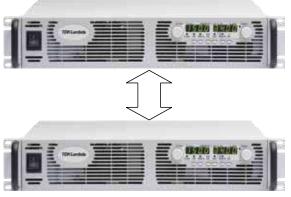
Up to two units may be connected in series to increase the output voltage or to provide bipolar output. (Max 600V to Chassis Ground).

## 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 with or without Multi-Drop option.







P/N: IEMD

P/N: MD

P/N: IS420

P/N: LAN

## **Programming Options (Factory installed)**

## **New IEEE Multi-Drop Interface**

- Allows IEEE Master to control up to 30 (Multi-Drop equipped) slaves over RS-485 daisy-chain
- Only the Master needs be equipped with IEEE Interface
- IEEE 488.2 SCPI Compliant
- Program Voltage
- Measure Voltage
- Over Voltage setting and shutdown
- Error and Status Messages

- Program Current
- Measure Current
- Current Foldback shutdown

## **New Multi-Drop Slave Option**

Slaves need to be equipped with the MD Slave (RS-485) option

## **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 ±1% Power supply Voltage and Current Monitoring Accuracy ±1.5%

Current Programming with 4-20mA signal.

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

- Meets all LXI-C Requirements
- Address Viewable on Front Panel
- Fixed and Dynamic Addressing
- Fast Startup

- VISA & SCPI Compatible
- LAN Fault Indicators
- Auto-detects LAN Cross-over Cable
- Compatible with most standard Networks

## USB Interface P/N: USB

- Allows Serial Connection to USB Port on Computer
- Serial commands same as (standard) RS-232/RS-485 Interface

5 Genesys™ 5kW 2U

## Power Supply Identification / Accessories How to order

<u>GEN</u> <u>8</u> - <u>600</u>

Series Output Output Name Voltage Current (0~8V) (0~600A) Pactory Options
Option: IEMD
MD
IS510
IS420
LAN

**USB** 

AC Input Options 3P208 (Three Phase 208VAC) 3P400 (Three Phase 400VAC)

## 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 options**

RS-232/RS-485 Interface built-in Standard GPIB (Multi-Drop Master) Interface IEMD
Multi-Drop Slave Interface MD
Voltage Programming Isolated Analog Interface IS510
Current Programming Isolated Analog Interface IS420
LAN Interface (Complies with LXI Class C) LAN
USB Interface USB

## **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

P/N

#### 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

<sup>\*</sup> Included with power supply



Also available, Genesys™
1U Half Rack 750W
1U Full Rack 750W/1500W
2U Full Rack 3300W
3U Full Rack 10/15kW

**TDK-Lambda** 16

## TDK·Lambda

## GLOBAL NETWORK

#### **USA**

TDK-Lambda Americas Inc. 405 Essex Rd. Neptune, NJ 07753

Tel: +1-732-922-9300 Fax: +1-732-922-1441

E-mail: sales@us.tdk-lambda.com www.us.tdk-lambda.com/hp

#### **CANADA**

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