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GOSSEN METRAWATT

SYSKON | P1500
Computer Controlled Laboratory Power Supply

3-349-437-03
4/4.08

- Series SYSKON P1500: 1500 W output power
- Measuring functions for voltage, current and power with threshold memory (min & max values)
- Minimal residual ripple and short response times
- USB, RS232C Interface (standard)
  IEEE488 Interface (plug-in module option)
- Integrated sequence function for the generation of voltage and current profiles with programmable sequence chain
- Storage of 12 device configurations
- Output can be switched on and off
- Operating functions can be protected
- Master-slave operation is possible
- Overvoltage, overcurrent and excessive temperature protection
- Compact design, lightweight and minimal power loss thanks to switching controller technology
- PC Software for remote control

Description

Series SYSKON (**SYS**TEM **KON**STANTERs) are manual and remote controllable DC power supplies for laboratory and system use. Owing to the highest quality in switching controller technology, the devices are compact and lightweight despite their high output power.

Active power factor control assures nearly sinusoidal mains input current.

The floating output features “safety separation” from the mains input as well as from the computer interfaces, and is classified as a safety extra-low voltage circuit (SELV) in accordance with VDE / IEC. Wide ranging nominal output power values are available from output voltage and output current.

The power output is voltage and current controlled with limiting to maximum withdrawable power.

Transition to the control modes is automatic in accordance with the selected setpoints and load circumstances.

The control loops are designed for short response times.

An automatically activated, dynamic sink (can be disabled) provides for quick discharging of the output capacitors.

Numerous protective functions and monitoring devices allow for ideal adaptation to actual conditions of use.

Features

The devices are generally equipped with a control panel and display, as well as an analog interface.

One USB port and one RS 232 interface are provided as standard equipment for integration into computer controlled systems. The drivers for the USB port are provided as accessories on the included CD ROM.

An optional IEEE 488 interface can be additionally installed, or retrofitted as an option, to connect and control programmable devices and to provide a standard interface for external communication with the device.

Manual adjustment of voltage and current is accomplished by means of two rotary encoders with selectable resolution, or with the numeric keypad. Numerous additional functions can be accessed via keys.

Two digital LED displays (5 digit each) read out measured values and settings. LEDs indicate the current operating mode, selected display parameters and the status of device and interface functions.

The analog interface makes it possible to adjust output voltage and current with the help of external control voltages. Monitor outputs read out an analog image of the voltage and current output quantities for further processing or additional displays.

These control inputs and monitor outputs can also be used to couple several devices for master-slave operation with parallel or series connection.

Two floating trigger inputs are available for controlling certain device functions. For example, they can be used to switch the output on and off, or to control sequences.

Furthermore, three signal outputs are included at the analog interface, two of which are floating. These can be activated depending upon various functions, and can thus be used to control external devices or sequences.

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Applications Range

Konstanters are suitable for use wherever electronic modules with controlled direct voltage or controlled current need to be supplied with electrical power, especially in the fields of R&D, testing, production, test systems and training.

Due to their characteristic U-I-P curve, the devices have a broad range of operation, making it possible to cover a large range of applications with a single device.

Due to their short response times, SYSKON KONSTANTERs can be used for replication and simulation of onboard electrical systems, for example in automotive applications. Test signals specified in the corresponding standards can be generated. The fact that these voltage-current-time profiles can be saved to memory at the Konstanter for running independent sequences is highly advantageous. When used in test systems, it is thus possible to significantly reduce workload for the control computer. Further functions for test applications of this sort include the Min-Max function for acquiring extreme values and the tolerance band function which generates a signal when measured values do not lie within the specified tolerance limits.

The Konstanter thus serves as an autonomous test system for many applications.

Adjustable Functions (selection)

- Voltage and current setpoint values
- Voltage and current limit values (soft-limits)
- Activate / deactivate the output
- Overvoltage protection trigger value (OVP)
- Overcurrent protection trigger value (OCP)
- Delay time for reaction to overvoltage
- Selection of the desired reaction when OVP and OCP are triggered
- Delay time for reaction to overcurrent
- Performance after power on
- Reset device settings
- Save device settings
- Recall device settings, individually or sequentially
- Function selection for trigger inputs
- Function selection for signal outputs
- Configurable status and events management with enabling windows (via computer interface)
- Activate / deactivate digital displays

Retrievable Information (selection)

- Presently measured voltage and current values
- Minimum and maximum measured voltage and current values
- Current output power
- Current device settings
- Current device status (i.e. control mode, overtemperature etc.)
- Occurred events (i.e. mains failure, overtemperature, overvoltage, overload etc.)
- Device ID (via computer interface)

Protection and Additional Functions

- Sensor terminals protected against polarity reversal and automatic switching to auto-sensing
- Protection against excessive temperature
- Output protected against reverse polarity
- Front panel control disabling
- Backup battery for device settings memory
- Recognition of mains or phase failure
- Inrush current limiting

Performance After Power on

In the event of mains failure, it's important to specify which operating state the device will assume when power is restored. This may be extremely important if the device is used in long-term testing applications.

One of the following states can be selected:

- Reset = default setting (0 V, 0 A, output deactivated)
- Standby = last used configuration but with deactivated output
- Recall = last used configuration – same as when the instrument was last switched off, with active output if it was active prior to mains failure
- Recall a device configuration from setup memory

Set Output Voltage and Output Current

Output voltage and output current can also be adjusted using the rotary encoders or the numeric keypad if desired. The rotary encoders are used exclusively for adjusting voltage and current. The decimal place to be changed is selected with the scroll keys. Additional functions and parameters can be accessed and adjusted with the keys.

Switching the Output On and Off

The power output can be switched on and off by pressing the appropriate key, with a computer command or by applying a signal to the trigger input. When switched off, the output is highly resistive and will not be galvanically isolated from the power consumer. The on/off status is indicated by the LED on the key.

Protection and Additional Functions

A multitude of protection and additional functions have been integrated, for example:

- Limiting of the setting ranges for voltage and current
- Overvoltage protection (OVP) with adjustable response delay and reaction
- Overcurrent protection (OCP) with adjustable response delay and reaction
- Protection in the event of reversed polarity at the sensing leads
- Automatic switching to auto-sensing
- Protection against excessive temperature
- Output protected against reverse polarity
- Front panel control disabling
- Backup battery for device settings memory
- Mains failure detection
- Inrush current limiting

Dynamic Sink

A dynamic sink is activated by the control loops as required for rapid discharging of the output capacitors.

This allows for short response times when switching to smaller setpoint values. Depending upon the application, the sink function can also be disabled.

Auto-Sensing

The device can be switched to sensing mode operation (remote sensing) in order to compensate for voltage drop at the output leads. Sensing lead terminals are available to this end at the analog interface. If the (–) negative sensing terminal is connected to the negative load point, the device is automatically switched to sensing mode operation. Maximum compensatable voltage drop is 1 V per output lead.

Front Panel Control Disabling

The controls can be disabled to prevent unauthorized operation by pressing the appropriate key, with a computer command or by applying a signal to the trigger input.

Analog Control Inputs

Voltage and current can also be adjusted by via the control inputs at the analog interface. A 5 V signal corresponds to 100% of the respective nominal value.

These inputs can be switched on and off using the keys, or with computer commands.

The controlled output quantity is the sum of the digital setpoint value and the specified value at the control input.

This function makes it possible to superimpose these control signals onto the output quantities.

Monitor Outputs

The actual values for output voltage and current can be acquired at the monitor outputs as a standardized signal (10 V corresponds to 100% nominal value).

Trigger Inputs

Two floating trigger inputs are available for controlling device functions. The following trigger input assignments can be selected:

- output = Switch the power output on and off
- local lock = Disable controls
- SQS = (**se**quence **s**tep) Step-by-step control of a stored sequence
- sequence = Start / stop the sequence function
- Analog input = Activate / deactivate the analog control inputs

Signal Outputs

Programmable Control Outputs

The analog interface is equipped with three digital control outputs for status messages to external monitoring devices, for switching external components on and off, or for coupling purposes.

The status of these outputs can be defined either directly, or depending upon the following device statuses:

- Output on or off
- Voltage or current regulation
- Sequence function running or finished
- SSET signal status for the sequence function
- Limit value message for the measuring function (tolerance band)

Min-Max Measured Value Memory

The Min-Max function automatically acquires and saves minimum and maximum voltage and current values.

Tolerance Band (in combination with Min-Max function)

Measured output values can be continuously compared with stored upper and lower tolerance band values. Evaluation is possible via the programmable control outputs.

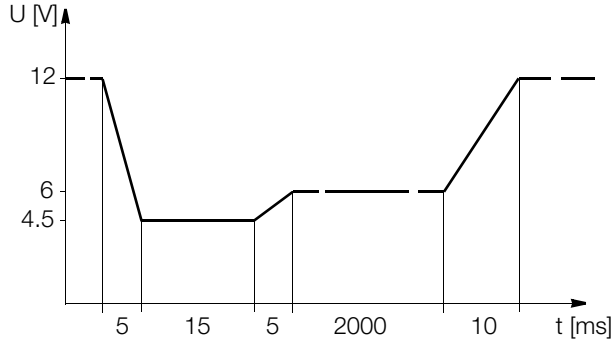
Memory

The memory function makes it possible to save and recall device configurations using a battery-backed memory module.
The memory module is equipped with two storage areas:

- Setup memory: 12 memory locations for complete configurations
- Sequence memory: **1536** memory locations for the following sequence parameters: voltage setpoint USET, current setpoint ISET, dwell time TSET and function request FSET, with the ability to invoke **subsequences**

Sample Application

Generation of a characteristic voltage curve in an automotive electrical system when starting the engine



Note:

Compliance with voltage rise and drop times is only assured within a limited load impedance range.

Balancing Function (adjust)

Offset and final values for setting and measured values for output quantities voltage and current are balanced digitally in the device. The user can execute balancing as required with this function.

DKD Calibration Certificate

All SYSKON Konstanters are shipped with a DKD calibration certificate *(DKD = Deutscher Kalibrierdienst; German calibration authority)* issued by our DKD test laboratory.

Operating Software for Computer Controlled Systems

Convenient software in English for quick and easy use of the SYSKON KONSTANTER is available free of charge. Its central element is the Soft Front Panel. This makes it possible for the user to take targeted advantage of the comprehensive range of included functions within his own application – without any programming at all. The panel has a clear-cut layout and is broken down into taskspecific displays.

The software detects KONSTANTERs which are connected to the various possible interfaces including USB, RS 232 and GPIB.

KONSTANTERs detected by the software are identified automatically and can be selected for the respective application.

If several KONSTANTERs are connected, the software can be started separately for each device, and each device can be individually controlled.

SYSKON | P1500
Computer Controlled Laboratory Power Supply

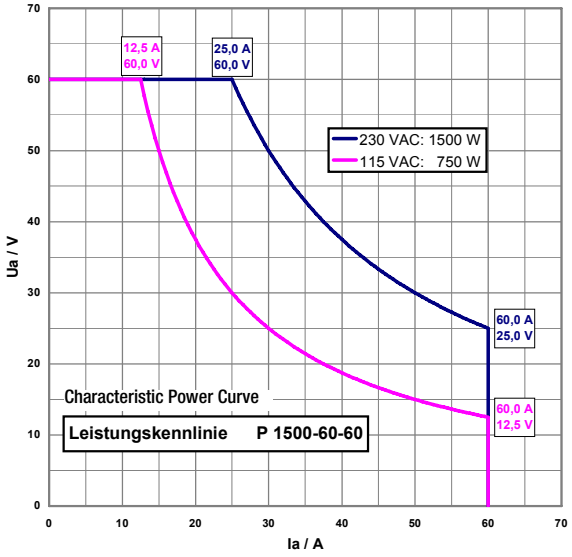
General Data

Output

Regulator type	Primary switched-mode regulator
Operating modes	Adjustable constant voltage / constant current source with automatic sharp transition
Output isolation	Floating output with “safe electrical separation” from the mains input and computer interfaces
Allowable potential, output–ground	Max. 240 V DC

Capacitance, output–ground (housing)
SYSKON P1500 series Typically 1000 nF

Output Operating Ranges, Characteristic U-I-P Curve



Analog Interface

Functions
– Auto-sensing mode
– 2 programmable trigger inputs
– 3 programmable signal outputs
– Voltage control input (0 ... 5 V)
– Current control input (0 ... 5 V)
– Voltage monitor output (0 ... 10 V)
– Current monitor output (0 ... 10 V)
– Master-slave parallel operation
– Master-slave series operation
– Auxiliary power output: 15 V / 60 mA

Computer Interfaces

- IEC-625 / IEEE 488 interface (optional)

- RS 232 interface

Transmission mode Half-duplex, asynchronous
Transmission speed 1200 to 115,200 baud, adjustable

- USB port

USB port: 4-pin, type B
USB 1.1 compatible with USB 2.0
Connector pin assignments 1: VCC, 2: D-, 3: D+, 4: GND
Transmission speed 9600 to 115,200 baud, adjustable

Power supply

Line voltage	115/230 V ~ + 10 / – 15%; 47 to 63 Hz
Starting current	Max. 50 A_s
Mains fuse	1 x M 15 A / 250 V (6.3 x 32 mm), UL

Electrical Safety

Safety class	I
Measuring category	II for mains input I for output and interfaces
Pollution degree	2
Earth leakage current	< 2.5 mA_{RMS}

Electrical isolation	Test voltage
Output – mains	2.2 kV ~
Output – bus/ground	1.4 kV ~
Mains – bus/ground	2.2 kV –
Bus – ground	No electrical isolation

Applicated Standards

IEC 61 010-1: 2001
DIN EN 61 010-1: 2001
VDE 0411-1: 2002
EN 61326

Electromagnetic Compatibility

Generic standard	EN 61326-1: October 2006
Interference emission	EN 55022: class B EN 61000-3-2 EN 61000-3-3
Interference immunity	EN 61000-4-2: feature A EN 61000-4-3: feature B EN 61000-4-4: feature A EN 61000-4-5: feature A EN 61000-4-6: feature A EN 61000-4-8: feature A EN 61000-4-11: feature A

Environmental Conditions

Temperature range	Operation:	0 to 40 °C
	Storage:	–25 to +75 °C
Atmospheric humidity	Operation:	≤ 75% rel. humidity, no condensation allowed
	Storage:	≤ 65% rel. humidity
Cooling	With integrated fan (temperature controlled)	
	Inlet vent:	Side panel
	Outlet vent:	Rear panel
Operating noise	Noise pressure level at a distance of 30 cm with fan set to low / high	
	Front	17 / 28 dBA
	Rear	22 / 32 dBA
	Left	17 / 28 dBA
	Right	20 / 31 dBA

Mechanical Data

Protection IP 00 for device and interface connections
IP 20 for housing

Table Excerpt Regarding Significance of IP Codes

IP XY (1st char. X)	Protection against penetration by solid particles	IP XY (2nd char. Y)	Protection against penetration by water
0	Not protected	0	Not protected
1	≥ 50.0 mm dia.	1	Vertical dripping
2	≥ 12.5 mm dia.	2	Dripping (15° inclination)

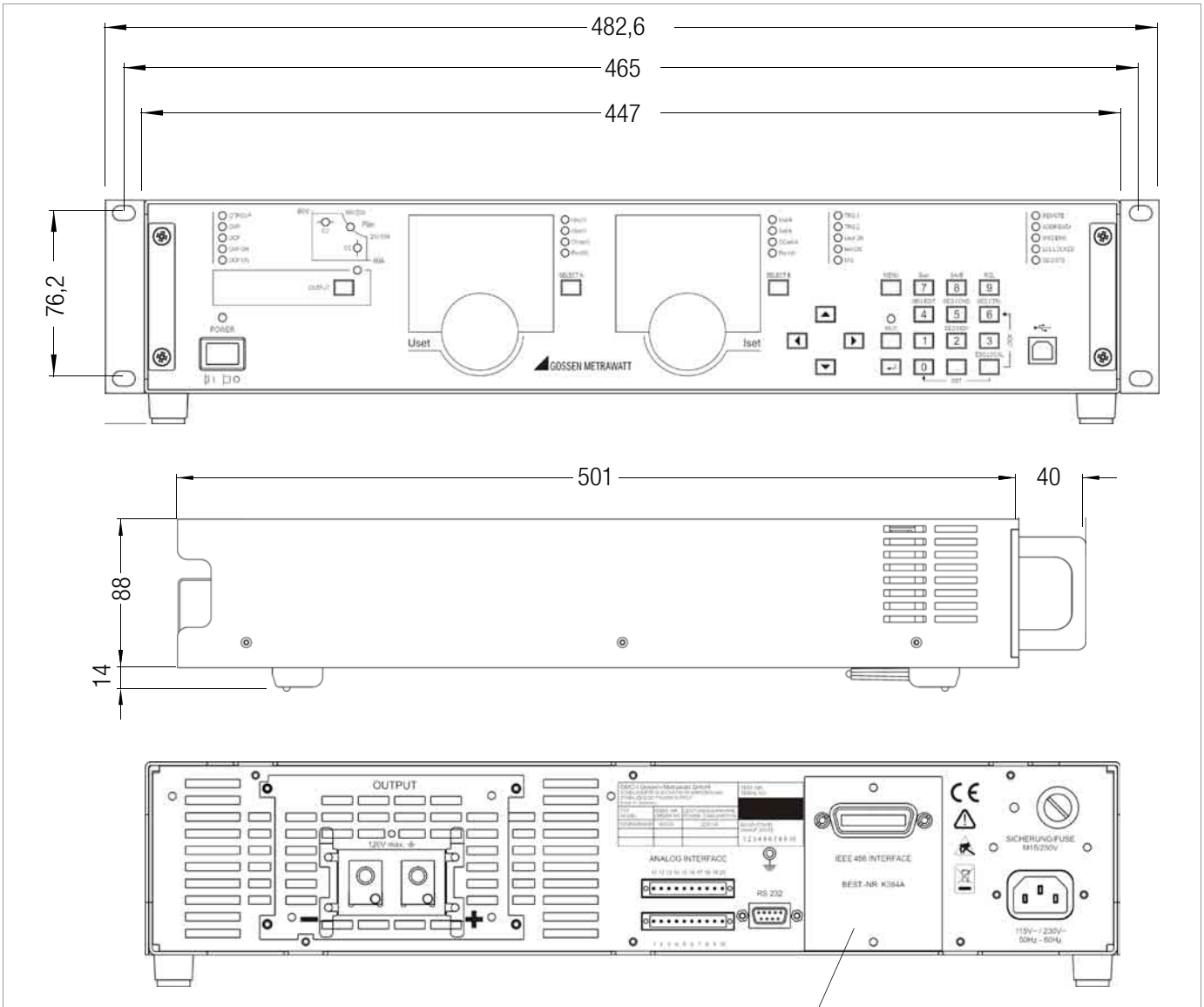
Design **Benchtop device, suitable for installation to 19" cabinets**

Article No.	Designation	Dimensions (W x H x D)	Weight
K353A	SYSKON P1500-060-060	19" x 2 standard height units 447 x 102 (88) x 541 (501) mm	10 kg
K384A	IEEE 488 interface (optional)		Approx. 0.14 kg

Terminals (rear panel)

Mains input	K353A: 10 A IEC inlet plug with earthing contact (L + N + PE)
Output	Terminal blocks with thread for M6 screws and 4 mm dia. holes
Analog interface / sensing leads	Double-row plug connector with two 10-pole screw terminals

Dimensional Drawing



All dimensions in mm

Installation position for optional IEEE-488 interface (material no. K384A).

SYSKON | P1500
Computer Controlled Laboratory Power Supply

Electrical Data

Reference conditions: ambient temperature: 23 °C ±2 K,
relative atmospheric humidity: 40 to 60%, warm-up time: 30 minutes.
Output characteristics (ppm and percentage values make reference to the respective setting or measured value)

Article Number			**K353A**
Type			**SYSKON P1500-060-060**
Nominal Output Data	Voltage setting range		**0 to 60 V**
	Current setting range		**0 to 60 A**
	Power		**Max. 1500 W**
Output Characteristics (ppm and percentage values make reference to the respective setting or measured value)			
Setting resolution		Voltage	1 mV
		Current	1 mA
Setting accuracy (at 23 ±5 °C)	Auto-sensing mode	Voltage	0.05% + 30 mV
	Without auto-sensing		0.05% + 48 mV
		Current	0.05% + 90 mA
Temperature coefficient		Voltage	100 ppm
for Δ / K setting		Current	100 ppm
Setting accuracy via analog interface (at 23 ±5 °C)		Voltage	0.6% + 120 mV
$U_{setnom}/U_{setanalog}$ = 12; $I_{setnom}/I_{setanalog}$ = 12		Current	0.6% + 120 mA
Static system deviation	Auto-sensing mode	Voltage	30 mV (< 500 µV/A)
at 100% load fluctuation	Without auto-sensing		48 mV (< 800 µV/A;)
		Current	30 mA (< 500 µA/V)
Static system deviation		Voltage	5 mV
with 10% line voltage fluctuation		Current	5 mA
Residual ripple	Voltage	Ripple: 10 Hz to 20 kHz	40 mV_{ss}
		Ripple: 10 Hz to 1 MHz	50 mV_{ss}
		Ripple + noise: 10 Hz to 10 MHz	60 mV_{ss} / 6 mV_{RMS}
	Current	Ripple + noise: 10 Hz to 10 MHz	50 mA_{RMS}
Output voltage transient recovery time with sudden		Tolerance	120 mV
load variation within range of 20 to 100% I_{nom}		ΔI = 10%	100 µs
		ΔI = + 80% + approx. 800 A/ms	400 µs
		ΔI = – 80 % + approx. 1200 A/ms	500 µs
Output voltage over and undershooting with sudden			
load variation within a range of 20 to 100% I_{nom} and		ΔI = 10%	150 mV
20 to 100% U_{nom}		ΔI = 80%	700 mV
Setting time for output voltage [1]		Tolerance	120 mV
Where Uset step = 0 V → U_{nom}		No-load; nominal load	2 ms; 2 ms
Where Uset step = U_{nom} → 1 V		No-load; nominal load	70 ms; 2 ms
Output capacitor		Nominal value	2020 µF
Sink (continuous power)		Power	40 to 65 W
Measuring Function			
Measuring Range		Voltage	– 16.3846 to + 98.300 V
		Current	– 2.766 to + 98.300 A
		Power	U x I
Measuring resolution		Voltage	2 mV
		Current	2 mA
		Power	100 mW
Measuring accuracy (at 23 ± 5 °C)		Voltage	0.05% + 30 mV
		Current	0.4% + 90 mA
		Power	0.5% + 1 W
Measured value temperature coefficient Δ / K		Voltage	0.4 mV + 50 ppm
		Current	1 mA + 100 ppm
Measuring accuracy (at 23 ± 5 °C) at analog interface		Voltage	0.4 % + 120 mV
$U_{actualnom}$ / $U_{actualanalog}$ = 6; $I_{actualnom}$ / $I_{actualanalog}$ = 6		Current	0.5 % + 180 mA
Protection and Additional Functions			
Output overvoltage protection	Trigger value	Setting Range	3 to 80 V
		Setting resolution	20 mV
		Setting accuracy	±150 mV – 10 mΩ x I_a
	Response time		200 µs
Output overcurrent protection	Trigger value	Setting Range	3 to 80 A
		Setting resolution	20 mA
		Setting accuracy	–(350 mA + 1%) – 20 mA / V x U_a
	Response time		200 µs
Reverse polarity protection load capacity		Continuous	60 A
Reverse voltage withstand capacity		Continuous	70 V –
Auto-sensing mode	Compensatable voltage drop	Per output lead	1 V

General		
Power supply with 230 V~ nominal line voltage	Line voltage	**230 V~** + 10 / – 15%, 47 to 63 Hz
Power consumption	At nominal load, 1500 W	1925 VA; 1865 W
	At no load	96 VA; 37 W
Power supply with 115 V~ nominal line voltage	Line voltage	**115 V~** + 10 / – 15%, 47 to 63 Hz
Power consumption	At nominal load, 750 W	1125 VA; 1100 W
	At no load	55 VA; 36 W
Max. power loss	At a nominal load of 1500 W	365 W
	At a nominal load of 750 W	350 W
Efficiency	At a nominal load of 1500 W	80%
	At a nominal load of 750 W	68%
Switching frequency, PFC / DC/DC	Typical	47 kHz / 230 kHz
Inrush current	Max.	50 A_S
Mains fuse (6.3 x 32 mm, UL)		1 x M 15 A / 250 V
MTBF (mean time between failures)	at 40 °C	> 50,000 hours

[1] At maximum current setting not including processing time for the previous voltage setting command

SYSKON | P1500
Computer Controlled Laboratory Power Supply

Order Information

Description (abbreviated name)	Article Number
SYSKON P1500-060-060 SYSTEM KONSTANTER	K353A
IEEE 488 interface (option)	K384A

Software

Further information regarding operating software and drivers is available for download on the internet:

http://www.gossenmetrawatt.com

Accessories

Description	Note	Article No.
RS 232 bus cable, 2 m	For connecting a device to an RS 232 interface (extension cable, 9-pin socket / 9-pin plug connector)	GTZ 3241 000 R0001
IEEE - IEEE bus cable, 2 m	For connecting a device to the IEEE 488 bus system	K931A

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