GOSSEN METRAWATT
GMC-INSTRUMENTS GROUP

SYSKON | P500, P800, P1500, P3000 and P4500
Computer Controlled Laboratory Power Supply

3-349-437-03
16/8.25

- Series SYSKON P500/P800/P1500: 500/800/1500 W output power
  SYSKON P3000/P4500 series: 3000 W/4500 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 (arbitrary function) for the generation of voltage and current profiles with programmable sequence chain
- Storage of 15 device configurations (setup memory)
- Storage of 1700 sequence parameters
- 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



SYSKON P500 / P800 / P1500



SYSKON P3000 / P4500



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 internet.

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.

SYSKON | P500, P800, P1500, P3000 and P4500
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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
- Line voltage monitoring

Line voltage monitoring

To protect the device, the power output is deactivated in the event of line undervoltage. The device must be restarted with „Power ON".

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**q**u**ence **s**tep) Step-by-step control of a stored sequence
- sequence = Start / stop the sequence function (arbitrary 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 (arbitrary function) running or finished
- SSET signal status for the sequence function (arbitrary 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.

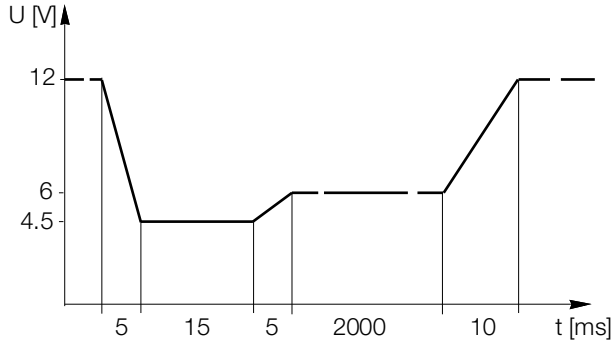
Memory

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: 15 memory locations for complete configurations
- Sequence memory: 1700 memory locations for the following sequence parameters:
  – voltage setpoint USET,
  – current setpoint ISET,
  – dwell time TSET
  – 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:

The drop times can be influenced by the input impedance of the DUT.

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.

DAkkS Calibration Certificate

All SYSKON Konstanters are shipped with a DAkkS calibration certificate *(DAkkS = German Akkreditation Body)* issued by our DAkkS 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.

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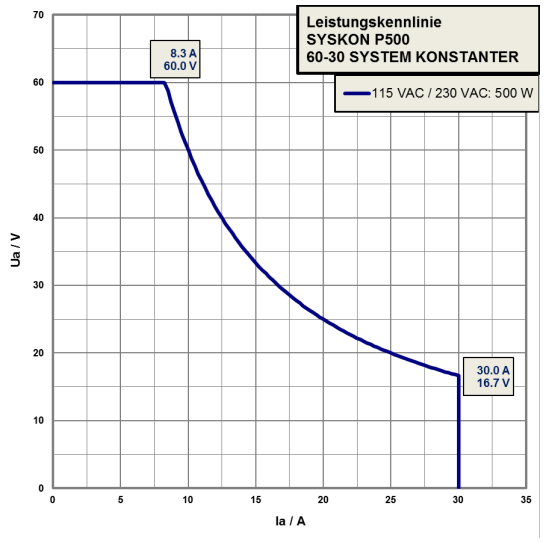
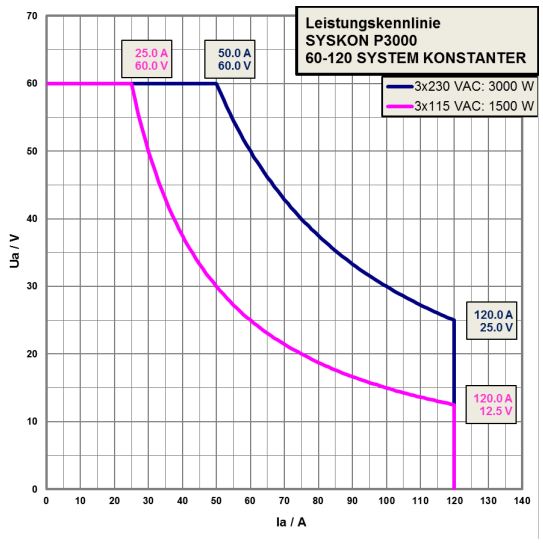
General Data

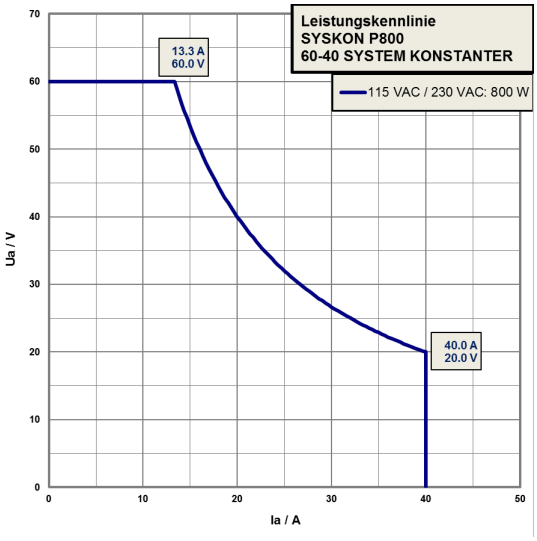
Output Operating Ranges, Characteristic U-I-P Curve SYSKON P500



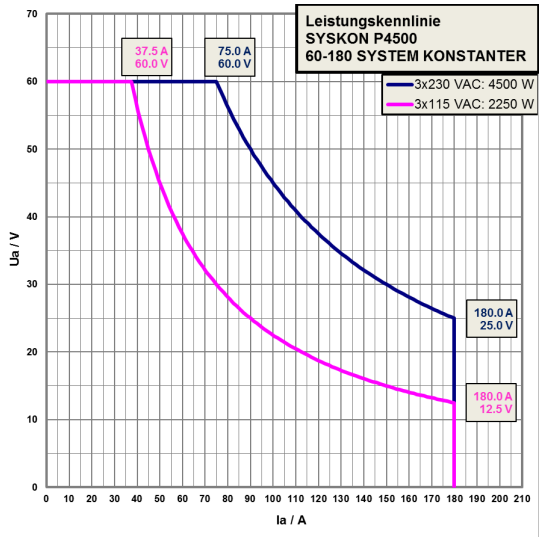
Output Operating Ranges, Characteristic U-I-P Curve SYSKON P3000



Output Operating Ranges, Characteristic U-I-P Curve SYSKON P800

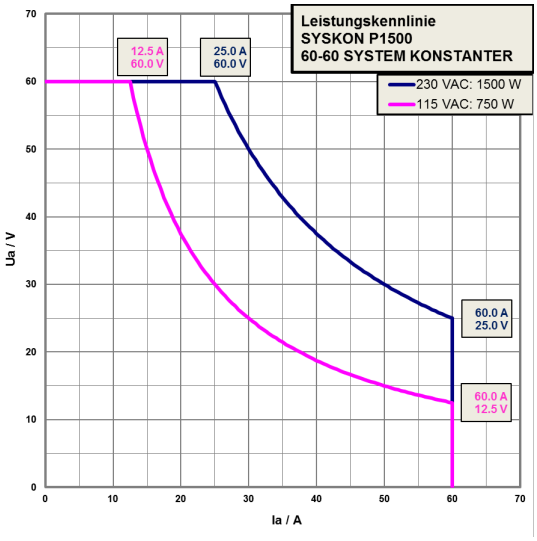


Output Operating Ranges, Characteristic U-I-P Curve SYSKON P4500 *)



*) The S-002 variant of the SYSKON P4500 functions without any derating.

Output Operating Ranges, Characteristic U-I-P Curve SYSKON P1500



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 P500	typ. 1000 nF
SYSKON P800	typ. 1
SYSKON P1500	typically 1000 nF
SYSKON P3000	typically 1000 nF
SYSKON P4500	typically 1000 nF

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	SYSKON P500/P800/P1500: 1 × M15 A / 250 V (6.3 × 32 mm), UL SYSKON P3000/4500: 3 × M15 A/250 V

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

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

Electromagnetic Compatibility

SYSKON P500/P800/P1500

Generic standard	EN 61326-1: October 2006
Interference emission	EN 55022: class B
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

SYSKON P3000/4500

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

* **Note:**
Approved for the deployment in industrial environment. This device may cause radio interferences in domestic areas.

Applicated Standards

IEC 61010-1:2010, DIN EN 61010-1:2010, VDE 0411-1:2011
EN 61326

Mechanical Data

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

Table Excerpt Regarding Significance of IP Codes

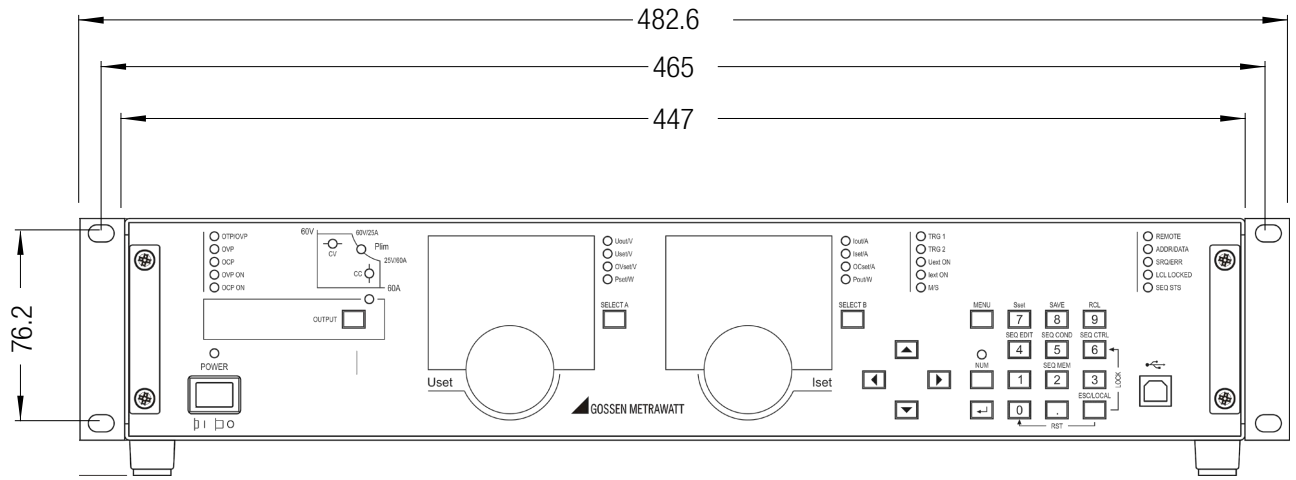
IP XY (1st char. X)	Protection against penetration by solid particles	IP XY (2nd char. Y)	Protection against penetration by water
0	Not protected	0	Not protected
1	≥ 50.0 mm dia.	1	Vertical dripping
2	≥ 12.5 mm dia.	2	Dripping (15° inclination)

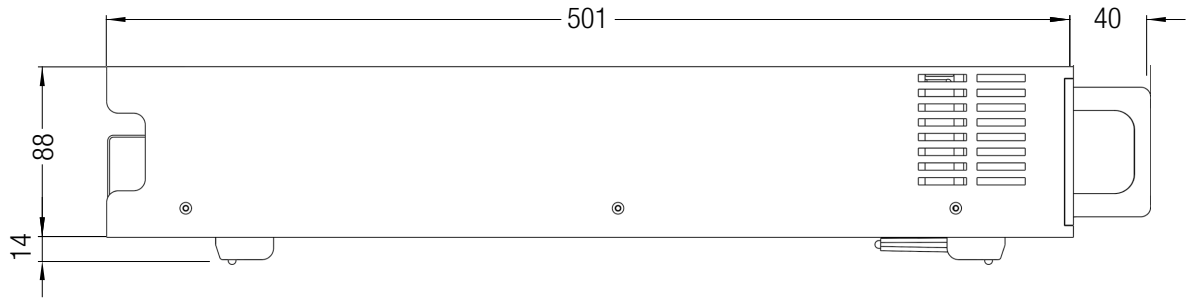
Design **Benchtop device, suitable for installation to 19" cabinets**

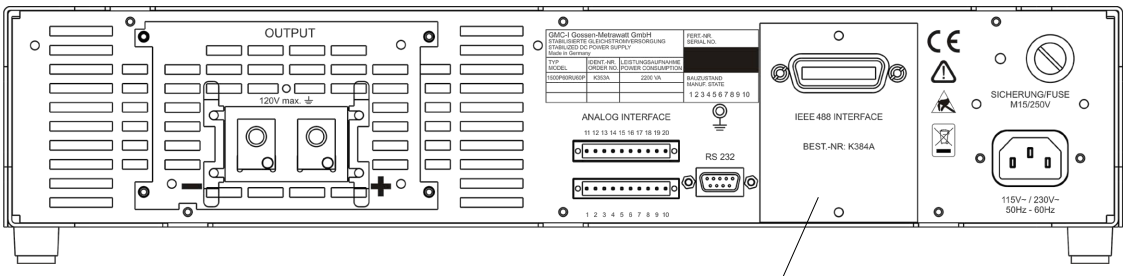
Article No.	Designation	Dimensions (W × H × D)	Weight
K346A	SYSKON P500-060-030	19" × 2 HE 447 × 102 (88) × 541 (501) mm	10 kg
K347A	SYSKON P800-060-040	19" × 2 HE 447 × 102 (88) × 541 (501) mm	10 kg
K353A	SYSKON P1500-060-060	19" × 2 HE 447 × 102 (88) × 541 (501) mm	10 kg
K363A	SYSKON P3000-060-120	19" × 4 HE 447 × 191 (177) × 541 (501) mm	16 kg
K364A	SYSKON P4500-060-180	19" × 4 HE 447 × 191 (177) × 541 (501) mm	20 kg
K384A	IEEE 488 interface (optional)		Approx. 0.14 kg

HE = standard height units

Dimensional Drawing SYSKON P500 / P800 / P1500



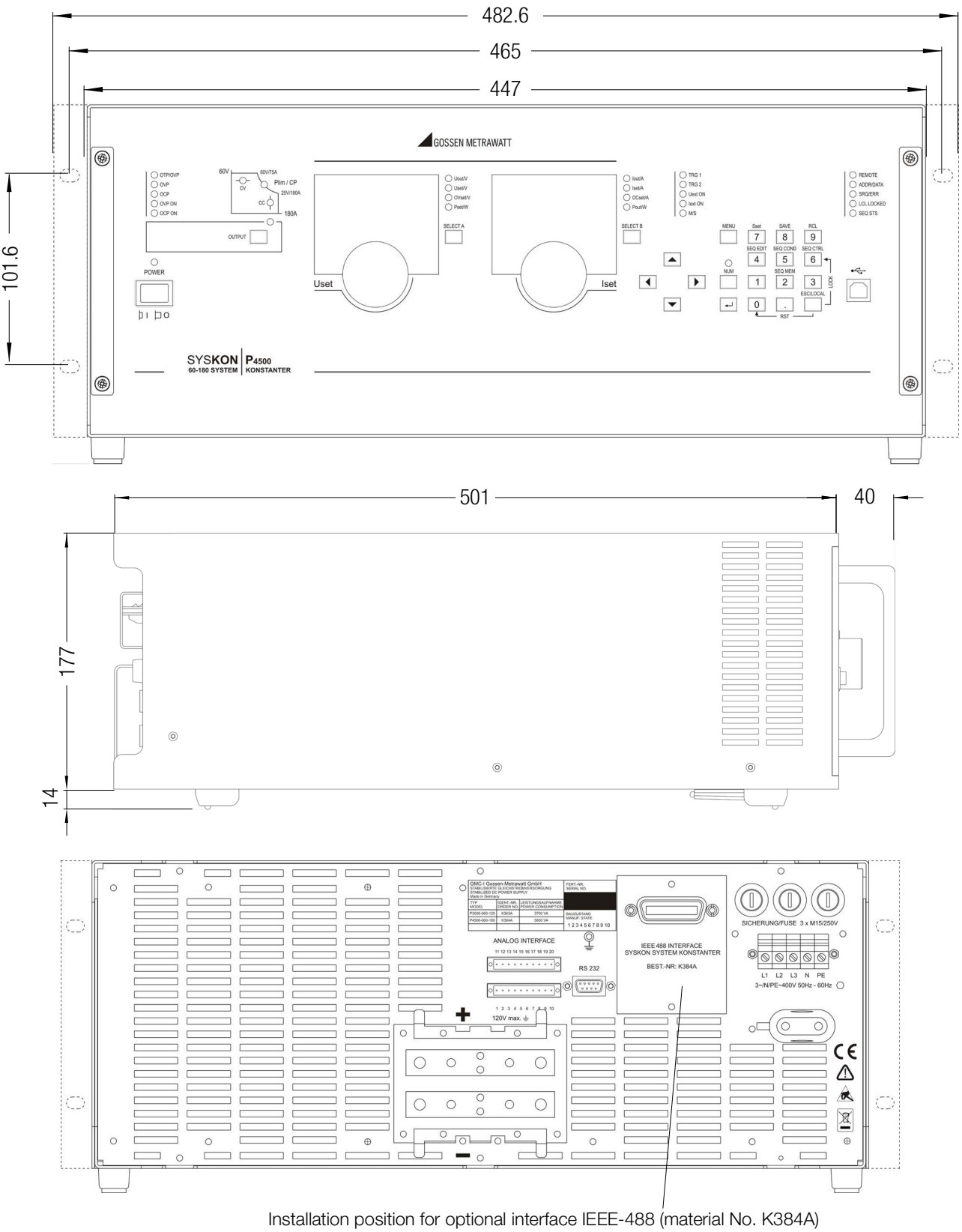




Installation position for optional interface IEEE-488 (material No. K384A)

All dimensions in millimeter

Dimensional Drawing SYSKON P3000 / P4500



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

All dimensions in millimeter

SYSKON | P500, P800, P1500, P3000 and P4500
Computer Controlled Laboratory Power Supply

Electrical Data SYSKON P500 / P800 / P1500

Article Number Type			K346A SYSKON P500-060-030	K347A SYSKON P800-060-040	K353A SYSKON P1500-060-060
Nominal Output Data		Voltage setting range Current setting range Power	0 … 60 V 0 … 30 A max. 500 W	0 … 60 V 0 … 40 A max. 800 W	0 to 60 V 0 to 60 A Max. 1500 W
Output Characteristics (ppm and percentage values make reference to the respective setting or measured value)					
Setting resolution		Voltage Current	1 mV 1 mA	1 mV 1 mA	1 mV 1 mA
Setting accuracy (at 23 ±5 °C)	Auto-sensing mode Without auto-sensing	Voltage Current	0.05 % + 30 mV 0.05 % + 48 mV 0.05 % + 90 mA	0.05 % + 30 mV 0.05 % + 48 mV 0.05 % + 90 mA	0.05% + 30 mV 0.05% + 48 mV 0.05% + 90 mA
Temperature coefficient for Δ / K setting		Voltage Current	100 ppm 100 ppm	100 ppm 100 ppm	100 ppm 100 ppm
Setting accuracy via analog interface (at 23 ±5 °C) $U_{setnom}/U_{setanalog}$ = 12; $I_{setnom}/I_{setanalog}$ = 12/24/36		Voltage Current	0.6 % + 120 mV 0.6 % + 120 mA	0.6 % + 120 mV 0.6 % + 120 mA	0.6% + 120 mV 1.2% + 120 mA
Static system deviation at 100% load fluctuation	Auto-sensing mode Without auto-sensing	Voltage Current	30 mV (< 500 µV/A) 48 mV (< 800 µV/A;) 30 mA (< 500 µA/V)	30 mV (< 500 µV/A) 48 mV (< 800 µV/A;) 30 mA (< 500 µA/V)	30 mV (< 500 µV/A) 48 mV (< 800 µV/A;) 30 mA (< 500 µA/V)
Static system deviation with 10% line voltage fluctuation		Voltage Current	5 mV 5 mA	5 mV 5 mA	5 mV 5 mA
Residual ripple	Voltage Current	Ripple: 10 Hz to 20 kHz Ripple: 10 Hz to 1 MHz Ripple + noise: 10 Hz to 10 MHz Ripple + noise: 10 Hz to 10 MHz	40 mV_{ss} 50 mV_{ss} 60 mV_{ss} / 6 mV_{eff} 50 mA_{eff}	40 mV_{ss} 50 mV_{ss} 60 mV_{ss} / 6 mV_{eff} 50 mA_{eff}	40 mV_{ss} 50 mV_{ss} 60 mV_{ss} / 6 mV_{RMS} 50 mA_{RMS}
Output voltage transient recovery time with sudden load variation within range of 20 to 100% I_{nom} and 20 to 100% U_{nom}		Tolerance ΔI = 10% ΔI = + 80% + approx. 800 A/ms ΔI = – 80 % + approx. 1200 A/ms	120 mV 100 µs 600 µs 950 µs	120 mV 100 µs 500 µs 650 µs	120 mV 100 µs 400 µs 500 µs
Output voltage over and undershooting with sudden load variation within a range of 20 to 100% I_{nom} and 20 to 100% U_{nom}		 ΔI = 10% ΔI = 80%	 150 mV 500 mV	 150 mV 550 mV	 150 mV 700 mV
Setting time for output voltage [1] where Uset step = 0 V → 60 V where Uset step = 60 V → 1 V where Uset step = 0 V → 25 V where Uset step = 25 V → 1 V		Tolerance No-load; nominal load [2] No-load; nominal load [2] No-load; nominal load [2] No-load; nominal load [2]	120 mV 2 ms / 2 ms 70 ms / 20 ms 1.4 ms / 1.4 ms 16 ms / 5 ms	120 mV 2 ms / 2 ms 70 ms / 15 ms 1.4 ms / 1.4 ms 16 ms / 3 ms	120 mV 2 ms / 2 ms 70 ms / 11ms 1.4 ms / 1.4 ms 16 ms / 3 ms
Output capacitor Sink (continuous power)		Nominal value Power	2020 µF 40 W – 65 W	2020 µF 40 W – 65 W	2020 µF 40 to 65 W
Measuring Function					
Measuring Range		Voltage Current Power	– 16.384 … + 98.300 V – 32.766 … + 98.300 A U × I	– 16.384 … + 98.300 V – 32.766 … + 98.300 A U × I	– 16.384 to + 98.300 V – 2.766 to + 98.300 A U × I
Measuring resolution		Voltage Current Power	2 mV 2 mA 100 mW	2 mV 2 mA 100 mW	2 mV 2 mA 100 mW
Measuring accuracy (at 23 ± 5 °C)		Voltage Current Power	0.05 % + 30 mV 0.4 % + 90 mA 0.5 % + 1 W	0.05 % + 30 mV 0.4 % + 90 mA 0.5 % + 1 W	0.05% + 30 mV 0.4% + 90 mA 0.5% + 1 W
Measured value temperature coefficient Δ / K		Voltage Current	50 ppm + 0.4 mV 100 ppm + 1 mA	50 ppm + 0.4 mV 100 ppm + 1 mA	0.4 mV + 50 ppm 1 mA + 100 ppm
Measuring accuracy (at 23 ± 5 °C) at analog interface $U_{actualnom}$ / $U_{actualanalog}$ = 6; $I_{actualnom}$ / $I_{actualanalog}$ = 6/12/18		Voltage Current	0.4 % + 120 mV 0.5 % + 180 mA	0.4 % + 120 mV 0.5 % + 180 mA	0.4 % + 120 mV 1.2 % + 180 mA
Protection and Additional Functions					
Output overvoltage protection	Trigger value Response time	Setting Range Setting resolution Setting accuracy	3 … 80 V 20 mV ±150 mV –10 mΩ × I_a 200 µs	3 … 80 V 20 mV ±150 mV –20 mΩ × I_a 200 µs	3 to 80 V 20 mV ±150 mV – 10 mΩ × I_a 200 µs
Output overcurrent protection	Trigger value Response time	Setting Range Setting resolution Setting accuracy	1.5 … 40 A 20 mA –(1% + 350 mA) – 20 mA/V × U_a 200 µs	2 … 53 A 20 mA –(1% + 350 mA) – 20 mA/V × U_a 200 µs	3 to 80 A 20 mA –(1% + 350 mA) – 20 mA/V × U_a 200 µs
Reverse polarity protection load capacity		Continuous	30 A	40 A	60 A
Reverse voltage withstand capacity		Continuous	70 V –	70 V –	70 V –
Auto-sensing mode	Compensatable voltage drop	Per output lead	1 V	1 V	1 V

Article Number Type			K346A SYSKON P500-060-030	K347A SYSKON P800-060-040	K353A SYSKON P1500-060-060
General					
Power supply with 230 V~ nominal line voltage Power consumption		Line voltage At nominal load, 100 % At no load	**230 V~** + 10 / – 15 %, 47 … 63 Hz 700 VA; 650 W 96 VA; 37 W	**230 V~** + 10 / – 15 %, 47 … 63 Hz 1050 VA; 1000 W 96 VA; 37 W	**230 V~** + 10 / – 15%, 47 to 63 Hz 1925 VA; 1865 W 96 VA; 37 W
Power supply with 115 V~ nominal line voltage Power consumption		Line voltage At nominal load, 50 % At no load	**115 V~** + 10 / – 15 %, 47 … 63 Hz 800 VA; 750 W 55 VA; 36 W	**115 V~** + 10 / – 15 %, 47 … 63 Hz 1175 VA; 1150 W 55 VA; 36 W	**115 V~** + 10 / – 15%, 47 to 63 Hz 1125 VA; 1100 W 55 VA; 36 W
Max. power loss	At a nominal load 500 W/800 W/1500 W (230 V~) At a nominal load 500 W/800 W/750 W (115 V~)		150 W 250 W	200 W 350 W	365 W 350 W
Efficiency	At a nominal load 500 W/800 W/1500 W (230 V~) At a nominal load 500 W/800 W/750 W (115 V~)		77 % 66 %	80 % 70 %	80% 68%
Switching frequency, PFC / DC/DC		Typical	47 kHz / 230 kHz	47 kHz / 230 kHz	47 kHz / 230 kHz
Inrush current		Max.	50 A_s	50 A_s	50 A_s
Mains fuse (6.3 × 32 mm, UL)			1 × M 15 A / 250 V	1 × M 15 A / 250 V	1 × M 15 A / 250 V
MTBF (mean time between failures)		at 40 °C	> 50,000 h	> 50,000 h	> 50,000 hours

[1] At maximum current setting not including processing time for the previous voltage setting command.
[2] Nominal load: Rload = $Uset^2$ / Pnom

Output operating characteristics (ppm and percentage specifications refer to the respective setting and/or measured value)

Reference Conditions

Ambient temperature	23 °C ±2 K
Relative humidity	40 … 60 %
Warm-up time	30 minutes

Terminals (rear panel)

Mains input	SYSKON P500/P800/P1500: 10 A IEC inlet plug with earthing contact (L + N + PE)
Output	SYSKON P500/P800/P1500: 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

SYSKON | P500, P800, P1500, P3000 and P4500
Computer Controlled Laboratory Power Supply

Electrical Data SYSKON P3000 / P4500

Article Number Type			K363A SYSKON P3000-060-120	K364A SYSKON P4500-060-180
Nominal Output Data		Voltage setting range Current setting range Power	0 … 60 V 0 … 120 A max. 3000 W	0 … 60 V 0 … 180 A max. 4500 W
Output Characteristics (ppm and percentage values make reference to the respective setting or measured value)				
Setting resolution		Voltage Current	1 mV 2 mA	1 mV 3.125 mA
Setting accuracy (at 23 ±5 °C)	Auto-sensing mode Without auto-sensing	Voltage Current	0.07 % + 48 mV 0.07 % + 60 mV 0.1 % + 135 mA	0.1 % + 48 mV 0.1 % + 60 mV 0.15 % + 180 mA
Temperature coefficient for Δ / K setting		Voltage Current	100 ppm 100 ppm	100 ppm 100 ppm
Setting accuracy via analog interface (at 23 ±5 °C) $U_{setnom}/U_{setanalog}$ = 12; $I_{setnom}/I_{setanalog}$ = 12/24/36		Voltage Current	0.6 % + 150 mV 1.2 % + 180 mA	0.6 % + 150 mV 1.2 % + 240 mA
Static system deviation at 100% load fluctuation	Auto-sensing mode Without auto-sensing	Voltage Current	60 mV (< 500 µV/A) 96 mV (< 800 µV/A) 60 mA (< 1000 µA/V)	90 mV (< 500 µV/A) 144 mV (< 800 µV/A) 90 mA (< 1500 µA/V)
Static system deviation with 10% line voltage fluctuation		Voltage Current	7 mV 30 mA	10 mV 60 mA
Residual ripple	Voltage Current	Ripple: 10 Hz to 20 kHz Ripple: 10 Hz to 1 MHz Ripple + noise: 10 Hz to 10 MHz Ripple + noise: 10 Hz to 10 MHz	60 mV_{ss} 75 mV_{ss} 90 mV_{ss} / 10 mV_{eff} 70 mA_{eff}	80 mV_{ss} 100 mV_{ss} 120 mV_{ss} / 15 mV_{eff} 100 mA_{eff}
Output voltage transient recovery time with sudden load variation within range of 20 to 100% I_{nom} and 20 to 100% U_{nom}		Tolerance ΔI = 10% ΔI = + 80% + approx. 800 A/ms ΔI = – 80 % + approx. 1200 A/ms	120 mV 400 µs 1200 µs 1900 µs	120 mV 500 µs 1600 µs 2500 µs
Output voltage over and undershooting with sudden load variation within a range of 20 to 100% I_{nom} and 20 to 100% U_{nom}		 ΔI = 10% ΔI = 80%	 200 mV 1200 mV	 250 mV 1300 mV
Setting time for output voltage [1] where Uset step = 0 V → 60 V where Uset step = 60 V → 1 V where Uset step = 0 V → 25 V where Uset step = 25 V → 1 V		Tolerance No-load; nominal load [2] No-load; nominal load [2] No-load; nominal load [2] No-load; nominal load [2]	120 mV 4 ms / 15 ms 70 ms / 11 ms 1.2 ms / 6 ms 16 ms / 6 ms	120 mV 7 ms / 19 ms 70 ms / 11 ms 2.4 ms / 11 ms 16 ms / 6 ms
Output capacitor Sink (continuous power)		Nominal value Power	4040 µF 80 W – 130 W	6060 µF 120 W – 195 W
Measuring Function				
Measuring Range		Voltage Current Power	– 16.384 … + 98.300 V – 65.532 … + 196.600 A U × I	– 16.384 … + 98.300 V – 98.298 … + 294.900 A U × I
Measuring resolution		Voltage Current Power	2 mV 4 mA 100 mW	2 mV 6 mA 100 mW
Measuring accuracy (at 23 ± 5 °C)		Voltage Current Power	0.07 % + 48 mV 0.6 % + 120 mA 0.7 % + 2 W	0.1 % + 48 mV 0.8 % + 180 mA 1 % + 3 W
Measured value temperature coefficient Δ / K		Voltage Current	50 ppm + 0.6 mV 100 ppm + 2 mA	50 ppm + 0.8 mV 100 ppm + 3 mA
Measuring accuracy (at 23 ± 5 °C) at analog interface $U_{actualnom}$ / $U_{actualanalog}$ = 6; $I_{actualnom}$ / $I_{actualanalog}$ = 6/12/18		Voltage Current	0.6 % + 180 mV 1.2 % + 240 mA	0.8 % + 180 mV 1.2 % + 300 mA
Protection and Additional Functions				
Output overvoltage protection	Trigger value Response time	Setting Range Setting resolution Setting accuracy	3 … 80 V 20 mV ±150 mV –20 mΩ × I_a 200 µs	3 … 80 V 20 mV ±150 mV –20 mΩ × I_a 200 µs
Output overcurrent protection	Trigger value Response time	Setting Range Setting resolution Setting accuracy	6 … 160 A 50 mA –(1% + 500 mA) – 40 mA/V × U_a 200 µs	9 … 240 A 100 mA –(1% + 700 mA) – 60 mA/V × U_a 200 µs
Reverse polarity protection load capacity		Continuous	120 A	180 A
Reverse voltage withstand capacity		Continuous	70 V –	70 V –
Auto-sensing mode	Compensatable voltage drop	Per output lead	1 V	1 V

Article Number Type		K363A SYSKON P3000-060-120	K364A SYSKON P4500-060-180
General			
Power supply with 230 V~ nominal line voltage Power consumption	Line voltage At nominal load, 100 % At no load	3 × 230/400 V~ + 10 / – 15 % 47 … 63 Hz 3810 VA; 3710 W 100 VA; 45 W	3 × 230/400 V~ + 10 / – 15 % 47 … 63 Hz 5660 VA; 5500 W 110 VA; 55 W
Power supply with 115 V~ nominal line voltage Power consumption	Line voltage At nominal load, 50 % At no load	3 × 115/200 V~ + 10 / – 15 % 47 … 63 Hz 2215 VA; 2180 W 73 VA; 48 W	3 × 115/200 V~ + 10 / – 15 % 47 … 63 Hz 3305 VA; 3255 W 92 VA; 60 W
Max. power loss	At a nominal load 3000 W/4500 W (230 V~) At a nominal load 1500 W/2250 W (115 V~)	710 W 680 W	1100 W 1030 W
Efficiency	At a nominal load 3000 W/4500 W (230 V~) At a nominal load 1500 W/2250 W (115 V~)	81 % 69 %	82 % 69 %
Switching frequency, PFC / DC/DC	Typical	47 kHz / 230 kHz	47 kHz / 230 kHz
Inrush current	Max.	50 A_s	50 A_s
Mains fuse (6.3 × 32 mm, UL)		3 × M 15 A / 250 V	3 × M 15 A / 250 V
MTBF (mean time between failures)	at 40 °C	> 40,000 hours	> 30,000 hours

[1] At maximum current setting not including processing time for the previous voltage setting command.
[2] Nominal load: Rload = $Uset^2$ / Pnom

Output operating characteristics (ppm and percentage specifications refer to the respective setting and/or measured value)

Reference Conditions

Ambient temperature	23 °C ±2 K
Relative humidity	40 … 60 %
Warm-up time	30 minutes

Terminals (rear panel)

Mains input	SYSKON P3000/4500: connection terminals (min. 16 A) (L1 + L2 + L3 + N + PE)
Output	SYSKON P3000/4500: Terminal blocks with thread for M8 and M6 screws and 4 mm dia. holes
Analog interface / sensing leads	Double-row plug connector with two 10-pole screw terminals

SYSKON | P500, P800, P1500, P3000 and P4500
Computer Controlled Laboratory Power Supply

Scope of delivery

- SYSKON P Konstanter
- Clear-cut user software [soft front-panel]
- Mains power cable (P500, P800, P1500)
- USB cable (90° angle)
- Installation set for 19" rack mounting
- DAkkS calibration certificate
- Operating instructions (printed)

Manufacturer's Guarantee

The SYSKON Konstanter is guaranteed for a period of 2 years after shipment. The manufacturer's guarantee covers materials and workmanship. Damages resulting from use for any other than the intended purpose, as well as any and all consequential damages, are excluded.

Calibration is guaranteed for a period of 12 months.

Order Information

Description (abbreviated name)	Article Number
SYSKON P500-060-030 SYSTEM KONSTANTER	K346A
SYSKON P800-060-040 SYSTEM KONSTANTER	K347A
SYSKON P1500-060-060 SYSTEM KONSTANTER	K353A
SYSKON P3000-060-120 SYSTEM KONSTANTER	K363A
SYSKON P4500-060-180 SYSTEM KONSTANTER	K364A
Option IEEE 488 interface for SYSKON KONSTANTER	K384A

Software

Further information and downloads regarding operating software and drivers are available on the internet:

www.gossenmetrawatt.com

Accessories

Description	Note	Article Number
RS 232 bus cable, 2 m	For connecting a device to an RS 232 interface (extension cable, 9-pin socket / 9-pin plug connector)	GTZ3241000R0001
Three-phase current cable, 3 m	To connect SYSKON P3000, SYSKON P4500 to the Three-phase-AC grid	K991B

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