

SLP KONSTANTER Series SLP 120 / 240 / 320

Laboratory Power Supplies

3-348-796-03
6/5.11

- Very short response times thanks to BET technology (bidirectional energy transformation)
- Auto-ranging output with 120 W, 240 W or 320 W
- Output power is doubled in short-time operating range
- Remote sensing
- Minimum residual ripple
- Very good dynamic control parameters
- Output ON / OFF function
- Output terminals at front and rear panels
- Master-slave operation for parallel and series connection
- Protection against excessive temperature
- Minimal power loss
- Compact design and minimum weight



Application

The SLP-KONSTANTER series (Single Output Laboratory Power Supplies) includes single-channel laboratory power supplies for universal use in research and development, production, training and service.

The instruments are capable of maintaining either constant voltage or constant current levels, and are deliver 120 W, 240 W or 320 W of nominal power over a wide range thanks to the auto-ranging output.

Setpoint Configuration

Precision manual adjustment of voltage and current is accomplished with ten-turn potentiometers whose setting ranges U_{lim} and I_{lim} can be limited with the help of a screwdriver, in order to prevent inadvertent adjustment to undesirably high values.

Display

Two large, 3½ place digital LED displays indicate the measured output voltage and output current. Furthermore, they can be switched to setpoint display as well, which is especially advantageous for current adjustment.

Control mode displays in the characteristic curve field indicate respective operating conditions.

Outputs

Floating outputs are available at both front and rear panels. Activation or deactivation is accomplished by pressing a key, or with a signal to the integrated analog interface which is included as standard equipment.

As soon as sensor cables are connected to the terminals, the KONSTANTER is automatically switched to remote sensing.

Housing

The quiet, temperature controlled fan prevents unnecessarily high noise levels in working areas.

The rugged metal housing is closed at both top and bottom, and is equipped with mounting feet and a tilt stand at the rear.

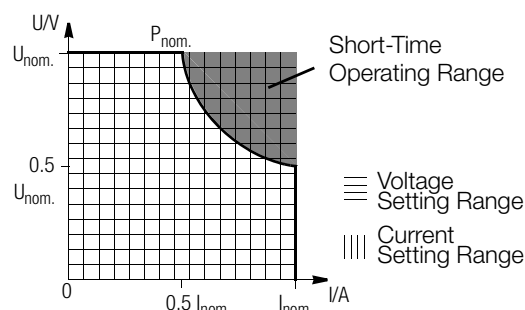
Several units can be quickly and easily fastened to one another for the creation of multi-channel units, or can be installed to a 19" rack with the appropriate mounting sets.

Only one electrical outlet is required for the supply of mains power to multi-channel units.

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Output Working Range



Analog Interface

Connection 11-pole plug-in terminal strip
 Reference potential Output negative pole
 floating TRG input

Connector Pin Assignments:

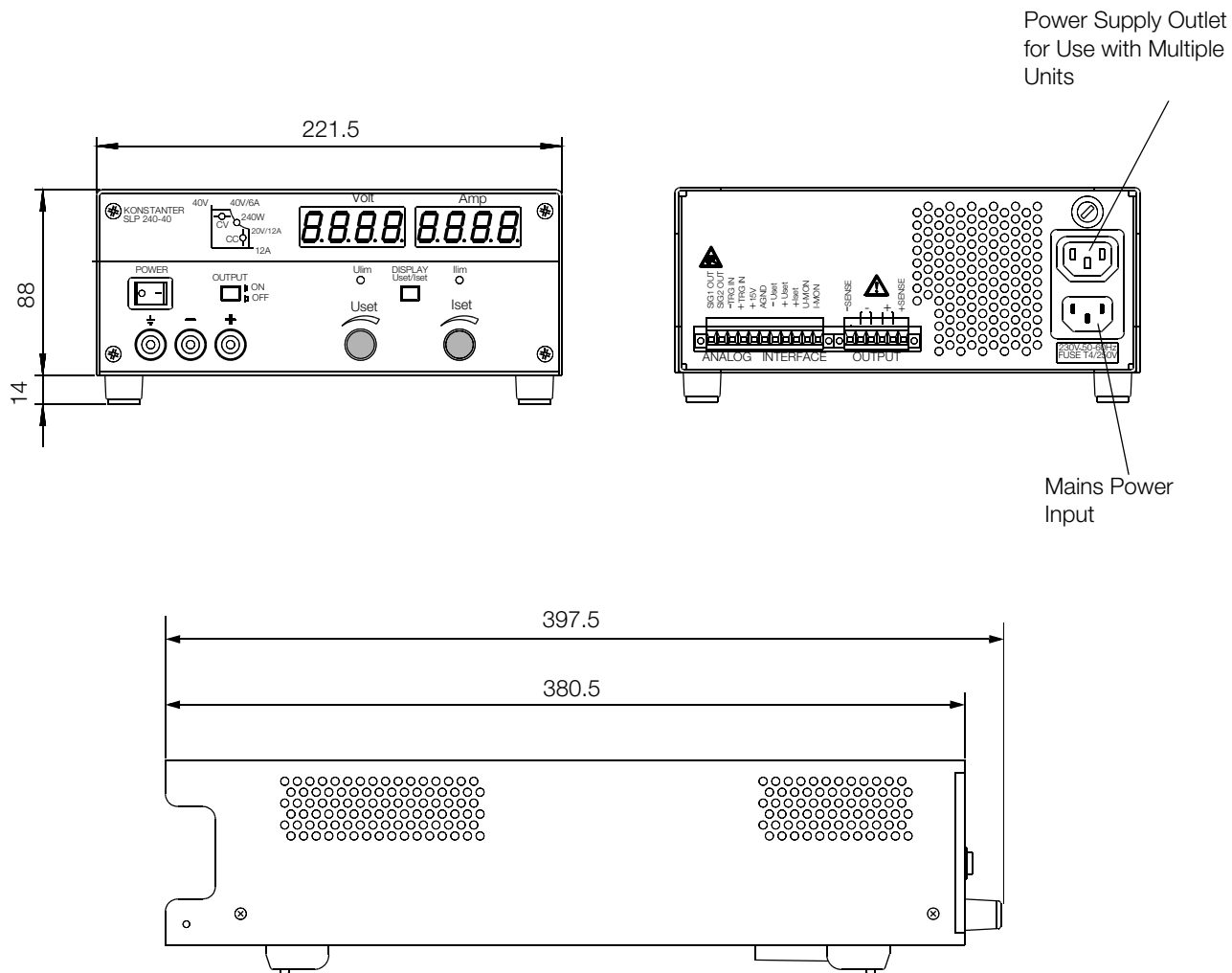
PIN	Designation	Function
1	SIG1 OUT	status signal output for input ON / OFF (open collector, max. 30 V – / 20 mA)
2	SIG2 OUT	status signal output control mode CV / CC (open collector, max. 30 V – / 20 mA)
3	TRG IN +	digital control input for input ON / OFF
4	TRG IN –	(low: < 1 V, high: 4 ... 26 V), floating input
5	+15 V	auxiliary voltage: +15 V / max. 40 mA
6	AGND	reference point connected to –output with reversible fuse
7	U_{set-}	analog, inverted voltage control input (0 ... –5 V corresponds to 0 ... $U_{nom.}$, $R_i = 10\text{ k}\Omega$)
8	U_{set+}	analog voltage control input (0 ... +5 V corresponds to 0 ... $U_{nom.}$, $R_i = 10\text{ k}\Omega$)
9	I_{set+}	analog current control input (0 ... +5 V corresponds to 0 ... $I_{nom.}$, $R_i = 10\text{ k}\Omega$)
10	U-MON	output voltage measurement output (0 ... 10 V corresponds to 0 ... $U_{nom.}$, $R_i = 9.8\text{ k}\Omega$)
11	I-MON	output current measurement output (0 ... 10 V correspond to 0 ... $I_{nom.}$, $R_i = 9.4\text{ k}\Omega$)

Applicable Regulations and Standards

IEC 61010-1/EN 61010-1/ VDE 0411-1	Safety requirements for electrical equipment for measurement, control and laboratory use – General requirements
VDE 0160:1988 + A1:1989 class W1	Equipment of power systems with electronic components
EN 60950:1992 VDE 0805:1990	Safety of IT systems
EN 60529 VDE 0470 Part 1	Test instruments and test procedures – Protection provided by enclosures (IP code)
IEC 68-2-6:1990	Vibration resistance
IEC 68-2-27:1989	Impact resistance
EN 61326-1:1997 + A1: 1998	Electromagnetic compatibility (CEM) Product standard
EN 55022:1998 class A	Electromagnetic Compatibility (CEM) Generic standard interference emission – industrial sector
EN 61000-4-2:1995 EN 61000-4-3:1996 + A1:1998 EN 61000-4-4:1995 EN 61000-4-5:1995 EN 61000-4-6:1996 EN 61000-4-11:1994	Electromagnetic Compatibility (CEM) Generic standard interference immunity – industrial sector

SLP KONSTANTER Series SLP 120 / 240 / 320 Laboratory Power Supplies

Dimensional Drawing (benchtop instrument)



All dimensions in mm

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Characteristic Values, 120 W Series

Unless otherwise indicated, all entries represent maximum values and are valid within an operating temperature range of 0 to 50° C, the nominal power range and a line voltage range of 230 V ± 10% after a warm-up period of 30 minutes.

Description (abbreviated designation)		SLP 120-20	SLP 120-40	SLP 120-80
Type		32 N 20 R 10	32 N 40 R 6	32 N 80 R 3
Nominal Output Data	Voltage Setting Range	0 ... 20 V	0 ... 40 V	0 ... 80 V
	Current Setting Range	0 ... 10 A	0 ... 6 A	0 ... 3 A
	Continuous Power at $T_u \leq 40^\circ \text{C}$	max. 120 W	max. 120 W	max. 120 W
	Short-Time Rating for $t < 90 \text{ s} / T_u \leq 25^\circ \text{C}$	max. 200 W	max. 240 W	max. 240 W
	Current Derating at $T_u > 40^\circ \text{C}$	– 0.25 A / K	– 0.15 A / K	– 0.07 A / K
Output Operating Characteristics				
Overall Setting Tolerance at $23 \pm 5^\circ \text{C}$ with Reference to 3½ Place Setpoint Display including System Deviation for Load / Line	Voltage	0.2 % + 50 mV	0.2 % + 150 mV	0.2 % + 250 mV
	Current	0.5 % + 45 mA	0.5 % + 35 mA	0.5 % + 20 mA
Static System Deviation ¹⁾ at 100% Load Variation ¹⁾	Voltage	15 mV	10 mV	10 mV
	Current	20 mA	10 mA	10 mA
Static System Deviation ¹⁾ at 10% Line Voltage Variation ¹⁾	Voltage	5 mV	5 mV	5 mV
	Current	8 mA	5 mA	5 mA
Residual Ripple ¹⁾	Voltage (10 Hz ... 10 MHz)	10 mV _{eff}	10 mV _{eff}	10 mV _{eff}
	Current (10 Hz ... 1 MHz)	25 mA _{eff}	20 mA _{eff}	10 mA _{eff}
Common-Mode Interference (10 Hz ... 1 MHz)		0.5 mA _{eff}	0.5 mA _{eff}	0.5 mA _{eff}
Settling Time (voltage) with Sudden Load Variations of 10 to 90% I_{nom} .	Tolerance	40 mV	80 mV	80 mV
	$\Delta I = 80\%$	200 µs	200 µs	200 µs
Under and Overshooting with Sudden Load Variations of 50 A / ms		400 mV	400 mV	800 mV
Response Time (voltage) with Setpoint Change 0 → 100% with Setpoint Change 100% → 0	Tolerance	40 mV	80 mV	160 mV
	Open-Circuit / Nominal Load	1 ms / 1 ms	1 ms / 1 ms	4 ms / 4ms
	Open-Circuit / Nominal Load	1 ms / 1 ms	1 ms / 1 ms	4 ms / 4ms
Response Time (current) with Setpoint Change 0 → 100% with Setpoint Change 100% → 0	Tolerance	100 mA	60 mA	30 mA
	Short-Circuit / Nominal Load	< 5 ms / < 5 ms	< 5 ms / < 5 ms	< 10 ms / < 10 ms
	Short-Circuit / Nominal Load	< 5 ms / < 5 ms	< 5 ms / < 5 ms	< 10 ms / < 10 ms
Measurement Value Display (3½ place)				
Measuring Resolution	Voltage	10 mV	100 mV	100 mV
	Current	10 mA	10 mA	10 mA
Measuring Accuracy at $23 \pm 5^\circ \text{C}$ with Reference to the respective Measurement Value	Voltage	0.15 % + 25 mV	0.2 % + 120 mV	0.2 % + 150 mV
	Current	0.5 % + 30 mA	0.5 % + 25 mA	0.5 % + 20 mA
Protective Functions				
Output Overvoltage Protection	Threshold	25 ± 1 V	50 ± 2 V	100 ± 4 V
Protection against Pole Reversal – Load Capacity	Continuous	10 A	6 A	3 A
Reverse Voltage Resistance	Continuous	40 V	80 V	100 V
General				
Power Supply ¹⁾	at Nominal Load in Standby Mode	230 V~ +10 / –15 % 47 ... 63 Hz	230 V~ +10 / –15 % 47 ... 63 Hz	230 V~ +10 / –15 % 47 ... 63 Hz
	at max. Short-Time Power	280 VA; 180 W	280 VA; 150 W	280 VA; 170 W
Power Consumption	at Nominal Load	45 VA; 15 W	45 VA; 15 W	45 VA; 15 W
	Typical	450 VA	500 VA	500 VA
Efficiency	at Nominal Load in Standby Mode	> 70 %	> 80 %	> 80 %
Switching Frequency	at max. Short-Time Power	200 kHz	200 kHz	200 kHz
Article Number		K220A	K221A	K222A

1) Indicated values are increased by a factor of approximately 1.2 within a mains input voltage range of –10% to –15%.

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Characteristic Values, 240 W Series

Unless otherwise indicated, all entries represent maximum values and are valid within an operating temperature range of 0 to 50° C, the nominal power range and a line voltage range of 230 V ± 10% after a warm-up period of 30 minutes.

Description (abbreviated designation)		SLP 240-20	SLP 240-40	SLP 240-80
Type		32 N 20 R 20	32 N 40 R 12	32 N 80 R 6
Nominal Output Data	Voltage Setting Range	0 ... 20 V	0 ... 40 V	0 ... 80 V
	Current Setting Range	0 ... 20 A	0 ... 12 A	0 ... 6 A
	Continuous Power at $T_u \leq 40^\circ \text{C}$	max. 240 W	max. 240 W	max. 240 W
	Short-Time Rating for $t < 90 \text{ s} / T_u \leq 25^\circ \text{C}$	max. 320 W	max. 360 W	max. 360 W
	Current Derating at $T_u > 40^\circ \text{C}$	– 0.5 A / K	– 0.3 A / K	– 0.15 A / K
Output Operating Characteristics				
Overall Setting Tolerance at $23 \pm 5^\circ \text{C}$ with Reference to 3½ Place Setpoint Display including System Deviation for Load / Line	Voltage	0.2 % + 100 mV	0.2 % + 150 mV	0.2 % + 250 mV
	Current	0.5 % + 55 mA	0.5 % + 45 mA	0.5 % + 35 mA
Static System Deviation ¹⁾ at 100% Load Variation ¹⁾	Voltage	25 mV	18 mV	18 mV
	Current	30 mA	30 mA	15 mA
Static System Deviation ¹⁾ at 10% Line Voltage Variation ¹⁾	Voltage	5 mV	5 mV	5 mV
	Current	8 mA	8 mA	5 mA
Residual Ripple ¹⁾	Voltage (10 Hz ... 10 MHz)	15 mV _{eff}	15 mV _{eff}	15 mV _{eff}
	Current (10 Hz ... 1 MHz)	50 mA _{eff}	25 mA _{eff}	20 mA _{eff}
Common-Mode Interference (10 Hz ... 1 MHz)		0.5 mA _{eff}	0.5 mA _{eff}	0.5 mA _{eff}
Settling Time (voltage) with Sudden Load Variations of 10 to 90% I_{nom} .	Tolerance	40 mV	80 mV	160 mV
	$\Delta I = 80\%$	400 µs	200 µs	200 µs
Under and Overshooting with Sudden Load Variations of 50 A / ms		400 mV	400 mV	800 mV
Response Time (voltage) with Setpoint Change 0 → 100% with Setpoint Change 100% → 0	Tolerance	40 mV	80 mV	160 mV
	Open-Circuit / Nominal Load	1 ms / 1 ms	1 ms / 1 ms	4 ms / 4ms
	Open-Circuit / Nominal Load	1 ms / 1 ms	1 ms / 1 ms	4 ms / 4ms
Response Time (current) with Setpoint Change 0 → 100% with Setpoint Change 100% → 0	Tolerance	200 mA	120 mA	60 mA
	Short-Circuit / Nominal Load	< 5 ms / < 5 ms	< 5 ms / < 5 ms	< 10 ms / < 10 ms
	Short-Circuit / Nominal Load	< 5 ms / < 5 ms	< 5 ms / < 5 ms	< 10 ms / < 10 ms
Measurement Value Display (3½ place)				
Measuring Resolution	Voltage	10 mV	100 mV	100 mV
	Current	10 mA	10 mA	10 mA
Measuring Accuracy at $23 \pm 5^\circ \text{C}$ with Reference to the respective Measurement Value	Voltage	0.2 % + 50 mV	0.2 % + 120 mV	0.2 % + 120 mV
	Current	0.5 % + 25 mA	0.5 % + 30 mA	0.5 % + 25 mA
Protective Functions				
Output Overvoltage Protection	Threshold	25 ± 1 V	50 ± 2 V	100 ± 4 V
Protection against Pole Reversal – Load Capacity	Continuous	20 A	12 A	6 A
Reverse Voltage Resistance	Continuous	40 V	80 V	100 V
General				
Power Supply ¹⁾	at Nominal Load	230 V~ +10 / –15 %	230 V~ +10 / –15 %	230 V~ +10 / –15 %
	in Standby Mode	47 ... 63 Hz	47 ... 63 Hz	47 ... 63 Hz
Power Consumption	at max. Short-Time Power	510 VA; 350 W	500 VA; 340 W	500 VA; 340 W
	at Nominal Load	45 VA; 15 W	45 VA; 15 W	45 VA; 15 W
	Typical	620 VA	690 VA	690 VA
Efficiency	at Nominal Load	> 68 %	> 70 %	> 70 %
Switching Frequency	in Standby Mode at max. Short-Time Power	200 kHz	200 kHz	200 kHz
Article Number		K230A	K231A	K232A

1) Indicated values are increased by a factor of approximately 1.2 within a mains input voltage range of –10% to –15%.

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Characteristic Values, 320 W Series

Unless otherwise indicated, all entries represent maximum values and are valid within an operating temperature range of 0 to 50° C, the nominal power range and a line voltage range of 230 V ± 10% after a warm-up period of 30 minutes.

Description (abbreviated designation)		SLP 320-32		
Type		32 N 32 R 18		
Nominal Output Data	Voltage Setting Range	0 ... 32 V		
	Current Setting Range	0 ... 18 A		
	Continuous Power at $T_u \leq 40^\circ \text{C}$	max. 320 W		
	Short-Time Rating for $t < 90 \text{ s} / T_u \leq 25^\circ \text{C}$	max. 430 W		
	Current Derating at $T_u > 40^\circ \text{C}$	– 0.5 A / K		
Output Operating Characteristics				
Overall Setting Tolerance at $23 \pm 5^\circ \text{C}$ with Reference to 3½ Place Setpoint Display including System Deviation for Load / Line	Voltage	0.2 % + 150 mV		
	Current	0.5 % + 50 mA		
Static System Deviation ¹⁾ at 100% Load Variation ¹⁾	Voltage	30 mV		
	Current	40 mA		
Static System Deviation ¹⁾ at 10% Line Voltage Variation ¹⁾	Voltage	10 mV		
	Current	20 mA		
Residual Ripple ¹⁾	Voltage (10 Hz ... 10 MHz)	30 mV _{eff}		
	Current (10 Hz ... 1 MHz)	50 mA _{eff}		
Common-Mode Interference (10 Hz ... 1 MHz)		0.5 mA _{eff}		
Settling Time (voltage) with Sudden Load Variations of 10 to 90% I_{nom} .	Tolerance	64 mV		
	$\Delta I = 80\%$	200 µs		
Under and Overshooting with Sudden Load Variations of 50 A / ms	$\Delta I = 80\%$	400 mV		
Response Time (voltage) with Setpoint Change 0 → 100% with Setpoint Change 100% → 0	Tolerance	64 mV		
	Open-Circuit / Nominal Load	1 ms / 1 ms		
Response Time (current) with Setpoint Change 0 → 100% with Setpoint Change 100% → 0	Tolerance	180 mA		
	Short-Circuit / Nominal Load	< 5 ms / < 5 ms		
	Short-Circuit / Nominal Load	< 5 ms / < 5 ms		
Measurement Value Display (3½ place)				
Measuring Resolution	Voltage	100 mV		
	Current	10 mA		
Measuring Accuracy at $23 \pm 5^\circ \text{C}$ with Reference to the respective Measurement Value	Voltage	0.2 % + 120 mV		
	Current	0.5 % + 40 mA		
Protective Functions				
Output Overvoltage Protection	Threshold	40 ± 1 V		
Protection against Pole Reversal – Load Capacity	Continuous	20 A		
Reverse Voltage Resistance	Continuous	64 V		
General				
Power Supply ¹⁾	at Nominal Load in Standby Mode	230 V~ +10 / –15 % 47 ... 63 Hz		
	at max. Short-Time Power	650 VA; 460 W		
Power Consumption	at Nominal Load	50 VA; 15 W		
	Typical	770 VA		
Efficiency	at Nominal Load in Standby Mode	> 69 %		
Switching Frequency	at max. Short-Time Power	200 kHz		
Article Number		K234A		

¹⁾ Indicated values are increased by a factor of approximately 1.2 within a mains input voltage range of –10% to –15%.

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Ambient Conditions

Vibration Resistance	IEC 68-2-6: 1990 10 ... 55 Hz, 0.3 mm, 1 oct. / min. 3 x 30 min.
Impact Resistance	IEC 68-2-27: 1989 15 gr., 11 ms, semi-sinusoidal, 3 x 6 impacts
Temperature Range	operation: 0 ... 50° C at > 40° C current derating storage: -25 ... +75° C
Humidity	operation: ≤ 75% relative humidity, no condensation allowed
Cooling	with built-in fan air intake: side panel air outlet: rear panel

Power Supply

Connectors	In: 10 A IEC inlet plug connector Out: 10 A IEC inlet socket connector, no switch, no fuse
Line Voltage	230 V~, +10 / -15%, 47 ... 63 Hz
Power Consumption	see Characteristic Values
Inrush Current	max. 50 A _s
Mains Fusing	1 ea. T 4 A / 250 V (6.3 x 32 mm, UL) internal: 1 ea. T 5 A / 250 V (5 x 20 mm)

Output

Connectors	
Output	front panel: 2 ea. 4 mm safety jacks rear panel: 6-pin plug-in terminal strip
Sensor	rear panel: 6-pin plug-in terminal strip
Regulator	primary switched-mode regulator with BET
Operating Modes	adjustable constant voltage / constant current source with automatic sharp transition
Output Isolation	floating output with "protective separation" from the mains inlet, max. allowable potential output-ground: 120 V, capacitance output-ground (housing): 60 nF

Electrical Safety

Safety Class	I
Overvoltage Category:	II for mains inlet I for output and interface
Contamination Level	2
Earth Leakage Current	typ. 2.5 mA
Electrical Isolation	test voltage
Mains / Output-PE	1.35 kV~
Mains-Output	2.7 kV~ (type test: 3.7 kV~7 kV~)

Electromagnetic Compatibility CEM

Product standard	EN 61326-1:1997 + A1: 1998
Interference Emission	EN 55022:1998 class A
Interference Immunity	EN 61000-4-2:1995 Feature A EN 61000-4-3:1996 + A1:1998 Feature B EN 61000-4-4:1995 Feature B EN 61000-4-5:1995 Feature B EN 61000-4-6:1996 Feature B EN 61000-4-11:1994 Feature B

Mechanical Design

Protection	IP 20 for housing in accordance with IEC 529: 1989 EN 60529: 1991 VDE 0470-1: 1992
Type	benchtop instrument, suitable for rack mounting
Dimensions (W x H x D)	benchtop unit: 221.5 x 102 x 397.5 mm 19" rack unit: 1/2 19" x 2 standard height units x 400 mm
Weight	approx. 2.8 kg

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Accessories

Description	Comment	Article No.
19" Adapter, 1 x 32 N	Required for mounting 1 type 32 N ... instrument to a 19" rack	K990A
19" Adapter, 2 x 32 N	Required for mounting 2 type 32 N ... instruments to a 19" rack	K990B
Mains Jumper Cable, 0.4 meters long	The cable is equipped with one 10 A inlet connector plug and one 10 A inlet connector socket. Used for cascading mains power when several instruments are mechanically connected to a single multi-channel unit. The system thus requires only one mains outlet.	K991A

Order Information

Description (Abbreviated Designation)	Type	Article No
Konstanter SLP 120-20	32 N 20 R 10	K220A
Konstanter SLP 120-40	32 N 40 R 6	K221A
Konstanter SLP 120-80	32 N 80 R 3	K222A
Konstanter SLP 240-20	32 N 20 R 20	K230A
Konstanter SLP 240-40	32 N 40 R 12	K231A
Konstanter SLP 240-80	32 N 80 R 6	K232A
Konstanter SLP 320-32	32 N 32 R 1	K234A

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