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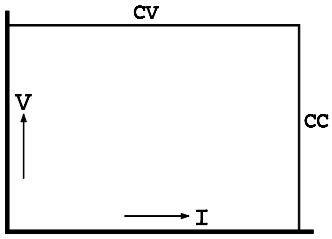
SM1500 - series

1500 watts DC POWER SUPPLIES

SM 15-100	**0 - 15 V**	**0 - 100 A**
SM 35-45	**0 - 35 V**	**0 - 45 A**
SM 52-30	**0 - 52 V**	**0 - 30 A**
SM 70-22	**0 - 70 V**	**0 - 22 A**
SM 120-13	**0 - 120 V**	**0 - 13 A**
SM 300-5	**0 - 300 V**	**0 - 5 A**



- Efficiency 90 %.
- Weight only 10.6 kg
- Wide input voltage range:
  90 - 265 VAC, 50-60 Hz or 125 - 380 VDC
- Active Power Factor Correction, PF=0.99
- 100 kHz MOSFET power conversion technique
- 0 - 5 V analog programmable
  (on both voltage and current)
- Isolated analog programming with optional
  ISO AMP CARD to prevent earth loops
- Programming Inputs and Monitoring Outputs have a very low offset
- **RS232** programming with optional
  internal interface PSC232P CARD,
  IEEE488 with optional external interface PSC 44M
- Very low output ripple
- Very stable output voltage or current
  (5.10^{-5} - 10^{-4})
- Low inrush current during switch on
- Input / output insulation 3750 V rms
- EMC: high immunity and low emission
- Withstands the high energy input pulse test of VDE0160-2 (2.3 $\hat{U}_N$, 1.3 ms)
- Designed for long life at full power
- Protected against all overload and short circuit conditions
- Voltage and current control with 10 turn potentiometers, resolution 0.03 %
- Low noise blower, fan speed adapts to temperature
- 48 hours burn-in

	SM 15-100	SM 35-45	SM 52-30	SM 70-22	SM 120-13	SM 300-5
Output						
voltage	0 - 15 V	0 - 35 V	0 - 52 V	0 - 70 V	0 - 120 V	0 - 300 V
current	0 - 100 A	0 - 45 A	0 - 30 A	0 - 22 A	0 - 13 A	0 - 5 A
Input						
AC single phase, 50 - 60 Hz	90 - 265 V	90 - 265 V	90 - 265 V	90 - 265 V	90 - 265 V	90 - 265 V
Power Derating vs input:						
90 V : $P_{out\ max}$ (W), I_{in} (A)	1140, 16	1180, 16	1178, 16	1180, 16	1170, 16	1175, 16
100 V : $P_{out\ max}$ (W), I_{in} (A)	1290, 16	1330, 16	1334, 16	1335, 16	1325, 16	1325, 16
110 V : $P_{out\ max}$ (W), I_{in} (A)	1446, 16	1460, 16	1480, 16	1490, 16	1480, 16	1480, 16
230 V : $P_{out\ max}$ (W), I_{in} (A)	**1500, 7.5**	**1575, 7.7**	**1560, 7.6**	**1540, 7.5**	**1560, 7.6**	**1500, 7.4**
power factor, 100%, 50% load	0.99, 0.98	0.99, 0.98	0.99, 0.98	0.99, 0.98	0.99, 0.98	0.99, 0.98
DC ($P_{out} = P_{out\ max}$)	125 - 380 V	125 - 380 V	125 - 380 V	125 - 380 V	125 - 380 V	125 - 380 V
internal fuses	25 AT	25 AT	25 AT	25 AT	25 AT	25 AT
standby input power (Vo=Io=0)	12 W	12 W	12 W	12 W	12 W	12 W
standby input power (Vo=$V_{max,}$)	20 W	25 W	25 W	30 W	27 W	25 W
Efficiency						
AC 230 V input, full load	87 %	90 %	90 %	90 %	90 %	90 %
AC 110 V input, max. load	82 %	85 %	85 %	85 %	85 %	85 %
DC 230 V input, full load	87 %	90 %	90 %	90 %	90 %	90 %
Regulation						
Load 0 - 100% **CV**	2.5 mV	5 mV	5 mV	5 mV	8 mV	15 mV
Line 120 - 265 V AC **CV**	0.2 mV	0.5 mV	2 mV	1 mV	2 mV	3 mV
Load 0 - 100% **CC**	6 mA	3 mA	2 mA	1.4 mA	0.8 mA	0.5 mA
Line 120 - 265 V AC **CC** (internal voltage sense)	1 mA	0.5 mA	0.5 mA	0.25 mA	0.15 mA	0.1 mA
Ripple + noise						
rms (BW=300 kHz) **CV**	2 mV	1.8 mV	2 mV	5 mV	7 mV	7 mV
p-p (BW=50 MHz) **CV**	8 mV	8 mV	15 mV	20 mV	30 mV	50 mV (typical 30 mV)
rms (BW=300 kHz) **CC**	15 mA	5 mA	3 mA	4 mA	2 mA	0.5 mA
p-p (BW=50 MHz) **CC**	80 mA	15 mA	10 mA	15 mA	10 mA	5 mA
Temp. coeff., per °C **CV**	35.10^{-6}					
CC	60.10^{-6}					
Stability after 1 hr warm-up during 8 hrs **CV**	5.10^{-5}					
CC	10.10^{-5}					
t_{amb} = 25 ± 1 °C, V_{in} = 230 VAC (internal voltage sensing for CC-stab.)						

Analog Programming	**CV**	**CC**
Programming inputs		
input range	0 - 5 V	0 - 5 V
accuracy	± 0.2%	± 0.5%
offset	- 0.1 ... +1.3 mV (on 5V)	0 ... +2.2 mV (on 5V)
temp. coeff. offset	10 µV / °C	50 µV / °C
input impedance	1 MOhm	1 MOhm
Monitoring output		
output range	0 - 5 V	0 - 5 V
accuracy	± 0.2%	± 0.5%
offset	- 2.2 ... - 0.2 mV (on 5V)	- 2.8 ... +0.1 mV (on 5V)
temp. coeff. offset	10 µV / °C	60 µV / °C
output impedance	2 Ohm / max. 4 mA	2 Ohm / max. 4 mA

Reference voltage on prog. connector	Vref	5.114 ± 15 mV (Ro = 2 Ohm, max. 4 mA)
	TC	20 ppm
+12V output	Vo	12 V ± 0.2 V
on prog. Connector	I_{max}	0.2 A
	Ro	3 Ohm

Status outputs		
CC - status	CC - operation	5V / 10 mA = logic 1
LIM - status	CV or CC limit	5V / 10 mA = logic 1
OT - status	Overtemperature	5V / 10 mA = logic 1
ACF - status	AC - Fail or AC - OK [1]	5V / 10 mA = logic 1
DCF - status	DC - Fail or DC - OK [1] [2]	5V / 10 mA = logic 1
Relay Outputs		
ACF	AC - Fail or AC - OK [1]	both NO and NC contact
DCF	DC - Fail or DC - OK [1] [2]	both NO and NC contact
	[1]) switch selectable	[2]) output ± 5% beyond set point
Remote shutdown	with + 5V, 1 mA or relay contact	
Indicators (font panel)	AC-Fail, DC-Fail, Overtemp, Remote-Shutdown, Remote-Control, CV-limit, CC-limit	
Controls (front panel)	Mains on/off, CV-and CC-potmeter, CV- and CC-limit-potmeter, display-settings button, display-limits button	

Programming speed (resistive load)	**SM 15-100**	**SM 35-45**	**SM 52-30**	**SM 70-22**	**SM 120-13**	**SM 300-5**
Rise time (10 - 90%)						
output voltage step	0 → 15 V	0 → 35 V	0 → 52 V	0 → 70 V	0 → 120 V	0 → 300 V
time, (100 % load)	5.5 ms	13 ms	4.5 ms	12 ms	3.5 ms	8.5 ms
time, (10 % load)	2.2 ms	5.2 ms	2.5 ms	5 ms	1.5 ms	3.6 ms
Fall time (90 - 10%)						
output voltage step	15 → 0 V	35 → 0 V	52 → 0 V	70 → 0 V	120 → 0 V	300 → 0 V
time, (100 % load)	5.7 ms	15 ms	6 ms	13 ms	3.6 ms	12 ms
time, (10 % load)	60 ms	150 ms	60 ms	135 ms	37 ms	110 ms
For High Speed versions (5 - 10 times faster), consult factory.						

	SM 15-100	**SM 35-45**	**SM 52-30**	**SM 70-22**	**SM 120-13**	**SM 300-5**
Recovery time						
recovery within	50 mV	50 mV	100 mV	100 mV	0.7 V	1 V
di/dt of load step	2.3 A/µs	1.1 A/µs	0.7 A/µs	0.6 A/µs	0.5 A/µs	0.2 A/µs
output voltage	14 V	30 V	48 V	70 V	110 V	280 V
time, @ 50 - 100% load step	100 µs	100 µs	100 µs	100 µs	100 µs	100 µs
max. deviation	250 mV	150 mV	300 mV	200 mV	2.5 V	1.7 V
@ 230 VAC input voltage						
Output impedance						
CV, 0-100 kHz	< 25 mOhm	< 30 mOhm	< 30 mOhm	< 30 mOhm	< 0.6 Ohm	< 1 Ohm
Pulsating load						
max. tolerable AC component of load current						
f > 1 kHz	15 A rms	15 A rms	13 A rms	13 A rms	2.5 A rms	1.2 A rms
f < 1kHz	100 A peak	45 A peak	30 A peak	22 A peak	13 A peak	5 A peak

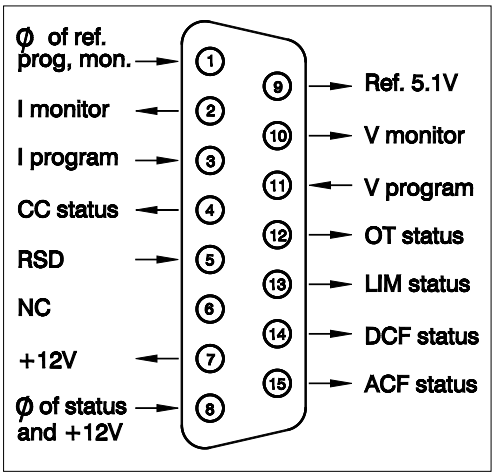
Insulation		
input / output		3750 Vrms (1 min.)
creepage / clearance		8 mm
input / case		2500 Vrms
output / case		600 V DC
Safety		EN 60950 / EN 61010
EMC	**Emission**	**EN50081-1**, EN55022B, EN61000-3-2, EN60555-2, EN61000-3-3
	Immunity	**EN50082-1, EN50082-2**, EN61000-4-2-lv3, EN61000-4-4-lv4, ENV50140-lv3, ENV50141-lv3, ENV50204-lv3, EN61000-4-5-lv3-diff-mode-on-output, EN61000-4-5-lv2-comm-mode-on-output, EN61000-4-5-lv4-on-input, EN61000-4-11, VDE0160-2-input-pulse (lv=level)
Operating Temperature at full load		- 20 to + 50 °C derate output to 75% at 60 °C
Humidity		max. 95% RH, non condensing, up to 40 °C max. 75% RH, non condensing, up to 50 °C
Storage temperature		- 40 to + 85 °C
Thermal protection		Output shuts down in case of insufficient cooling
MTBF		500 000 hrs

Hold-Up time Vout = 100% , Iout = 100% Vout = 85% , Iout = 100% Vout = 100% , Iout = 50% *@ 230 VAC input*	 7.5 ms 18 ms 24 ms
Turn on delay after mains switch on	 300 ms
Inrush current	22 A, < 40 ms @ 90-265V AC input (electronic limit)

Series operation max. total voltage Master / Slave operation	 600 V with optional external Master / Slave Module
Parallel operation max. total current Master / Slave operation	 no limit max. 4 units
Remote sensing max. voltage drop per load lead	 2 V
Limits **OVP / OVL** [3]) adjust range **OCL** adjust range	0 - 102% 0 - 102%
Potentiometers front panel control with knobs resolution screwdriver adjustment at front panel	 standard 0.03 % option P001

	SM 15-100	**SM 35-45**	**SM 52-30**	**SM 70-22**	**SM 120-13**	**SM 300-5**
Meters scale voltage scale current accuracy read output read limit setting (d = digit)	3.5 digit 0 - 15.00 V 0 - 100.0 A 0.5% + 2 d 2% + 2 d	3.5 digit 0 - 35.0V 0 - 45.0 A 0.5% + 2 d 2% + 2 d	3.5 digit 0 - 52.0V 0 - 30.0 A 0.5% + 2 d 2% + 2 d	3.5 digit 0 - 70.0V 0 - 22.0 A 0.5% + 2 d 2% + 2 d	3.5 digit 0 - 120.0 V 0 - 13.00 A 0.5% + 2 d 2% + 2 d	3.5 digit 0 - 300 V 0 - 5.00 A 0.5% + 2 d 2% + 2 d

Mounting	Stacking of units allowed, air flow is from left to right.
Input Connector	IEC320/C20, EN60320/C20
Output Terminals	M8 bolts
Programming connector	15 pole D-connector at rear panel (FEMALE)
Cooling audio noise level airflow	Low noise blower, fan speed adapts to temperature of internal heatsink. ca. 51 dBA at full load, 25 °C ambient temperature, 1 m distance ca. 58 dBA at full load, 50 °C ambient temperature, 1 m distance from left to right
Enclosure degree of protection	 IP20
Dimensions behind front panel: l*d*h front panel: l*h	 442 x 365 x 89 mm (with option P099, feet are removed) 483 x 89 mm (19", 2 U)
Weight	10.6 kg



connections programming connector

CV = Constant Voltage
CC = Constant Current

[3])
OVP = Over Voltage Protection
OVL = Over Voltage Limit (Protection)
OCL = Over Current Limit (Protection)

Specifications measured at
t_{amb} *= 25 ± 5 °C and Vin = 230V AC, 50 Hz unless otherwise noted.*