

DC Sources LAB SMS 3 – 90 kW



▶ 19" x 2 U x 440 – 600 mm

DC Sources LAB HP 5 – 250 kW



▶ 19" x 3 U x 620 mm

OVERVIEW

- Efficiency up to 94 %
- Compact design
- Active parallel and serial connectable
- Easiest operation via front panel
- Constant current, voltage, resistance and power operation
- Randomly programmable memory locations for U/I waves
- UI, UIP, UIR Mode, Simulation of PV-Arrays
- Script Control: process programming and booting from memory card
- Creating user defined output characteristics via memory card or digital interface
- Digital interfaces IEEE488, RS485, USB and LAN (optional)
- Standard integrated ATI 5/10 galvanically isolated analogue interface 0 – 5 V or 0 – 10 V (user selectable) and RS232, Master/Slave, Soft Interlock
- Storable U/I wave forms (e.g. for PV simulation and sequential control)
- Graphical display
- Special version on request
- Datalog function: operation values can be saved in an adjustable interval to a memory card
- Script operation in combination with Datalog function allows an independent stand-alone test field setup
- U_{max} and I_{max} randomly selectable to limit maximum output voltage and current

PRODUCT EXAMPLES LAB SMS

Type	Power W	Voltage V	Current A	Dimensions
LAB/SMS 315	3000	0 – 15	0 – 200	19" x 2 U x 440 mm
LAB/SMS 335	3000	0 – 35	0 – 90	19" x 2 U x 440 mm
LAB/SMS 345	3000	0 – 45	0 – 70	19" x 2 U x 440 mm
LAB/SMS 370	3000	0 – 70	0 – 45	19" x 2 U x 440 mm
LAB/SMS 3100	3000	0 – 100	0 – 30	19" x 2 U x 440 mm
LAB/SMS 3150	3000	0 – 150	0 – 20	19" x 2 U x 440 mm
LAB/SMS 3300	3000	0 – 300	0 – 10	19" x 2 U x 440 mm
LAB/SMS 3600	3000	0 – 600	0 – 5	19" x 2 U x 440 mm
LAB/SMS 3800	3000	0 – 800	0 – 4	19" x 2 U x 440 mm
LAB/SMS 31000	3000	0 – 1000	0 – 3	19" x 2 U x 440 mm
LAB/SMS 31200	3000	0 – 1200	0 – 2.6	19" x 2 U x 440 mm
LAB/SMS 31500	3000	0 – 1500	0 – 2	19" x 2 U x 440 mm
LAB/SMS 420	4000	0 – 20	0 – 200	19" x 2 U x 440 mm
LAB/SMS 435	4000	0 – 35	0 – 115	19" x 2 U x 440 mm
LAB/SMS 445	4000	0 – 45	0 – 90	19" x 2 U x 440 mm
LAB/SMS 470	4000	0 – 70	0 – 60	19" x 2 U x 440 mm
LAB/SMS 4100	4000	0 – 100	0 – 40	19" x 2 U x 440 mm
LAB/SMS 4150	4000	0 – 150	0 – 30	19" x 2 U x 440 mm
LAB/SMS 4300	4000	0 – 300	0 – 15	19" x 2 U x 440 mm
LAB/SMS 4600	4000	0 – 600	0 – 7	19" x 2 U x 440 mm
LAB/SMS 4800	4000	0 – 800	0 – 5	19" x 2 U x 440 mm
LAB/SMS 41000	4000	0 – 1000	0 – 4	19" x 2 U x 440 mm
LAB/SMS 41200	4000	0 – 1200	0 – 3.4	19" x 2 U x 440 mm
LAB/SMS 41500	4000	0 – 1500	0 – 2.7	19" x 2 U x 440 mm
LAB/SMS 525	5000	0 – 25	0 – 200	19" x 2 U x 440 mm
LAB/SMS 535	5000	0 – 35	0 – 150	19" x 2 U x 440 mm
LAB/SMS 545	5000	0 – 45	0 – 120	19" x 2 U x 440 mm
LAB/SMS 570	5000	0 – 70	0 – 75	19" x 2 U x 440 mm
LAB/SMS 5100	5000	0 – 100	0 – 50	19" x 2 U x 440 mm
LAB/SMS 5150	5000	0 – 150	0 – 35	19" x 2 U x 440 mm
LAB/SMS 5300	5000	0 – 300	0 – 17	19" x 2 U x 440 mm
LAB/SMS 5600	5000	0 – 600	0 – 8.5	19" x 2 U x 440 mm
LAB/SMS 5800	5000	0 – 800	0 – 6.25	19" x 2 U x 440 mm
LAB/SMS 51000	5000	0 – 1000	0 – 5	19" x 2 U x 440 mm
LAB/SMS 51200	5000	0 – 1200	0 – 4.2	19" x 2 U x 440 mm
LAB/SMS 51500	5000	0 – 1500	0 – 3.4	19" x 2 U x 440 mm
LAB/SMS 615	6000	0 – 15	0 – 400	19" x 2 U x 600 mm
LAB/SMS 620	6000	0 – 20	0 – 300	19" x 2 U x 600 mm
LAB/SMS 635	6000	0 – 35	0 – 175	19" x 2 U x 600 mm
LAB/SMS 645	6000	0 – 45	0 – 140	19" x 2 U x 600 mm
LAB/SMS 670	6000	0 – 70	0 – 90	19" x 2 U x 600 mm
LAB/SMS 6100	6000	0 – 100	0 – 60	19" x 2 U x 600 mm
LAB/SMS 6150	6000	0 – 150	0 – 40	19" x 2 U x 600 mm
LAB/SMS 6300	6000	0 – 300	0 – 20	19" x 2 U x 600 mm
LAB/SMS 6600	6000	0 – 600	0 – 10	19" x 2 U x 600 mm
LAB/SMS 6800	6000	0 – 800	0 – 7.5	19" x 2 U x 600 mm
LAB/SMS 61000	6000	0 – 1000	0 – 6	19" x 2 U x 600 mm
LAB/SMS 61200	6000	0 – 1200	0 – 5	19" x 2 U x 600 mm
LAB/SMS 61500	6000	0 – 1500	0 – 4	19" x 2 U x 600 mm

PRODUCT EXAMPLES LAB SMS

Type	Power W	Voltage V	Current A	Dimensions
LAB/SMS 820	8000	0-20	0-440	19" x 2 U x 600 mm
LAB/SMS 825	8000	0-25	0-320	19" x 2 U x 600 mm
LAB/SMS 835	8000	0-35	0-230	19" x 2 U x 600 mm
LAB/SMS 845	8000	0-45	0-180	19" x 2 U x 600 mm
LAB/SMS 870	8000	0-70	0-115	19" x 2 U x 600 mm
LAB/SMS 8100	8000	0-100	0-80	19" x 2 U x 600 mm
LAB/SMS 8150	8000	0-150	0-55	19" x 2 U x 600 mm
LAB/SMS 8300	8000	0-300	0-30	19" x 2 U x 600 mm
LAB/SMS 8600	8000	0-600	0-15	19" x 2 U x 600 mm
LAB/SMS 8800	8000	0-800	0-10	19" x 2 U x 600 mm
LAB/SMS 81000	8000	0-1000	0-8	19" x 2 U x 600 mm
LAB/SMS 81200	8000	0-1200	0-6.7	19" x 2 U x 600 mm
LAB/SMS 81500	8000	0-1500	0-5.4	19" x 2 U x 600 mm
LAB/SMS 1020	10000	0-20	0-500	19" x 2 U x 600 mm
LAB/SMS 1035	10000	0-35	0-350	19" x 2 U x 600 mm
LAB/SMS 1045	10000	0-45	0-250	19" x 2 U x 600 mm
LAB/SMS 1070	10000	0-70	0-175	19" x 2 U x 600 mm
LAB/SMS 10100	10000	0-100	0-100	19" x 2 U x 600 mm
LAB/SMS 10150	10000	0-150	0-75	19" x 2 U x 600 mm
LAB/SMS 10300	10000	0-300	0-40	19" x 2 U x 600 mm
LAB/SMS 10600	10000	0-600	0-17	19" x 2 U x 600 mm
LAB/SMS 10800	10000	0-800	0-13	19" x 2 U x 600 mm
LAB/SMS 101000	10000	0-1000	0-10	19" x 2 U x 600 mm
LAB/SMS 101200	10000	0-1200	0-8.4	19" x 2 U x 600 mm
LAB/SMS 101500	10000	0-1500	0-7	19" x 2 U x 600 mm

Other versions on request

PRODUCT EXAMPLES LAB HP

Type	Power W	Voltage V	Current A	Dimensions
LAB/HP 520	5000	0-20	0-250	19" x 3 U x 620 mm
LAB/HP 540	5000	0-40	0-125	19" x 3 U x 620 mm
LAB/HP 580	5000	0-80	0-65	19" x 3 U x 620 mm
LAB/HP 5100	5000	0-100	0-50	19" x 3 U x 620 mm
LAB/HP 5150	5000	0-150	0-35	19" x 3 U x 620 mm
LAB/HP 5300	5000	0-300	0-17	19" x 3 U x 620 mm
LAB/HP 5600	5000	0-600	0-8.5	19" x 3 U x 620 mm
LAB/HP 5800	5000	0-800	0-6.25	19" x 3 U x 620 mm
LAB/HP 51000	5000	0-1000	0-5	19" x 3 U x 620 mm
LAB/HP 51200	5000	0-1200	0-4	19" x 3 U x 620 mm
LAB/HP 51500	5000	0-1500	0-3.4	19" x 3 U x 620 mm
LAB/HP 1020	10000	0-20	0-500	19" x 3 U x 620 mm
LAB/HP 1040	10000	0-40	0-250	19" x 3 U x 620 mm
LAB/HP 1080	10000	0-80	0-130	19" x 3 U x 620 mm
LAB/HP 10100	10000	0-100	0-100	19" x 3 U x 620 mm
LAB/HP 10150	10000	0-150	0-70	19" x 3 U x 620 mm
LAB/HP 10300	10000	0-300	0-34	19" x 3 U x 620 mm
LAB/HP 10600	10000	0-600	0-17	19" x 3 U x 620 mm
LAB/HP 10800	10000	0-800	0-13	19" x 3 U x 620 mm
LAB/HP 101000	10000	0-1000	0-10	19" x 3 U x 620 mm
LAB/HP 101200	10000	0-1200	0-8	19" x 3 U x 620 mm
LAB/HP 101500	10000	0-1500	0-7	19" x 3 U x 620 mm

PRODUCT EXAMPLES LAB HP

Type	Power W	Voltage V	Current A	Dimensions
LAB/HP 1520	15000	0 – 20	0 – 750	19" x 3 U x 620 mm
LAB/HP 1540	15000	0 – 40	0 – 375	19" x 3 U x 620 mm
LAB/HP 1580	15000	0 – 80	0 – 195	19" x 3 U x 620 mm
LAB/HP 15100	15000	0 – 100	0 – 150	19" x 3 U x 620 mm
LAB/HP 15150	15000	0 – 150	0 – 100	19" x 3 U x 620 mm
LAB/HP 15300	15000	0 – 300	0 – 50	19" x 3 U x 620 mm
LAB/HP 15600	15000	0 – 600	0 – 25	19" x 3 U x 620 mm
LAB/HP 15800	15000	0 – 800	0 – 19	19" x 3 U x 620 mm
LAB/HP 151000	15000	0 – 1000	0 – 15	19" x 3 U x 620 mm
LAB/HP 151200	15000	0 – 1200	0 – 12	19" x 3 U x 620 mm
LAB/HP 151500	15000	0 – 1500	0 – 10	19" x 3 U x 620 mm

Other versions on request

MODEL NUMBER DESCRIPTION

LAB /	HP	15	150 / 3P400	LAN	Kfz 12	Mod
DC-Source	Series	Output power	Output voltage Input voltage description	Interface option	Process option	Modification

OPTIONS

Appendix	Description
../230	230 / 207 – 253 VAC Input
../3P208	3 x 208 / 187 – 229 VAC Input
../3P400	3 x 400 / 360 – 440 VAC Input
../3P440	3 x 440 / 396 – 484 VAC Input
../3P480	3 x 480 / 432 – 528 VAC Input
../400Hz	400 Hz Input
../DC	250...750 VDC Input
../ATE	Without Manual Operation
../LT IEEE	IEEE488 Interface
../LTRS485	RS485 Interface
../LAN	LAN Interface
../USB	USB Interface
../KFZ12	Preselected Start-up Curve 12 V
../KFZ24	Preselected Start-up Curve 24 V
../OPT	Predefined Output characteristic
../SD	SD Card Slot

LINE INPUT

	LAB HP										
	LAB SMS										
Device Power	3 kW	4 kW	5 kW	6 kW	8 kW	10 kW	15 kW	20 kW	30 kW	45 kW	60 kW
Connection	3 wire (1P+N+E) / 5 wire (3P+N+E)										
Input 1P/230	1 x 230 VAC (207 – 253 VAC 47 – 63 Hz)										
Input 3P/200	3 x 200 VAC (180 – 220 VAC 47 – 63 Hz)										
Input 3P/208	3 x 208 VAC (187 – 229 VAC 47 – 63 Hz)										
Input 3P/400	3 x 400 VAC (360 – 440 VAC 47 – 63 Hz)										
Input 3P/440	3 x 440 VAC (396 – 484 VAC 47 – 63 Hz)										
Input 3P/480	3 x 480 VAC (432 – 528 VAC 47 – 63 Hz)										
Max. allowed non symmetry (3P-System)	< 3 %										
Input current 1P/230 model ^{1,2}	22 A eff	28 A eff	33 A eff	x ¹⁴	x ¹⁴	x ¹⁴	x ¹⁴	x ¹⁴	x ¹⁴	x ¹⁴	x ¹⁴
Input current 3P/200 model ^{1,2}	15 eff	20 eff	25 eff	30 eff	40 eff	50 eff	74 eff	99 eff	148 eff	221 eff	295 eff
Input current 3P/208 mode ^{1,2}	14 A eff	19 A eff	23 A eff	28 A eff	37 A eff	46 A eff	69 A eff	92 A eff	138 A eff	207 A eff	276 A eff
Input current 3P/400 model ^{1,2}	7.5 A eff	10 A eff	11.5 A eff	15 A eff	20 A eff	22.9 A eff	34.4 A eff	45.8 A eff	68.7 A eff	103.1 A eff	137.5 A eff
Input current 3P/440 model ^{1,2}	7 A eff	9 A eff	11 A eff	14 A eff	18 A eff	21 A eff	32.5 A eff	42 A eff	63.5 A eff	95 A eff	127 A eff
Input current 3P/480 model ^{1,2}	6.5 A eff	8 A eff	10 A eff	12.5 A eff	16.5 A eff	19.5 A eff	30.0 A eff	39 A eff	58 A eff	87 A eff	117 A eff
Inrush transient current ²	< 25	< 25	< 25	< 51	< 51	< 51	< 76	< 102	< 153	< 229	< 305
Norminal current Internal Fuse 3P/400 model	15 A	15 A	15 A	30 A	30 A	30 A	45 A	60 A	90 A	135 A	180 A
Recommended Supply Breaker 3P/400 model (value and curve)	16 A Type D/K	16 A Type D/K	16 A Type D/K	32 A Type D/K	32 A Type D/K	32 A Type D/K	63 A Type D/K	63 A Type D/K	80 A Type D/K	120 A Type D/K	150 A Type D/K
Leakage current	< 35 mA										
cos phi	> 0.7										
Harmonic Content ³	50 Hz = 72 % 100 Hz = 2 % 150 Hz = 0.9 % 200 Hz = 0.1 % 250 Hz = 11 % 350 Hz = 0.6 %										
Efficiency Type	94 %										

¹ For nominal current and nominal voltage

² For nominal input voltage

³ Total harmonic distortion input current ([%]/lin)

⁴ 250 A is the maximum possible current for an 5 kW Unit

⁵ If the ripple is not specified, the maximum allowed ripple is 0.2 % of F.S.

⁶ The measurement of the peak peak ripple is strongly dependent of the measurement setup

⁷ The given accuracy is also all interfaces valid

⁸ Notices: The relative accuracy will not change.

Only the absolute value will be change because the nominal Values of the "unit" are change

⁹ A higher number is possible, ask the manufacturer

¹⁰ The LAB HP unit can also build up at 30 kW, 45 kW, 60 kW, 75 kW and 90 kW units

¹¹ The ripple measurement method of ET System is specified at application note : ET Ripple-Spec

¹² The ripple specification are reservation to change on the part of manufacturer

¹³ Device is at the moment only available with highspeed output (Low output cap)

¹⁴ Not as standard unit available

OUTPUT

		LAB HP																
		LAB SMS																
Control quality	Static Regulation	± 0.1 % of F.S.																
	Line Regulation voltage	± 0.02 % F.S.																
	Line Regulation current	± 0.02 % F.S.																
	Load Regulation voltage	± 0.05 % F.S. ± 2 mV																
	Load Regulation current	± 0.05 % F.S. ± 20 mA																
	Dynamic Responce Time @ Load Step 10 – 90 %	< 3 ms																
Output cuurrent	Output voltage / [V]	15	20	25	35	40	45	70	80	100	150	300	600	800	1000	1200	1500	
	SMS: 3 kW Unit/ [A]	x	250	200	145	125	120	72	65	50	35	17	8,5	6,5	5	4,2	3,3	
	SMS: 4 kW Unit/ [A]	x	250	200	145	125	120	72	65	50	35	17	8,5	6,5	5	4,2	3,3	
	SMS: 5 kW Unit/ [A]	250 ⁴	250	200	145	125	120	72	65	50	35	17	8,5	6,5	5	4,2	3,3	
	SMS: 6 kW Unit/ [A]	x	500	400	290	250	240	144	130	100	67	34	17	13	10	8,4	6,6	
	SMS: 8 kW Unit/ [A]	x	500	400	290	250	240	144	130	100	67	34	17	13	10	8,4	6,6	
	SMS/HP: 10 kW Unit/ [A]	500 ⁴	500	400	350	250	250	175	130	100	75	40	17	13	10	8,4	6,6	
	HP: 15 kW Unit/ [A]	750 ⁴	750	600	435	375	360	220	195	150	100	50	25	19,5	15	12,5	10	
	Other combinations of voltage and current also possible, ask the manufactory																	
	Basic calculation of possible combinations are: Pout = Vout x Iout Pmax for one unit 90 kW Vmax = 1500 V Cmax = 250 A each 5 kW																	
Rippel and Noise ¹⁾	Voltage Ripple (p-p) 20 MHz	40 ¹²	80 ¹²	80 ¹²	80 ¹²	140 ¹²	140 ¹²	140 ¹²	140 ¹²	140 ¹²	900 ¹²	900 ¹²	900 ¹²	1000 ¹²	1200	2500	2500	
	Voltage Ripple (p-p) 300 kHz	15 ¹²	35 ¹²	35 ¹²	35 ¹²	60 ¹²	60 ¹²	60 ¹²	60 ¹²	60 ¹²	400 ¹²	400 ¹²	400 ¹²	700 ¹²	800	1500	1500	
	Voltage Ripple (rms) ⁵ mV 20 MHz	15	35	35	35	60	60	60	60	60	400	400	400	400	400	400	500	
	Voltage Ripple (rms) ⁵ mV 300 kHz	10 ¹²	25 ¹²	25 ¹²	25 ¹²	40 ¹²	40 ¹²	40 ¹²	40 ¹²	40 ¹²	300 ¹²	300 ¹²	300 ¹²	300 ¹²	300	300	400	
	Current Ripple (p-p)	< 0.5 % of F.S.																
	Current Ripple (rms)	< 0.4 % of F.S.																
Isolation	Primary / Secondary	3000 VAC																
	DC-Output / Earth	500 VDC								2000 VDC								
	Primary / Earth	2150 VDC																
Output speed	Rise Time, Full load	6 ms	6 ms	6 ms	6 ms	12 ms	12 ms	12 ms	20 ms	20 ms	20 ms	20 ms	20 ms	20 ms	40 ms	40 ms	40 ms	6 ms ¹³
	Rise Time, No load	5 ms	5 ms	5 ms	5 ms	10 ms	10 ms	10 ms	10 ms	10 ms	10 ms	10 ms	10 ms	10 ms	20 ms	20 ms	20 ms	5 ms ¹³
	Fall Time, Full Load	15 ms	15 ms	15 ms	15 ms	20 ms	20 ms	20 ms	20 ms	20 ms	40 ms	40 ms	50ms	60 ms	80 ms	100 ms	25 ms ¹³	
	Fall Time, No Load	5 s to get below 50 V																
Accuracy	Rel. Accuracy ± [%] ⁷																	
	Voltage [V] 0.25	0.038	0.050	0.063	0.088	0.100	0.113	0.175	0.200	0.250	0.375	0.750	1.500	2.000	2.500	3.000	3.750	
	Current [A] 0.4	1.000	1.000	0.800	0.600	0.500	0.480	0.300	0.260	0.200	0.140	0.068	0.034	0.026	0.020	0.017	0.013	
	Relative Accuracy for Sens Operation (worst case) [%] ⁷																	
	Voltage [V] 0.5	0,075	0,100	0,125	0,175	0,200	0,225	0,350	0,400	0,500	0,750	1,500	3,000	4,000	5,000	6,000	7,500	
Max. Sens Voltage over nominal Voltage	± 1 % of F.S.												no Sens at Standard Units					

OUTPUT

LAB HP

LAB SMS

Maximum Device at Master/Slave-Mode is 8																	
Absolute Accuracy for Master-Slave Operation \pm [%] ⁷																	
Master / Slave	M/S-Parallel-Mode ^{7,8} N: number of parallel connected device; example N=3																
	Voltage [V] 0.25	0.038	0.050	0.063	0.088	0.100	0.113	0.175	0.200	0.250	0.375	0.750	1.500	2.000	2.500	3.000	3.750
	Current [A] 0.4 x N	3.000	3.000	2.400	1.740	1.500	1.440	0.864	0.780	0.600	0.420	0.204	0.102	0.078	0.060	0.050	0.040
	M/S-Serial-Mode ^{7,8} N: number of serial connected device; example N=3																
Voltage [V] 0.25 x N	0.113	0.150	0.188	0.263	0.300	0.338	0.525	0.600	0.750	1.125	0.525	0.750	2.250	4.500	6.000	7.500	
Current [A] 0.4	1.000	1.000	0.800	0.580	0.500	0.480	0.288	0.260	0.200	0.140	0.288	0.200	0.068	0.034	0.026	0.020	
Resolution voltage	Resolution voltage	10 V – 69.99 V				70 V – 99.9 V				100 V – 999 V				1000 V – 1500 V			
	Display																
	Voltage Setting resolution	00.00				00.0				000				0000			
	Single & M/S-Serial-Mode																
	Voltage Setting resolution	N x 00.01				N x 00.1				N x 001				N x 0001			
	M/S-Parallel Mode																
	Resolution current	2 A – 69.99 A				70 A – 99.9 A				100 A – 999 A				1000 A – 2000 A			
Display																	
Current Setting resolution	00,00				00,0				000				0000				
Single & M/S-Serial-Mode																	
Current Setting resolution	N x 00.01				N x 00.1				N x 001				N x 0001				
M/S-Parallel Mode																	
Device Function	OVP	Over Voltage Protection: is adjustable between 0 % and 120 % of Voltage full range															
	OCP	Over Current Protection: is realised by the current setpoint, the output current can not go over the set output current															
	OTP	Over Temperature Protection: if the internal heat sink temperature is go above 90°C the device will automatical shut down															
	UVLO	Under Voltage Lock out: if set limit reach device shut down															
	UI-MODE	Voltage and Current Operation Mode: Voltage and current are setable															
	UIP-MODE	Power Limit Mode: A Powerlimit is setable															
	UIR-MODE	Output Resistor Mode: A Output resistor is setable between [Rmax=Vout_max/Iout_max] and [Rmin=Rmax X 0.1]															
	PV-SIM-MODE	Photovoltaic Simulation Mode: Simulation of a PV-Cell is possibel															
	SLOPE-FUNCTION	Adjustable Slope for current and Voltage: Range-Minimum 1 A/s resp. 1 V/s Range-Maximum is 30 ms to Vmax resp. Imax															
	AI-FILTER	Adjustable filter function for Analoginterface Setvalues. Avergare time is adjustable between approximate 0 s to 80 s 0=0 s; 2=15 ms; 3=30 ms; 4=60 ms; 5=125 ms; 6=250 ms; 7=500 ms; 8=1 s; 9=2 s; 10=3 s; 11=5 s; 12=10 s; 13=20 s; 14=40 s; 15=80 s															
t-ENABLE	Adjustable on time for the device after press the start button (standby). Time is adjustable between 1 s and 65000 s																

INTERFACE

Analog Interface

Digital outputs (CV, Standby, Error)	Output type: Open collector with pull-up resistor 10 k Ω after +5 V Isinkmax: 50 mA
Digital inputs (Ext. Control, Standby)	Input resistance: 47 k Ω Maximum input voltage: 50 V High level: Uin > 2 V Low level: Uin < 0.8 V
Analog outputs (Xmon)	Output resistance: 100 Ω Minimum permissible load resistance: 2 k Ω Minimum load resistance for 0.1 % accuracy: 100 k Ω
Analog inputs (Xset)	Input resistance: 1 M Ω Maximum permissible input voltage: 25 V
Reference voltage	Reference voltage Uref: 10 V \pm 10 mV Output resistance: < 10 Ω Maximum output current: 10 mA (not short-circuit-proof)
5 V – supply voltage	Output voltage: 5 V \pm 300 mV Maximum output current: 50 mA (not short-circuit-proof)
Programming Response Time	< 10 ms

RS232

Signal inputs (Rx, D, CTS)	Maximum input voltage: \pm 25 V Input resistance: 5 k Ω (Type) Switching thresholds: UH < -3 V, UL > +3 V
Signal outputs (Tx, D, RTS)	Output voltage (at RL > 3 k Ω): min \pm 5 V, Type \pm 9 V, max \pm 10 V Output resistance: < 300 Ω ; Short circuit current: Type \pm 10 mA

RS485

Maximum input voltage	\pm 5 V
Input resistance	> 12 k Ω
Output current	\pm 60 mA Max
High level	Ud > 0.2 V
Low level	Ud < -0.2 V

Master-Slave

Number of devices ⁹	up to 8
Maximum Voltage serial	1000 V
Maximum Power Standard Device	LAB/SMS 80 kW LAB/HP 120 kW
Maximum Power LAB HP modified Device ¹⁰	720 kW
Set-Value Accuracy (V/A) by using internal Reference	\pm 0.5 %

EMC AND SAFETY STANDARDS

Safety standard	EN 60950
Emission	EN 61000-6-4:2007
Immunity	EN 61000-6-2:2005
Measurement, control- and laboratory equipment	EN 61010-1:2010

AMBIENT CONDITIONS

Cooling	Fans
Operating temperature	0 – 50°C
Storage temperature	-20°C – 70°C
Humidity	< 80 %
Operating height	< 2000 m
Vibration	10 – 55 Hz / 1 min / 2G XYZ
Shock	< 20 G
Weight / Dimension LAB SMS 3 – 5 kW	18 kg / 19" x 2 U x 440 mm
Weight / Dimension LAB SMS 6 – 10 kW	25 kg / 19" x 2 U x 600 mm
Weight/Dimension LAB HP	5 kW 19 kg, 10 kW 26 kg, 15 kW 33 kg / 19" x 3 U x 620 mm
FAN Volume	42 – 43 dB