

DC Sources VP/MSL 1,2 – 5 kW

with integrated load | voltage-controlled for 2-quadrant operation



 19" x 2 U x 440 mm

DC Sources VP/HPL 5 – 10 kW

with integrated load | voltage-controlled for 2-quadrant operation



 19" x 3 U x 620 mm

OVERVIEW

- with integrated load; voltage-controlled 300 – 2.000 W for 2-quadrant operation
- Efficiency up to 94 %
- Compact design
- Active parallel connectable
- Easiest operation via front panel
- Constant current, voltage, resistance and power operation
- UI, UIP, UIR Mode, Simulation of PV-Arrays
- Script Control: process programming of sequences and characteristics
- Standard integrated AT1 5/10 galvanically isolated analogue interface 0 – 5 V or 0 – 10 V (user selectable) and RS232, Master/Slave, Soft Interlock
- Creating user defined output characteristics via memory card or digital interface
- Digital interfaces IEEE488, RS485, USB and LAN (optional)
- Storable U/I wave forms (e.g. for PV simulation and sequential control)
- Graphical display
- 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
- Special version on request

PRODUCT EXAMPLES VP/MSL

Type	Power W	Voltage V	Current A	Dimensions
VP/MSL 115	1.200	0 – 15	0 – 80	19" x 2 U x 440 mm
VP/MSL 135	1.200	0 – 35	0 – 35	19" x 2 U x 440 mm
VP/MSL 145	1.200	0 – 45	0 – 30	19" x 2 U x 440 mm
VP/MSL 170	1.200	0 – 70	0 – 20	19" x 2 U x 440 mm
VP/MSL 1150	1.200	0 – 150	0 – 8	19" x 2 U x 440 mm
VP/MSL 1300	1.200	0 – 300	0 – 4	19" x 2 U x 440 mm
VP/MSL 1600	1.200	0 – 600	0 – 2	19" x 2 U x 440 mm
VP/MSL 215	2.400	0 – 15	0 – 160	19" x 2 U x 440 mm
VP/MSL 235	2.400	0 – 35	0 – 68	19" x 2 U x 440 mm
VP/MSL 245	2.400	0 – 45	0 – 53	19" x 2 U x 440 mm
VP/MSL 270	2.400	0 – 70	0 – 34	19" x 2 U x 440 mm
VP/MSL 2150	2.400	0 – 150	0 – 16	19" x 2 U x 440 mm
VP/MSL 2300	2.400	0 – 300	0 – 8	19" x 2 U x 440 mm
VP/MSL 2600	2.400	0 – 600	0 – 4	19" x 2 U x 440 mm
VP/MSL 315	3.000	0 – 15	0 – 200	19" x 2 U x 440 mm
VP/MSL 335	3.000	0 – 35	0 – 90	19" x 2 U x 440 mm
VP/MSL 345	3.000	0 – 45	0 – 70	19" x 2 U x 440 mm
VP/MSL 370	3.000	0 – 70	0 – 45	19" x 2 U x 440 mm
VP/MSL 3100	3.000	0 – 100	0 – 30	19" x 2 U x 440 mm
VP/MSL 3150	3.000	0 – 150	0 – 20	19" x 2 U x 440 mm
VP/MSL 3300	3.000	0 – 300	0 – 10	19" x 2 U x 440 mm
VP/MSL 3600	3.000	0 – 600	0 – 5	19" x 2 U x 440 mm
VP/MSL 420	4.000	0 – 20	0 – 200	19" x 2 U x 440 mm
VP/MSL 435	4.000	0 – 35	0 – 115	19" x 2 U x 440 mm
VP/MSL 445	4.000	0 – 45	0 – 90	19" x 2 U x 440 mm
VP/MSL 470	4.000	0 – 70	0 – 60	19" x 2 U x 440 mm
VP/MSL 4100	4.000	0 – 100	0 – 40	19" x 2 U x 440 mm
VP/MSL 4150	4.000	0 – 150	0 – 30	19" x 2 U x 440 mm
VP/MSL 4300	4.000	0 – 300	0 – 15	19" x 2 U x 440 mm
VP/MSL 4600	4.000	0 – 600	0 – 7	19" x 2 U x 440 mm
VP/MSL 525	5.000	0 – 25	0 – 200	19" x 2 U x 440 mm
VP/MSL 535	5.000	0 – 35	0 – 150	19" x 2 U x 440 mm
VP/MSL 545	5.000	0 – 45	0 – 120	19" x 2 U x 440 mm
VP/MSL 570	5.000	0 – 70	0 – 75	19" x 2 U x 440 mm
VP/MSL 5100	5.000	0 – 100	0 – 50	19" x 2 U x 440 mm
VP/MSL 5150	5.000	0 – 150	0 – 35	19" x 2 U x 440 mm
VP/MSL 5300	5.000	0 – 300	0 – 17	19" x 2 U x 440 mm
VP/MSL 5600	5.000	0 – 600	0 – 8,5	19" x 2 U x 440 mm

Other versions on request

PRODUCT EXAMPLES VP/HPL

Type	Power W	Voltage V	Current A	Dimensions
VP/HPL 520	5.000	0 – 20	0 – 250	19" x 3 U x 620 mm
VP/HPL 540	5.000	0 – 40	0 – 125	19" x 3 U x 620 mm
VP/HPL 580	5.000	0 – 80	0 – 65	19" x 3 U x 620 mm
VP/HPL 5100	5.000	0 – 100	0 – 50	19" x 3 U x 620 mm
VP/HPL 5150	5.000	0 – 150	0 – 35	19" x 3 U x 620 mm
VP/HPL 5300	5.000	0 – 300	0 – 17	19" x 3 U x 620 mm
VP/HPL 5600	5.000	0 – 600	0 – 8.5	19" x 3 U x 620 mm
VP/HPL 1020	10.000	0 – 20	0 – 500	19" x 3 U x 620 mm
VP/HPL 1040	10.000	0 – 40	0 – 250	19" x 3 U x 620 mm
VP/HPL 1080	10.000	0 – 80	0 – 125	19" x 3 U x 620 mm
VP/HPL 10100	10.000	0 – 100	0 – 100	19" x 3 U x 620 mm
VP/HPL 10150	10.000	0 – 150	0 – 70	19" x 3 U x 620 mm
VP/HPL 10300	10.000	0 – 300	0 – 34	19" x 3 U x 620 mm
VP/HPL 10600	10.000	0 – 600	0 – 17	19" x 3 U x 620 mm

Other versions on request

MODEL NUMBER DESCRIPTION

VP /	HPL	5	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
../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

	VP/HPL					
	VP/MSL					
Device power	1.2 kW	2.4 kW	3 kW	4 kW	5 kW	10 kW
Connection	3 wire (1P+N+E) / 5 wire (3P+N+E)					
Input 1P/230	1 x 230 Vac (207 – 253 Vac 47 – 63Hz)					
Input 3P/200	3 x 200 Vac (180 – 220 Vac 47 – 63Hz)					
Input 3P/208	3 x 208 Vac (187 – 229 Vac 47 – 63Hz)					
Input 3P/400	3 x 400 Vac (360 – 440 Vac 47 – 63Hz)					
Input 3P/440	3 x 440 Vac (396 – 484 Vac 47 – 63Hz)					
Input 3P/480	3 x 480 Vac (432 – 528 Vac 47 – 63Hz)					
Max.allowed non symmetry (3P-System)	< 3 %					
Input current 1P/230 Modell ^{1,2}	15	18	22	28	33	–
Input current 3P/200 Modell ^{1,2}	9.5	11.5	15	20	25	50
Input current 3P/208 Modell ^{1,2}	9	11	14	19	23	46
Input current 3P/400 Modell ^{1,2}	4.5	5.5	7.5	10	11.5	22.9
Input current 3P/440 Modell ^{1,2}	4	5	7	9	11	21
Input current 3P/480 Modell ^{1,2}	3.5	4.5	6.5	8	10	19.5
Inrush transient current ²	< 25	< 25	< 25	< 25	< 25	< 51
Normalinal current internal Fuse 3P/400 Modell	15 A	15 A	15 A	15 A	15 A	30 A
Recommended supply breaker 3P/400 Modell (value and curve)	16 A Type D/K	16 A Type D/K	16 A Type D/K	16 A Type D/K	16 A Type D/K	32 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 ((%)/I_{in})

⁴ 500 A is the maximum possible current for an 10 kW Unit

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

⁶ The measurement of the peak peak rippel 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 manufactor

¹¹ The ripple measurement methode is specific at application note : Rippel-Spec

¹² Ther rippel specification are reservation to change on the part of manufactor

¹³ Device Is at the moment only avalibale with highspped output (Low output cap)

¹⁴ Not as standard unit available

OUTPUT VP/MSL - VP/HPL

Control quality	Static Regulation	±0,1 % 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 %	< 30 ms														
	Output current	Output voltage	15	20	25	35	40	45	50	60	70	80	100	150	300	600
MSL: 1,2 kW Unit		80	60	48	34,29	30	26,67	24	20	17,14	15	12	8	4	2	
MSL: 2,4 kW Unit		160	120	96	68,57	60	53,33	48	40	34,29	30	24	16	8	4	
MSL: 3 kW Unit		200	150	120	85,71	75	66,67	60	50	42,86	37,50	30	20	10	5	
MSL: 4 kW Unit		250	200	160	114,29	100	88,89	80	66,67	57,14	50	40	26,67	13,33	6,67	
MSL/HPL: 5 kW Unit		x	250	200	142,86	125	111,11	100	83,33	71,43	62,50	50	33,33	16,67	8,33	
HPL: 10 kW Unit		x	500	460	285	250	222	200	167	143	120	100	70	34	17	
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 10 kW Vmax = 600 V Cmax = 500 A each 10 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	140 ¹²	140 ¹²	900 ¹²	900 ¹²	900 ¹²	
	Voltage Ripple (p-p) 300 kHz	15 ¹²	35 ¹²	35 ¹²	35 ¹²	60 ¹²	60 ¹²	60 ¹²	60 ¹²	60 ¹²	60 ¹²	60 ¹²	400 ¹²	400 ¹²	400 ¹²	
	Voltage Ripple (rms) ⁵ mV 20 MHz	15	35	35	35	60	60	60	60	60	60	60	400	400	400	
	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	40 ¹²	40 ¹²	300 ¹²	300 ¹²	300 ¹²	
	Current Ripple (p-p)	< 0.5 % of F.S.														
	Current Ripple (rms)	< 0.4 % of F.S.														
Isolation	Primary / Secondary	3.000 VAC														
	DC-Output / Earth	500 VDC										2.000 VDC				
	Primary / Earth	2.150 VDC														
Output speed	Rise Time, Full load	6 ms	6 ms	6 ms	6 ms	12 ms	12 ms	12 ms	12 ms	12 ms	20 ms	20 ms	20 ms	20 ms	20 ms	
	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	10 ms	
	Fall Time, Full Load	15 ms	15 ms	15 ms	15 ms	20 ms	20 ms	20 ms	20 ms	20 ms	20 ms	20 ms	40 ms	40 ms	50 ms	
	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	0,125	0,150	0,175	0,200	0,250	0,375	0,750	1,500	
	Current [A] 0,4	1,000	1,000	0,800	0,571	0,500	0,444	0,400	0,333	0,286	0,250	0,200	0,133	0,067	0,033	
	Relative Accuracy for Sens Operation (worst case) [%] ⁷															
	Voltage [V] 0,5	0,075	0,100	0,125	0,175	0,200	0,225	0,250	0,300	0,350	0,400	0,500	0,750	1,500	3,000	
	Max. Sens Voltage over nominal Voltage ⁷	± 1 % of F.S.														
Max. Sens voltage inside the nominal voltage range ⁷	5 % of F.S. (if higher voltage is needed ask manufactory)															

OUTPUT VP/MSL VP/HPL

	15	20	25	35	40	45	50	60	70	80	100	150	300	600	
Master / Slave	Output voltage														
	Maximum Device at Master/Slave-Mode is 8														
	Absolute Accuracy for Master-Slave Operation \pm [%] ⁷														
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	0,125	0,150	0,175	0,200	0,250	0,375	0,750	1,500
Current [A] 5 kw 0,4 x N	3,000	3,000	2,400	1,714	1,500	1,333	1,200	1,000	0,857	0,750	0,600	0,400	0,200	0,100	
Resolution	Resolution voltage	20 V – 99,99 V										100 V – 999,9 V			
	Display														
	Current Setting resolution Single & M/S-Serial-Mode	00.00										000.0			
	Current Setting resolution M/S-Parallel Mode	N x 00.01										N x 000.1			
Sink mode	Resolution current	0,000 A – 9,999 A				10,00 A – 99,99 A				100,0 A – 999,9 A					
	Display														
Sink mode	Maximum continuous power @ Tamb. = 50°C	VP/MSL 1,2 – 5 kW: 300 – 600 W VP/HPL 5 – 10 kW: 300 – 2.000 W													
	Maximum sink current	Iout max of the Device													
	Protection	PL (Power is limited by digital frontpanel control) OTP (Over temperature protect by the frontpane) Fan is linear controlled by an Temp.-Sensor													
	Responce time ¹⁶	< 20 ms													
	Voltage threshold above which the load is applied	Voltage Set Value +100 mV \pm 10 mV													
	Output Voltage [V]	15	20	25	35	40	45	50	60	70	80	100	150	300	600
Device Function	Programming	45 ms	45 ms	45 ms	45 ms	60 ms	60 ms	60 ms	60 ms	60 ms	60 ms	120 ms	120 ms	150 ms	
	Down Speed @ No Load	45 ms	45 ms	45 ms	45 ms	60 ms	60 ms	60 ms	60 ms	60 ms	60 ms	120 ms	120 ms	150 ms	
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 tempearture 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: $U_{in} > 2$ V Low level: $U_{in} < 0.8$ 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 U_{ref} : 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: $U_H < -3$ V, $U_L > +3$ V
Signal outputs (Tx, D, RTS)	Output voltage (at $R_L > 3$ 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	$U_d > 0.2$ V
Low level	$U_d < -0.2$ V

Master-Slave parallel

Number of devices ⁹	up to 8
Maximum Power Standard Device	VP/MSL 40 kW VP/HPL 80 kW

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
Operating temperature	-20°C – 70°C
Humidity	< 80 %
Operating height	< 2.000 m
Weight / Dimension VP/MSL 1,2 – 5 kW	14 – 19 kg / 19" x 2 U x 440 mm
Weight / Dimension VP/HPL 5 kW	19 kg / 19" x 3 U x 620 mm
Weight / Dimension VP/HPL 10 kW	27 kg / 19" x 3 U x 620 mm
FAN Volume	42 – 43 dB