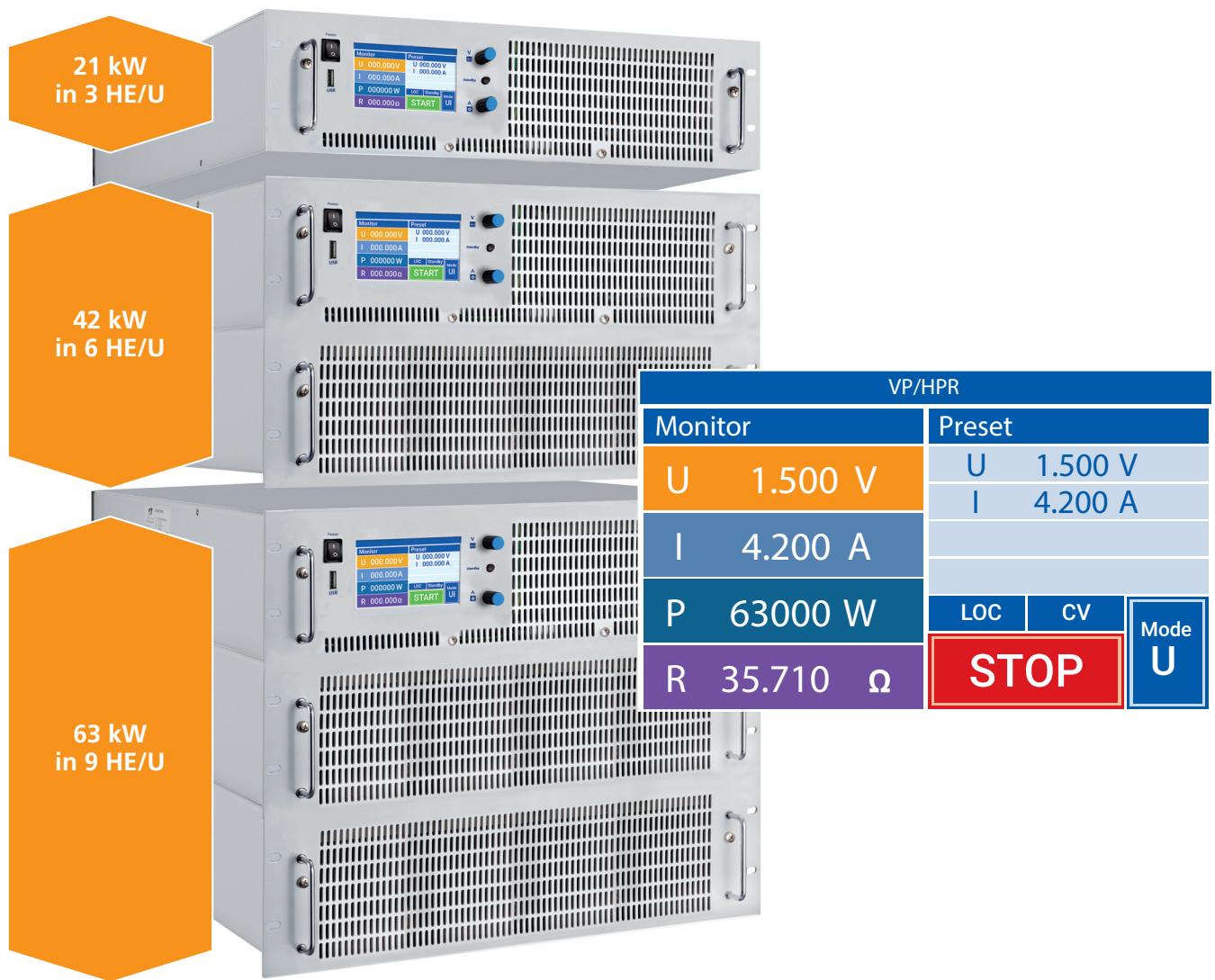




Your Power House  
**VP**ELECTRONIQUE

6 ]X]fYW]cbU·  
8 7 ·Gci fWYg·JD·<DF  
+·\_K ·E\*· \$·\_K





## Bidirectional DC Sources VP HPR

7 – 210 kW

19" x 3 U x 620 mm



## OVERVIEW

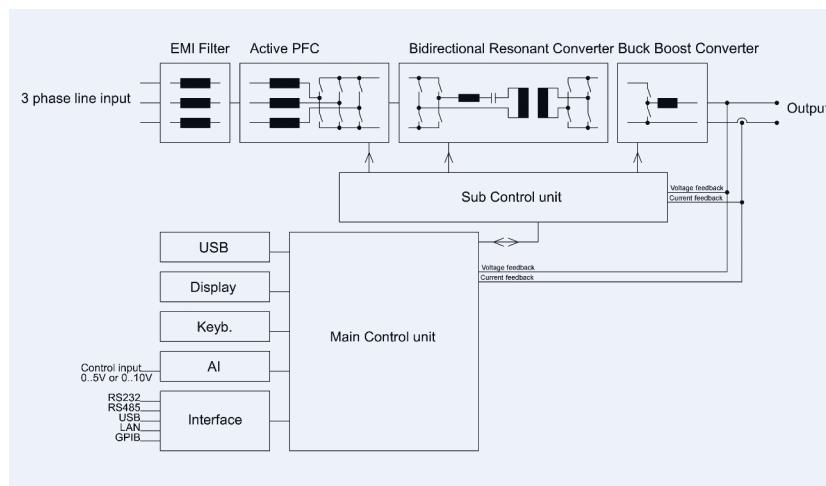
- TFT touch-display
- Additionally controllable via WiFi
- Frontside USB flash drive connection
- Full bidirectional operation made possible by grid-tie source sink technology
- Product line with various output voltages:  
100, 150, 300, 500, 750, 1.500 VDC
- Constant voltage (0 to 100 %), constant current (0 to 100 %), constant power operation (5 to 100 %) with automatic and fast crossover as well as mode indication and internal resistance simulation
- Power categories from 7 to 630 kW are available for each nominal output voltage
- Software for battery simulation (option)
- DataLog function: current operations values are saved to an USB flash drive at adjustable time intervals
- Measuring range switchover for current and voltage
- Power increased easily through modular design: Parallel, series, matrix or multiload master-slave-operation
- Full digital control and regulation
- Smart functions for monitoring
- Customized designs



## BLOCKDIAGRAMM

## BLOCK DIAGRAM

On the network, the usual EMC filter is followed by a PFC that can operate bidirectionally. The circuit concept of this PFC is implemented in such a way that it works on 1- and 3-phase networks. In view of the ever-increasing line voltages and the power required for the measurement procedure, which is always audible, we are thus well equipped for the future. The output voltage of the PFC is 650V.

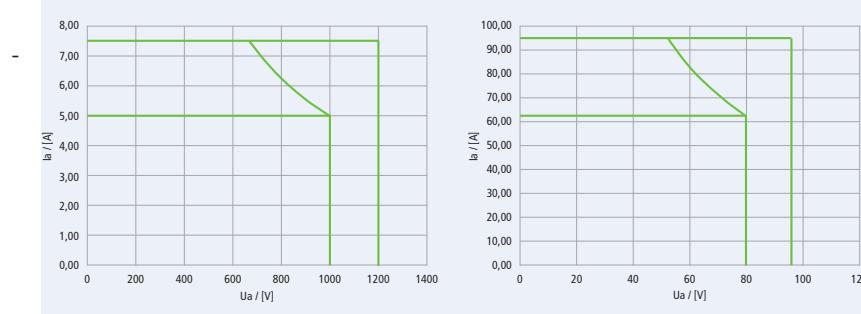


The output of the PFC is followed by a DC/DC converter, which is also bidirectional. This takes over the galvanic isolation and has an output voltage of about 1000V. Since this converter works with an almost constant output voltage, it can be designed to be fully resonant and therefore achieves a very good efficiency.

The downstream up/down converter offers an adjustable output voltage and current and is also bidirectional.

## AUTO RANGING

The bidirectional DC sources of the VP/HPR series have a power control which reacts flexibly. At high output currents the output voltage is limited so that the maximum permissible output power cannot be exceeded or vice versa.

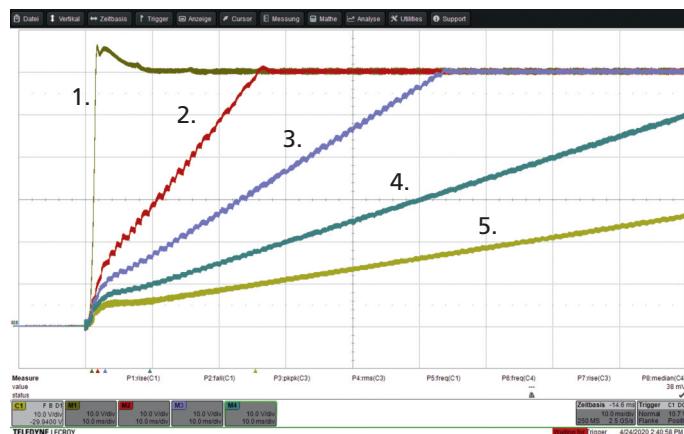




## DESCRIPTION

Additional scope of functions:

The bidirectional DC-source has some additional functions that simplify the daily work with the source, such as t-Enable: after a defined time the source is automatically put back into standby. Possible applications are for example the manual testing of varistors, or the examination of motor starting processes.



- Slope: A parameter which increases the rise time for both current and voltage when switching out of standby. One possible application is testing laser diodes.
1. Slope off (Option High speed)
  2. Slope 2000 V/s
  3. Slope 1000 V/s
  4. Slope 500 V/s
  5. Slope 250 V/s

- AI filter: A digitally adjustable filter for the analog interface. The filter enables the use of highly noisy analog signals as control signals in non-time critical applications.
- Lock front: The display of the source can be locked by a simple key combination. If the source is switched off while the display is locked, it will output the last set values right after being switched on again.
- Remember last settings: The source has the ability to restore the last stored values on restart (the source remains in standby). This makes it easier to test applications that require frequent changes in setup and where the test source is often deactivated.

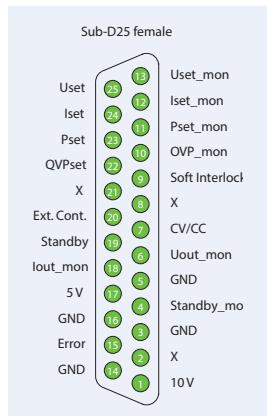
### Protection functions for customer applications

UVLO: This function can switch off the output after a defined time if a short circuit occurs in the customer application when the device is operated in V constant mode.

OCP: This function switches the output off after a defined time if the specified current is exceeded.



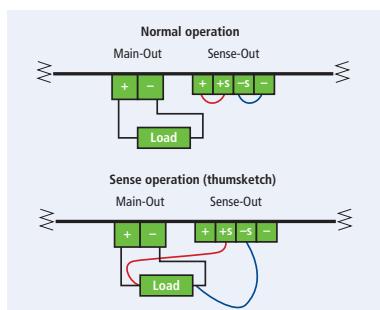
### Galvanically isolated analog interface



By default, the DC sources of the VP/HPR-series have an ATI5/10 analog interface integrated. The logic levels can be configured to 0-5 V and 0-10 V by the customer.

The ATI interface can be used to set the set-values for voltage, current, OVP and power.

The present set-values for voltage, current, power and OVP can also be read back via the interface.

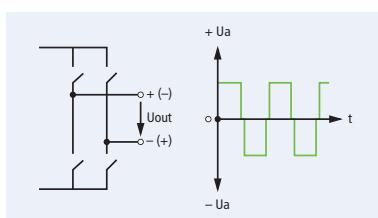


### Sense function

The VP/HPR series DC sources have a Sense function which allows to compensate the line resistance between the source output and the load, this is possible within the output characteristic field of 0 - 101% of the nominal voltage. A maximum of 10% of the maximum output voltage can be compensated.

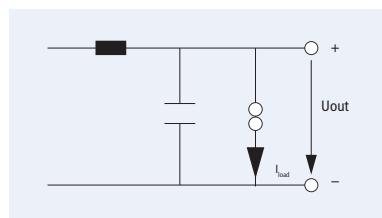
### Polarity reversal

This option enables reversing the polarity of the DC output when the device is in Standby-Mode. This can be done manually or via an interface.



### Internal electrical load

Long lasting overvoltage events can be caught by the internal electrical load.



### Master-Slave function

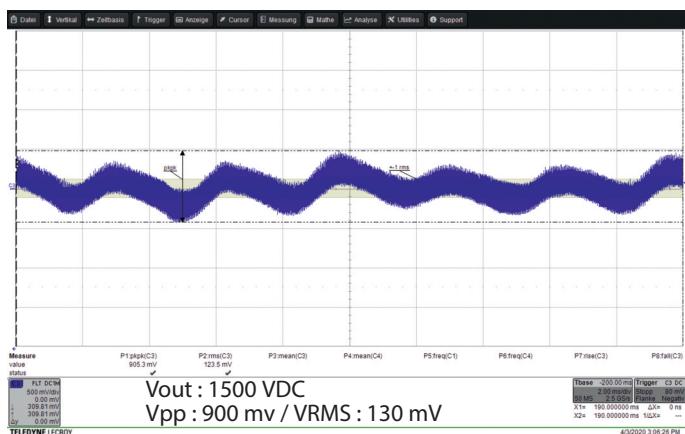
In Master - Slave mode, several independent sources can be used simultaneously. The sources can be connected in series, parallel, or both. This way the same sources can be used for different load conditions by changing their output connections.

If the master device fails, one of the slave devices takes over the function of the original master device.

Master  $\triangleq$  Slave

### Ripple and noise

The amplitude of the AC voltage component on the DC output of a power supply. This characteristic is shown in the values for peak-to-peak voltage ( $V_{pp}$ ) and rms voltage ( $V_{rms}$ ), which are calculated at a specified bandwidth.

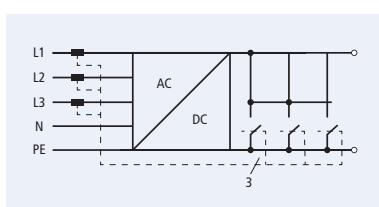


The ripple consists of:

- fed through rectified mains voltage
- internal switching transients as well as other sources of noise.

### Emergency shutdown DC output

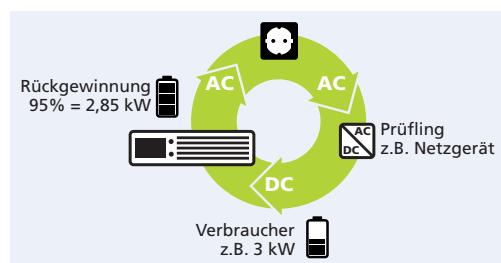
In the event of a mains failure, the DC output of the source is short circuited. This ensures that the output voltage is below 60 VDC within 10 s, which is in accordance with EN 61010-1.



Since this protection circuit is already integrated it doesn't need to be added by the user.

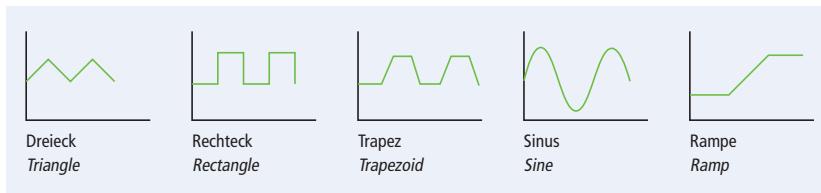
### Power recovery

The bidirectional devices of the VP/HPR series work as a



source as well as an electronic load. In this case, the power consumed in load operation is not converted into heat but fed back into the network. This means that the mains connection is always used for mains feedback.

### Function generator



A real function generator is made available via the USB stick application, which can be used to display various curves.

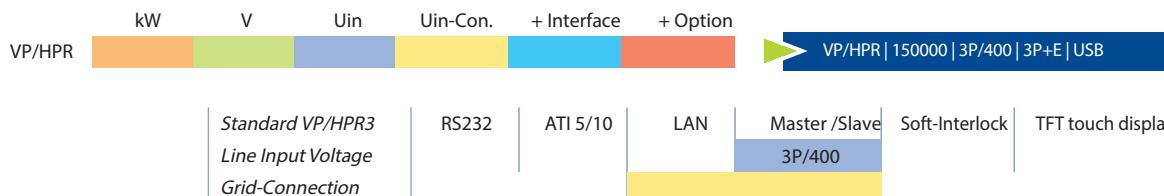
## OUTPUT CURRENT 7 KW - 63 KW

Output-Power <sup>1</sup>	7kW	16kW	21kW	28kW	35kW	42kW	49kW	56kW	63kW
Height	3HE/U			6HE/U			9HE/U		
Output Voltage [V] <sup>2</sup>	Output Current [A]								
100	150	300	450	600	750	900	1050	1200	1350
150	117	233	350	467	584	700	817	934	1050
300	70	140	210	280	350	420	490	560	630
500	42	84	126	168	210	252	294	336	378
750	28	56	84	112	140	168	196	224	252
1000	21	42	63	84	105	126	147	168	189
1500	14	28	42	56	70	84	96	110	124

## DEVICE FEATURES

Device type	VP/HPR
Function	
<i>TFT touch display</i>	x
<i>USB port</i>	x
<i>Master/slave function</i>	x
<i>Soft interlock</i>	x
<i>UI mode</i>	x
<i>UIP mode</i>	x
<i>UIR mode</i>	x
<i>Simulation of PV arrays</i>	x

## EXAMPLE DEVICE DESIGNATION



## OPTIONS LIST

Option	Option for	LAB/HPR
ATE	<i>ATE without manual control</i>	x
IEEE 488	<i>IEEE 488 interface</i>	x
RS 485	<i>RS 485 interface</i>	x
<b>USB</b>	<i>USB interface</i>	x
USB Port	<i>USB-Stick</i>	x
IIO	<i>Increased isolation output to earth 2000 DC at an output voltage up to 300 VDC</i>	x
<b>CC</b>	<i>Conformal coating</i>	x
MRI AC	<i>Interlock according to machine guidelines for mains input</i>	x
MRI DC	<i>Interlock according to machine guidelines for DC output</i>	x
NA	<i>DC output emergency shutdown: The DC output is safely short-circuited when the mains supply is switched off.</i>	x
SC	<i>Cover for mains and DC connections</i>	x
3y	<i>Extended warranty 3 years</i>	x

<sup>1</sup> Higher output power on request<sup>2</sup> Voltage data are examples, any voltages at no extra charge, starting at one unit.<sup>3</sup> maximum 3 digital interfaces



## INPUT DATA

<i>Height</i>	7kW	3HE / U	21kW	28kW	6HE / U	42kW	49kW	9HE / U	56kW	63kW
<i>Output-Power</i>										
Grid-Connection-Information										
<i>Grid Connection</i>										
<i>Input 3P/400</i>										
<i>Input current 3P/400 model / [Arms]</i> <sup>1</sup>										
12	25,5	33	45	57	66	78	90	99		
5 wire (3P+N+E)										
3 x 400 VAC (360-440 VAC 47-63Hz)										
Grid-Information										
<i>Inrush Transient current</i> <sup>3</sup>										
< 51										
< 76										
< 102										
< 127										
< 153										
< 178										
< 203										
< 229										
<i>Max.allowed asymmetry (3P-System)</i>										
<3%										
<i>Leakage current</i>										
< 35 mA										
<i>Power factor</i>										
> 0.99										
<i>Harmonic content</i> <sup>3</sup>										
50Hz = 72%   100Hz = 2%   150Hz = 0.9%   200Hz = 0.1%   250Hz = 11%   350 Hz = 0.6%										
<i>Efficiency Type</i>										
94%										
Fuse Information										
<i>Recommended Supply breaker 3P/400 model (value and curve)</i>										
16	32	35	50	64	75	90	100	120		
Type D/K	Type D/K	Type D/K	Type D/K	Type D/K	Type D/K	Type D/K	Type D/K	Type D/K		

<sup>1</sup> for nominal current and nominal voltage

<sup>2</sup> not standard or not available

<sup>3</sup> for nominal input voltage; the inrush current occurs only when first connecting to the grid

## OUTPUT DATA

Output ripple							
Voltage range in [V] for spec. below	100	150	300	500	750	1000	1500
Voltage ripple (mVpp) 20MHz	140	140	300	350	350	700	900
Voltage ripple (mVpp) 300kHz	60	60	200	250	250	500	550
Voltage ripple (mVrms) 20MHz	60	60	200	150	150	300	200
Voltage ripple (mVrms) 300kHz	40	40	100	100	100	200	150
Current ripple (Vpp)			< 0.5% of F.S. of I <sub>max</sub> from one 7KW-Unit				
Current ripple (Arms)	260	220	60	30	25		12
Output speed							
Voltage range in [V] for spec. below	100	150	300	500	750	1000	1500
Rise time, full load	12ms	20ms	20ms	20ms	40ms	40ms	6ms
Rise time, no load	10ms	10ms	10ms	10ms	10ms	10ms	5ms
Fall time, full load	20ms	20ms	40ms	50ms	60ms	60ms	25ms
Fall time, no load	tf < 5s @ U <sub>a</sub> < 60V		10s				
Dynamic response time during load variations			< 3ms				
Insulation							
Voltage range in [V] for spec. below	0-300V		301V -1500V				
Primary / secondary			3000 VAC				
Primary / earth			2150 VDC				
DC output / earth	500 VDC		2000 VDC				
Output stability							
Static regulation			±0.1% F.S.				
Voltage stability during line variation			±0.02% F.S.				
Current stability during line variation			±0.02% F.S.				
Voltage stability during load variation			±0.05% F.S. ± 20mV				
Current stability during load variation			±0.05% F.S. ± 20mA				
Accuracy-SET value							
Voltage			0,1%				
Current			0,2%				
Voltage during sense operation			0,50%				
Voltage during M/S-serial operation			0,1% x N (N : number of devices)				
Current during M/S-parallel operation			0,2% x N (N: number of devices)				
Resolution of displayed value							
Voltage range in [V] for spec. below	20V - 99.99V		100.0V - 999.9V			1000V - 1500V	
Voltage	000.0		000.0			0000	
Voltage during M/S-serial operation	N x 00.01		N x 000.1			N x 0001	
Current range in [A] for spec. below	10.00A - 99.99A		100.0A - 999.9A			1000A - 99999A	
Current	00.00		000.0			00000	
Current during M/S-parallel operation	N x 00.01		N x 000.1			N x 000.1	

## DEVICE FUNCTION

OVP	<i>Over Voltage Protection: is adjustable between 0% and 120% of maximum voltage</i>
OCP	<i>Over Current Protection: is realised by the current setpoint. The output current can not go over the set output current</i>
OTP	<i>Over Temperature Protection: if the internal heat sink temperature is above 90°C the device will automatically shut down</i>
UVLO	<i>Under Voltage Lockout: The device shuts down when the UVLO-value is reached.</i>
UI-MODE	<i>Operating mode: voltage- and current-limited output</i>
UIP-MODE	<i>Operating mode: UI-MODE with additional power limit. Only for LAB/HP</i>
UIR-MODE	<i>Operating mode: UI-MODE with adjustable internal resistance</i>
PV-SIM-MODE	<i>Simulation of a photovoltaic array. Only for LAB/HP</i>
SLOPE-FUNCTION	<i>Adjustable rise time for current and voltage. Range-minimum 1A/s resp. 1V/s   range-maximum is 30ms to <math>I_{max}</math> resp. <math>V_{max}</math>, only for LAB/HP</i>
AI-FILTER	<i>Adjustable moving average filter for set-values that are transmitted over the analog interface. The interval over which the average is calculated. can be configured between 0s and 80s.</i>
t-ENABLE	<i>Adjustable operating time after pressing the start button (Standby). The operating time is configurable between 1s and ca. 18h. Only for LAB/HP</i>



## INTERFACES

<i>Digital outputs (CV,Standby,Error)</i>	<i>Output type: Open collector with pull-up resistor 10kΩ after +5V Isinkmax: 50mA</i>
<i>Digital inputs (Ext. control, standby)</i>	<i>Input resistance: 47kΩ</i>
<i>Analog output (Xmon)</i>	<i>Maximum input voltage: 50V High level: Uin &gt; 2V Low Level: Uin &lt; 0.8V Output resistance : 100Ω</i>
<i>Analog input (Xset)</i>	<i>Minimum permissible load resistance : 2kΩ Minimum load resistance for ± 0.1% accuracy: 100kΩ Input resistance: 1M Ω Maximum permissible input voltage: 25V</i>
<i>Reference voltage</i>	<i>Reference voltage Uref: 10V ± 10mV Output resistance: &lt; 10Ω</i>
<i>5V - supply voltage</i>	<i>Maximum output current: 10mA (not short-circuit-proof) Output voltage: 5V ± 300 mV</i>
<i>Set-Value accuracy (V/A) when using internal reference</i>	<i>Maximum output current: 50mA (not short-circuit-proof) ± 0.5%</i>
<i>Response time</i>	<i>&lt; 10ms</i>
<i>Signal inputs (RxD,CTS)</i>	<i>Maximum input voltage: ± 25V Input resistance: 5kΩ (Type) Switching thresholds: UH &lt; -3V, UL &gt; +3V Output voltage (at RL &gt; 3kΩ): min ± 5V, Type ± 9V, max ± 10V Output resistance: &lt; 300Ω Short circuit current: Type ± 10mA</i>
<i>Maximum input voltage</i>	<i>± 5V</i>
<i>Input resistance</i>	<i>&gt; 12 kΩ</i>
<i>Output current</i>	<i>± 60 mA Max</i>
<i>High level</i>	<i>Ud &gt; 0.2V</i>
<i>Low level</i>	<i>Ud &lt; -0.2V</i>
<i>Number of devices</i>	<i>up to 8</i>
<i>Maximum voltage serial</i>	<i>1000V</i>
<i>Maximum power standard device</i>	<i>VP/HPR 630 kW</i>
<i>Maximum power custom device</i>	<i>1.4 MW</i>



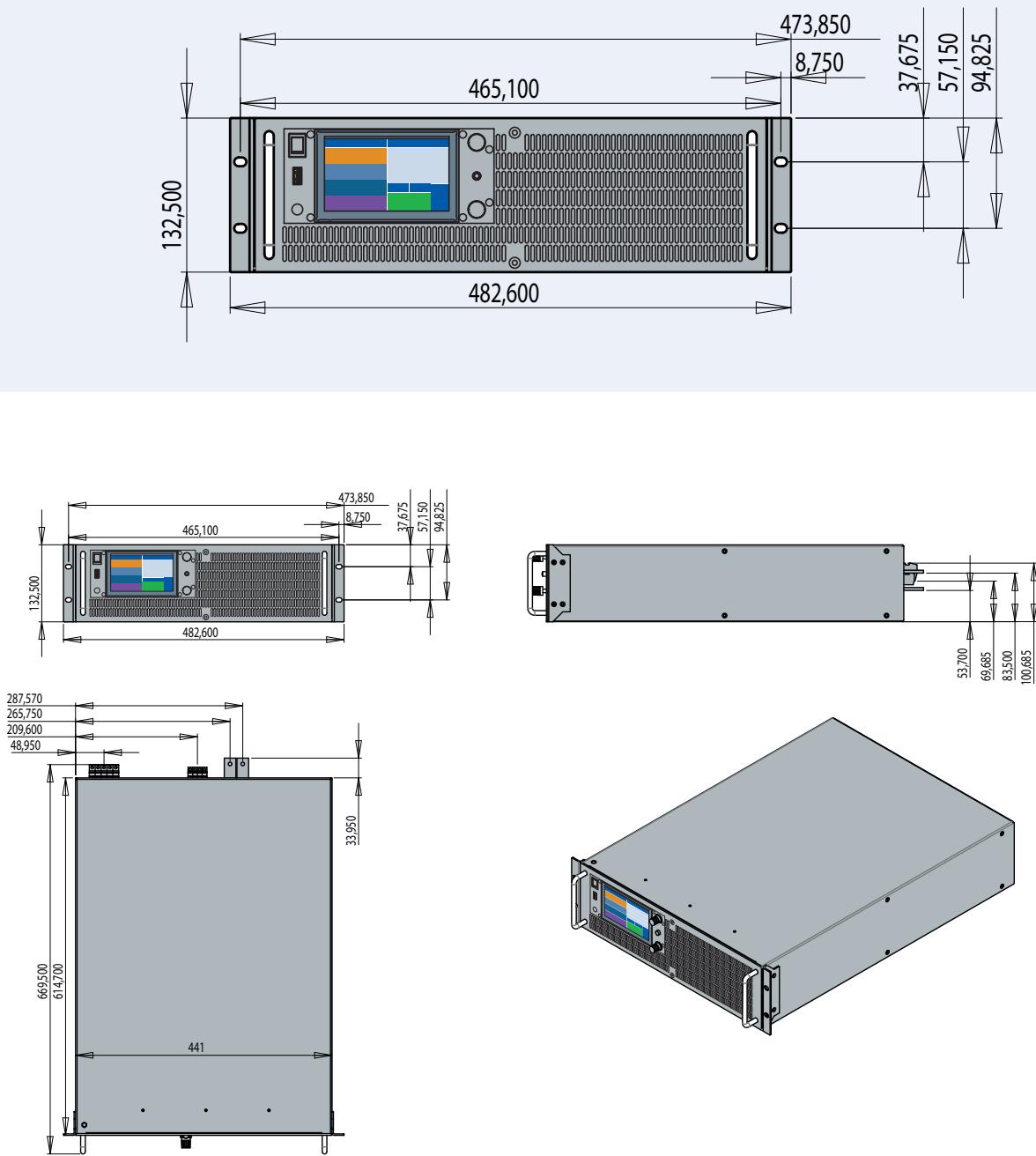
## STANDARD SPECIFICATION

EMC and Safety Standards	
<i>Stafety standard</i>	<i>EN 60950</i>
<i>Emission</i>	<i>EN 61000-6-4:2007</i>
<i>Immunity</i>	<i>EN 61000-6-2:2005</i>
<i>Measurement, control and laboratory equipment</i>	<i>EN 61010-1:2010</i>
Ambient Conditions	
<i>Cooling method</i>	<i>Fans</i>
<i>Operating temperature</i>	<i>0 - 50°C</i>
<i>Storage temperature</i>	<i>-20°C - 70°C</i>
<i>Humidity</i>	<i>&lt; 80 %</i>
<i>Operating height</i>	<i>&lt; 2000 m</i>
<i>Vibration</i>	<i>10-55Hz / 1 min / 2G XYZ</i>
<i>Shock</i>	<i>&lt; 20G</i>
<i>Protection class</i>	<i>IP 20</i>
Weight/Dimensions	
<i>VP/HP 7 kW</i>	<i>26 kg / 19" x 3 U x 620mm</i>
<i>VP/HP 16 kW</i>	<i>26 kg / 19" x 3 U x 620mm</i>
<i>VP/HP 21 kW</i>	<i>33 kg / 19" x 3 U x 620mm</i>
<i>VP/HP 28 kW</i>	<i>52 kg / 19" x 6 U x 620mm</i>
<i>VP/HP 35 kW</i>	<i>59 kg / 19" x 6 U x 620mm</i>
<i>VP/HP 42 kW</i>	<i>66 kg / 19" x 6 U x 620mm</i>
<i>VP/HP 49 kW</i>	<i>85 kg / 19" x 9 U x 620mm</i>
<i>VP/HP 56 kW</i>	<i>99 kg / 19" x 9 U x 620mm</i>
<i>VP/HP 63 kW</i>	<i>111 kg / 19" x 9 U x 620mm</i>
<i>Fon level</i>	<i>42-43 dB</i>



## TECHNICAL DRAWINGS

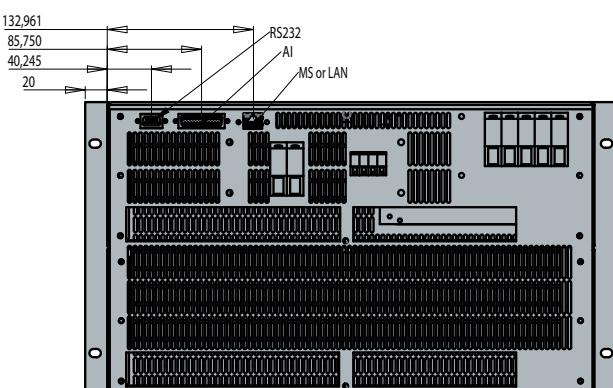
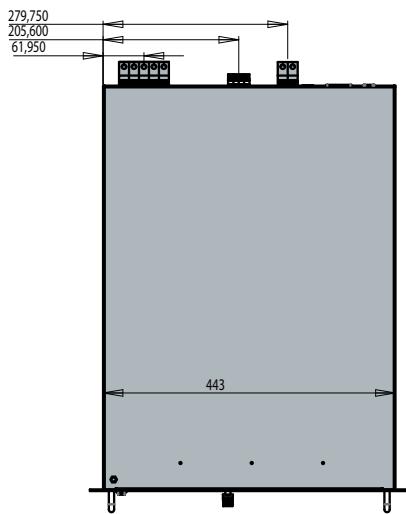
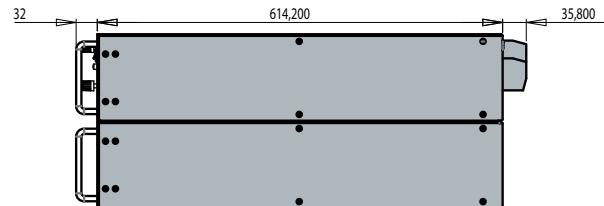
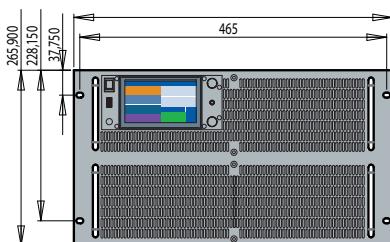
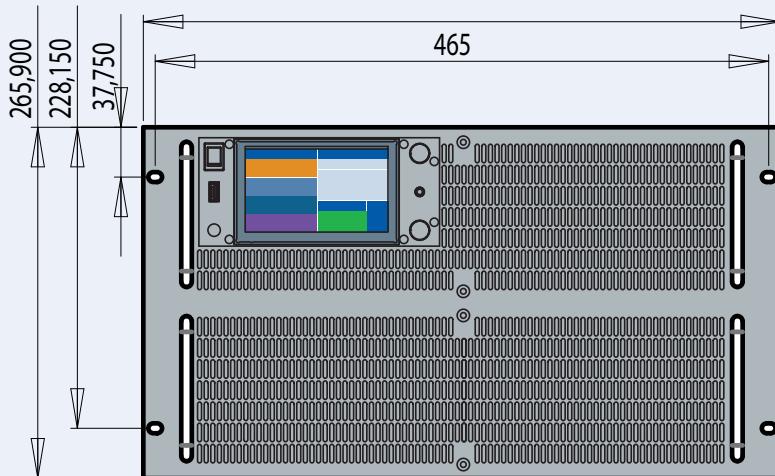
► VP/HPR 7 kW - 21 kW 3 HE / U



All values in mm



► VP/HPR 28 kW - 42 kW 6 HE / U

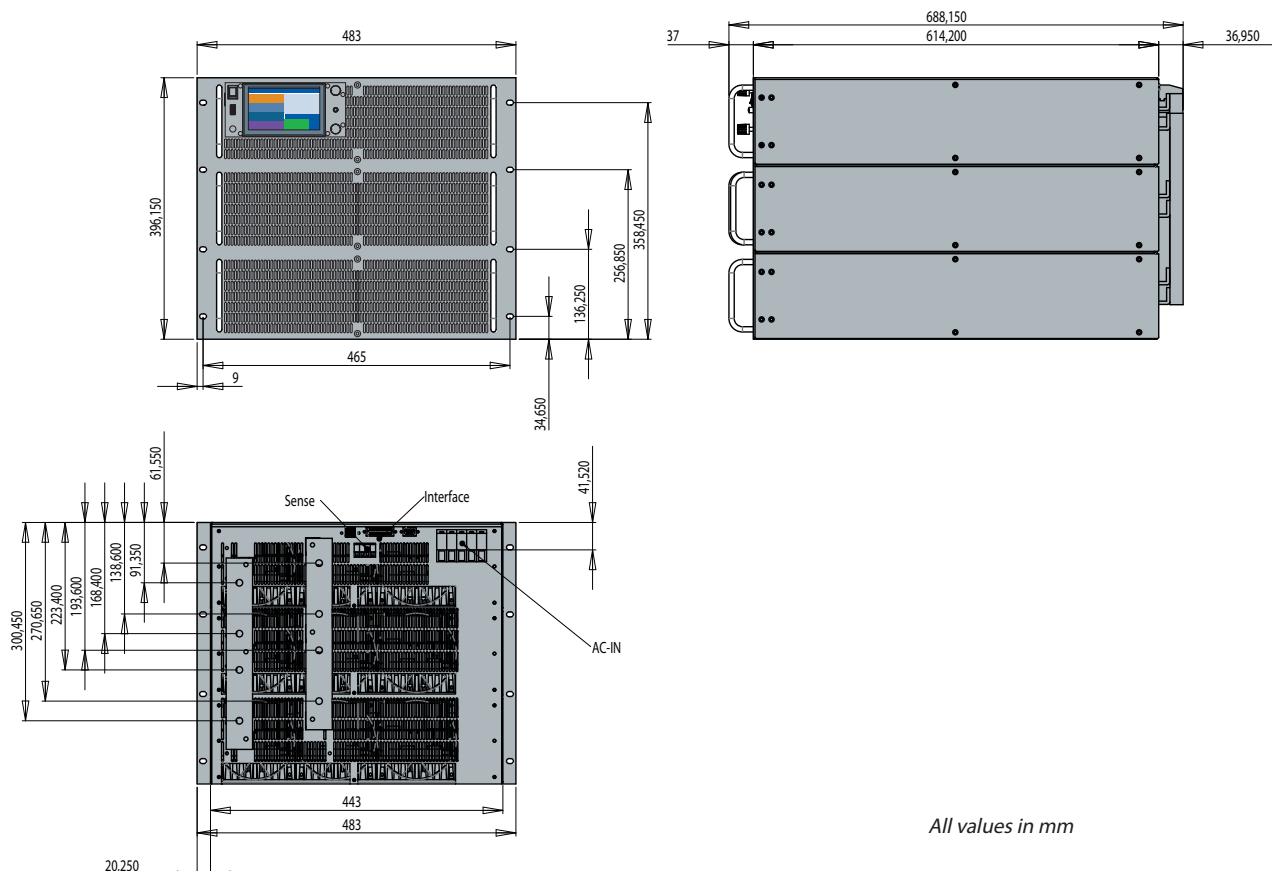
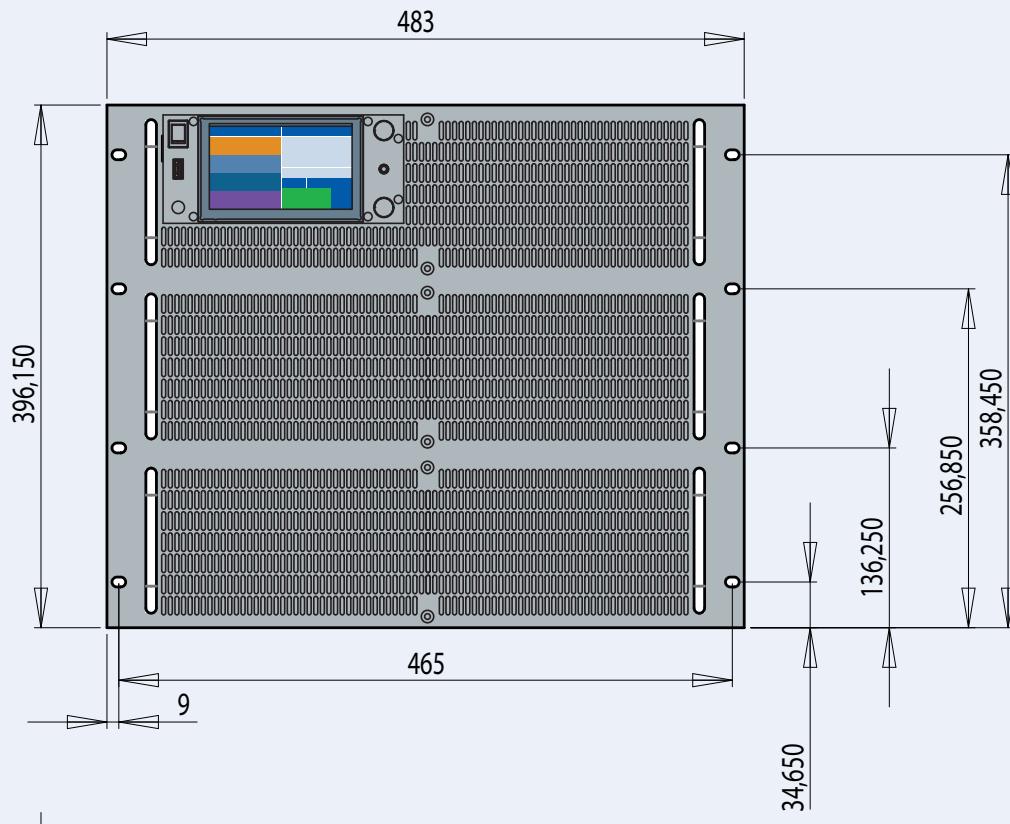


The exact position of the interface can be changed by the manufacturer due to different device parameters

All values in mm



► VP/HPR 49 kW - 63 kW 9 HE / U



All values in mm