AP153
1 Output
19" Power Supply, 48 to 60 Watt

PULS AP153

- **High efficiency: 87% (@ 24V)**
- **ACin 115/230V manual switch**
- **6 HP plug in width**
- **H15 standard pinout**
- **Parallel mode automatic load sharing (@ AP153.133)**
- **Meets EMC standards EN 50081-1 (EN 55022/B), EN 50082-2, EN 61000-4, VDE 0160/2 and NAMUR**

CE

Data Sheet

This power supply is designed to meet a wide range of applications. Output voltage is stable with ripple and noise below 30mVpp over the total range of up to 60W. The high-efficiency flyback converter provides for greater reliability and economy.

Multiple supplies can be used in parallel to increase system power without extra control wiring, as the current is automatically shared between units (AP153.133 only).

The design ensures immunity to disturbances according to EN 61000-4, and VDE 0160 pulses (class 2 for total range!). The unit is also protected against over-voltage and short-circuits. Construction and design meet all relevant safety standards such as EN 60950, VDE 805 and VBG 804.

See the web for current data sheet version: **www.puls-power.de**

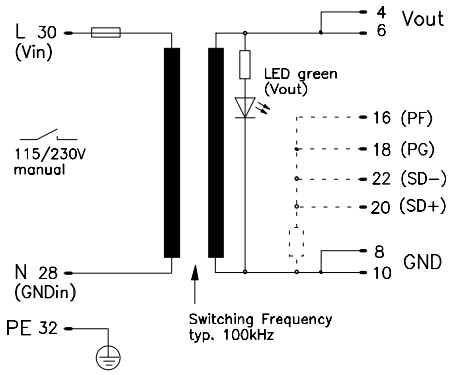
Vout	Iout	Pout	Features	Order-No.
12V	**4A**	48W	OVP	**AP153.111**
12V	**4A**	48W	OVP, PF, PG, SD	**AP153.112**
15V	**3.5A**	53W	OVP	**AP153.121**
15V	**3.5A**	53W	OVP, PF, PG, SD	**AP153.122**
24V	**2.5A**	60W	OVP	**AP153.131**
24V	**2.5A**	60W	OVP, PF, PG, SD	**AP153.132**
24V	**2.5A**	60W	OVP, parallel mode	**AP153.133**
27.6V	**2A**	56W	OVP, Vout adjustable	**AP153.141**

"**F**" appended to Order-No. means: 6HP front panel included and fitted.

Accessories: H15 connector, 6.3mm flat contacts: **ZP100**
H15 connector with soldering pins: **ZP120**

Warranty: 2 years from date of delivery.

Schematic:



Output

Voltage Vout fixed			All except AP153.141.
Vout adjustable	min.	± 5%	AP153.141 only.
Accuracy			Includes: production-adjustment,
AP153.111 to 132	max.	± 2%	line regulation,
AP153.133	max.	± 5%	and load regulation.
AP153.141	max.	± 0.5%	
Sense lines		None	Not available.
Minimum load		None	Not necessary.
Output power Pout	max.	60W	Mounting side by side possible.
AP 153.133 only	max.	48W	Per unit @ parallel operation.
Noise, Ripple	max.	30mVpp	20Hz...200kHz.
including spikes	max.	65mVpp	20Hz...20MHz.
Over-voltage protection	typ.	1.15 x Vout	Threshold accuracy ± 4%.
Derating		1W/K	+55°C to +70°C Ta.
Operating indicator		1 green LED	On the front.
Isolation Vout to Vin		SELV	EN 60 950, VDE 0805.

The output is protected against open-circuit, short-circuit, and overload.

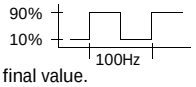
Input

Line input AC 1		100...120V AC	Switch position 115V.
· Range		88...132V AC	Full spec.
		80...150V AC	Derated, see page 2.
Line input AC 2		220...240V AC	Switch position 230V.
· Range		187...264V AC	Full spec.
		150...300V AC	Derated, see page 2.
Line frequency		47...63Hz	DC or 400Hz, see page 2.
Input current rms.	max.	1.3Aeff. / 0.7Aeff.	@ 115/230V AC.
Noise suppression		EN 55 022/B	10kHz...30MHz, conducted.

Mechanical: 6HP/3U board (DIN 41494),
Al/Mg alloy cover for component side,
plastic cover for bottom side,
LxWxH = 171.93 x 30.48 x 110mm (100),
the length includes the connector, see page 4.

Weight: App. 370g

Connector: H15 (DIN 41612), coding option,
max. load per pin 11A @70° C.

Output (continued)			AP153.	.111 to .122	.131 .132	.133	.141	
Voltage regulation:								
· Line regulation		max.	%	± 0.2	± 0.2	± 0.2	± 0.2	88...132V AC / 187...264V AC, Iout = 100%.
· Load regulation stat.	ΔU_{stat}	max.	%	± 0.5	± 0.5	± 4.0	± 0.5	Iout = 50%, Δ Iout = ± 50%.
· Load regulation dyn.	ΔU_{dyn}	max.	%	± 0.5	± 0.5	± 2	± 0.5	Δ Iout = 10%...90%...10%, rise time dt = typ. 20µs. 
Response time	t_s	max.	ms	1	1	1	1	Till ΔVout is within < 0.5% of final value.
· Temperature coefficient		typ.	%/K	± 0.01	± 0.01	± 0.01	± 0.01	
Ripple		max.	mVpp	30	25	25	25	20Hz...200kHz, @ACnom, Iout = 100%.
· incl. spikes		max.	mVpp	65	55	55	55	20Hz...20MHz, @ACnom, Iout = 100%.
Current limitation								
· Threshold		min/max.	A	105% ... 120% of Iout				Fixed.
· Characteristic				See graph on page 3				
· Short-circuit		max.	A	180% of Iout				
Start delay	t_{Delay}	typ.	ms	5				After switch on. 
Vout rise-up time	t_{Rise}	typ.	ms	40				
On and off characteristic								Approximately monotonic.
Power back immunity	U_{Back}	max.	V	1.2 x Vout				Unit off/on.

Input (continued)

AC input range 1 / 2		V AC	88...132 / 187...264			Full spec.
DC input range		V DC	250...300			Full spec. (Voltage Selector at '230V'!)
Derated AC range 1 / 2		V AC	80...88 / 150...187, 150 / 300 for 0.5s			
Derated DC range		V DC	176...250			Power loss typ. 20% (no start below 196V).
		V DC	300...370			Full spec, but air- and leakage distances not longer than stated in VDE 0805.
Frequency range		Hz	47...63			Full spec.
Derated frequency range		Hz	63...400			Increase leakage currents.
In-rush current acording to NAMUR	max.	A	14	14	14	14	Wait min. 30s before switching on again (cold-start),
Hold-up time	min.	ms	31	29	29	29	@ 88V AC, Iout = 100%, see graph on page 3.
	min.	ms	43	40	40	40	@ 187V AC, Iout = 100%.
Power factor λ	typ.		0.63				@ 88V AC, Iout = 100%.
Internal fuse			5x20mm T2A/250V (IEC127/2-5)				To replace, see page 4.
Input range selection			Manual (230V AC set at factory)				115/230V AC switch, position see page 4.

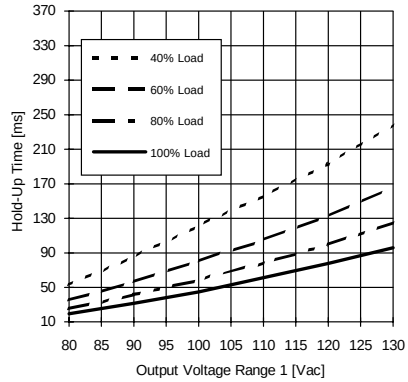
Logic Functions

Power Fail signal PF			Power fail			Open-collector signal (I_{max} = 5mA).
· PF high if			ACin > 76/142V AC			
Hold-up time						@187V ACin, Iout = 100%, Vout ≥ 0.95 x Vrated.
· from Power failure to PF-signal	min.	ms	33	30	30	30	
· from PF-signal	min.	ms	5	5	5	5	
PG-signal			Output voltage within tolerance				
· PG high if			0.95 x Vnom				
SD remote switch off			Unit off				SD+ and SD- connected.
Parallel operation for AP153.133		units	—	—	∞	—	No limit of number of AP153.133.
· Current distribution			—	—	Equal	—	Characteristics see page 3.
· Connection			No additional wiring needed.				Use equal-length output cables.
Vout adjustable for AP153.141	min.	%	—	—	—	± 5	Position of trimmer see page 4.

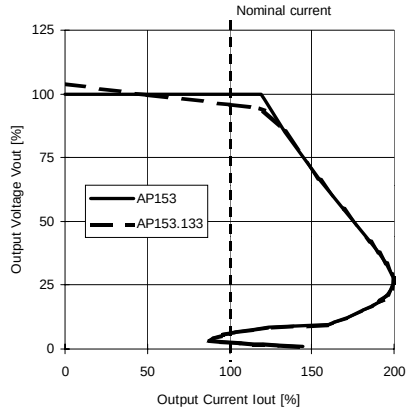
Electromagnetic Compatibility

Emissions according to EN 50081-1		EN 50081-2 is also satisfied
· Radio interference, EN 55011, EN 55022	Class B	Conducted 10kHz...30MHz.
Immunity according to EN 50082-2		EN 50082-1 is also satisfied
· Electrostatic discharge ESD, EN 61000-4-2	8kV direct discharge (level 4) 15kV air discharge (level 4)	
· Radiated fields, EN 61000-4-5	10V/m (level 3)	To ACin, Vout and signal lines: length = 1m.
· Fast transients, EN 61000-4-4	4kV (level 4)	Coupled to ACin line.
	2kV (level 3)	Coupled to DCout line.
	2kV (level 4) cap. coupling	Coupled to Vout and signal lines.
· Surge transients, EN 61000-4-5	4kV (Isolation class 4)	Common mode, unit on.
	2kV (Isolation class 4)	Differential mode, unit on.
· Transient voltage, IEC 255	5kV	Common mode, unit off.
· NAMUR-prescription	Satisfied	
· Transient resistance, VDE 0160 §5.3.1.1.2	750V / 1.3ms (class 2)	Valid for total load range.
· Over-voltage resistance (PULS standard)	150/300V AC / 0.5s	Switch position 115 / 230V AC.

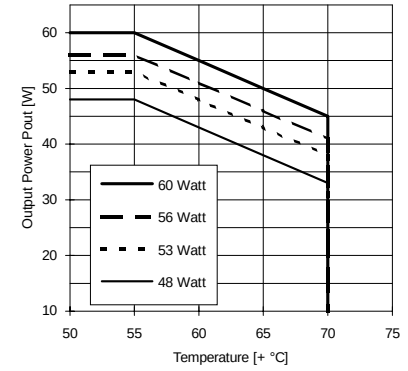
Minimum Hold-Up Time



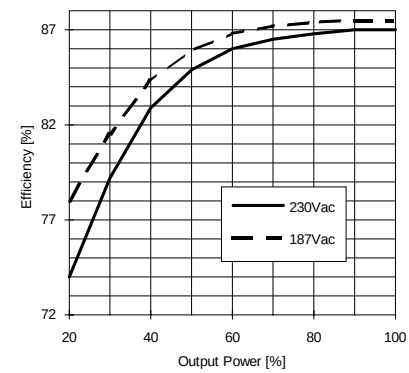
Typ. Output Characteristic



Typ. Derating over Temperature



Typ. Efficiency



Protection

Unit protection			
· Overload		Yes	See current limit.
· Short-circuit proof		Yes	Auto restart.
· Open-circuit proof		Yes	
· Over-temperature (OTP)		—	
· Reverse battery protect.		Yes	
· ACin range selection		Manual	Switch for 115/230V AC.
Load protection			
· Over-voltage (OVP)		Yes	
Threshold	typ.	14.2V	AP153.111, 112.
	typ.	17.2V	AP153.121, 122.
	typ.	28.2V	AP153.131, 132, 133.
	typ.	31.2V	AP153.141.
Accuracy	max.	± 4%	
Method			Independent second regulator.

Safety

Electrical safety			
· Test voltage		3kV AC	Primary / secondary.
according to EN 60 950		2.5kV AC	Primary / PE.
for t = 2sec		500V AC	Secondary / PE.
· Air- and leakage distance		6.4 / 8mm	Primary / secondary.
		4mm	Primary / PE.
· Isolation resistance	min.	5MΩ	VDE 0551.
· Protection class		I	VDE 0106 part 1, IEC 536 .
· PE resistance		< 0.1Ω	VDE 0805.
· Protection system		IP20	DIN 40050, IEC 529.
· Leakage current	max.	0.75mA	EN 60 950 (47...63Hz line) .
· Safe low voltage		SELV	EN 60 950, VDE 0805, VDE 0160.
· Over-voltage class		II	VDE 0110 part 1, IEC 664.
Touch safety		Finger test	VDE 0100 §6, EN 60 950, VBG4.

Operation and Ambient Area

Application class		KSF	DIN 40040.
Operation temperature	max.	0° ... +70°C	Ta (measured at 1cm distance).
· Derating range		+55° ... +70°C	Derating, see diagram.
Storage temperature	typ.	–20° ... +100°C	Ta.
Humidity	max.	95%	Non-condensing.
Mechanical usage		Vertical	See page 4.
· Lateral spacing		None	No gap needed.
Cooling		Normal convection	Don't obstruct air flow.
Dirt protection level	max.	2	VDE 0110 part 1.
Vibration		0.075mm	IEC 68-2-6 (10...60Hz).
Shock		11ms / 15g	IEC 68-2-27 (3 shocks).
Operation height	max.	2,000m	Above sea level.

Efficiency and Power Loss

AP153.111 and 112	typ.	83% / 9.8W	@ 230V ACin, Iout = 100%.
AP153.121 and 122	typ.	84% / 10W	As above.
AP153.131, 132, 133	typ.	87% / 9W	As above.
AP153.141	typ.	87% / 8.2W	As above.

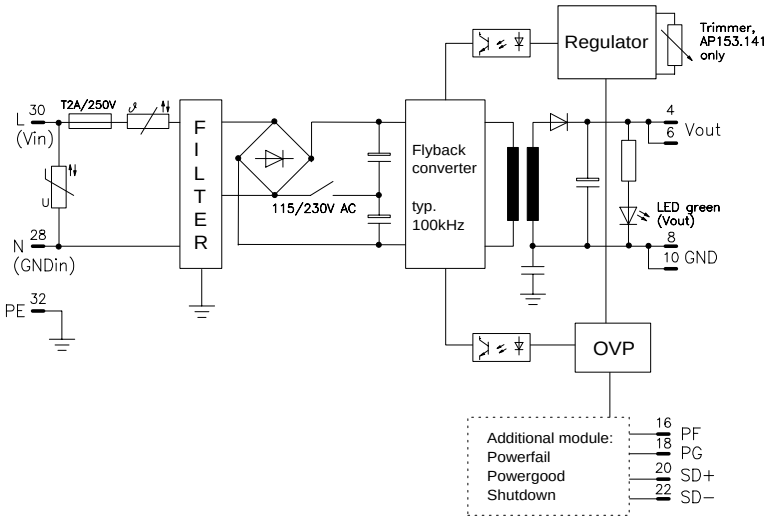
Reliability and Lifetime

MTBF according to Siemens			
standard SN29500	typ.	300,000h	230VAC, Iout = 100%, +40°C Ta.
Only long life (>2,000h @105° C) electrolytic capacitors are used.			
Function test		100%	Test certificate enclosed.
In-circuit test		Yes	
Run-in (burn-in)		24h	Full load, Ta = +55° C, on/off cycle.

Fuse

The PSU has electronic protection against external short-circuits. In case of an internal defect, a fuse disconnects the unit. It can only be replaced by opening the unit which should be done by the supplier.

Schematic



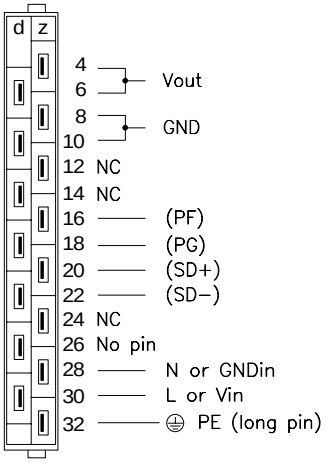
Installation for Operating

The unit is constructed for 19" systems:
Ensure that pin 4 of H15 connector is on top. For other installation considerations consult your representative. Ensure free air flow.

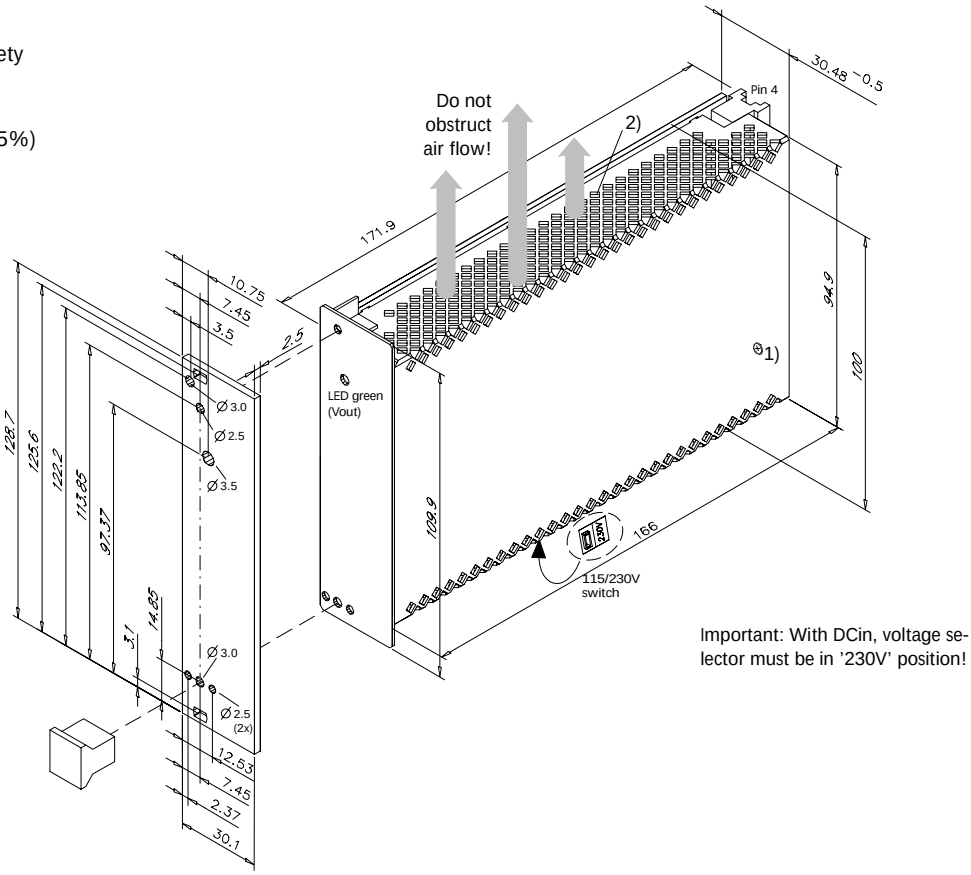
Dimensions and Connections

19" board, with Al/Mg alloy cover on component side, and a plastic cover on the bottom side. 6HP plug in width. See figure below for dimensions.

1) Do not remove any screws on box, as internal safety connections could be disconnected!
2) Vout adjustable at trimmer on AP153.141 (in the unit, able to be reached through the grill, min. ± 5%)



H15 pinout (DIN 41612)
NC = **N**o **C**onnection - Do not use!



Important: With DCin, voltage selector must be in '230V' position!

Modifications (contact supplier)

Other output voltages.
Other DC input voltages.
Lower cost versions.

Accessory ZP510

Installation set for mounting on DIN rail.