

# AP155

## 1 Output

### 19" Power Supply, 96 to 120 Watt

- ◆ High efficiency: 88% (@ 24V)
- ◆ ACin 115/230V manual switch
- ◆ 8 HP plug in width
- ◆ H15 standard pinout
- ◆ Parallel mode automatic load sharing (@ AP155.133)
- ◆ Meets EMC standards EN 50081-1 (EN 55022/B), EN 50082-2, EN 61000-4, VDE 0160/2 and NAMUR



## Data Sheet

This power supply is designed to meet a wide range of applications. Output voltage is stable with ripple and noise below 60mVpp over the total range of up to 120W. 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 (AP155.133 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.

48V and 60V versions are available for telecommunications and motor control applications.

Vout	Iout	Pout	Features	Order-No.
12V	8A	96W	OVP	AP155.111
12V	8A	96W	OVP, PF, PG, SD	AP155.112
15V	7A	105W	OVP	AP155.121
15V	7A	105W	OVP, PF, PG, SD	AP155.122
24V	5A	120W	OVP	AP155.131
24V	5A	120W	OVP, PF, PG, SD	AP155.132
24V	5A	120W	OVP, parallel mode	AP155.133
27.6V	4A	110W	OVP, Vout adjustable	AP155.141
48V	2.5A	120W	OVP	AP155.151
60V	2A	120W	OVP	AP155.161

"F" appended to Order-No. means: 8HP front panel included and fitted.

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

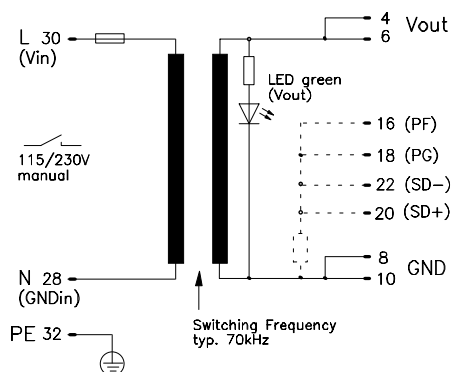
Warranty: 2 years from date of delivery.

### Output

Parameter	Value	Notes
Voltage	Vout fixed / Vout adjustable	All except AP155.141. AP155.141.
Accuracy	min. ± 5% / max. ± 2%	Includes: production-adjustment, line regulation, and load regulation.
AP155.133	max. ± 5%	
AP155.141	max. ± 0.5%	
Sense lines	None	Not available.
Minimum load	None	Not necessary.
Output power Pout	max. 120W	Mounting side by side possible.
AP155.133	max. 96W	Per unit @ parallel operation.
Noise, Ripple	max. 60mVpp	20Hz...200kHz (@ 24V DC).
including spikes	max. 80mVpp	20Hz...20MHz (@ 24V DC).
Over-voltage protection	typ. 1.2 x Vout	Threshold accuracy ± 4%.
Derating	2W/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.

Schematic:



**Mechanical:** 8HP/3U board (DIN 41494), Al/Mg alloy cover for component side, plastic cover for bottom side, LxWxH = 171.93 x 40.64 x 110mm (100), the length includes the connector, see page 4.

**Weight:** App. 510g

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

### Input

Line input AC 1	100...120V AC	Switch position 115V.
· Range	88...132V AC	Full spec.
Line input AC 2	80...150V AC	Derated, see page 2.
· Range	220...240V AC	Switch position 230V.
	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. 3.0Aeff. / 1.4Aeff.	@ 115/230V AC.
Noise suppression	EN 55 022/B	10kHz...30MHz, conducted.

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Output (continued)				AP155. to					.111	.131			.151
				.122	.132	.133	.141	.161					
Voltage regulation:													
· Line regulation		max.	%	± 0.2	± 0.2	± 0.2	± 0.2	± 0.2	88...132V AC / 187...264V AC, I <sub>out</sub> = 100%.				
· Load regulation stat.	Δ U <sub>stat</sub>	max.	%	± 0.75	± 0.75	± 4.0	± 0.75	± 0.75	I <sub>out</sub> = 50%, Δ I <sub>out</sub> = ± 50%.				
· Load regulation dyn.	Δ U <sub>dyn</sub>	max.	%	± 0.5	± 0.5	± 2.5	± 0.5	± 0.5	Δ I <sub>out</sub> = 10%...90%...10%, 90% rise time dt = typ. 20μs. 10% Till ΔV <sub>out</sub> is within < 0.5% of final value.				
Response time	t <sub>s</sub>	max.	μs	800	800	1500	800	800					
· Temperature coefficient		typ.	%/K	± 0.01	± 0.01	± 0.01	± 0.01	± 0.01					
Ripple													
· incl. spikes		max.	mVpp	25	25	25	25	60	20Hz...200kHz, @AC <sub>nom</sub> , I <sub>out</sub> = 100%.				
Current limitation		max.	mVpp	30	50	50	50	80	20Hz...20MHz, @AC <sub>nom</sub> , I <sub>out</sub> = 100%.				
· Threshold		min/max.	A	105% ... 120% of I <sub>out</sub>					Fixed.				
· Characteristic				See graph on page 3									
· Short-circuit		max.	A	220% of I <sub>out</sub>									
Start delay	t <sub>Delay</sub>	typ.	ms	100					After switch on.				
V <sub>out</sub> rise-up time	t <sub>Rise</sub>	typ.	ms	30									
On and off characteristic									Approximately monotonic.				
Power back immunity	U <sub>Back</sub>	max.	V	1.2 x V <sub>out</sub>					Unit off/on. AP155.151 and .161 are not power back immune!				

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. 10% (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		max.	A	16					Wait min. 30s before switching on again (cold-start).			
Hold-up time		min.	ms	23	20	20	22	20	@88V AC, I <sub>out</sub> = 100%.			
		min.	ms	31	27	27	30	27	@187V AC, I <sub>out</sub> = 100%.			
Power factor	λ	typ.		0.63					@88V AC, I <sub>out</sub> = 100%.			
Internal fuse				5x20mm T5A/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.			

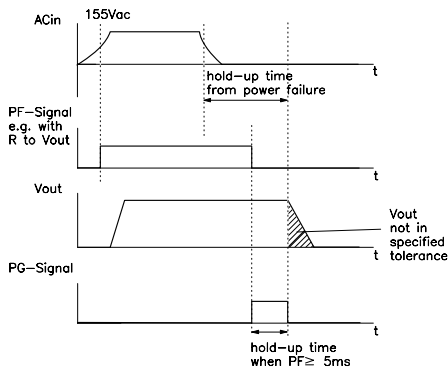
## Logic Functions

Power Fail signal PF				Power fail					Open-collector signal (I <sub>max</sub> = 5mA), see figure page 3.			
· PF high if				ACin > 74/155V AC								
Hold-up time									@187V ACin, I <sub>out</sub> = 100%, V <sub>out</sub> ≥ 0.95 x V <sub>rated</sub> .			
· from Power failure to PF-signal		min.	ms	21	17	17	20	17				
· from PF-signal		min.	ms	5	5	5	5	5				
PG-signal				Output voltage within tolerance								
· PG high if				0.95 x V <sub>nom</sub>								
SD remote switch off				Unit off					SD+ and SD- connected.			
Parallel operation for AP155.133			units	—	—	Unlimited	—	—	No limit of number of AP155.133.			
· Current distribution				—	—	Equal	—	—	Characteristics see page 3.			
· Connection				No additional wiring needed.					Use equal-length output cables.			
V <sub>out</sub> adjustment for AP155.141		min.	%	—	—	—	± 5	—	Position of trimmer see page 4.			

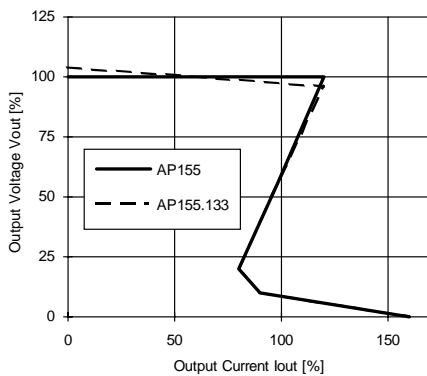
## Electromagnetic Compatibility

Emissions according to EN 50081-1				Class B					EN 50081-2 is also satisfied			
· Radio interference, EN 55011, EN 55022									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 61000-4-3				10V/m (level 3)					To ACin, V <sub>out</sub> 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 V <sub>out</sub> 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.			
				5kV					Common mode, unit off.			
· Transient voltage, IEC 255				Satisfied								
· NAMUR-prescription				750V / 1.3ms (class 2)					Valid for total load range.			
· Transient resistance, VDE 0160 §5.3.1.1.2				150/300V AC / 0.5s					Switch position 115 / 230V AC.			
· Over-voltage resistance (PULS standard)												

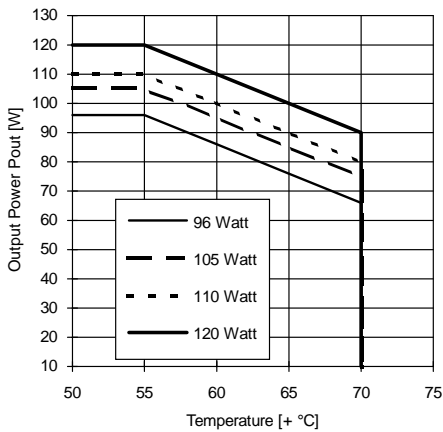
## PF-Signal, PG-Signal and Hold-Up Time



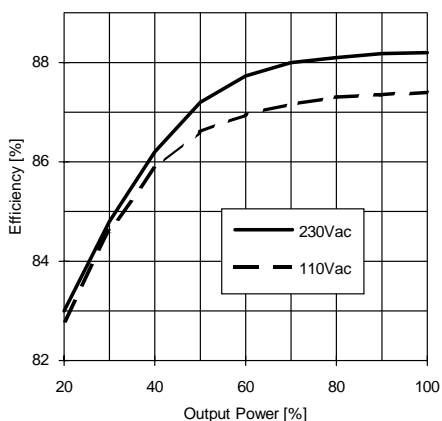
## Typ. Output Characteristics



## 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. 15.0V	AP155.111, 112.
	typ. 18.0V	AP155.121, 122.
	typ. 29.0V	AP155.131, 132, 133.
	typ. 32.0V	AP155.141.
	typ. 58.0V	AP155.151.
	typ. 70.0V	AP155.161.
	max. ± 4%	

Accuracy  
Restart

After line disconnection; wait time 1min.

## 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

· Penetration protection	Finger test	VDE 0100 §6, EN 60 950, VBG4.
	> Ø 3mm	e.g. screws, small parts etc.

## 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

AP155.111 and .112	typ. 86% / 15.6W	@230V ACin, Iout = 100%.
AP155.121 and .122	typ. 86% / 17.0W	As above.
AP155.131 to .133	typ. 88% / 16.4W	As above.
AP155.141	typ. 88% / 15.1W	As above.
AP155.151, 161	typ. 89% / 14.8W	As above.

## Reliability and Lifetime

MTBF according to Siemens standard SN29500	typ. 300,000h	230VAC, Iout = 100%, +40° C ambient.
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.

## PULS Munich

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This technical information is valid for +25° C ambient temperature and 5 min. run in time, unless otherwise stated.

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## Fuse

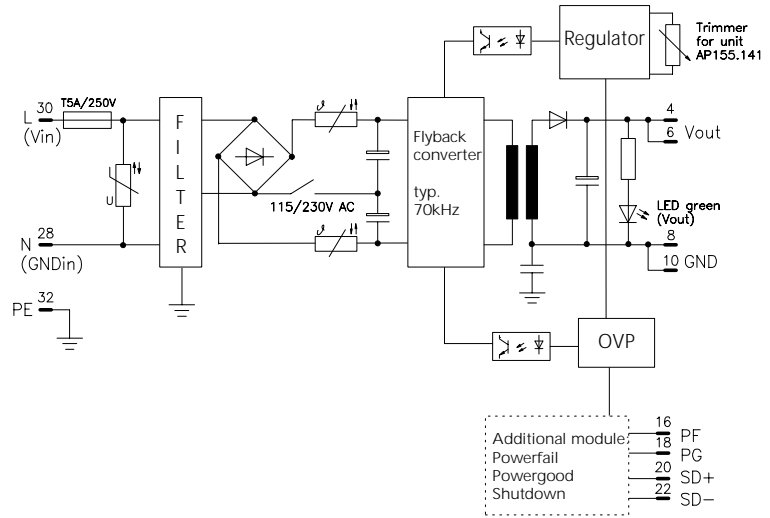
The PSU has electronic protection against external short-circuits. In case of an internal defect, a fuse disconnects the unit. It can only be replaced by opening the unit which should be done by the supplier.

## 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.

**Important:** Use non-conductive (plastic) guide rails only; conductive rails would inadmissibly reduce leakage distance.

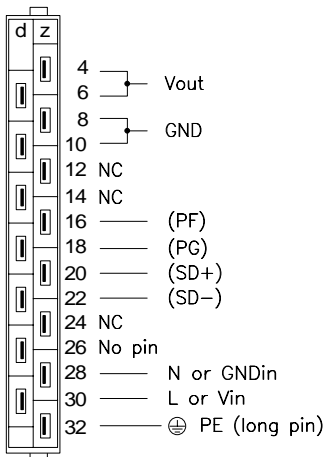
## Schematic



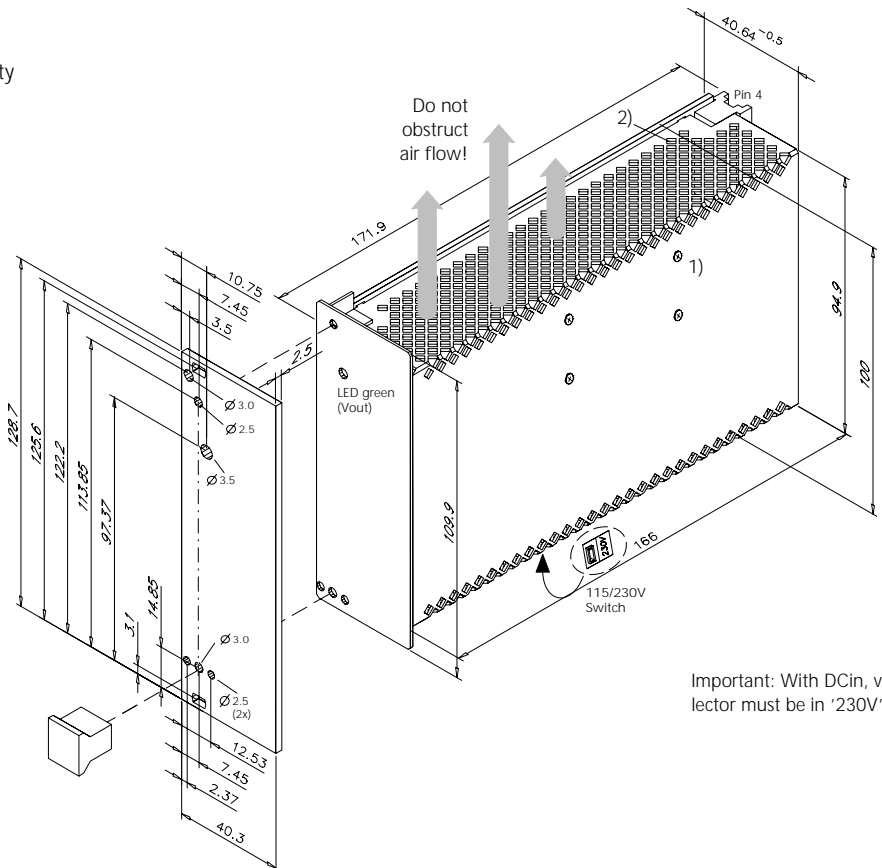
## Dimensions and Connections

19" board, with Al/Mg alloy cover on component side, and a plastic cover on the bottom side. 8HP plug in width. See figure below for dimensions.

- Do not remove any screws on box, as internal safety connections could be disconnected!
- Vout adjustable at trimmer on AP155.141 (min.  $\pm 5\%$ ).



H15 pinout (DIN 41612)  
NC = No Connection - 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.