

# AP157

## 1 Output

### 19" Power Supply, 156 to 240 Watt

- High efficiency: 88% (@ 24V)
- ACin 115/230V manual switch
- 14 HP plug in width
- H15 standard pinout
- Meets EMC standards  
EN 50081-1 (EN 55022/B), EN 5082-2,  
EN 61000-4, NAMUR and VDE 0160/2



## Data Sheet

This unit is designed to supply a variety of popular voltages for high-power rack-mounted applications. The output voltage is stable with ripple and noise below 120mVpp over the total range of up to 240W. The high-efficiency flyback converter provides for greater reliability and economy.

The design ensures line disturbance immunity according to EN 6100-4, and VDE 0160 pulses (class 2 over the total range!). The unit is also protected against over-voltage and short-circuits. Design and construction meet all relevant safety standards, such as EN 60950, VDE 805 and VBG 804.

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

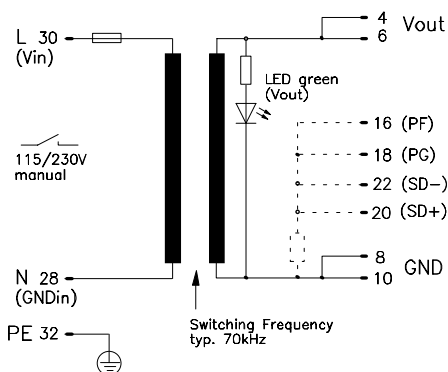
Vout	Iout	Pout	Features	Order-No.
12V	13A	156W	OVP	AP157.111
12V	13A	156W	OVP, PF, PG, SD	AP157.112
15V	12A	180W	OVP	AP157.121
15V	12A	180W	OVP, PF, PG, SD	AP157.122
24V	10A	240W	OVP	AP157.131
24V	10A	240W	OVP, PF, PG, SD	AP157.132
28V	8.5A	238W	OVP	AP157.141
48V	5A	240W	OVP	AP157.151
60V	4A	240W	OVP	AP157.161

"F" appended to Order-No. means: 14HP 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	Accuracy	max. ± 2%	Fixed. Includes production-adjustment, line regulation, and load reg.
Sense lines	Minimum load	None	Not available. Not necessary.
Output power Pout	max. 240W	max. 192W	With single operation. Mounting without lateral spacing.
Noise, Ripple	AP157.111 ... 141 including spikes	max. 30mVpp max. 60mVpp	20Hz...200kHz. 20Hz...20MHz.
	AP157.151 and .161 including spikes	max. 120mVpp max. 130mVpp	20Hz...200kHz. 20Hz...20MHz.
Over-voltage protection	typ. 29.0V		Threshold accuracy ±4%. +55°C to +70°C Ta.
Derating	5W/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.

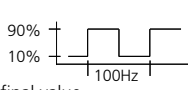
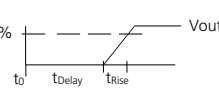
The output is protected against open-circuit, short-circuit, and overload.

## Input

Mechanical:	14HP/3U board (DIN 41494), Al/Mg alloy cover for component side, plastic cover for bottom side, LxWxH = 171.93 x 71.12 x 110mm (100), the length includes the connector, see page 4.	Line input AC 1 · Range	100...120V AC 88...132V AC 80...150V AC 220...240V AC 187...264V AC 150...300V AC	Switch position 115V. Full spec. Derated, see page 2. Switch position 230V. Full spec. Derated, see page 2.
Weight:	App. 860g	Line frequency	47...63Hz	DC or 400Hz, see page 2.
Connector:	H15 (DIN 41612), coding option, max. load per pin 11A @70° C.	Input current rms.	max. 6.0Aeff. / 2.8Aeff.	@ 115/230V AC.
		Noise suppression	EN 55 022/B	10kHz...30MHz, conducted.

Specifications are valid at 230V AC, unless otherwise stated. They are subject to change without prior notice.

# AP157 1 Output · 19" Power Supply · 156 to 240 Watt

Output (continued)				AP157.	to	.111 .122	.131 .132	.141 .141	.151 .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	± 0.75	± 0.75	± 0.75	I <sub>out</sub> = 50%, Δ I <sub>out</sub> = ± 50%.
· Load regulation dyn.	Δ U <sub>dyn</sub>	max.	%	± 1.5		± 0.5	± 0.5	± 0.5	± 0.3	Δ I <sub>out</sub> = 10%...90%...10%, rise time dt = typ. 20μs. Till ΔV <sub>out</sub> is within < 0.5% of final value.
Response time	t <sub>s</sub>	max.	μs	500		500	500	500	500	
· Temperature coefficient		typ.	%/K	± 0.01		± 0.01	± 0.01	± 0.01	± 0.01	
Ripple										
· incl. spikes		max.	mVpp	30		30	30	120	120	20Hz...200kHz, @ACnom, I <sub>out</sub> = 100%.
Current limitation										
· Threshold		min/max.	A	105% ... 125% of I <sub>out</sub>				Fixed.		
· Characteristic				See graph on page 3						
· Short-circuit		max.	A	200% of I <sub>out</sub>						
Start delay	t <sub>Delay</sub>	typ.	ms	50				After switch on.		
V <sub>out</sub> rise-up time	t <sub>Rise</sub>	typ.	ms	35				Approximately monotonic.		
On and off characteristic										
Power back immunity	U <sub>Back</sub>	max.	V	1.2 x V <sub>out</sub>				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				max.	A	50				Wait min. 30s before switching on again (cold-start), NAMUR standard met (T <sub>a</sub> = 25° C).
Hold-up time				min.	ms	24	18	18	18	@ 88V AC, I <sub>out</sub> = 100%.
				min.	ms	33	25	25	25	@ 187V AC, I <sub>out</sub> = 100%.
Power factor λ				typ.	0.67				@ 88V AC, I <sub>out</sub> = 100%.	
Internal fuse				5x20mm T8A/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.		

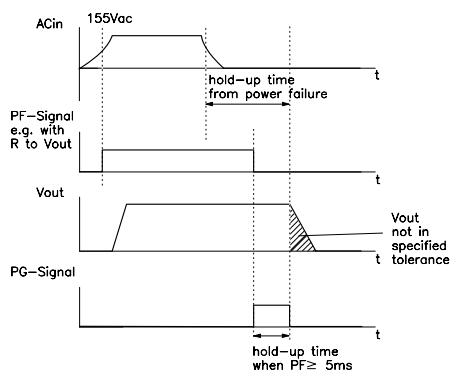
## Logic Functions

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	23	15	15	15
· from PF-signal				min.	ms	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.	

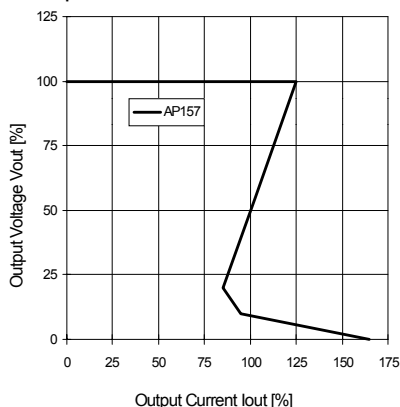
## Electromagnetic Compatibility

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)				To ACin, V <sub>out</sub> and signal lines: length = 1m.	
· Radiated fields, EN 61000-4-3				10V/m (level 3)				Coupled to ACin line.	
· Fast transients, EN 61000-4-4				4kV (level 4) 2kV (level 3) 2kV (level 4) cap. coupling				Coupled to DCout line.	
· Surge transients, EN 61000-4-5				4kV (Isolation class 4) 2kV (Isolation class 4) 5kV				Coupled to V <sub>out</sub> and signal lines.	
· Transient voltage, IEC 255				Satisfied				Common mode, unit on.	
· NAMUR-prescription				750V / 1.3ms (class 2)				Differential mode, unit on.	
· Transient resistance, VDE 0160 §5.3.1.1.2				150/300V AC / 0.5s				Common mode, unit off.	
· Over-voltage resistance (PULS standard)								Valid for total load range. Switch position 115 / 230V AC.	

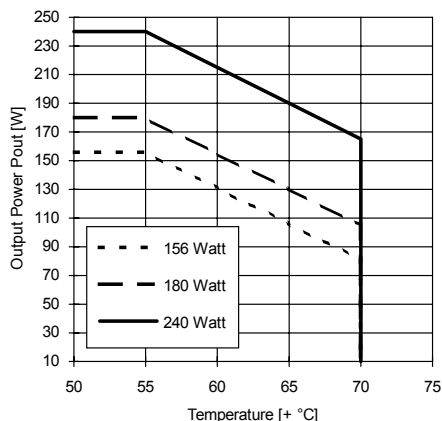
## PF-Signal, PG-Signal and Hold-Up Time



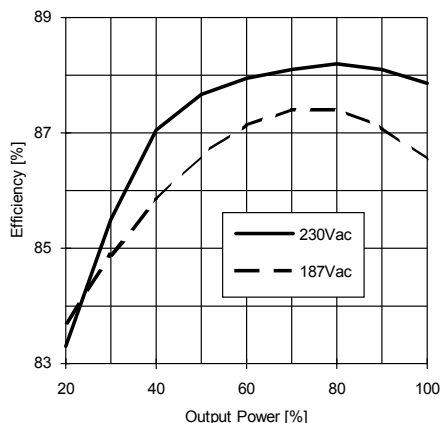
## Typ. Output Characteristics



## 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) Threshold	Yes	
	typ. 15.0V	AP157.111, 112.
	typ. 18.0V	AP157.121, 122.
	typ. 29.0V	AP157.131, 132.
	typ. 32.0V	AP157.141.
	typ. 58.0V	AP157.151.
	typ. 70.0V	AP157.161.
	max. ± 4%	
Accuracy Method		Independent second regulator.

## Safety

### Electrical safety

· Test voltage according to EN 60 950 for t = 2sec	3kV AC	Primary / secondary.
	2.5kV AC	Primary / PE.
	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	1HP	To neighbouring units on the component side only, at fullload.
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

AP157.111 and .112	typ. 87% / 23W	@ 230V ACin, Iout = 100%.
AP157.121 and .122	typ. 87% / 27W	As above.
AP157.131 to .141	typ. 88% / 33W	As above.
AP157.151	typ. 88% / 33W	As above.
AP157.161	typ. 88% / 33W	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.

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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.

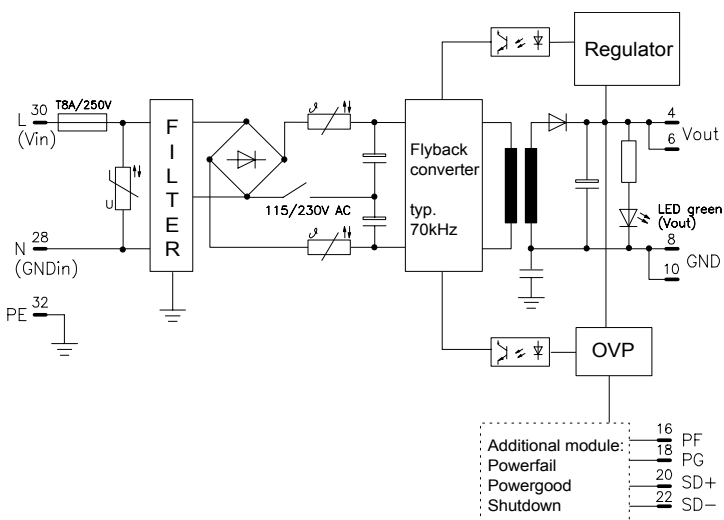
## Installation for Operating

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

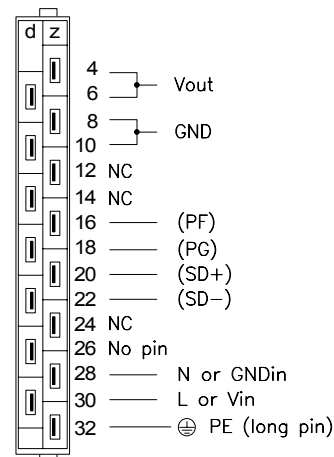


## Dimensions and Connections

19" board, with Al/Mg alloy cover on component side, and a plastic cover on the bottom side. 14HP plug in width. See figure below for dimensions.

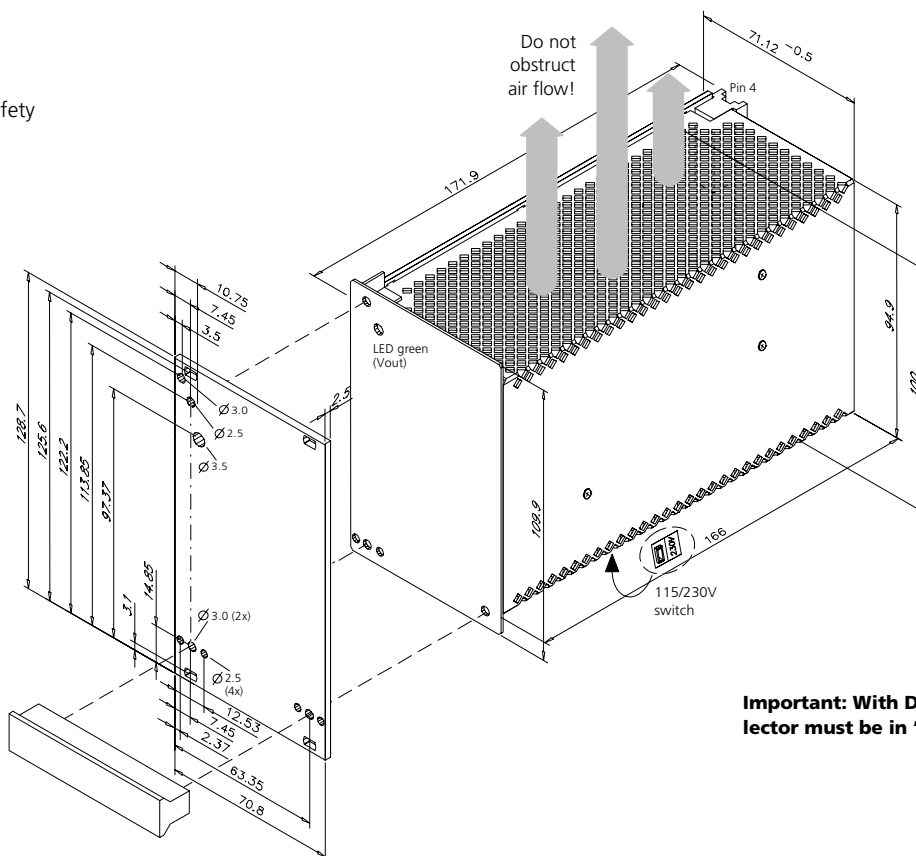
### Caution:

Do not remove any screws on box, as internal safety connections could be disconnected!



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.