5. AC-INPUT

AC input	nom.	AC 100-240V	Wide-range input, TN-, TT-, IT-Mains, see Fig. 5-1
AC input range		85-264Vac	Continuous operation
		264-300Vac	< 0.5s
Input frequency	nom.	50 – 60Hz	±6%
Turn-on voltage	typ.	59Vac	Steady-state value, see Fig. 5-1
Shut-down voltage	typ.	54Vac	Steady-state value, see Fig. 5-1

		AC 100V	**AC 120V**	**AC 230V**	
Input current (rms)	typ.	0.34A	0.28A	0.17A	At 5V, 3A see Fig. 5-3
Power factor *)	typ.	0.52	0.51	0.44	At 5V, 3A see Fig. 5-1
Crest factor **)	typ.	3.45	3.53	3.94	At 5V, 3A
Start-up delay	typ.	630ms	630ms	630ms	See Fig. 5-2
Rise time	typ.	10ms	10ms	10ms	At 5V, 3A, see Fig. 5-2
Turn-on overshoot	max.	100mV	100mV	100mV	See Fig. 5-2

*) The power factor is the ratio of the true (or real) power to the apparent power in an AC circuit.
**) The crest factor is the mathematical ratio of the peak value to RMS value of the input current waveform.

Fig. 5-1 **Input voltage range**

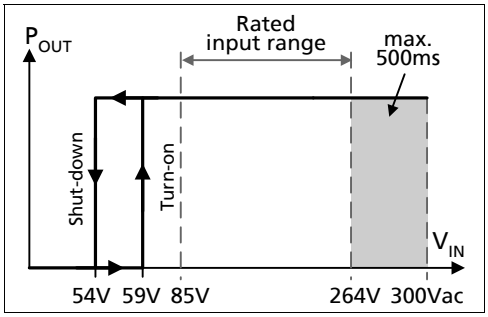


Fig. 5-2 **Turn-on behavior, definitions**

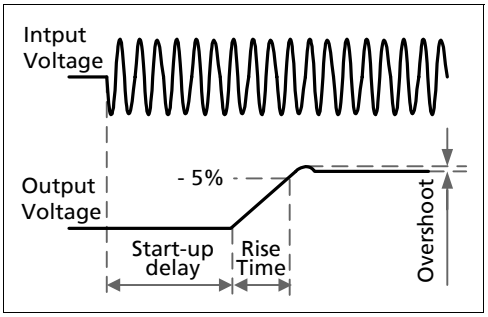


Fig. 5-3 **Input current vs. output load**

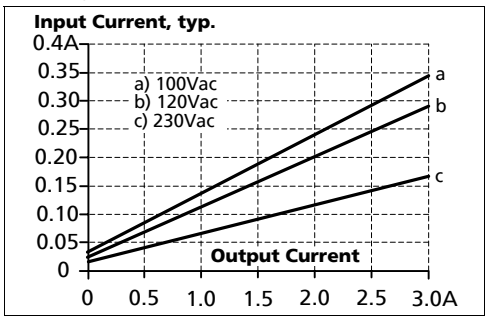
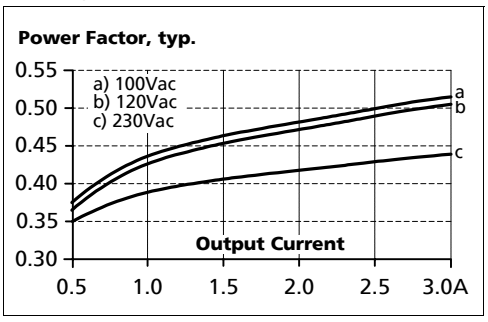


Fig. 5-4 **Power Factor vs. output load**

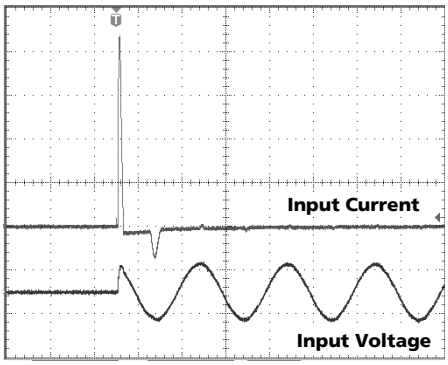


6. INPUT INRUSH CURRENT SURGE

A NTC limits the input inrush current after turn-on of the input voltage. The inrush current is input voltage and ambient temperature dependent.

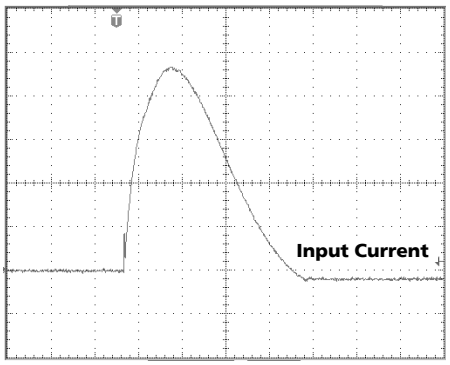
		AC 100V	AC 120V	AC 230V	
Inrush current	max.	$13A_{peak}$	$16A_{peak}$	$31A_{peak}$	40°C ambient, cold start
	typ.	$11A_{peak}$	$13A_{peak}$	$26A_{peak}$	40°C ambient, cold start
Inrush energy	typ.	$0.1A^2s$	$0.1A^2s$	$0.4A^2s$	40°C ambient, cold start

Fig. 6-1 **Input inrush current, typical behavior**



Input: 230Vac
Output: 5V, 3A
Ambient: 25°C
Upper curve: Input current 5A / DIV
Lower curve: Input voltage 500V / DIV
Time scale: 10ms / DIV

Fig. 6-2 **Input inrush current, zoom into the first peak**



Input: 230Vac
Output: 5V, 3A
Ambient: 25°C
Input current curve: 5A / DIV, 500µs / DIV
Ipeak **23A**
The charging current into EMI suppression capacitors is disregarded in the first microseconds after switch-on.

7. HOLD-UP TIME

		AC 100V	AC 120V	AC 230V	
Hold-up Time	typ.	61ms	93ms	355ms	5V, 1.5A, see **Fig. 7-1**
	typ.	29.5ms	45ms	191ms	5V, 3A, see **Fig. 7-1**

Fig. 7-1 **Hold-up time vs. input voltage**

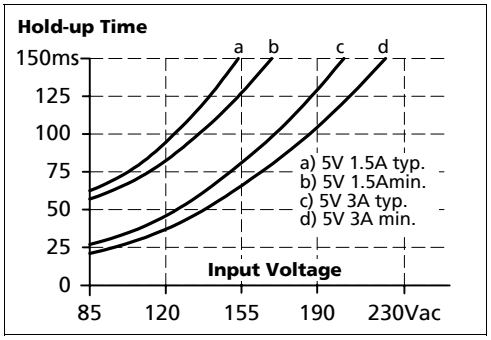
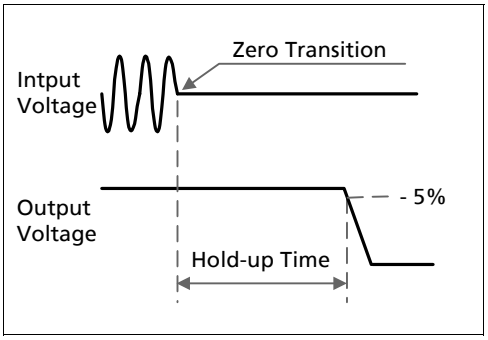


Fig. 7-2 **Shut-down behavior, definitions**



Note: At no load, the hold-up time can be up to several seconds. The green DC-ok lamp is also on during this time.

8. DC-INPUT

DC input	nom.	DC 110-290V	-25%/+30%
DC input range	min.	85-375Vdc	Continuous operation
DC input current	typ.	0.16A / 0.057A	110Vdc / 300Vdc, at 5V and 3A output load
Turn-on voltage	typ.	80Vdc	Steady state value
Shut-down voltage	typ.	60Vdc	Steady state value

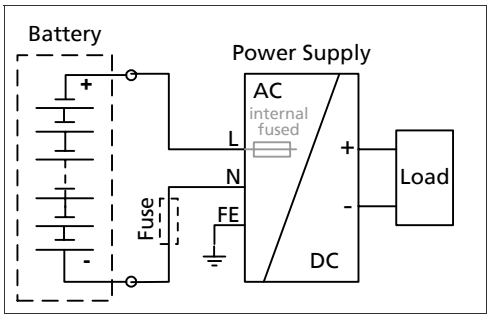
Instructions for DC use:

a) Use a battery or similar DC source.

b) Connect +pole to L and – pole to N.

c) In case the – pole of the battery is not connected to earth, use an appropriate fuse to protect the N terminal.

Fig. 8-1 **Wiring for DC Input**



9. OUTPUT

Output voltage	nom.	5V	
Adjustment range	min.	5.0-5.5V	Guaranteed
	max.	6V	At clockwise end position of potentiometer
Factory setting		5.1V	±0.2%, at full load, cold unit
Line regulation	max.	10mV	85 to 264Vac
Load regulation	max.	100mV	Static value, 0A → 3A → 0A
Ripple and noise voltage	max.	50mVpp	20Hz to 20MHz, 50Ohm
Output capacitance	typ.	4800µF	
Output current	nom.	3A	See Fig. 9-1 for typical values
Output power	nom.	15W	
Short-circuit current	min.	Hiccup mode	See Fig. 9-2
	max.	Hiccup mode	See Fig. 9-2

Fig. 9-1 **Output voltage vs. output current, typ.**

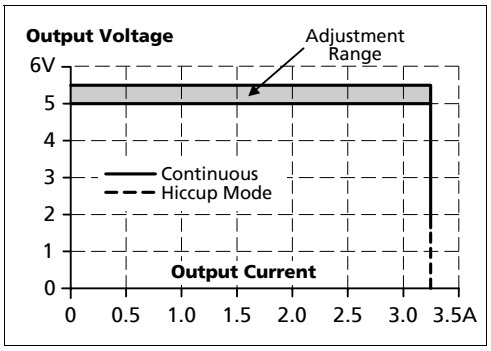
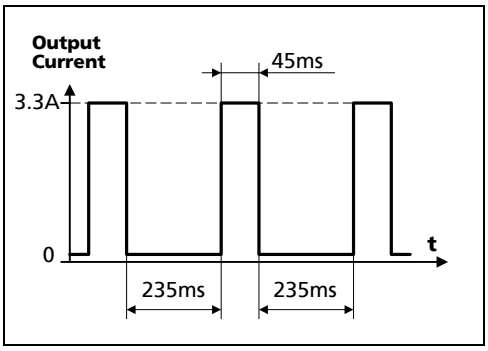


Fig. 9-2 **Hiccup mode, Output current at shorted output, 230V typ.**



Peak current capability (up to several ms)

The power supply can deliver a peak current which is higher than the specified short term current. This helps to start current demanding loads or to safely operate subsequent circuit breakers.

The extra current is supplied by the output capacitors inside the power supply. During this event, the capacitors will be discharged and cause a voltage dip on the output. Detailed curves can be found in chapter 25.1

Peak current voltage dips	typ.	from 5V to 2.4V	At 6A for 50ms, resistive load
	typ.	from 5V to 1.0V	At 15A for 2ms, resistive load
	typ.	from 5V to 0.8V	At 15A for 5ms, resistive load

10. EFFICIENCY AND POWER LOSSES

		AC 100V	AC 120V	AC 230V	
Efficiency	typ.	75.8%	76.8%	77.2%	5V, 3A (full load)
Power losses	typ.	0.2W	0.3W	0.6W	At no load
	typ.	2.3W	2.3W	2.4W	5V, 1.5A (half load)
	typ.	4.9W	4.6W	4.5W	5V, 3A (full load)

Fig. 10-1 **Efficiency vs. output current at 5V**

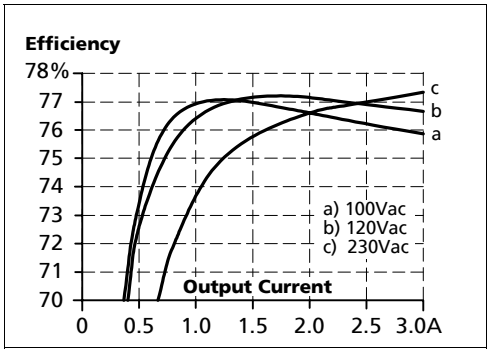


Fig. 10-2 **Losses vs. output current at 5V**

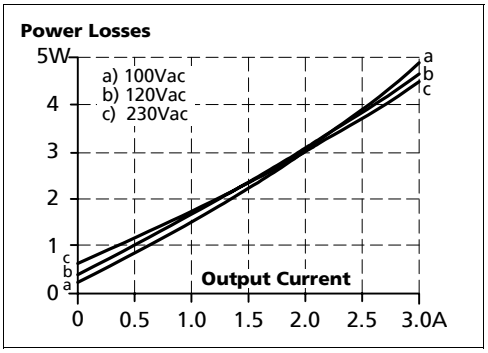


Fig. 10-3 **Efficiency vs. input voltage at 5V and 3A**

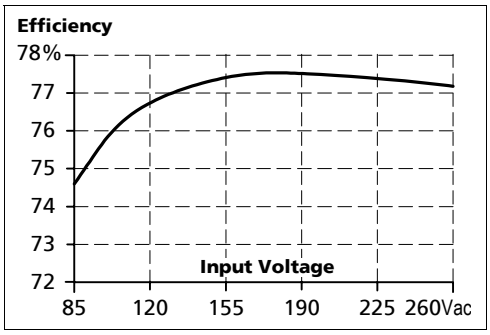


Fig. 10-4 **Losses vs. input voltage at 5V and 3A**