N2Power™
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Product Specification

XL180 series

180W AC-DC

Power Supplies

Document No. 702702 Rev. 09-09-22

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For information about this product specification, please write or call *N2Power* at:

N2Power
A subsidiary of Qualstar Corporation

1267 Flynn Road
Camarillo, CA 93012

FAX: (805) 978-5212
Phone: (805) 583-7744

E-Mail: sales@n2power.com
www.n2power.com

Table of Contents

1. Introduction

1.1 Introduction

This specification defines the XL180 series of universal input, single output 180W switchmode power supplies. It includes information regarding the mechanical details, electrical and environmental ranges for storage and operation of the power supply. These power supplies achieve very high packaging densities. All of the XL180 family models are listed in Table 3-1.

All models of the XL180 series can be used as standalone power supplies and have different chassis options – XLO180 for Open frame, XLE180 for Enclosure and XLD180 for Din rail.

XLO180

XLE180

XLD180

Figure 1-1 XL180 Series

1.2 Agency Compliance

All of the XL180 models comply with the following international agency

Safety	Complies with Standard	Remarks
United States	UL 62368-1	I/P-O/P: 3000VAC; I/P-GND: 2000VAC
	(Information and Communications Technology) and AV (Audio/Video) equipment)	
Canada	CSA 22.2 62368-1	
EU Council	2014/35/EU	Low Voltage
International	IEC/EN 62368-1	

United States	FCC Part 15, Subpart B	Conducted (Class B) Radiated (Class A)
EU Council	2014/30/EU	EMC Directive

EMC	Complies with Standard	Remarks
International	EN55032: 2015+AC: 2016	Conducted (Class B) Radiated (Class A)
	EN61000-3-2	Harmonic Current Emissions
	EN61000-3-3	Voltage Fluctuations & Flicker
	EN55024: 2010 + A1: 2015	Immunity Standard
	EN61000-4-2	Electrostatic discharge immunity
	EN61000-4-3	Radio frequency immunity
	EN61000-4-4	Electrical fast transient burst immunity
	EN61000-4-5	Power line surge immunity
	EN61000-4-6	RF Common mode immunity
	EN61000-4-8	Power frequency magnetic field immunity
	EN61000-4-11	Voltage dips and short interruptions immunity

Reduction of Hazardous Substances (RoHS)	Complies with Standard	Remarks
EU Council	2002/95/EC 2011/65/EU 2015/863/EU	RoHS Directive RoHS 2 Directive Amending Annex II to Directive 2011/65/EU

Marks of Conformance

United States & Canada — Underwriters Laboratories File E211115 (Industrial)

EU Council

RoHS

Table 1-1 Agency Compliance

2. AC Input

2.1 Input Line Requirements

The following table defines the voltage and frequency requirements for the AC line inputs to the XL180 models which are capable of supplying full rated power in continuous operation throughout the specified ranges of voltages and frequencies. The power supply will automatically recover from AC power loss and is capable of starting under maximum load at the minimum AC input voltage described below.

Parameter	Minimum	Nominal	Maximum
RMS Input Voltage	85VAC 120DC	100–240VAC	264VAC 370DC
RMS Input Current	-	-	3A / 100VAC
Input Frequency	47Hz	50/60Hz	0.9A / 240VAC

Table 2-1 XL180 Series Input Parameters

2.2 Input Over Current Protection

The XL180 series incorporate a primary AC line fuse for input over current protection to prevent damage to the power supply and meet product safety requirements as outlined in Section 1.2.

2.3 Inrush Current Limiting

The cold-start (25°C) inrush current at 90° input phase angle (i.e. AC switch is closed at the peak of the AC sine wave input) is limited to less than 100 Amps peak for 230 VAC.

Repetitive ON-OFF cycling of the AC input voltage should not damage the power supply or cause the input fuse to open.

2.4 Low Input Voltage

The application of an input voltage below the minimums specified in Table 2-1 shall not cause damage to the power supply.

2.5 Leakage Current

The leakage current from AC line or AC Neutral inputs to Earth Ground is less than 300uA at 264VAC.

3. DC Outputs

3.1 Output Voltage Regulation

The DC output voltages shall remain within the Minimum and Maximum limits of Table 3-1 when measured at the power supply connector under all specified line, load and environmental conditions contained herein.

Model	Rated Voltage (VDC)	Load Regulation	Minimum (VDC)	Nominal (VDC)	Maximum (VDC)
XL#180-12	12	±1.0%	11.88	12	12.12
XL#180-15	15	±1.0%	13.85	15	15.15
XL#180-18	18	±1.0%	17.82	18	18.18
XL#180-24	24	±1.0%	23.76	24	24.24
XL#180-28	28	±1.0%	27.72	28	28.28
XL#180-36	36	±1.0%	35.64	36	36.36
XL#180-48	48	±1.0%	47.52	48	48.48
XL#180-53	53	±1.0%	52.47	53	53.53

Table 3-1 Output Voltage Specifications

Note: "#" denotes the type of chassis, which can be
O =Open frame, E=Enclosure, D=Din Rail

3.2 No Load Operation

The power supply will operate under no load condition and will not result in damage to the supply. The power supply will remain stable and operate normally after application of loads.

3.3 Output Current/Power

The maximum available output power is always a function of the input voltage and ambient temperature. The maximum output currents of all models of XL180 are listed in Table 3-2. Refer to Section 3.3.1 and 3.4.1 for input voltage range and ambient temperature at which XL180 can deliver these maximum output powers.

MODEL	VOLTAGE	MAXIMUM CURRENT (A) with 10CFM	MAXIMUM CURRENT (A) Convection
XL#180-12	12V	15	12.5
XL#180-15	15V	12	10
XL#180-18	18V	10	8.34
XL#180-24	24V	7.5	6.25
XL#180-28	28V	6.43	5.36
XL#180-36	36V	5	4.17
XL#180-48	48V	3.75	3.13
XL#180-53	53V	3.4	2.83

Table 3-2 Max Load

3.3.1 Input Voltage Derating

The XL65 series can be operated at the minimum input voltage of 85VAC with the maximum load of 80% of the total maximum output power. From 85VAC to 90VAC, the output load can be increased by 4%/VAC and from 90VAC onwards, the output load can be 100%.

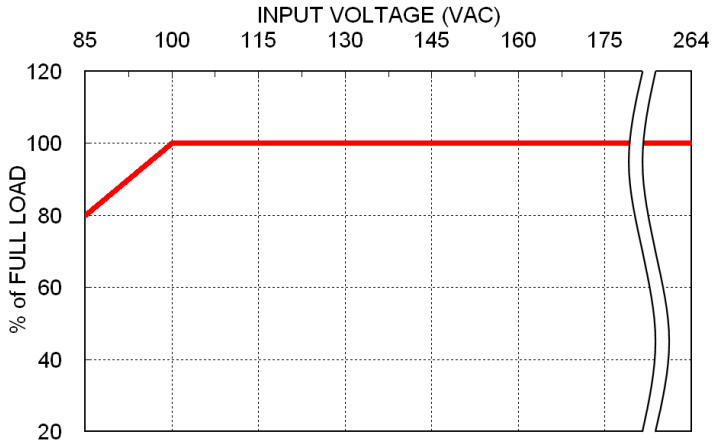


Figure 3-1 Load vs. Input Voltage

3.4 Cooling

XL180 can deliver maximum output power with unrestricted convection cooling at 50° C. "Unrestricted" means there are no nearby obstructions that would impede the convection cooling process.

3.4.1 High Temperature Derating

The XL180 series can be operated at elevated temperatures by derating the total maximum output power (or current). Refer to below graphs to get the maximum output power at a specific ambient temperature.

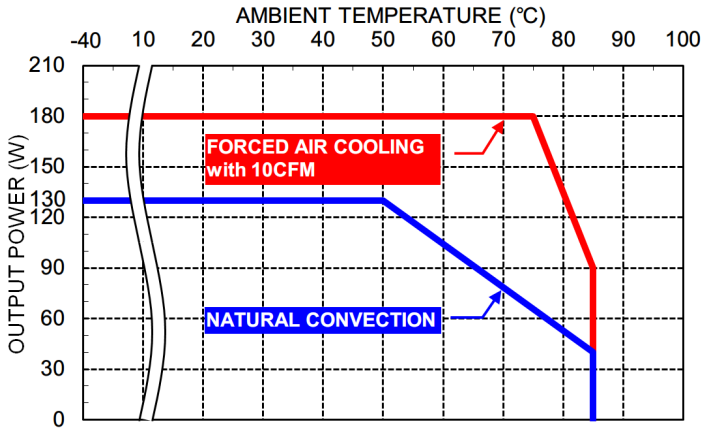


Figure 3-2

Derating Curve vs. Ambient Temperature
Vin=115VAC Enclosed type / Din rail type

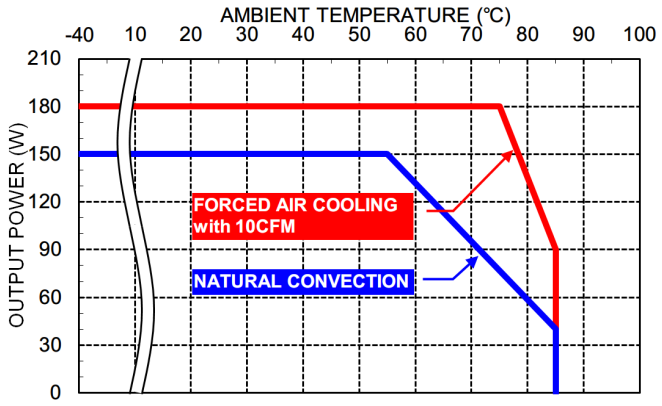


Figure 3-3

Derating Curve vs. Ambient Temperature
Vin=230VAC Enclosed type / Din rail type

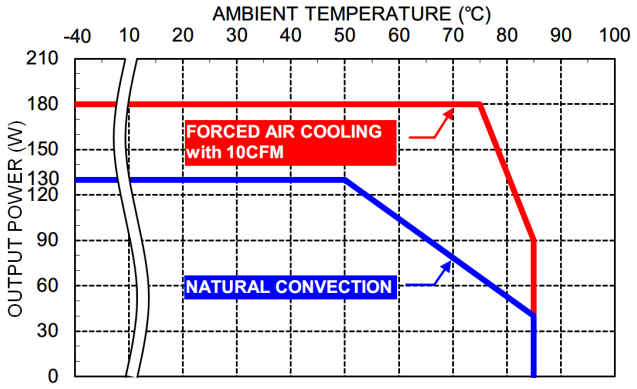


Figure 3-4

Derating Curve vs. Ambient Temperature
Vin=115VAC Enclosed type / Din rail type

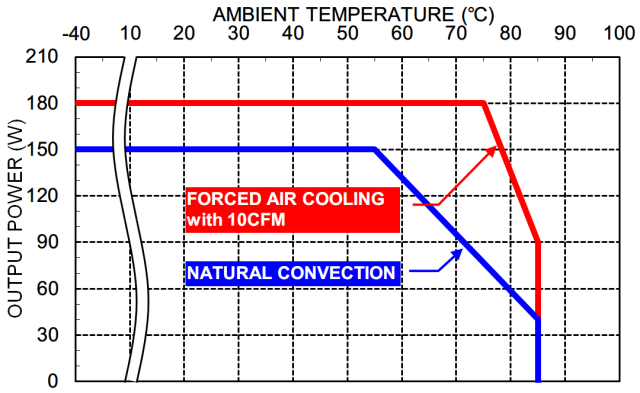


Figure 3-4b

Derating Curve vs. Ambient Temperature
Vin=230VAC Enclosed type / Din rail type

3.5 Output Ripple/Noise

Output ripple voltage and noise are measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a ceramic capacitor (MLCC) in parallel. The capacitance value of this MLCCs are 11µF for 100V 12V, 15V, 18V output models, 1µF 150V for 24V, 28V, 36V output models or 0.1µF for 100V 48V and 53V output models. The ripple noise is measured from the output pin connectors.

3.5.1 Ripple/Noise Limits

The ripple voltage of the outputs is measured at the pins of the mating connector. Ripple and noise shall not exceed the limits specified in Table 3-3 under any condition of line voltage and frequency specified in Section 2.1 and DC loading specified in Section 3-2.

MODEL	VOLTAGE	Ripple Noise (P-P)
XL#180-12	12V	120 mV
XL#180-15	15V	120 mV
XL#180-18	18V	120 mV
XL#180-24	24V	120 mV
XL#180-28	28V	120 mV
XL#180-36	36V	120 mV
XL#180-48	48V	250 mV
XL#180-53	53V	250 mV

Table 3-3 Ripple Voltage of XL180

3.5.2 Ripple/Noise Test Setup

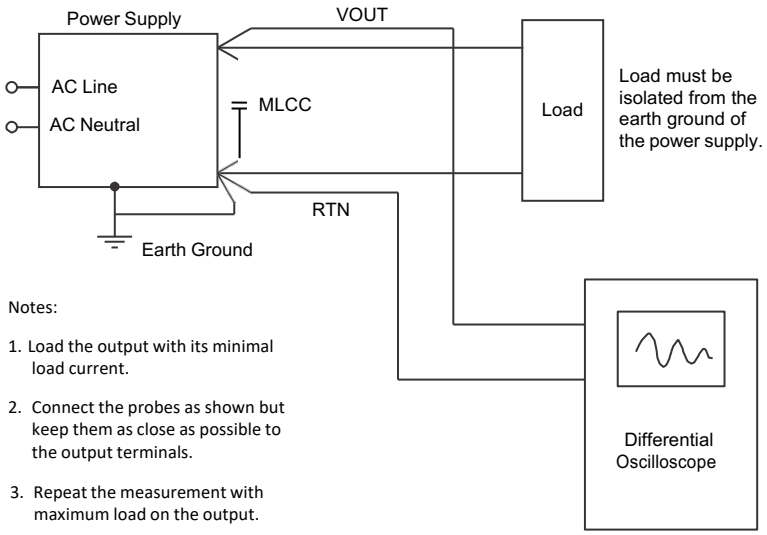


Figure 3-5 Ripple Noise Measurement Setup

3.6 Output Protection

There are output protection schemes designed to protect the load and the XL180 seriesfrom component failures and extraordinary circumstances.

3.6.1 Over Voltage Protection (OVP)

No single fault is able to cause a sustained over voltage condition on the output. When an over-voltage condition occurs at output, the power supply will shut down. Following an OVP event, the XL180 will not restart until AC power is turned off and back on.

			OVP Voltage	
Model	**Output (VDC)**	**Minimum (VDC)**	**Nominal (VDC)**	**Maximum (VDC)**
XL#180-12	12	13.8	15	16.2
XL#180-15	15	17.25	18.75	20.25
XL#180-18	18	20.7	22.5	24.3
XL#180-24	24	27.6	26.45	32.5
XL#180-28	28	32.2	30.8	37.8
XL#180-36	36	41.4	39.6	48.6
XL#180-48	48	55.2	57.6	64.8
XL#180-53	53	60.95	66.25	71.55

Table 3-4 Over Voltage Protection Limits

3.6.2 Over Current Protection (OCP)

An excessive load will cause the output to shut down. The maximum output power before the power supply shuts down is about 150% (typical) of the rated output power. The power supply will periodically attempt to restart until the over-current condition is removed.

3.6.3 Short Circuit Protection

A short circuit is defined as an impedance of less than 0.1 ohms placed between RTN and output. A short circuit will cause no damage to the power supply, but will cause it to shut down. The power supply will periodically attempt a restart until the short circuit condition is removed. After successfully restarting, the power supply will operate normally.

3.7 Output Rise Time

Output voltage shall rise from 10% to 90% of nominal output voltage within 15ms. The output voltage waveform must be a monotonic ramp from 10% to 90% of final set point within the regulation band under any loading conditions specified in the respective load current tables in Table 3-2.

For the purposes of this specification, a monotonic ramp is defined as always having a positive slope from zero to 10*VOUT volts/millisecond. During any 5-millisecond portion of the ramp, its slope must be greater than 5% of its rated voltage per millisecond.

3.8 Overshoot at Turn On/Turn Off

The output voltage overshoot upon the application or removal of the input mains voltage is less than 5% for all XL180 models above the nominal voltage. No opposite polarity voltage will be present on any output during turn on or turn off.

3.9 Voltage Trim

A potentiometer (see picture below) is provided to allow the user to adjust the output up or down by up to 8%. The ability of the output to maintain its specified regulation accuracy under severe load or line conditions could be diminished by trimming the output to a higher than nominal voltage. The load current and power should not exceed the maximum limits described in Section 3.3.

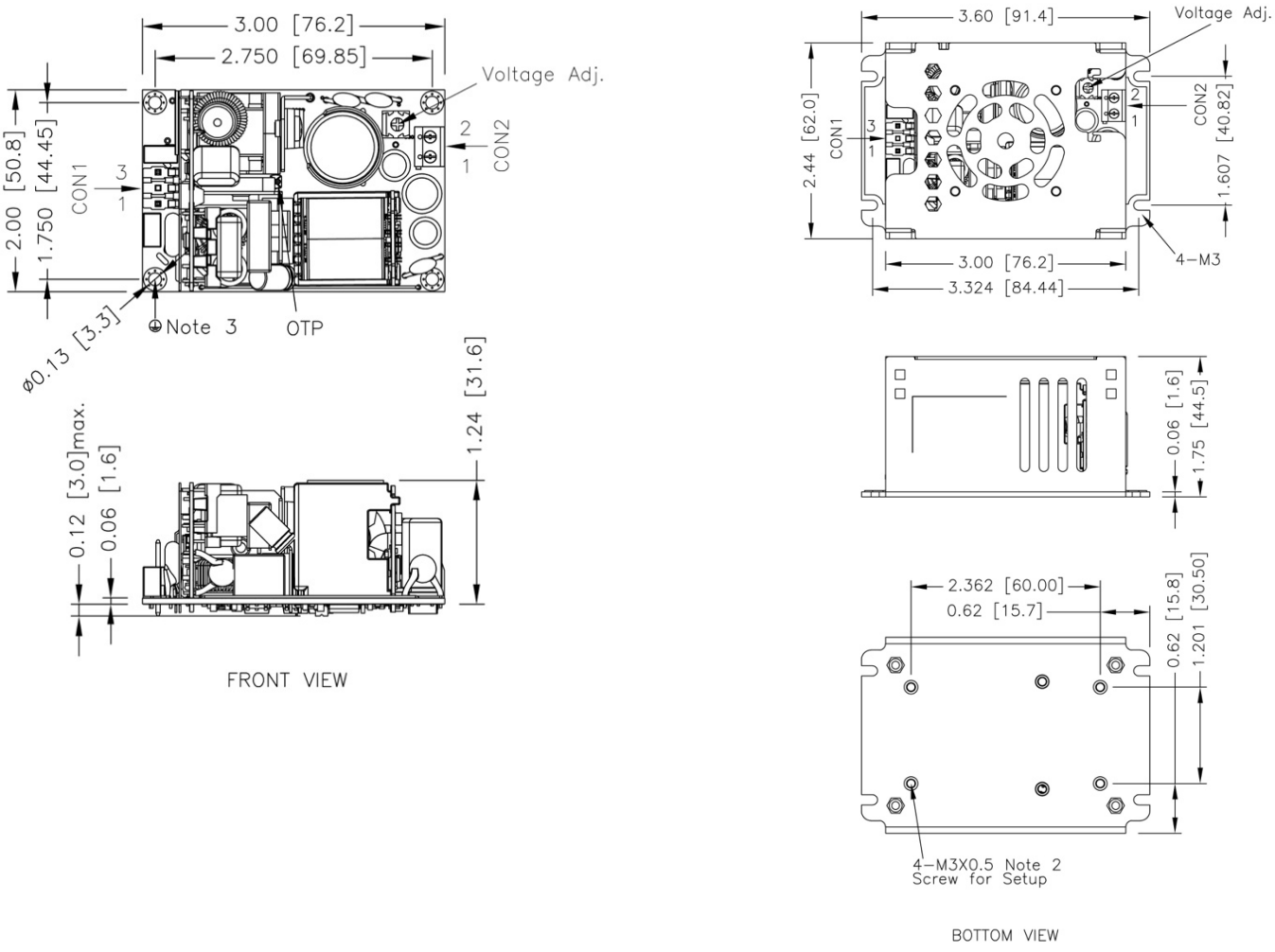


Figure 3-6 Potentiometer to adjust output

4. General Specifications

4.1 Environmental

The XL180 series meets or exceeds the following environmental

Parameter	Conditions	Specification	Remarks
	Operating	-40°C to 85°C*	
	Non-Operating	-40°C to 85°C*	
Relative Humidity	Operating	5-95% Maximum	Non-Condensing
	Non-Operating	95% Maximum	Non-Condensing
Altitude	Operating	16404 feet MSL Max.	5,000 meters
Vibration	No damage	2.0 G RMS Maximum	10-500Hz, 10-min/1cycle, 60 min each along x, y, z
		2.0 G RMS Maximum	axis. Mounting: Compliance to IEC60068-2-6

Table 4-1 Environmental Specifications

Note on (*): Refer to **Figure 3-2** for derating at different temperatures.

4.2 Mean Time between Failures

The calculated MTBF of all models is equal to or greater than 1.145 x 10^6 hours of continuous operation at maximum output loading and worst-case input line voltage with convection cooling at 25°C. N2Power does not warrant the MTBF to be representative of any particular unit. The MTBF of the power supply is calculated in accordance with (MIL-HDBK-217F). Actual failure rates vary from unit to unit.

4.3 Labeling/Marking

The power supply is marked and labeled with the N2Power logo and part number, model number, input and output specifications, production code, appropriate safety agency logos and CE mark. A typical label is pictured below.

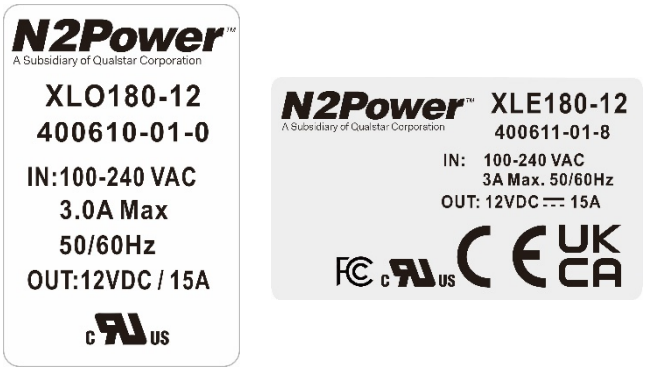


Figure 4-1 Sample XL180 series Label

4.4 Net Weight

Model	Pound	Ounces	Grams
XLO180	0.356	5.7	162
XLE180	0.481	7.7	218
XLD180	0.529	8.47	240

Table 4-2 Net Weights

4.5 Mounting and Physical Dimensions

All XL180 models are provided with four mounting holes of the following

Model	Millimeter (mm)	Inch (in)
XL#180	3.3	0.129

Table 4-3 Mounting Screw Sizes

See mechanical drawings for mounting hole locations and the dimensions of the power supplies. All the units are in "mm [in]" format with the tolerance of x.xx±0.5 [x.xxx±0.02].

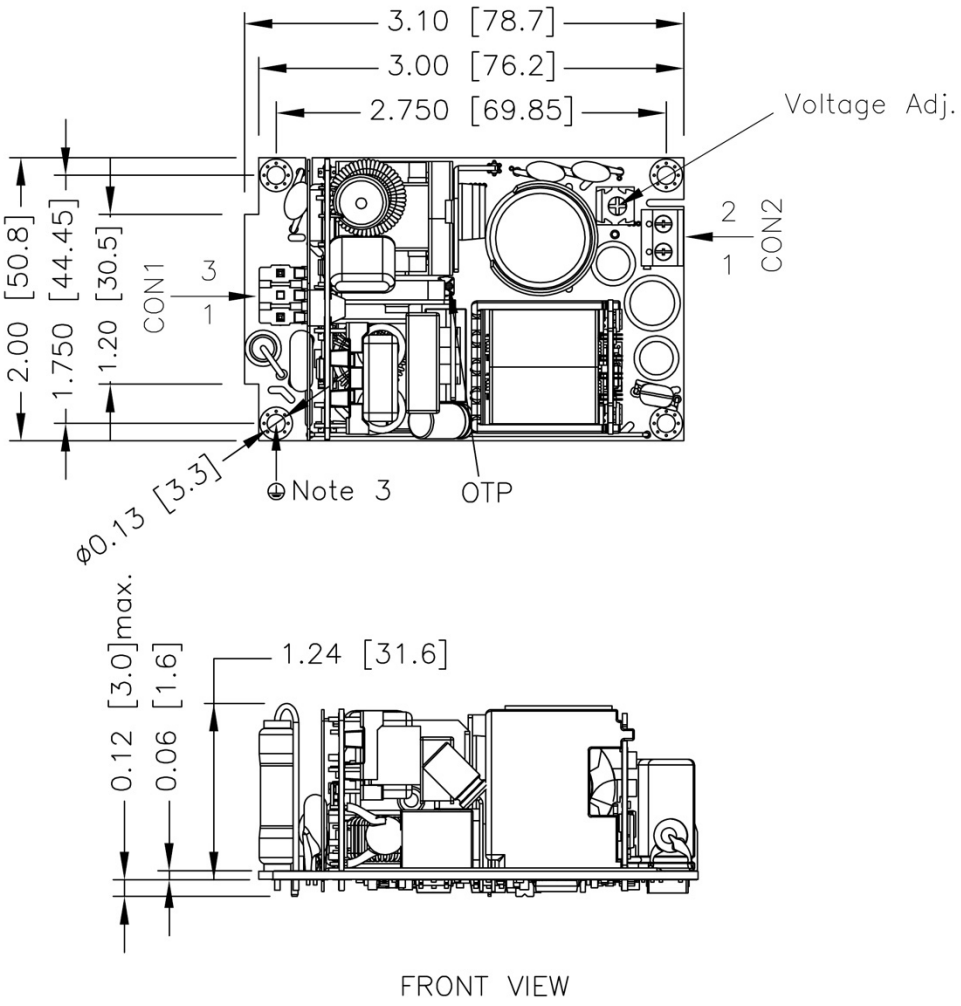


Figure 4-2 XLO180 models: Mounting Hole Locations and Dimensions

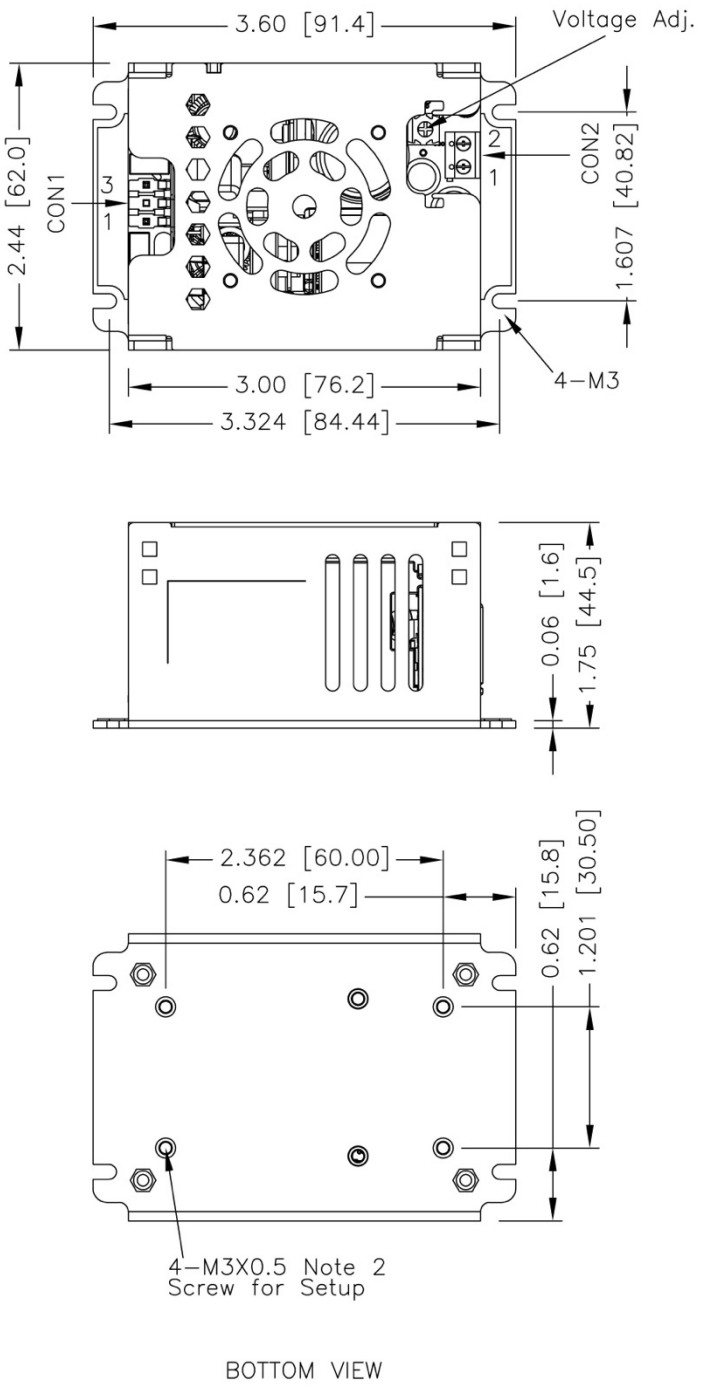
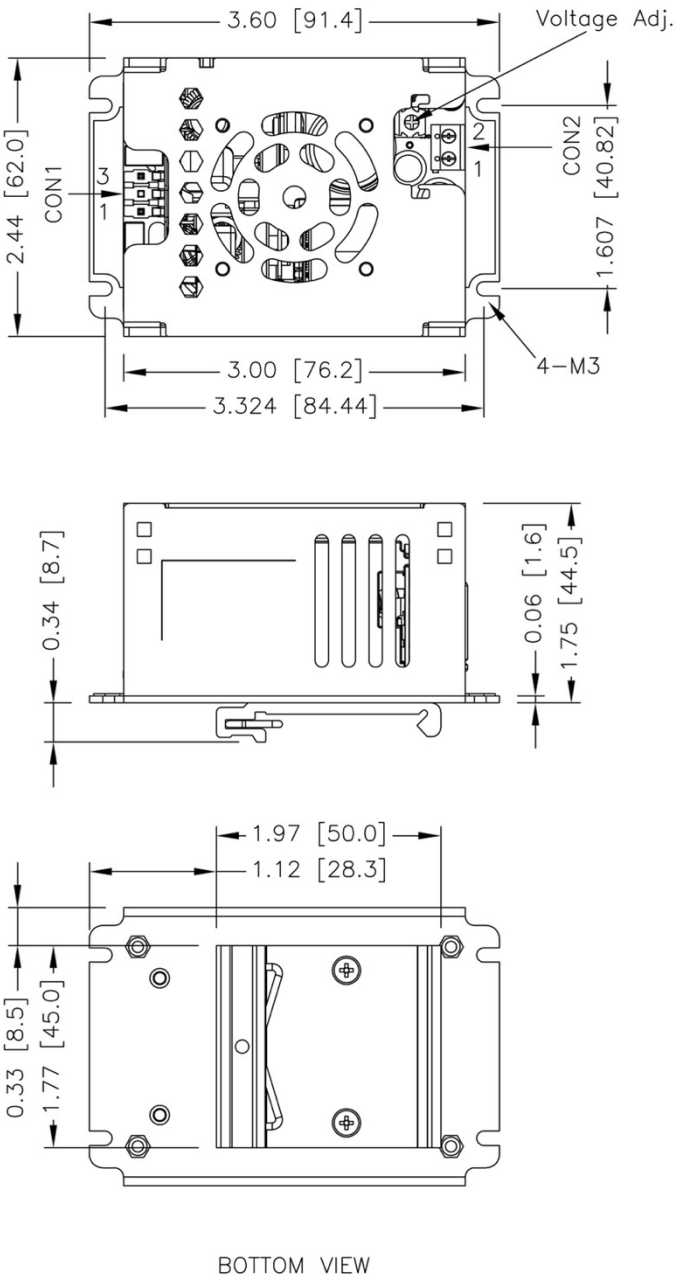


Figure 4-4 XLE180 models: Mounting Hole Locations and Dimensions



Minimum distance from PCB to mounting plate = 8.5mm

Figure 4-5 XLD180 models: Mounting Hole Locations and Dimensions

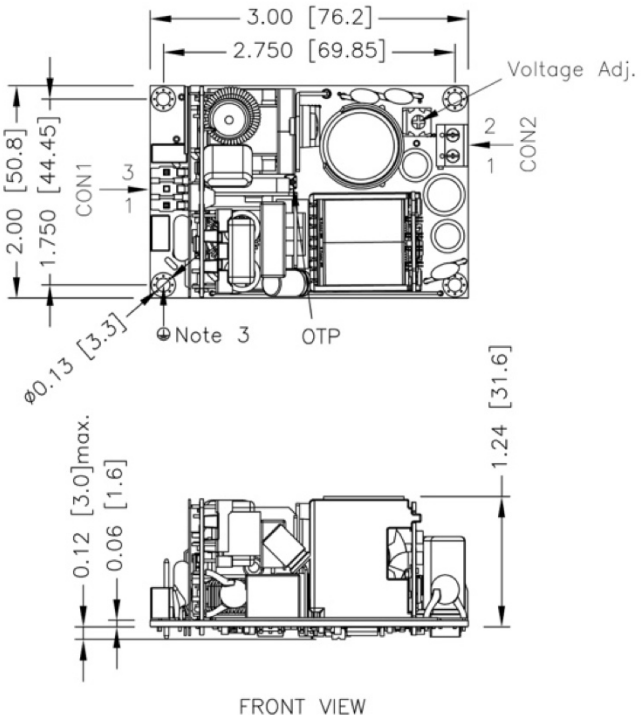


Figure 4-6 XL180 minimum distance requirement from mounting

When XL180 models are mounted on the FG mounting plate, the distance from themounting plate to the PCB must be at least 8.5mm.

A standoff less than 8.5mm high is acceptable when a thin insulator, 0.4mm thick (polyester, fish paper or equivalent UL rated 94V-2 minimum) is placed between the power supply and the mounting chassis (refer to applicable UL standard for clearance requirements).

4.6 Mating Connectors

The user must furnish all mating connectors. The mating connectors must meet the requirements of all applicable safety agencies (UL and/or TUV).

CONNECTORS CONNECTIONS

CON1 – Input Connector		
Pin Number	AC Input	DC Input
Pin 3	Line	DC+
Pin 1	Neutral	DC-

Mates with
Molex housing : **09-50-8031**
Molex crimp terminals : **2478,6838,45570**

CON2 – Output Connector	
Pin 1	+Vout
Pin 2	-Vout

Mates with
Screw locked torque MAX 2.5Kgf.cm/0.25N.m
Wire dimension range 24 ~ 14AWG

Table 4-4 Mating connectors

4.7 Output Grounding

For CLASS I protection type power supplies, the RTN signal may be connected to the power supply chassis ground (safety earth) screw terminals on the power supplies as shown in Figure 4-7.

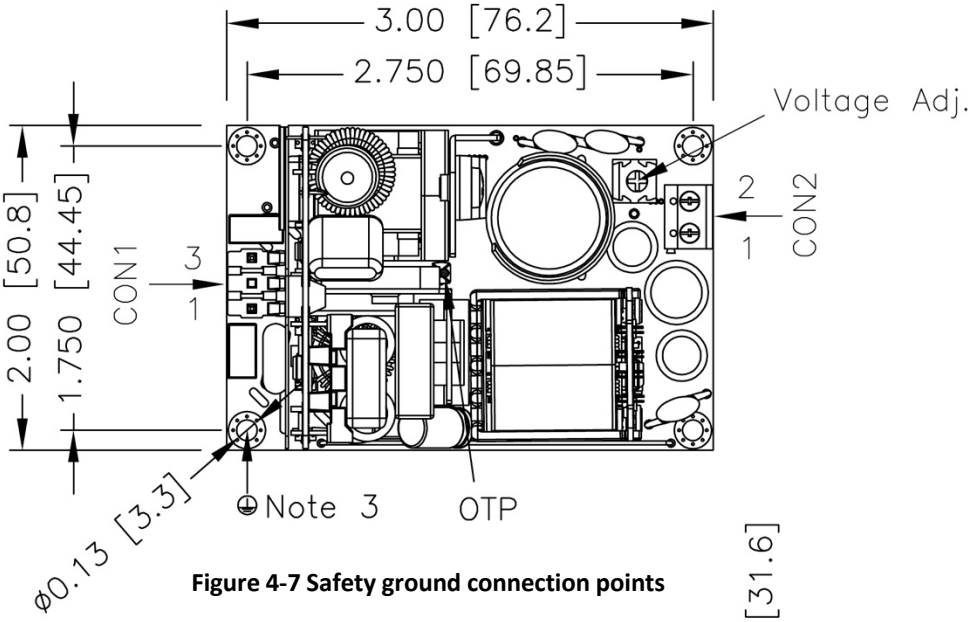


Figure 4-7 Safety ground connection points

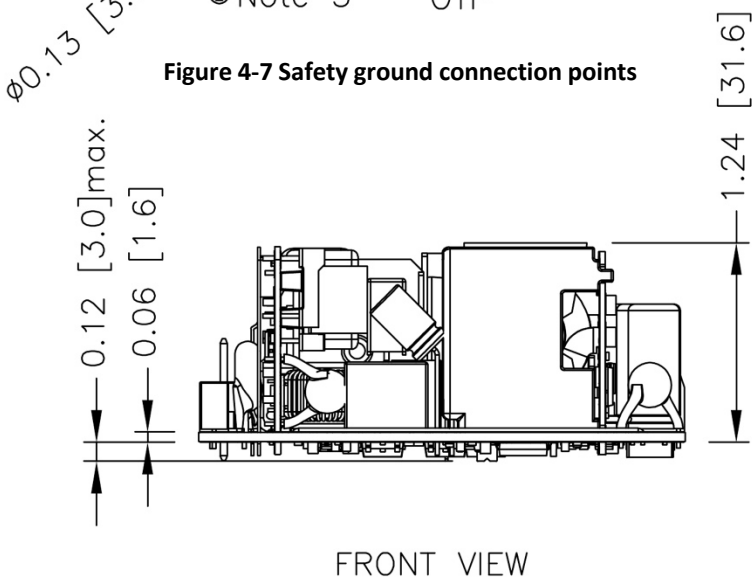


Figure 4-8 Pin Definitions

Model	Con 1 AC Input Connector	DC Input	Pin No.
	AC Line	DC+	Pin 3
ALL	AC Neutral	DC-	Pin 1
	Con 2 DC Output Connector	**DC Output**	**Pin No.**
		+Vout	Pin 1
ALL		-Vout	Pin2

Table 4-5 Pin Definitions

5. Efficiency

The efficiencies for the XL180 power supply models are listed below. They were measured at full load, 25 ˚C at 230AC.

Model	Ouput Voltage	Total Load	Efficiency	Maximum Capcaitor Load
XL#180-12	12V	180 W	92%	10000 uF
XL#180-15	15V	180 W	92%	6800 uF
XL#180-18	18V	180 W	92%	4700 uF
XL#180-24	24V	180 W	94%	2700 uF
XL#180-28	28V	180 W	93%	1800 uF
XL#180-36	36V	180 W	93%	1200 uF
XL#180-48	48V	180 W	93%	680 uF
XL#180-53	53V	180 W	93%	560 uF

Table 5-1 Efficiency

6. Timing and Control

6.1 Power Supply Timing

The maximum duration for the output to rise up to regulated output voltage (99% of nominal voltage) from the start of AC input voltage is 1.5 second.

6.2 Voltage Hold-Up Time

The power supply will maintain output regulation per Table 3-1 despite a loss of input power at 115VAC/60Hz and 230VAC/50Hz at maximum rated continuous output for a minimum of 10ms.

7. Ordering Information

The following table provides the N2Power part numbers that should appear on your purchase order and will appear on any N2Power correspondence:

MODEL	PART NUMBER	VOLTAGE	REGULATION	MAXIMUM CURRENT (A) with 10CFM	MAXIMUM CURRENT (A) Convection	Ripple Noise (P-P)
XLO180-12	400610-01-0	12V	±0.5%	15	12.5	120 mV
XLO180-15	400610-02-8	15V	±0.5%	12	10	120 mV
XLO180-18	400610-03-6	18V	±0.5%	10	8.34	120 mV
XLO180-24	400610-04-4	24V	±0.5%	7.5	6.25	120 mV
XLO180-28	400610-05-1	28V	±0.5%	6.43	5.36	120 mV
XLO180-36	400610-06-9	36V	±0.5%	5	4.17	120 mV
XLO180-48	400610-07-7	48V	±0.5%	3.75	3.13	250 mV
XLO180-53	400610-08-5	53V	±0.5%	3.4	2.83	250 mV
XLO180-12B	400610-09-3	12V	±0.5%	15	12.5	120 mV
XLO180-15B	400610-10-1	15V	±0.5%	12	10	120 mV
XLO180-18B	400610-11-9	18V	±0.5%	10	8.34	120 mV
XLO180-24B	400610-12-7	24V	±0.5%	7.5	6.25	120 mV
XLO180-28B	400610-13-5	28V	±0.5%	6.43	5.36	120 mV
XLO180-36B	400610-14-3	36V	±0.5%	5	4.17	120 mV
XLO180-48B	400610-15-0	48V	±0.5%	3.75	3.13	250 mV
XLO180-53B	400610-16-8	53V	±0.5%	3.4	2.83	250 mV
XLE180-12	400611-01-8	12V	±0.5%	15	12.5	120 mV
XLE180-15	400611-02-6	15V	±0.5%	12	10	120 mV
XLE180-18	400611-03-4	18V	±0.5%	10	8.34	120 mV
XLE180-24	400611-04-2	24V	±0.5%	7.5	6.25	120 mV
XLE180-28	400611-05-9	28V	±0.5%	6.43	5.36	120 mV
XLE180-36	400611-06-7	36V	±0.5%	5	4.17	120 mV
XLE180-48	400611-07-5	48V	±0.5%	3.75	3.13	250 mV
XLE180-53	400611-08-3	53V	±0.5%	3.4	2.83	250 mV
XLE180-12B	400611-09-1	12V	±0.5%	15	12.5	120 mV
XLE180-15B	400611-10-9	15V	±0.5%	12	10	120 mV
XLE180-18B	400611-11-7	18V	±0.5%	10	8.34	120 mV
XLE180-24B	400611-12-5	24V	±0.5%	7.5	6.25	120 mV
XLE180-28B	400611-13-3	28V	±0.5%	6.43	5.36	120 mV
XLE180-36B	400611-14-1	36V	±0.5%	5	4.17	120 mV
XLE180-48B	400611-15-8	48V	±0.5%	3.75	3.13	250 mV
XLE180-53B	400611-16-6	53V	±0.5%	3.4	2.83	250 mV
XLD180-12	400612-01-6	12V	±0.5%	15	12.5	120 mV
XLD180-15	400612-02-4	15V	±0.5%	12	10	120 mV
XLD180-18	400612-03-2	18V	±0.5%	10	8.34	120 mV
XLD180-24	400612-04-0	24V	±0.5%	7.5	6.25	120 mV
XLD180-28	400612-05-7	28V	±0.5%	6.43	5.36	120 mV
XLD180-36	400612-06-5	36V	±0.5%	5	4.17	120 mV
XLD180-48	400612-07-3	48V	±0.5%	3.75	3.13	250 mV
XLD180-53	400612-08-1	53V	±0.5%	3.4	2.83	250 mV
XLD180-12B	400612-09-9	12V	±0.5%	15	12.5	120 mV
XLD180-15B	400612-10-7	15V	±0.5%	12	10	120 mV
XLD180-18B	400612-11-5	18V	±0.5%	10	8.34	120 mV
XLD180-24B	400612-12-3	24V	±0.5%	7.5	6.25	120 mV
XLD180-28B	400612-13-1	28V	±0.5%	6.43	5.36	120 mV
XLD180-36B	400612-14-9	36V	±0.5%	5	4.17	120 mV
XLD180-48B	400612-15-6	48V	±0.5%	3.75	3.13	250 mV
XLD180-53B	400612-16-4	53V	±0.5%	3.4	2.83	250 mV

Table 7-1 XL180 Part Numbers

The model names in the above table are for CLASS II B protection type. XL180s for CLASS I protection are also available.

All XL180 power supplies are RoHS compliant. For warranty information, refer to www.n2power.com. Direct all questions, orders or requests for quotation as follows:

N2Power Order Desk:	orders@n2power.com	805-583-7744 x112
Fax (Attention N2Power):		805-978-5212
Sales:	sales@n2power.com	805-583-7744 x122
Technical Support:	techsupport@n2power.com	805-583-7744 x119
Address:	1267 Flynn Road Camarillo, CA 93012	