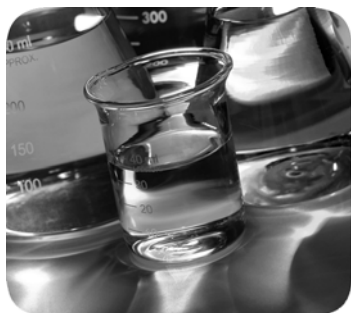


# Basic Power Supply 10 A

Catalog Number 1606-XLB240E



# Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.



**WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.



**ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.

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**IMPORTANT** Identifies information that is critical for successful application and understanding of the product.

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Labels may also be on or inside the equipment to provide specific precautions.



**SHOCK HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.



**BURN HAZARD:** Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.



**ARC FLASH HAZARD:** Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

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## Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
Switched Mode Power Supply Technical Data, publication <a href="#">1606-TD002</a>	Provides specifications and approximate dimensions for full line of switched mode power supplies.
Industrial Automation Wiring and Grounding Guidelines, publication <a href="#">1770-4.1</a>	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, <a href="http://www.rockwellautomation.com/global/certification/overview.page">http://www.rockwellautomation.com/global/certification/overview.page</a>	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at <http://www.rockwellautomation.com/global/literature-library/overview.page>.

To order paper copies of technical documentation, contact your local Allen-Bradley distributor or Rockwell Automation sales representative.

## Terminology and Abbreviations

Term	Definition
<b>230V AC</b>	A figure with the unit (V AC) at the end is a momentary figure without any additional tolerances included.
<b>50 Hz vs. 60 Hz</b>	As long as not otherwise stated, AC 100V and AC 230V parameters are valid at 50 Hz mains frequency. AC 120V parameters are valid for 60 Hz mains frequency.
<b>AC 230V</b>	A figure that is displayed with the AC or DC before the value represents a nominal voltage with standard tolerances included. for example: DC 12V describes a 12V battery, whether it is full (13.7V) or flat (10V)
<b>Earth, Ground</b>	This document uses the term “earth” which is the same as the U.S. term “ground”.
<b>PE and symbol</b>	PE is the abbreviation for <b>P</b> rotective <b>E</b> arth and has the same meaning as the symbol.
<b>PELV</b>	Protection by extra-low voltage
<b>SELV</b>	Safety by extra-low voltage

## Product Overview

1606-XLB Basic Power Supplies are compact, industrial grade power supplies that focus on the essential features needed in industrial applications.

The mechanically robust housing is made of a high-grade, reinforced molded material, which permits the units to be used in ambient temperatures up to 70 °C (158 °F).

This power supply features a wide input voltage range, which makes it suitable for global use.

The addition of a DC-OK signal makes the power supply ideal for many industry applications such as: process, automation, and many other critical applications where preventive function monitoring can help to avoid long downtimes.

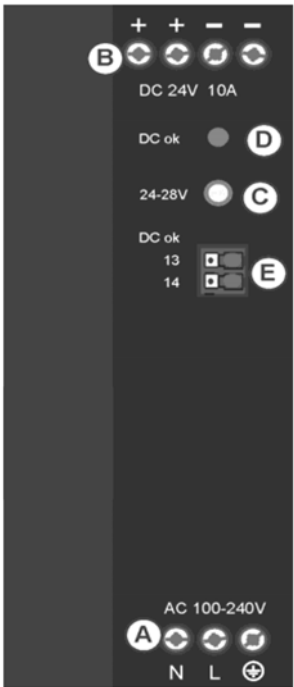
The 1606-XLB240E power supply offers these features:

- Wide input range, AC 100...240V
- Active PFC
- Cost optimized without compromising quality or reliability.
- Small width of only 49 mm (1.93 in.)
- Efficiency up to 95.2%
- Full power between -25...+55 °C (-13...+131 °F)
- DC-OK relay contact
- 1-year warranty



# Front Side and User Elements

Figure 1 - Front Side of DC-UPS



Letter	Description
A	<b>Input terminals</b> - (screw terminals) N, L - Line input PE - Protective earth input
B	<b>Output terminals</b> - (screw terminals, two pins per pole) + Positive output – Negative (return) output
C	<b>Output voltage potentiometer</b> - Guaranteed adjustment range: 24...28V Factory set: 24.1V
D	<b>DC-OK status indicator</b> (green) On, when the output voltage is >18V
E	<b>DC-OK Relay Contact</b> (push-in terminals)

## Protection Features

Attribute	1606-XLB240E	
Output protection	Electronically protected against overload, no-load, and short circuits <sup>(1)</sup>	
Output overvoltage protection	typ 30.5V DC max 32 V DC	In case of an internal power supply anomaly, a redundant circuit limits the maximum output voltage. In such a case, the output shuts down and stays down until the input voltage is turned off and on again for at least 1 minute or until the green status indicator went off.
Degree of protection	IP 20	EN/IEC 60529 Caution: For use in a controlled environment according to CSA 22.2 No 107.1-01.
Over-temperature protection	yes	Output shut-down with automatic restart
Input transient protection	MOV (Metal Oxide Varistor)	
Internal input fuse	Included	not user replaceable

(1) If there is a protection event, audible noise can occur.

## Safety Features

Attribute	1606-XLB240E	
Input/output separation	SELV	IEC/EN 60950-1
	PELV double or reinforced insulation	IEC/EN 60204-1, EN 50178, IEC 62103, IEC 60364-4-41
Class of protection	I	PE (Protective Earth) connection required
Isolation resistance	> 5 MΩ	input to output, 500V DC
Touch current (leakage current)	typ 0.30 mA/0.79 mA	100V AC, 50 Hz, TN-, TT-mains/IT-mains
	typ 0.42 mA/1.1 mA	120V AC, 60 Hz, TN-, TT-mains/IT-mains
	typ 0.67 mA/1.7 mA	230V AC, 50 Hz, TN-, TT-mains/IT-mains
	< 0.37 mA/0.94 mA	110V AC, 50 Hz, TN-, TT-mains/IT-mains
	< 0.54 mA/1.33 mA	132V AC, 60 Hz, TN-, TT-mains/IT-mains
	< 0.88 mA/2.18 mA	264V AC, 50 Hz, TN-, TT-mains/IT-mains

## Installation Notes

- Use appropriate copper cables that are designed for minimum operating temperatures of:
  - 75 °C (167 °F) for ambient up to 55 °C (131 °F) minimum.
  - 90 °C (194 °F) for ambient up to 70 °C (158 °F) minimum.
- Follow national installation codes and installation regulations.
- Verify that all strands of a stranded wire enter the terminal connection.
- Do not use the power supply without a PE connection.
- Securely tighten unused terminal compartments.
- Ferrules are allowed.

## Terminals and Wiring

The terminals are IP20 fingersafe constructed and suitable for field- and factory wiring.

Attribute	Input and Output	DC-0K Signal
Terminal type	Screw terminals	Push-in terminals
Solid wire, max	6 mm <sup>2</sup>	1.5 mm <sup>2</sup>
Stranded wire, max	4 mm <sup>2</sup>	1.5 mm <sup>2</sup>
American Wire Gauge	AWG 20-10	AWG 28-16
Wire diameter, max	2.8 mm (including ferrules)	1.6 mm (including ferrules)
Wire stripping length	7 mm (0.28 in.)	7mm (0.28 in.)
Screwdriver	3.5 mm slotted or cross-head No 2	Not required
Recommended tightening torque	1 N·m, 9 lb·in	Not applicable

## Input

Attribute		1606-XLB240E	
AC input	nom	100...240V AC	Auto-select, suitable for TN-, TT- and IT mains networks
AC input range	min	90...264V AC	continuous operation
	min	264...300V AC	< 500 ms
Allowed voltage L or N to earth	max	300V AC	continuous, IEC 62103
Input frequency	nom	50...60 Hz	±6%
Turn-on voltage	typ	81V AC	at 24V 10 A, steady-state value, see <a href="#">Figure 2</a>
Shut-down voltage	typ	63V AC/71V AC	at no load/nominal load, steady-state value, see <a href="#">Figure 2</a>
External input protection		See recommendations in <a href="#">External Input Protection on page 16</a> .	

Attribute		AC 100V	AC 120V	AC 230V	
Input current	typ	2.60 A	2.17 A	1.18 A	at 24V, 10 A, see <a href="#">Figure 3</a>
Power factor <sup>(1)</sup>	typ	0.99	0.98	0.93	at 24V, 10 A, see <a href="#">Figure 5</a>
Crest factor <sup>(2)</sup>	typ	1.6	1.7	2.0	at 24V, 10 A
Start-up delay	typ	400 ms	260 ms	200 ms	see <a href="#">Figure 4</a>
Rise time	typ	60 ms			at 24V, 10 A const. current load, 0 mF load capacitance, see <a href="#">Figure 4</a>
	typ	230 ms			at 24V, 10 A const. current load, 5 mF load capacitance, see <a href="#">Figure 4</a>
Turn-on overshoot	max	200 mV			see <a href="#">Figure 4</a>

(1) The power factor is the ratio of the true (or real) power to the apparent power in an AC circuit.

(2) The crest factor is the mathematical ratio of the peak value to the T ms value of the input current waveform.

Figure 2 - Input Voltage Range, typ

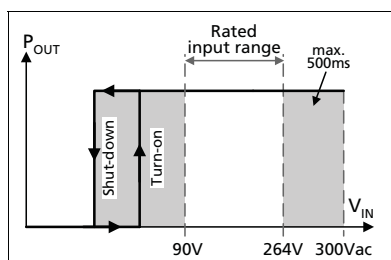


Figure 4 - Turn-on Behavior, Definitions

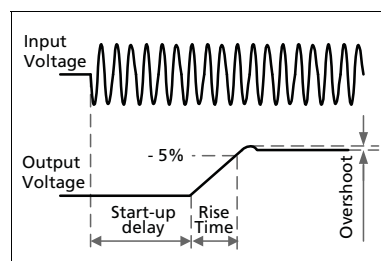


Figure 3 - Input Current vs. Output Load at 24V

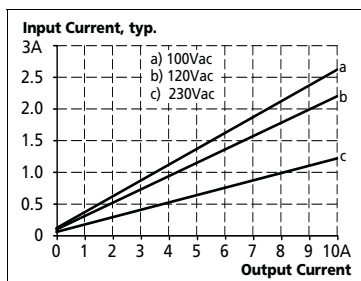
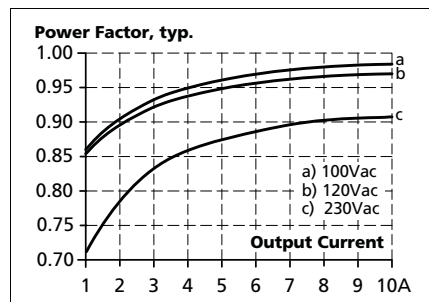


Figure 5 - Power Factor vs. Output Load





## DC-Input

Do not operate the power supply with DC-input voltage.

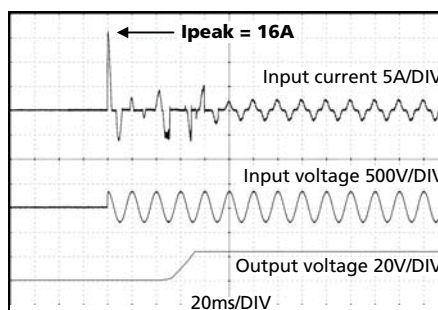
## Input Inrush Current

A NTC inrush limiter limits the input inrush current after turn-on of the input voltage.

Attribute		AC 100V	AC 120V	AC 230V	Notes
Inrush current <sup>(1)</sup>	max	14.5 A peak	17 A peak	32 A peak	40 °C (104 °F) ambient, cold start
	typ	7 A peak	8.5 A peak	16 A peak	40 °C (104 °F) ambient, cold start
Inrush energy	typ	11.5 A peak	14 A peak	26 A peak	25 °C (77 °F) ambient, cold start
	max	0.2 A <sup>2</sup> s	0.3 A <sup>2</sup> s	1 A <sup>2</sup> s	40 °C (158 °F) ambient, cold start

(1) The charging current into EMI suppression capacitors is disregarded in the first microseconds after switch-on.

**Figure 6 - Input Inrush Current, Typical Behavior,  
230V AC Input, 24V 10 A Output, 25°C (77 °F) Ambient**



## Output

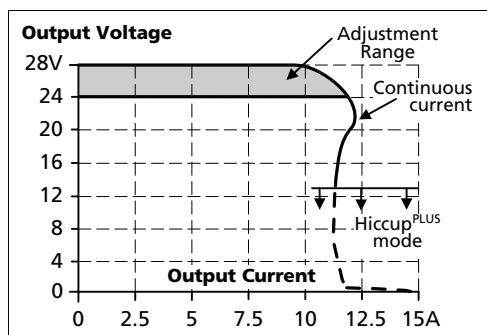
Attribute		1606-XLB240E	Notes
Output voltage	nom	DC 24V	
Adjustment range		24...28V	guaranteed
		30V <sup>(1)</sup>	at clockwise end position of potentiometer
Factory settings	typ	24.1V	±0.2%, at full load, cold unit
Line regulation	max	5 mV	90...264V AC
Load regulation	max	100 mV	static value, 0A .. 10A, see <a href="#">Figure 7</a>
Ripple and noise voltage	max	100 mVpp	20 hz to 20 MHz, 50 Ohm
Output current	nom	10 A	at 24V, below +55 °C (131 °F) ambient temperature
		6.25 A	at 28V, below +55 °C (131 °F) ambient temperature
		8.6 A	at 24V, at +70 °C (158 °F) ambient temperature
		5.4 A	at 28V, at +70 °C (158 °F) ambient temperature
Output power	nom	240 W	ambient temperature < 55 °C (131 °F)
		150 W	ambient temperature < 70 °C (158 °F)
Overload behavior		continuous current	output voltage > 13V DC, see <a href="#">Figure 7</a>
		Hiccup <sup>PLUS</sup> mode	output voltage < 13V DC, see <a href="#">Figure 7</a>
Short circuit current	min	11 A <sup>(2)</sup>	load impedance 50mOhm, see <a href="#">Figure 7</a>
	max	15 A	load impedance 50mOhm, see <a href="#">Figure 7</a>
	typ	4.8 A <sup>(3)</sup>	average (R.M.S.) current, load impedance 50 mOhm, see <a href="#">Figure 7</a>
Output capacitance	typ	2 850 µF	included inside the power supply

(1) This is the maximum output voltage that can occur at the clockwise end position of the potentiometer due to tolerances. It is not a guaranteed value that can be achieved. The typical value is about 28.5V.

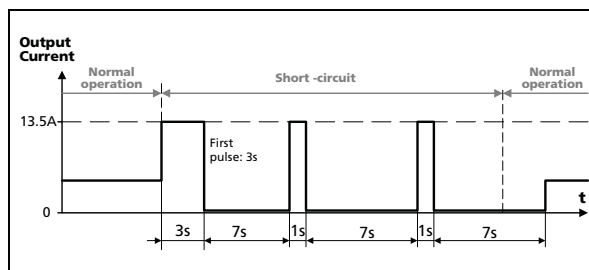
(2) Discharge current of output capacitors is not included.

(3) Discharge current of output capacitors is not included.

**Figure 7 - Output Voltage vs. Output Current, typ**



**Figure 8 - Short circuit (50 mOhm) on output, Hiccup**



## Hold-Up Time

Type		AC 100V	AC 120V	AC 230V	Notes
24V, 5 A	typ	65 ms	65 ms	65 ms	See <a href="#">Figure 9</a>
	min	53 ms	53 ms	53 ms	
24V, 10 A	typ	32 ms	32 ms	32 ms	
	min	26 ms	26 ms	26 ms	

Figure 9 - Hold-up Time vs. Input Voltage

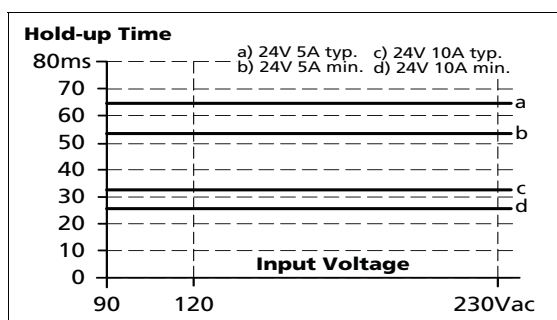
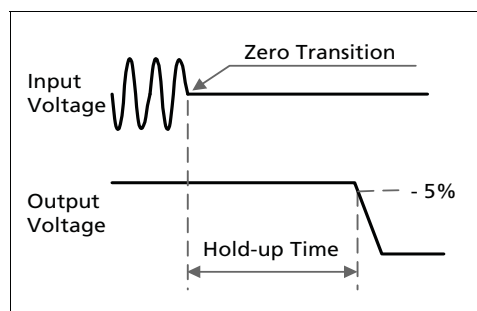


Figure 10 - Shut-down Behavior, Definitions

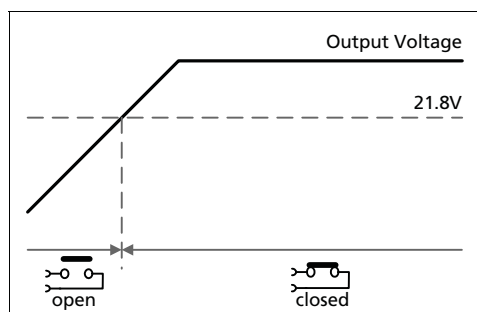


## DC OK Relay Contact

This feature monitors the output voltage, which is produced by the power supply itself. It is independent of a back-fed voltage from a unit that is connected in parallel to the power supply output such as a redundant application.

Attribute	1606-XLB240E		
Contact closes	As soon as the output voltage reaches 21.8V		
Contact opens	As soon as the output voltage dips below 21.7V		
Contact ratings	max	60V DC, 0.3 A; 30V AC, 1 A; 30V AC, 0.5 A	resistive load
	min	1 mA at 5V DC	min required load
Isolation voltage	See <a href="#">Dielectric Strength on page 21</a>		

Figure 11 - DC-OK Relay Contact Behavior



## Efficiency and Power Loss

Attribute		AC 100V	AC 120V	AC 230V	Notes
Efficiency	typ	93.2%	94.0 %	95.2 %	at 24V, 10 A
Average efficiency <sup>(1)</sup>	typ	92.7%	93.1 %	93.9 %	25% at 2.5 A 25% at 5 A 25% at 7.5 A 25% at 10 A
Power losses	typ	4.0 W	4.0 W	3.4 W	at 24V, 0A
	typ	9.0 W	8.5 W	7.5 W	at 24V, 5 A
	typ	17.5 W	15.3 W	12.1 W	at 24V, 10 A

(1) The average efficiency is an assumption for a typical application where the power supply is loaded with 25% of the nominal load for 25% of the time, 50% of the nominal load for another 25% of the time, 75% of the nominal load for another 25% of the time and with 100% of the nominal load for the rest of the time.

Figure 12 - Efficiency vs. Output Current, typ

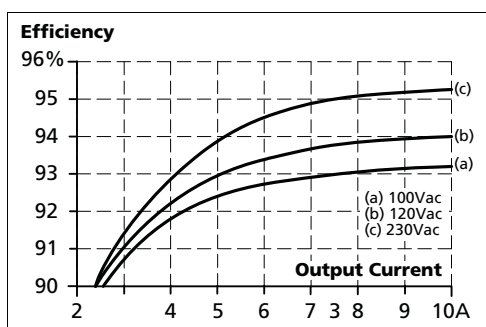


Figure 14 - Power Losses vs. Output Current at 24V, typ

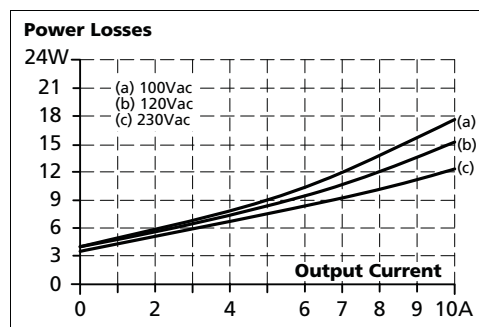


Figure 13 - Efficiency vs. Input Voltage at 24V, 10 A, typ

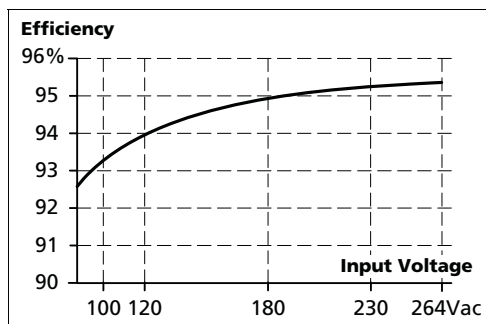
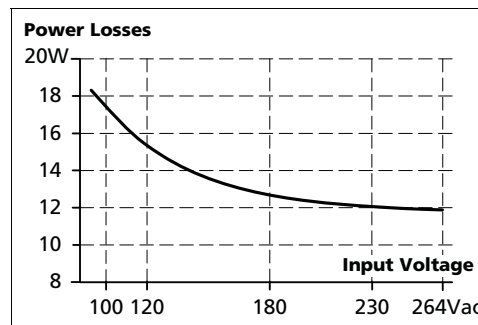


Figure 15 - Power Losses vs. Input Voltage at 24V, 10 A



## Lifetime Expectancy and Mean Time Between Failure (MTBF)

Attribute		AC 100V	AC 120V	AC 230V	Notes
Lifetime expectancy <sup>(1)</sup>		89 000 h	93 000 h	103 000 h	at 24V, 5 A and 40 °C (158 °F)
		252 000 h	262 000 h	291 000 h	at 24V, 5 A and 25 °C (77 °F)
		47 000 h	55 000 h	74 000 h	at 24V, 10 A and 40 °C (158 °F)
		133 000 h	156 000 h	209 000 h	at 24V, 10 A and 25 °C (77 °F)
MTBF (2)	SN 29500, IEC 61709	pending			at 24V, 10 A and 40 °C (104 °F)
					at 24V, 10 A and 25 °C (77 °F)
	MIL HDBK 217 F				at 24V, 10 A and 40 °C (104 °F) ; Ground Benign GB40
					at 24V, 10 A and 25 °C (77 °F) ; Ground Benign GB25
					at 24V, 10 A and 40 °C (104 °F) ; Ground Fixed GF40
					at 24V, 10 A and 25 °C (77 °F) ; Ground Fixed GF25

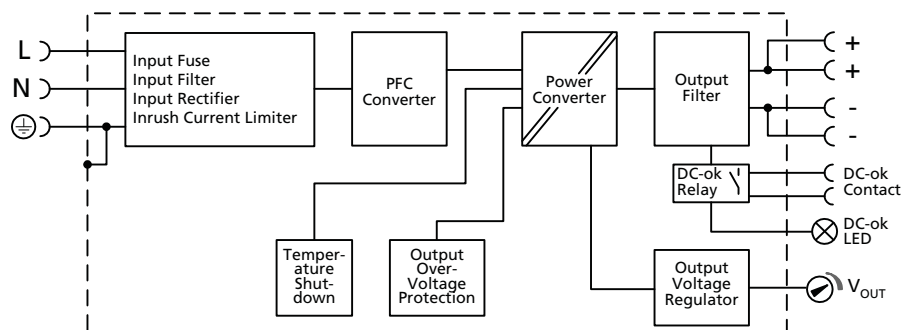
(1) The Lifetime expectancy that is shown in the table indicates the minimum operating hours (service life) and is determined by the lifetime expectancy of the built-in electrolytic capacitors. Lifetime expectancy is specified in operational hours and is calculated according to the capacitor's manufacturer specification. The manufacturer of the electrolytic capacitors only guarantees a maximum life of up to 15 years (131 400 h). Any number exceeding this value is a calculated theoretical lifetime that can be used to compare devices.

(2) MTBF stands for Mean Time Between Failure, which is calculated according to statistical device failures, and indicates reliability of a device. It is the statistical representation of the likelihood of a unit to fail and does not necessarily represent the life of a product.

The MTBF figure is a statistical representation of the likelihood of a device to fail. A MTBF figure of for example, 1 000 000 h means that statistically one unit fails every 100 hours if 10 000 units are installed in the field. However, it cannot be determined if the failed unit has been running for 50 000 h or only for 100 h.

## Functional Diagram

Figure 16 - Functional Diagram



## EMC

EMC Immunity	According to Generic Standards EN 61000-6-1 and EN 61000-6-2			Criterion <sup>(1)</sup>
Electrostatic discharge	EN 61000-4-2	contact discharge air discharge	8kV 8kV	Criterion A Criterion A
Electromagnetic RF field	EN 61000-4-3	80MHz-2.7GHz	20V/m	Criterion A
Fast transients (Burst)	EN 61000-4-4	input lines output lines DC-OK signal (coupling clamp)	4 kV 2 kV 2 kV	Criterion A Criterion A Criterion A
Surge voltage on input	EN 61000-4-5	L ->N L ->PE, N ->PE	2 kV 4 kV	Criterion A Criterion A
Surge voltage on output	EN 61000-4-5	+ ->- +/- ->PE	500V 1 kV	Criterion A Criterion A
Surge voltage on DC-OK	EN 61000-4-5	DC-OK signal... PE	1 kV	Criterion A
Conducted disturbance	EN 61000-4-6	0.15...80 MHz	10V	Criterion A
Mains voltage dips	EN 61000-4-11	0% of 120V AC 40% of 120V AC 40% of 120V AC 70% of 120V AC 0% of 200V AC 40% of 200V AC 70% of 200V AC	0V AC, 20 ms 48V AC, 200 ms 48V AC, 500 ms 84V AC, 20 ms 0V AC, 20 ms 80V AC, 200 ms 140V AC, 500 ms	Criterion A Criterion C >7 A Criterion A <7 A Criterion A Criterion A Criterion C Criterion A
Voltage interruptions	EN 61000-4-11	0% of 220V AC (=0V)	5000 ms	Criterion C
Voltage sags	SEMI F47 0706	dips on the input voltage according to SEMI F47 standard		
		80% of 120V AC (96V AC) 70% of 120V AC (84V AC) 50% of 120V AC (60V AC) 50% of 120V AC (60V AC)	1000ms 500ms 200ms 200ms	Criterion A Criterion A Criterion C >8 A Criterion A <8 A
Powerful transients	VDE 0160	over entire load range	750V, 0.3ms	Criterion A

(1) Criterion A: Power supply shows normal operation behavior withing the defined limits.

Criterion C: Temporary loss of function is possible. Power supply can shut down and restart by itself. No damage or hazard for the power supply occurs.

EMC Emission	According to Generic Standards: EN 61000-6-3, EN 610000-6-4	
Conducted emission input lines	EN 55011, EN 55022 FCC Part 15 CISPR 11, CISPR 22	Class B
Conducted emission output lines <sup>(1)</sup>	IEC/CISPR 16-1-2, IEC/CISPR 16-2-1	limits for DC power port according EN 61000-6-3 not fulfilled
Radiated emission	EN 55011, EN 55022	Class B
Harmonic input current	EN 61000-3-2	Fulfilled for class A equipment
Voltage fluctuations, flicker	EN 61000-3-3	Fulfilled <sup>(2)</sup>

This device complies with FCC Part 15 rules. Operation is subjected to following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

(1) For information only, not mandatory for EN 61000-6-3.

(2) Tested with constant current loads, non-pulsing.

## Application Notes

### Peak Current Capability

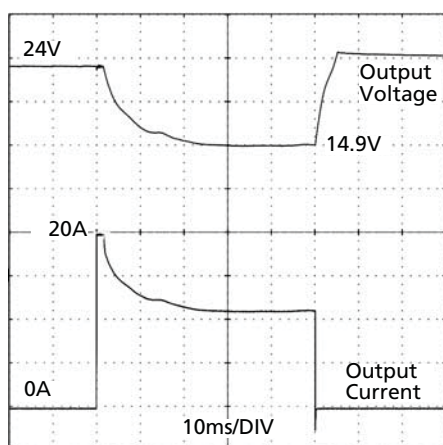
The unit can deliver peak currents (up to several milliseconds) which are higher than the specified short-term currents.

This helps to start current demanding loads. Solenoids, contactors, and pneumatic modules often have a steady state coil and a pick-up coil. The inrush current demand of the pick-up coil is several times higher than the steady-state current and usually exceeds the nominal output current. The same situation applies when starting a capacitive load.

The peak current capability also delivers the safe operation of subsequent circuit breakers of load circuits. The load branches are often individually protected with circuit breakers or fuses. If there is a short or an overload in one branch circuit, the fuse or circuit breaker need a certain amount of overcurrent to open in a timely manner. This avoids voltage loss in adjacent circuits.

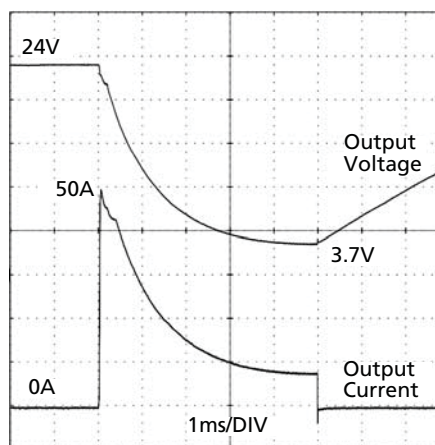
The extra current (peak current) is supplied by the power converter and the built-in large sized output capacitors of the power supply. The capacitors get discharged during such an event, which causes a voltage dip on the output. The following two examples show typical voltage dips:

**Figure 17 - Peak Load with 2x the Nominal Current for 50 ms, typ**



20A Peak load (resistive) for 50ms  
Output voltage dips from 24V to 14.9V.

**Figure 18 - Peak Load with 5x the Nominal Current for 5 ms, typ**



50A Peak load (resistive) for 5ms  
Output voltage dips from 24V to 3.7V.

Peak Current Capability		Voltage Dip	Peak Load
Peak current voltage dips	typ	24...14.9V	at 20 A for 50 ms, resistive load
	typ	24...7.1V	at 50 A for 2 ms, resistive load
	typ	24...3.7V	at 50 A for 5 ms, resistive load

## Back Feeding Loads

Loads such as decelerating motors and inductors can feed voltage back to the power supply. This feature is also called return voltage immunity or resistance against Back- E.M.F. (Electro Magnetic Force).

This power supply is resistant and does not show malfunctioning when a load feeds back voltage to the power supply. It does not matter whether the power supply is on or off.

The maximum allowed feed-back-voltage is 35V DC. The absorbing energy can be calculated according to the built-in large sized output capacitor that is specified in [Output on page 10](#).

## External Input Protection

The unit is tested and approved for branch circuits up to 30 A (UL) and 32 A (IEC). An external protection is only required if the supplying branch has an ampacity greater than this. Check also local codes and local requirements. In some countries local regulations can apply.

If an external fuse is necessary or utilized, minimum requirements need to be considered to avoid nuisance tripping of the circuit breaker. A minimum value of 10A B-characteristic or 6A C-characteristic breaker should be used.

## Parallel Use to Increase Output Power

Do not use the power supply in parallel to increase the output power.

## Parallel Use for Redundancy

Power supplies can be paralleled for redundancy to gain higher system availability. Redundant systems require a certain amount of extra power to support the load in case one power supply unit fails. The simplest way is to put two power supplies in parallel. This is called a 1+1 redundancy. In case one power supply unit fails, the other one is automatically able to support the load current without any interruption.

Please note: This simple way to build a redundant system does not cover failures such as an internal short circuit in the secondary side of the power supply. In such a case, the defect unit becomes a load for the other power supplies and the output voltage can not be maintained any more. This can only be avoided by utilizing decoupling diodes that are included in the redundancy module.



Recommendations for building redundant power systems:

- Use the DC-OK signal contact to monitor the individual power supply units.
- Use separate input fuses for each power supply.
- Use separate mains systems for each power supply whenever it is possible.
- It is desirable to set the output voltages of all units to the same value ( $\pm 100$  mV) or leave it at the factory setting.

## Series Operation

Power supplies of the same type can be connected in series for higher output voltages. It is possible to connect as many units in series as needed, providing the sum of the output voltage does not exceed 150V DC. Voltages with a potential above 60V DC are not SELV any more and can be dangerous. Such voltages must be installed with a protection against touching.

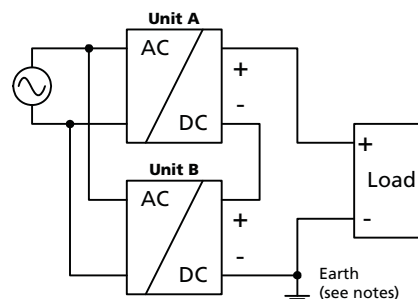
Earthing of the output is required when the sum of the output voltage is above 60V DC.

Avoid return voltage (for example, from a decelerating motor or battery) which is applied to the output terminals.

Keep an installation clearance of 15 mm (0.59 in.) (left/right) between two power supplies and avoid installing the power supplies on top of each other.

Pay attention that leakage current, EMI, inrush current, harmonics increase when using multiple power supplies.

**Figure 19 - Series Operation**



## Inductive and Capacitive Loads

The unit is designed to supply any kind of loads, including capacitive and inductive loads. If extreme large capacitors, such as EDLCs (electric double layer capacitors or “UltraCaps”) with a capacitance larger than 2.0 F are connected to the output, the unit might charge the capacitor in the HiccupPLUS mode, see [Output on page 10](#).

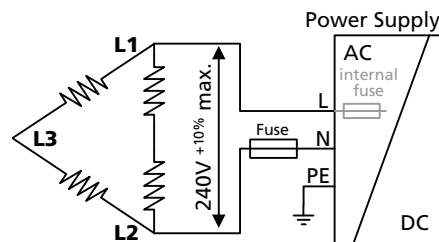
## Charging of Batteries

Do not use the power supply to charge batteries.

## Operation on Two Phases

The power supply can also be used on two-phases of a three-phase-system. Such a phase-to-phase connection is allowed as long as the supplying voltage is below  $240V^{+10\%}$ .

**Figure 20 - Operation on Two Phases**



## Use in a Tightly Sealed Enclosure

When the power supply is installed in a tightly sealed enclosure, the temperature inside the enclosure is higher than outside. In such situations, the inside temperature defines the ambient temperature for the power supply.

The following measurement results can be used as a reference to estimate the temperature rise inside the enclosure.

The power supply is placed in the middle of the box; no other heat producing items are inside the box.

- Enclosure
  - Rittal Type IP66 Box PK 9516 100
  - Plastic
  - 110 x 180 x 165 mm (4.33 x 7.09 x 6.50 in.)
- Input
  - 230V AC

Attribute	Case A	Case B
Load <sup>(1)</sup>	24V, 10 A	24V, 8 A (=80%)
Temperature inside the box <sup>(2)</sup>	48.6 °C (119.4 °F)	43.7 °C (110.1 °F)
Temperature outside the box	24.9 °C (76.8 °F)	24.9 °C (76.8 °F)
Temperature rise	23.7 K	18.8 K

(1) Load is placed outside the box.

(2) In the middle of the right side of the power supply with a distance of 1 cm (0.39 in.)

## Specifications

Attribute	1606-XLB240E	Notes
Output Voltage	24V DC	
Adjustment range	24...28V DC	
Output Current	10 A	at 24V, amb <55°C (131°F)
	6.25 A	at 24V, amb <70°C (158 °F)
	8.6 A	at 28V, amb <55°C (131°F)
	5.4 A	at 28V, amb <70°C (158 °F)
Output power	240 W	ambient <55°C (131°F)
	150 W	ambient <70°C (158 °F)
Output ripple	< 100 mVpp	20 Hz...20 MHz
AC Input voltage	100...240V AC	±10%
Mains frequency	50...60Hz	±6%
AC Input current	2.17 A/1.18 A	at 120/230V AC
Power factor	0.98/0.93	at 120/230V AC
AC Inrush current	14A/26A peak	at 120/230V AC, 40°C (104 °F)
Efficiency	94.0%/95.2%	at 120/230V AC
Losses	15.3W/12.1W	at 120/230V AC
Temperature range	-25...+70 °C (-13...+158 °F)	operational
Derating	6W/°C	55...70 °C (131...158 °F)
Hold-up time	typ 32 ms/ 32 ms	at 120/230V AC
Dimensions	49 x 124 x 124 mm (	W x H x D
Weight	540 g/1.2 lb	

## Environment

Attribute	1606-XLB240E	Notes
Operational temperature <sup>(1)</sup>	-25... +70 °C (14...158 °F)	reduce output power, see <a href="#">Figure 21</a> .
Storage temperature	-40... +85°C (-40...185 °F)	for storage and transportation
Output derating	6W/°C	50°...70 °C (131...158 °F)
Humidity <sup>(2)</sup>	5...95% r.h.	IEC 60068-2-30
Vibration sinusoidal <sup>(3)</sup>	2...17.8 Hz: ±1.6 mm (0.06 in.); 17.8...500Hz: 2 g 2 hours/axis	IEC 60068-2-6
Shock <sup>(4)</sup>	30 g 6ms, 20 g 111ms 3 bumps/direction, 18 bumps in total	IEC 60068-2-27
Altitude	0...2000 m (0...6 560 ft)	without any restrictions
	2000...6000 m (6 560... 20,000 ft)	reduce output power or ambient temperature, see <a href="#">Figure 22</a> . IEC 62103, EN 50178, overvoltage category II
Altitude derating	15 W/1000 m or 5 °C/1000 m	> 2000 m (6500 ft), see <a href="#">Figure 22</a> .
Overvoltage category	III	IEC 62103, EN 50178, altitudes up to 2000 m
	II	altitudes from 2000 m to 6000 m
Degree of pollution	2	IEC 62103, EN 50178, not conductive
LABS compatibility	The unit does not release any silicone or other LABS-critical substances and is suitable for use in paint shops.	

(1) Operational temperature is the same as the ambient or surrounding temperature and is defined as the air temperature 2 cm (0.79 in.) below the unit.

(2) Do not energize while condensation is present.

(3) Tested on a DIN Rail with a thickness of 1.3 mm (0.05 in.)

(4) Tested on a DIN Rail with a thickness of 1.3 mm (0.05 in.)

Figure 21 - Output Current vs. Ambient Temperature

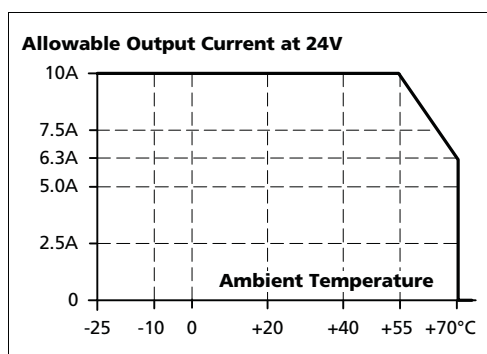
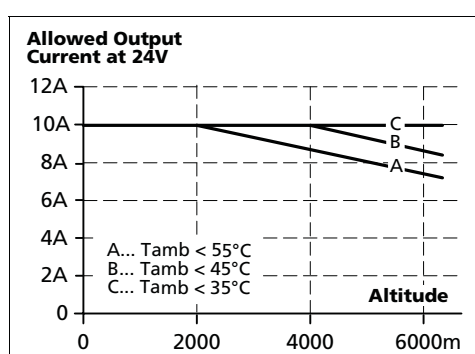


Figure 22 - Output Current vs. Altitude

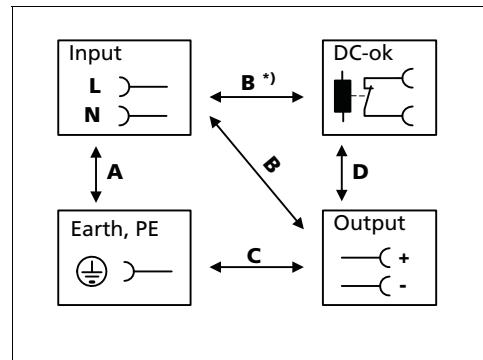


## Dielectric Strength

The output voltage is floating and has no ohmic connection to the ground. Type and factory tests are conducted by the manufacturer. Field tests can be conducted in the field using the appropriate test equipment, which applies the voltage with a slow ramp (2 s up and 2 s down). Connect all input-terminals together and all output poles before conducting the test. When testing, set the cutoff current settings to the value in the following table.






		A	B	C	D
Type test	60 s	2500V AC	3000V AC	1000V AC	500V AC
Factory test	5 s	2500V AC	2500V AC	500V AC	500V AC
Field test	5 s	2000V AC	2000V AC	500V AC	500V AC
Cutoff current setting		> 15 mA	> 15 mA	> 20 mA	> 1 mA

**Figure 23 - Dielectric Strength**



To meet the PELV requirements according to EN60204-1 § 6.4.1, we recommend that either the + pole, the – pole or any other part of the output circuit shall be connected to the protective earth system. This helps to avoid situations in which a load starts unexpectedly or cannot be switched off when unnoticed earth faults occur.

## Standards Compliance and Certifications

EC Declaration of Conformity		The CE Marking indicates conformance with the low voltage and EMC Directive. EN 60950-1, EN 61000-6
UL 508		Listed for use as Industrial Control Equipment ;U.S.A. (UL 508) and Canada (C22.2 No. 14-15); File: E56639
UL 60950-1		Recognized for use as Information Technology Equipment, U.S.A. (UL 60950-1) and Canada (C22.2 No. 60950); File: E 168663.
RCM Declaration of Conformity		C-tick is for products intended for sale and use within the Australian market.
EAC		EAC is for products intended for sale and use within the Russian market.

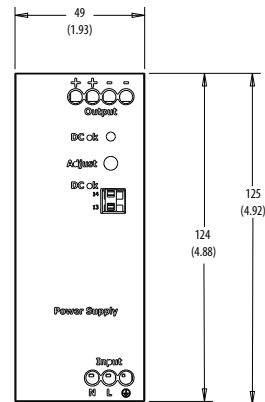
## Approximate Dimensions and Weight

Attribute	Value
Width	49 mm (1.93 in.)
Height	124 mm (4.88 in.)
Depth <sup>(1)</sup>	124 mm (4.88 in.)
Weight	540 g (1.21 lb)
DIN rail	Use 35 mm DIN rails according to EN 60715 or EN 50022 with a height of 7.5 or 15 mm (0.30 or 0.59 in.).
Plastic Material of Housing	Flame retardant Polycarbonate (PC) - UL94-V0 Vicat softening temperature specified with 149 °C (300 °F) according to ASTM D1525
Installation Clearances	Keep the following installation clearances: 40 mm (1.57 in.) on top, 20 mm (0.79 in.) on the bottom, 5 mm (0.20 in.) on the left and right sides are recommended when the device is loaded permanently with more than 50% of the rated power. Increase this clearance to 15 mm (0.59 in.) in case the adjacent device is a heat source (for example, another power supply).

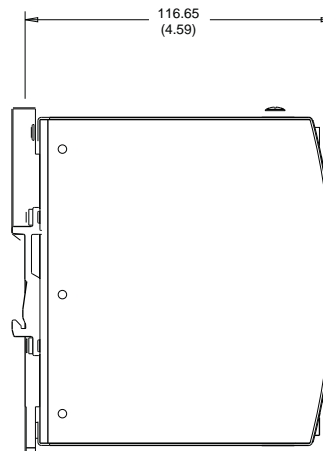
(1) The DIN rail height must be added to the unit depth to calculate the total required installation depth.

Dimensions are in mm (in.).

**Figure 24 - Front View**



**Figure 25 - Side View**



## Notes:





## Rockwell Automation Support

Use the following resources to access support information.

<b>Technical Support Center</b>	Knowledgebase Articles, How-to Videos, FAQs, Chat, User Forums, and Product Notification Updates.	<a href="https://rockwellautomation.custhelp.com/">https://rockwellautomation.custhelp.com/</a>
<b>Local Technical Support Phone Numbers</b>	Locate the phone number for your country.	<a href="http://www.rockwellautomation.com/global/support/get-support-now.page">http://www.rockwellautomation.com/global/support/get-support-now.page</a>
<b>Direct Dial Codes</b>	Find the Direct Dial Code for your product. Use the code to route your call directly to a technical support engineer.	<a href="http://www.rockwellautomation.com/global/support/direct-dial.page">http://www.rockwellautomation.com/global/support/direct-dial.page</a>
<b>Literature Library</b>	Installation Instructions, Manuals, Brochures, and Technical Data.	<a href="http://www.rockwellautomation.com/global/literature-library/overview.page">http://www.rockwellautomation.com/global/literature-library/overview.page</a>
<b>Product Compatibility and Download Center (PCDC)</b>	Get help determining how products interact, check features and capabilities, and find associated firmware.	<a href="http://www.rockwellautomation.com/global/support/pcdc.page">http://www.rockwellautomation.com/global/support/pcdc.page</a>

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