



# Switched Mode Power Supplies

The Broadest Line of Power Supplies for DIN Rails

Bulletin 1606



**Rockwell**  
**Automation**

Rockwell Automation has extended its breadth of quality products by introducing the Allen-Bradley General Purpose DIN-rail-mount switched mode power supplies. This comprehensive line of power supplies accepts wide ranges of both AC and DC input voltages and has global approvals to meet worldwide single-phase and 3-phase application requirements.

### Reliable Design

Allen-Bradley offers both the Standard and the Compact size units. All power supply units are extremely durable, reliable and fail-safe. Prior to shipment all devices must pass a critical burn-in test to eliminate the possibility of a unit failing during commissioning. The intelligent circuit design results in minimal ripple and noise and protects against short and open circuits. The design features the smallest per watt profile in the world.

### Leading Edge Technology

The industry-leading service life is obtained through a design that incorporates long-life electrolytic capacitors in combination with a very low thermal-loss circuit concept. With this leading edge

technology, efficiency levels exceeding 90% are achieved. All devices provide superior Electro-Magnetic Compatibility (EMC) performance and most meet the EN61000-3-2 harmonics standard for Power Factor Correction (PFC).

### Reserve Power and Load Response

No need to oversize your system. The standard units are designed with a power boost that provides additional power reserves up to 15% without any reduction in output voltage. The overload design delivers up to 80% higher continuous current at a reduced voltage with no negative thermal effects. These robust power supplies prevent the designer from oversizing the system.

### Parallel Connection Compatible

Virtually all units are specially designed for effective operation when wired in parallel. Their start-up and overload response is designed in such a way as to provide a smooth load distribution as required. This means an increase in performance and reliability without suffering possible damage as a result of an overload.



#### Installation Without Tools

The patented mounting bracket with plastic locking cylinder provides a DIN-rail mount that is not susceptible to vibration.



3-Phase 1606-XL240E-3

#### Overload Response Flexibility

FUSE mode switches off permanently and reliably in the event of an overload. CONTINUOUS mode delivers up to 80% more current at a reduced output voltage to start even the heaviest loads.

#### Single or Parallel Operation

Capable of current sharing when used in parallel with multiple units.

#### Reliability

Units continue to operate even if one phase drops out.

**Redundancy Modules  
and Space-Saving Compact Unit**

See Inside Back Cover

Bulletin 1606-(number from table) e Power Supply Quick Guide

	50...40 W	60 W	60 W	72 W	100 W
5...6.6V	XLP25A	—	—	—	—
10...12V	XLP30B	—	—	—	—
12...15V	—	XLP30B	—	—	—
(+/-)12 and 15V	XLP36C	—	—	—	—
24...28V 1-Ph	XLP30E	XLP30E	XL60D	XLP72E	XLP100E
24...28V 3-Ph	—	—	—	—	—
36...48V	—	—	—	—	—
48...60V	—	XLP30F	—	—	XLP100F
24V Redundant	—	—	XL60DR	—	—
	—	—	—	—	XLDNET4

## Bulletin 1606 Quick Guide

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## Bulletin 1606 Product Selection Table

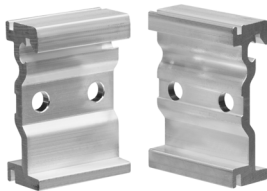
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1606-XLP Compact Single Phase Specifications

	1606-XLP25A	1606-XLP30B
<b>Watts</b>	5...5.5/625 W	10...12/930 W
<b>Input Voltage <math>\phi</math></b>	AC 100...240V wide range DC 85...370V	AC 100...240V DC 85
<b>Operational Range</b>		
<b>Hold-up Time</b>	>170 ms (AC 230V) >19 ms (AC 100V)	>170 ms (AC 230V) >19 ms (AC 100V)
<b>Rated Input Current</b>	<0.5 A (AC 100V) <0.35 A (AC 196V)	<0.6 A (AC 100V) <0.25 A (AC 240V)
<b>Efficiency</b>	>80% (AC 230V)	typ. 84% (AC 230V)

## Bulletin 1606 Specifications

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## Bulletin 1606 Accessories

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# Power Supplies Selection Guide

## Product Overview/Quick Guide/Cat. No. Explanation



### Bulletin 1606 — Power Supplies ① ②

**Physical**

- Quick mounting and connecting, innovative DIN-Rail mount, smallest in class

**Electrical**

- Low inrush current
- PFC choke
- Wide range input; auto select input
- Superior overload design (continuous current, no hiccup)
- NEC Class 2 'Limited Power' option
- Selectable operating mode (single/parallel)
- Superior efficiency and temperature rating

**Special Modules**

- Brownout buffer, DC to DC converter, N+1 redundancy

**Approvals**

- World-wide approvals ③
- NEC Class 2
- FM Class 1 Div. 2 (T3A)

① Not all features apply to all power supplies; see individual supply descriptions for specifics

② A more detailed list of performance specifications can be found at [www.ab.com/industrialcontrols/products/power\\_supplies/index.html](http://www.ab.com/industrialcontrols/products/power_supplies/index.html)

③ Dual UL rating with cUR<sub>us</sub> 60950 relating to approved use in information technology

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### Standards Compliance



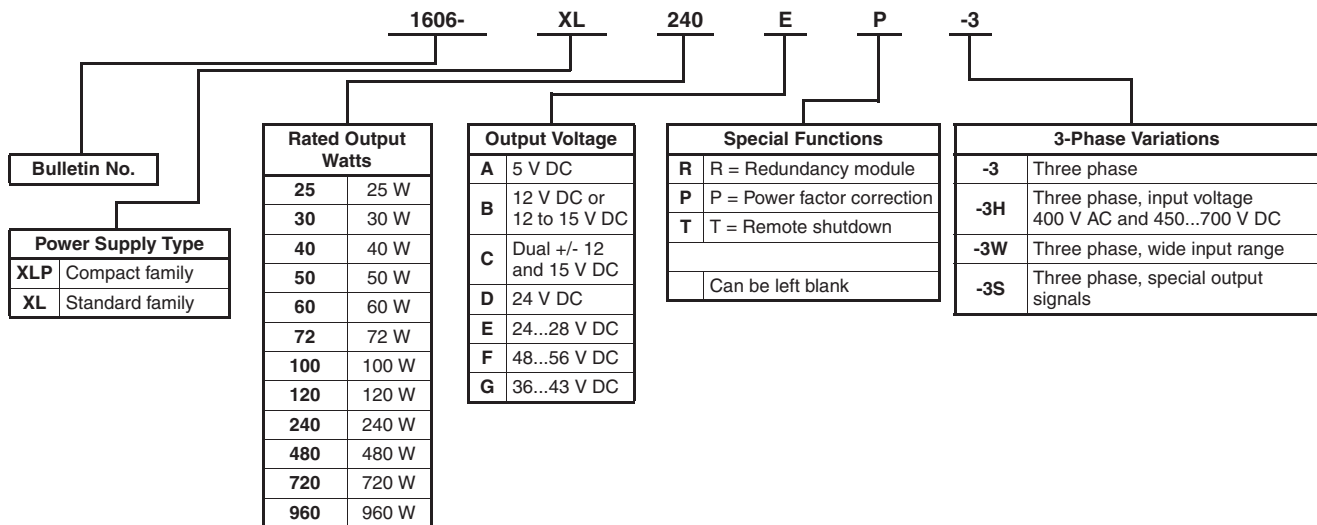
### Bulletin 1606-(number from table) ④ Power Supply Quick Guide

	30...40 W	50 W	60 W	72 W	100 W	120 W	240 W	480 W	720 W	960 W
5...5.5V	XLP25A	—	—	—	—	—	—	—	—	—
10...12V	XLP30B	—	—	—	—	—	—	—	—	—
12...15V	—	XLP50B	—	—	—	—	—	—	—	—
(+/-)12 and 15V	XLP36C	—	—	—	—	—	—	—	—	—
24...28V 1-Ph	XLP30E	XLP50E	XL60D	XLP72E	XLP100E	XL120D	XL240E XL240EP	XL480E XL480EP XL480EPT	—	—
24...28V 3-Ph	—	—	—	—	—	XL120E-3	XL240E-3	XL480E-3 XL480E-3W XL480F-3H	XL720E-3	XL960E-3 XL960E-3S
36...43V	—	—	—	—	—	—	—	XL480GP	—	—
48...56V	—	XLP50F	—	—	XLP100F	—	XL240FP	XL480F	—	—
24V Redundant	—	—	XL60DR	—	—	XL120DR	XL240DR	XLRED20-30		XLRED40
	—	—	—	—	XLDNET4	—	XLDNET8	—	—	—

④ Example: For a 24...28 Volt, 3-Phase, 120 Watt power supply, the cat. no. would be 1606-XL120E-3.

### Power Supply Cat. No. Explanation

**Important:** The following cat. no. breakdown is for explanation purposes only. It is not a product configurator. Not all combinations of fields are valid product cat. nos. First, select the desired power supply using the product selection table on page 5. Then, use this breakdown for verification and explanation only.



**Bulletin 1606 Product Selection Table**

	Output Power	Output Voltage	Special Feature(s)	Stocked Item	Parallel Operation (Inclined Characteristic)	Meets EN 61000-3-2 (PFC Harmonics)	Catalog Number
<b>1606-XLP Compact</b>							
<b>Single Phase</b>	25 W	DC 5...5.5V	NEC Class 2	X	—	N/A	1606-XLP25A
	30 W	DC 10...12V	NEC Class 2	X	—	N/A	1606-XLP30B
		DC 24...28V	NEC Class 2	X	—	N/A	1606-XLP30E
	36 W	DC +/- 12/15V	Output voltage adjustable	X	—	N/A	1606-XLP36C
		DC 12...15V	NEC Class 2	X	—	N/A	1606-XLP50B
	50 W	DC 24...28V	NEC Class 2	X	—	N/A	1606-XLP50E
		DC 48...56V	NEC Class 2	X	—	N/A	1606-XLP50F
	72 W	DC 24...28V	NEC Class 2	X	—	N/A	1606-XLP72E
100 W	DC 24...28V	NEC Class 2	X	X ②	Yes	1606-XLP100E	
	DC 48...56V		X	X ②	Yes	1606-XLP100F	
<b>1606-XL Standard Single Phase</b>							
<b>Single Phase</b>	60 W	DC 24V	NEC Class 2	X	—	N/A	1606-XL60D
	120 W		—	X	—	Yes	1606-XL120D
	240 W	DC 24...28V	FM Class 1 Div. 2 T3A	X	—	No	1606-XL240E
			—	X	—	Yes	1606-XL240EP
	480 W	DC 48...56V	—	X	—	Yes	1606-XL240FP
			Low inrush current	X	X ②	No	1606-XL480E
			—	X	X ②	Yes	1606-XL480EP
			Remote shut down	X	X ②	Yes	1606-XL480EPT
DC 36...43V	—	X	X ②	Yes	1606-XL480GP		
	DC 48...56V	—	X	X ②	No	1606-XL480F	
<b>1606-XL Standard Three Phase</b>							
<b>Three Phase</b>	120 W	DC 24...28V	—	X	—	Yes	1606-XL120E-3
	240 W		Overload behavior selectable (FUSE Mode/continuous current), 2-phase operation admissible	X	X ②	Yes	1606-XL240E-3
			—	X	X ②	Yes	1606-XL480E-3
	480 W	Wide input range; overload behavior selectable (FUSE Mode/continuous current)	X	X ②	Yes	1606-XL480E-3W	
		DC 48...56V	Input voltage 400 V AC	X	X ②	Yes	1606-XL480F-3H
	720 W	DC 24...28V	—	X	X ②	Yes	1606-XL720E-3
	960 W		Passive load sharing	X	X ②	Yes	1606-XL960E-3
Low inrush current; output signals		X	Active current sharing	Yes	1606-XL960E-3S		
<b>1606-XL Special Modules</b>							
<b>Special Modules</b>	480 W	DC 23...27.8V	Brownout buffer module	X	—	N/A	1606-XLBUFFER
	40 W	DC 5.1V	DC/DC converter	X	—	No	1606-XLDC40A
	120 W	DC 24V	Electronically limited 4 A	X	—	Yes	1606-XLDNET4
	240 W	DC 24V	Electronically limited 8 A	X	—	No	1606-XLDNET8
	60 W	DC 24...28V	N+1 Redundant capable ①, NEC Class 2	X	X ②	N/A	1606-XL60DR
	120 W		N+1 Redundant capable ①	X	X ②	Yes	1606-XL120DR
	240 W		N+1 Redundant capable ①	X	X ②	No	1606-XL240DR
	720 W	V <sub>in</sub> -5V typ.	Dual N+1 redundancy ②	X	—	N/A	1606-XLRED20-30
	960 W	V <sub>in</sub> -6V typ.	Single N+1 redundancy ③	X	—	N/A	1606-XLRED40

**Accessories**






<b>1606 Accessory</b>							
Accessory	—	—		X	—	—	
			Back of panel bracket for XL	X	—	—	1606-XLA






- ① Used with a pair of identical power supplies to offer N+1 redundancy
- ② To be used alongside 20 and 30 A power supplies (or smaller)
- ③ Single/parallel operation (inclined characteristic) selectable (jumper); low inrush current
- ④ To be used alongside 40 A power supplies (or smaller)

# Power Supplies Selection Guide

## Compact Single Phase Specifications

### 1606-XLP Compact Single Phase Specifications






					
<b>Watts</b>	5...5.5V/25 W	10...12V/30 W	24...28V/30 W	±12V/±15V 36 W	12...15V/50 W
<b>Input Voltage</b> Ⓜ	AC 100...240V wide range DC 85...370V	AC 100...240V wide range DC 85...375V		AC 100...240V wide range DC 85...375V	AC 100...240V wide range DC 85...375V
<b>Operational Range</b>	85...264 V AC				
<b>Hold-up Time</b>	>170 ms (AC 230V) >19 ms (AC 100V)	>170 ms (AC 230V) >18 ms (AC 100V)	>190 ms (AC 230V) >19 ms (AC 100V)	>180 ms (AC 230V) >18 ms (AC 100V)	>170 ms (AC 230V) >17 ms (AC 100V)
<b>Rated Input Current</b>	<0.5 A (AC 100V) <0.35 A (AC 196V)	<0.6 A (AC 100V) <0.25 A (AC 240V)	<0.6 A (AC 100V) <0.35 A (AC 196V)	<0.7 A (AC 100V) <0.4 A (AC 196V)	<1.0 A (AC 100V) <0.6 A (AC 196V)
<b>Efficiency</b>	>80% (AC 230V)	typ. 84% (AC 230V)	typ. 87.5% (AC 230V)	86% (AC 230V)	typ. 90% (AC 230V)
<b>Output Voltage</b>	5...5.5V 5.1V preset	10...12V 12V preset (with jumper), 10...12V adjustable (without jumper)	24...28V 24.5V preset	±12V (without jumper), ±15V (with jumper) ±15V preset	12...15V 15V preset (with jumper) 12...15V adjustable (without jumper)
<b>Rated Output Current</b>	5 A (at 5.1V), 4.5 A (at 5.5V)	3 A (at 10V), 2.5 A (at 12V)	1.3 A (at 24.5V), 1 A (at 28V)	0...2.8 A (+12V), 0...1.4 A (-12V), 0...2.4 A (+15V), 0...1.4 A (-15V)	4.2 A (at 12V), 3.4 A (at 15V)
<b>Ripple/Noise (20 MHz)</b>	<50 mV <sub>pp</sub>	<2 mV <sub>pp</sub> (200 kHz) <10 mV <sub>pp</sub> (20 MHz)	<50 mV <sub>pp</sub>	<50 mV <sub>pp</sub>	<100mV <sub>pp</sub>
<b>Operating Temperature Range (T<sub>amb</sub>)</b>	-10...+70°C >60°C: 0.5 W/K derating	-10...+70°C >60°C: 0.6 W/K derating	-10...+70°C >60°C: 0.5 W/K derating	-10...+70°C >60°C: 1 W/K derating	-10...+70°C >60°C: 1 W/K derating
<b>MTBF</b> Ⓜ	600 000 hours	appr. 650 000 hours		600 000 hours	appr. 600 000 hours
<b>Dimensions (W x H x D)</b>	45 x 75 x 91 mm				
<b>Weight</b>	240 g	250 g	230 g	240 g	260 g
<b>Approvals/Standards</b> Ⓜ	1, 2, 3, 5, 6				
<b>Special Features</b>	NEC Class 2 power supply			Output voltage adjustable: DC ±12V without jumper or DC ±15V with jumper; NEC Class 2 power supply	Output voltage adjustable: DC 12...15V without jumper or DC 15V with jumper; NEC Class 2 power supply






					
<b>Watts</b>	24...28V/50 W	48...56V/50 W	24...28V/72 W	24...28V/100 W	48...56V/100 W
<b>Input Voltage</b> Ⓜ	AC 100...240V wide range DC 85...375V		AC 100...120/220...240V manual select DC 220...375V	AC 100...120/220...240V auto select DC 220...375V	
<b>Operational Range</b>	85...264 V AC		85...132/184...264 V AC		
<b>Hold-up Time</b>	>171 ms (AC 230V) >17 ms (AC 100V)	>170 ms (AC 230V) >17 ms (AC 100V)	>40 ms (AC 230V) >25 ms (AC 100V)	>40 ms (AC 230V) >20 ms (AC 100V)	
<b>Rated Input Current</b>	<1.0 A (AC 100V) <0.6 A (AC 196V)		<1.6 A (AC 100V) <0.8 A (AC 220V)	<2.1 A (AC 100V) <1.0 A (AC 220V)	
<b>Efficiency</b>	typ. 88.5% (AC 230V)	typ. 90% (AC 230V)	typ. 89% (AC 230V)	typ. 90% (AC 230V)	
<b>Output Voltage</b>	24...28V 24.5V preset	48...56V 48V preset	24...28V 24.5V preset (at 2.9 A)	24...28V 24.5V preset	48...56V 48V preset
<b>Rated Output Current</b>	2.1 A (at 24.5V), 1.8 A (at 28V)	1.05 A (at 48V), 0.9 A (at 56V)	3 A (at 24V), 2.6 A (at 28V)	4.2 A (at 24.5V), 3.6 A (at 28V)	2.1 A (at 48V), 1.8 A (at 56V)
<b>Ripple/Noise (20 MHz)</b>	<50 mV <sub>pp</sub>	<200 mV <sub>pp</sub>	<50 mV <sub>pp</sub>	<50 mV <sub>pp</sub>	<50 mV <sub>pp</sub>
<b>Operating Temperature Range (T<sub>amb</sub>)</b>	-10...+70°C >60°C: 1 W/K derating		-10...+70°C >60°C: 1.5 W/K derating	-10...+70°C >60°C: 2 W/K derating	
<b>MTBF</b> Ⓜ	appr. 600 000 hours		appr. 600 000 hours	appr. 500 000 hours	
<b>Dimensions (W x H x D)</b>	45 x 75 x 91 mm		45 x 75 x 91 mm	73 x 75 x 103 mm	
<b>Weight</b>	240 g		260 g	360 g	
<b>Approvals/Standards</b> Ⓜ	1, 2, 3, 5, 6		1, 2, 3, 5, 6	1, 2, 3, 5, 6	
<b>Special Features</b>	NEC Class 2 power supply		NEC Class 2 power supply	Single/parallel operation (inclined characteristic) select on front panel; NEC Class 2 power supply	

Ⓜ 1) = CE, 2) = UL508 (cULus LISTED), 3) = UL1950 (cURus), 5) Safety standards = IEC/EN 60950, EN 50178, 6) EMC standards = EN 50081-1, EN 61000-6-2, EN 61000-3-2 (A14)

Ⓜ 47...63Hz Ⓜ MTBF determined by Siemens norm SN 29500 at full load current and 40°C

**1606-XL Single Phase Specifications**

					
<b>Watts</b>	24V/60 W	24...28V/120 W	24...28V/240 W	24...28V/240 W	48...56V/240 W
<b>Input Voltage</b> ②	AC 100...120/ 200...240V, Manual select, DC 160...375V	AC 100...120/ 200...240V, Manual select, DC 210...375V	AC 100...120/200...240V, Manual select, DC 240...375V		
<b>Operational Range</b>	85...132/176...264 V AC				
<b>Hold-up Time</b>	>20 ms (AC 196V)	>37 ms (AC 196V)	>25 ms (AC 196V)	>20 ms (AC 196V)	>25 ms (AC 196V)
<b>Rated Input Current</b>	<1.3 A/<0.7 A	<2.6 A/<1.4 A	<6 A/<2.8 A		
<b>Efficiency</b>	typ. 87.5%	typ. 90%	typ. 90%	typ. 89%	typ. >90%
<b>Output Voltage</b>	24V	24V	24...28V 24.5V preset	24...28V 24.5V preset	48...56V 48.5V preset
<b>Rated Output Current</b>	2.5 A	5 A	10 A (at 24V), 8.6 A (at 28V)	10 A (at 24V), 8.6 A (at 28V)	5 A (at 48V), 4.3 A (at 56V)
<b>Power Boost</b>		6 A	12 A	12 A	
<b>Ripple/Noise (20 MHz)</b>	<25 mV <sub>pp</sub>	<50 mV <sub>pp</sub>	<30 mV <sub>pp</sub>	<30 mV <sub>pp</sub>	<50 mV <sub>pp</sub>
<b>Operating Temperature range (T<sub>amb</sub>)</b>	-10...+70°C >60°C with derating		0...+70°C >60°C with derating		
<b>MTBF</b> ③	740 000 hours	520 000 hours	425 000 hours	225 000 hours	425 000 hours
<b>Dimensions (W x H x D)</b>	49 x 124 x 102 mm	64 x 124 x 102 mm	120 x 124 x 102 mm		
<b>Weight</b>	460 g	620 g	980 g	1195 g	980 g
<b>Approvals/Standards</b> ④	1, 2, 3, 5, 6, 7		1, 2, 3, 5, 6	1, 2, 3, 5, 6, 7	
<b>Special Features</b>			⑤	PFC choke, ⑥	





					
<b>Watts</b>	24...28V/480 W				
<b>Input Voltage</b> ②	AC 200...240V DC 270...370V	AC 100...120/200...240V Auto select			
<b>Operational Range</b>	184...264 V AC	85...132/184...264 V AC			
<b>Hold-up Time</b>	30 ms (AC 230V)			>27 ms (AC 230V)	30 ms (AC 230V)
<b>Rated Input Current</b>	5 A	10 A/5 A			
<b>Efficiency</b>	typ. 91%	typ. 90%	typ. 90.5%	typ. 92%	typ. 93%
<b>Output Voltage</b>	24...28V Front panel potentiometer			36...43V/480W front panel potentiometer	48...56V Front panel potentiometer
<b>Rated Output Current</b>	20 A (at 24V), 18 A (at 28V)			13.0 A (at 36V), 11.2 A (at 43V)	10 A (at 48V), 8.6 A (at 56V)
<b>Power Boost</b>	25 A (22 A)			16.6 A (14 A)	12.5 A (10.7 A)
<b>Ripple/Noise (20 MHz)</b>	<20 mV <sub>pp</sub> (single operation) <40 mV <sub>pp</sub> (parallel operation)			<30 mV <sub>pp</sub> (single operation) <80 mV <sub>pp</sub> (parallel operation)	<40 mV <sub>pp</sub> (single operation) <80 mV <sub>pp</sub> (parallel operation)
<b>Operating Temperature range (T<sub>amb</sub>)</b>	0...+70°C >60°C with derating				
<b>MTBF</b> ③	519 000 hours				
<b>Dimensions (W x H x D)</b>	220 x 124 x 102 mm				
<b>Weight</b>	1800 g	2500 g			1800 g
<b>Approvals/Standards</b> ④	1, 2, 3, 5, 6	1, 2, 3, 5, 6, 7			1, 2, 3, 5, 6
<b>Special Features</b>	Single/parallel operation (inclined characteristic) selectable (jumper), ⑤	PFC choke, Overload behavior selectable (hiccup/continuous current), ⑥	PFC choke, ⑥	Single/parallel operation (inclined characteristic) selectable (jumper), PFC choke, ⑥	⑤

① 1) = CE, 2) = UL508 (cULus LISTED), 3) = UL1950 (cURus), 5) Safety standards = IEC/EN 60950, EN 50178, 6) EMC standards = EN 55011 (Class B), EN 55022 (Class B), EN 61000-6-2, 7) = EMC standards = EN 61000-3-2 (A14), EN 50081-1  
 ② 47...63Hz  
 ③ Low inrush current  
 ④ FM Class 1 Div. 2, Groups A, B, C, D T3A  
 ⑤ MTBF determined by Siemens norm SN 29500 at full load current and 40°C

# Power Supplies Selection Guide

## Standard Three Phase Specifications

### 1606-XL Three Phase Specifications

				
	<b>1606-XL120E-3</b>	<b>1606-XL240E-3</b>	<b>1606-XL480E-3</b>	<b>1606-XL480E-3W</b>
<b>Watts</b>	24...28V/120 W	24...28V/240 W	24...28V/480 W	24...28V/490 W
<b>Input Voltage ②</b>	3Ø AC 400...500V wide range DC 450...820V	3Ø AC 400...500V wide range DC 450...820V	3Ø AC 480V DC 550...820V	3Ø AC 400...500V wide range DC 450...820V
<b>Operational Range</b>	340...576 V AC		408...576 V AC	340...576 V AC
<b>Hold-up Time</b>	>16ms(3ØAC400V) >10 ms (2Ø AC 400V)	>24ms(3ØAC400V) >20 ms (2Ø AC 400V)	>11 ms	>11 ms (3Ø AC 400V)
<b>Rated Input Current</b>	3 x 0.5 A	3 x 0.8/0.7 A @400/500V	3 x 1.5 A	
<b>Efficiency</b>	typ. 89% (400V)	typ. 91.2% (400V) typ. 92% (500V)	typ. 92%	typ. 92% (400V)
<b>Output Voltage</b>	24...28V 24.5V preset	24...28V 24.5V preset	24...28V 24V preset	24...28V 24.5V preset
<b>Rated Output Current</b>	5 A (at 24V), 4.3 A (at 28V)	10 A (at 24V) 8.6 A (at 28V)	20 A (at 24V), 18 A (at 28V)	
<b>Power Boost</b>	6 A	12 A (up to 288 W)	25 A	
<b>Ripple/Noise (20 MHz)</b>	<25 mV <sub>pp</sub>	<30 mV <sub>pp</sub>	<20 mV <sub>pp</sub>	<30 mV <sub>pp</sub>
<b>Operating Temperature range (T<sub>amb</sub>)</b>	-10...+70°C >60°C with derating	0...+70°C >60°C with derating		
<b>MTBF ④</b>	410 000 hours	543 000 hrs. (3-ph), 525 000 hrs. (2-ph.)	310 000 hours	504 000 hours
<b>Dimensions (W x H x D)</b>	73 x 124 x 117 mm	89 x 124 x 117 mm	220 x 124 x 102 mm	150 x 124 x 121 mm
<b>Weight</b>	730 g	980 g	1800 g	
<b>Approvals/Standards ①</b>	1, 2, 3, 5, 6, 7			
<b>Special Features</b>	PFC choke	Overload behavior selectable (FUSE Mode/continuous current), 2-phase operation admissible, Single/parallel operation (inclined characteristic) select on front panel, PFC choke, ⑤	Single/parallel operation (inclined characteristic) selectable (jumper), PFC choke, ⑤	Single/parallel operation (inclined characteristic) selectable, Overload behavior selectable (FUSE Mode/continuous current), PFC choke, ⑤

① 1) = CE, 2) = UL508 (cULus LISTED), 3) = UL1950 (cURus), 5) Safety standards = IEC/EN 60950, EN 50178, 6) EMC standards = EN 55011 (Class B), EN 55022 (Class B), EN 61000-6-2, 7) = EMC standards = EN 61000-3-2 (A14), EN 50081-1  
 ② 47...63Hz  
 ③ Low inrush current  
 ④ MTBF determined by Siemens norm SN 29500 at full load current and 40°C

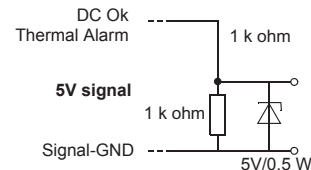
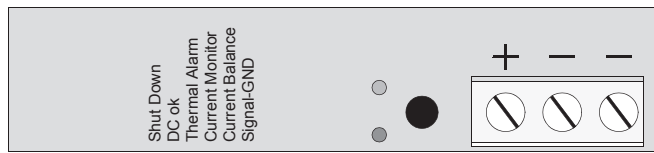


1606-XL Three Phase Specifications, Continued

	<b>1606-XL480F-3H</b>	<b>1606-XL720E-3</b>	<b>1606-XL960E-3</b>	<b>1606-XL960E-3S ⑥</b>
<b>Watts</b>	48...56V/480 W	24...28V/720 W	24...28V/960 W	
<b>Input Voltage ②</b>	3Ø AC 400V DC 450...700V	3Ø AC 400...500V wide range DC 450...820V	3Ø AC 400...500V wide range	
<b>Operational Range</b>	340...479 V AC			340...576 V AC
<b>Hold-up Time</b>	>11 ms	>10 ms (3Ø AC 400V)	>15 ms (3Ø AC 400V)	
<b>Rated Input Current</b>	3 x 1.5 A	3 x 2.0 A	3 x 3.0 A	
<b>Efficiency</b>	typ. 92%	typ. 92.5% (400V)	typ. 92.5% (400V)	
<b>Output Voltage</b>	48...56V 48.1V preset	24...28V front panel potentiometer	24...28V front panel potentiometer	
<b>Rated Output Current</b>	10 A (at 48V), 9 A (at 56V)	30 A (at 24V), 26 A (at 28V)	40 A (at 24V), 35 A (at 28V)	
<b>Power Boost</b>	12.5 A	33 A	46 A	
<b>Ripple/Noise (20 MHz)</b>	<50 mV <sub>pp</sub>	<20 mV <sub>pp</sub> (single operation) <40 mV <sub>pp</sub> (parallel operation)	<50 mV <sub>pp</sub>	
<b>Operating Temperature range (T<sub>amb</sub>)</b>	0...+70°C >60°C with derating			
<b>MTBF ④</b>	310 000 hours	425 000 hrs. @ AC 400V, 360 000 hrs. @ AC 480V	305 000 hours	268 000 hours
<b>Dimensions (W x H x D)</b>	220 x 124 x 102 mm	240 x 124 x 112 mm	275 x 124 x 117 mm	
<b>Weight</b>	1800 g	2000 g	3300 g	
<b>Approvals/Standards ①</b>	1, 2, 3, 5, 6, 7			
<b>Special Features</b>	Single/parallel operation (inclined characteristic) selectable (jumper), PFC choke, ⑤	PFC choke, ⑤	Single/parallel operation (inclined characteristic) selectable (jumper), passive load sharing, PFC choke, ⑤	Parallel operation through active current sharing; Output signals (Power-Fail, Shut-Down, internal current measurement, over-temperature warning), PFC choke, ⑤ ⑥






① 1) = CE, 2) = UL508 (cULus LISTED), 3) = UL1950 (cURus), 5) Safety standards = IEC/EN 60950, EN 50178, 6) EMC standards = EN 55011 (Class B), EN 55022 (Class B), EN 61000-6-2, 7) = EMC standards = EN 61000-3-2 (A14), EN 50081-1  
 ② 47...63Hz ③ Low inrush current ④ MTBF determined by Siemens norm SN 29500 at full load current and 40°C ⑤ 1606-XL960E-3S Signalling details below:





<p><b>"Shut Down" Input</b></p> <p><b>Function:</b> Turning the unit on or off using logic signal (remote monitoring)</p> <p>Unit switches off when Input is connected to "Signal GND" terminal (DU &lt; 1V) or the input has a voltage of +20...28V with respect to the "Signal GND" terminal (max. 20 mA).</p>	<p><b>Permissible load:</b> resistance - min. 300 Ω, e.g. 24V relay, control lights (LEDs need no series resistance), Evaluation logic.</p> <p><b>For 5V signal:</b> In order to receive a 5V signal: switch a 5V Zener diode (0.5 W) and 1 k ohm resistance in parallel between this output and the "Signal GND" terminal.</p>	<p><b>"Current Monitor" Output</b></p> <p><b>Function:</b> Measuring the output current (power output). Output signal is proportional to the output current of the unit.</p> <p><b>Connection:</b> Made with respect to the "Signal GND" terminal (signal output).</p> <p><b>Important:</b> Do not connect to the power output (terminals ⊕ and ⊖).</p> <p><b>Signalling:</b> Voltage measuring: Voltage at signal output is 1V per 10 A output current (Ri(voltmeter) &gt; 100 k ohm) Current measurement: Current at signal output is 1 mA per 10 A output current (Ri(ammeter) &lt; 100 W)</p>	<p><b>Connection:</b> Connect together "Current Balance" outputs of all units involved.</p> <p><b>Important:</b> Signal common here is the ⊖ terminal of the power output, <b>not</b> the "Signal GND". Do not connect the "Signal GND" terminals to each other!</p>
<p><b>"DC Ok" Output</b></p> <p><b>Function:</b> Indicating whether the unit is operating properly. Output can directly energize a relay or a control light.</p> <p><b>Signalling:</b> Output signal is at a "high" level (24V, current source) in normal operation (no overload, overheating, short circuit). When the output signal switches to "low" level (no power at output), Vout remains for 5 ms (nominal) at nominal load.</p> <p><b>Connection (signal common):</b> Connection is made with respect to the "Signal GND" terminal (signal output).</p> <p><b>Important:</b> Do not connect to the power output (terminals ⊕ and ⊖).</p>	<p><b>"Thermal Alarm" Output</b></p> <p><b>Function:</b> Output gives warning shortly before and while overtemperature state occurs. Output can directly control a relay or a control light.</p> <p><b>Signalling:</b> Output signal is at a "high" level (24V, current source) in normal operation (no overtemperature). At overtemperature, the output switches to "low". Only when the temperature in the unit increases further will the unit reduce its output current (power output).</p> <p><b>Connection and permissible load:</b> same as for "DC ok" output.</p>	<p><b>"Current Balance" In-/Output</b></p> <p><b>Function:</b> Using these terminals, parallel operating units ensure an equal load sharing (active balancing). Balancing also works reliably with decoupling diodes at the power output (redundancy).</p>	<p><b>"Signal GND" Terminal</b></p> <p><b>Function:</b> grounding terminal for all signal terminals (not for "Current Balance").</p> <p><b>Connection instructions:</b> Do not connect this terminal with terminals ⊕ or ⊖ of the unit (not even over a load: risk of overload). Do not connect this terminal with terminals of <i>other</i> units (not even with the "Signal GND" terminal of another unit).</p> <p><b>Permissible load:</b> Maximum current load: 0.3 A. Terminal is fused internally with a self-healing fuse (polyswitch).</p>



Special Module Specifications

1606-XL Special Modules

					
	Buffer Module	DC/DC Converter	—	—	N+1 Redundancy
	1606-XLBUFFER	1606-XLDC40A	1606-XLDNET4	1606-XLDNET8	1606-XL60DR
Watts	22.5V...27.8V/480 W	DC 5.1V ±1%	24V/120 W	24V/240 W	24V/60 W
Input Voltage ②	DC 24V (DC 24...28.8V)	DC 18...36V	AC 100...120V/ 200...240V Manual select DC 210...375V	AC 100...120V/ 200...240V Manual select DC 240...375V	AC 100...120V/ 200...240V Manual select DC 160...375V
Operational Range	23...35 V DC	18...36 V DC	85...132/176...264 V AC		
Hold-up Time	>0.2 s (20 A)	>10 ms (DC 24 Vin)	>37 ms (AC 196V)	>25 ms (AC 196V)	>20 ms (AC 196V)
Rated Input Current	charging current <600 mA	<2.9 A/<1.5 A	<2.6 A/<1.4 A	<6 A/<2.8 A	<1.3 A/<0.7 A
Efficiency	N/A	typ. 82%	typ. 90%	typ. 89%	typ. 86.5%
Output Voltage	V <sub>in</sub> -1V; 23...27.8V 22.5V fixed	DC 5.1V ±1% selectable 4.5 to 5.5V	24V	24V	24V
Rated Output Current	0...20 A	8 A	*4 A	*8 A	2.5 A
Power Boost	—	N/A	N/A	N/A	—
Ripple/Noise (20 MHz)	<200 mV <sub>pp</sub>	<50 mV <sub>pp</sub>	<50 mV <sub>pp</sub>	<30 mV <sub>pp</sub>	<30 mV <sub>pp</sub>
Operating Temperature range (T <sub>amb</sub> )	-10°C...+70°C >60°C with derating	0...+70°C >60°C with derating	-10...+70°C >60°C with derating	0...+70°C >60°C with derating	-10...+70°C >60°C with derating
MTBF ④	480 000 hours	510 000 hours	520 000 hours	390 000 hours	700 000 hours
Dimensions (W x H x D)	64 x 124 x 102 mm	49 x 124 x 102 mm	64 x 124 x 102 mm	120 x 124 x 102 mm	49 x 124 x 102 mm
Weight	740 g	470 g	620 g	980 g	470 g
Approvals/Standards ①	under preparation: 1, 2, 3, 5 (6, 7)	1, 5, 6	1, 2, 3, 5, 6, 7	1, 2, 3, 5, 6	1, 2, 3, 5, 6, 7
Special Features	Selectable buffered voltage, ⑤	MOSFET inverse battery protection, ⑤	* Electronically limited to 4 A	*Electronically limited to 8 A; RDY relay contact, N+1 redundancy, plug connectors	RDY relay contact, N+1 redundancy, plug connectors

				
	N+1 Redundancy	N+1 Redundancy	N+1 Redundancy	N+1 Redundancy
	1606-XL120DR	1606-XL240DR	1606-XLRED20-30	1606-XLRED40
Watts	24V/120 W	24V/240 W	30 A Dual redundancy module	40 A Single redundancy module
Input Voltage ②	AC 100...120V/ 200...240V Manual select DC 210...375V	AC 100...120V/ 200...240V Manual select DC 240...375V	DC 24V (max. 35V)	
Operational Range	85...132/176...264 V AC		18...36 V DC	
Hold-up Time	>37 ms (AC 196V)	>25 ms (AC 196V)	—	—
Rated Input Current	<2.6 A/<1.4 A	<6 A/<2.8 A	20...30 A (max. 35 A)	0...40 A (max. 50 A)
Efficiency	typ. 89%	typ. 89%	>97%	>97%
Output Voltage	24V	24V	V <sub>in</sub> -0.5V typ.	V <sub>in</sub> -0.6V typ.
Rated Output Current	5 A	10 A	20...30 A (max. 35 A)	0...40 A (max. 50 A)
Power Boost	6 A	12 A	—	—
Ripple/Noise (20 MHz)	<30 mV <sub>pp</sub>	<30 mV <sub>pp</sub>	—	—
Operating Temperature range (T <sub>amb</sub> )	-10°C...+70°C >60°C with derating	0...+70°C >60°C with derating	-10...+70°C	
MTBF ④	480 000 hours	390 000 hours	—	—
Dimensions (W x H x D)	64 x 124 x 102 mm	120 x 124 x 102 mm	48 x 124 x 102 mm	48 x 124 x 117 mm
Weight	620 g	980 g	625 g	646 g
Approvals/Standards ①	1, 2, 3, 5, 6, 7	1, 2, 3, 5, 6	1, 2, 3, 6	
Special Features	RDY relay contact, N+1 redundancy, plug connectors		Dual redundancy module for 2x35 A, N+1 redundancy	Single redundancy module for 2.5-50 A, N+1 redundancy

① 1) = CE, 2) = UL508 (cULus LISTED), 3) = UL1950 (cURus), 5) Safety standards = IEC/EN 60950, EN 50178, 6) EMC standards = EN 55011 (Class B), EN 55022 (Class B), EN 61000-6-2, 7) = EMC standards = EN 61000-3-2 (A14), EN 50081-1

② 47...63Hz ③ Low inrush current ④ MTBF determined by Siemens norm SN 29500 at full load current and 40°C

**Approximate Dimensions and Wire Size**

Approximate dimensions are shown in inches (mm) unless otherwise indicated. Dimensions are not to be used for manufacturing purposes.

**Bulletin 1606 Dimensions Table**

Catalog Number	W	H	D ❶	Wire Size ❷	
				(Input and Output unless otherwise noted)	
1606-XLP25A	1.77" (45 mm)	2.95" (75 mm)	3.58" (91 mm)	<b>Input/Output ❷</b> Stranded 28...12 AWG (0.3...2.5 mm <sup>2</sup> ) Solid 28...12 AWG (0.3...4 mm <sup>2</sup> )	
1606-XLP30B					
1606-XLP30E					
1606-XLP36C					
1606-XLP50B					
1606-XLP50E					
1606-XLP50F					
1606-XLP72E					
1606-XLP100E	2.87" (73 mm)	2.95" (75 mm)	4.06" (103 mm)		
1606-XLP100F					
1606-XL60D	1.93" (49 mm)	4.88" (124 mm)	4.02" (102 mm)	<b>Input/Output ❷</b> Stranded 20...10 AWG (0.5...4 mm <sup>2</sup> ) Solid 20...10 AWG (0.5...6 mm <sup>2</sup> )	
1606-XL120D	2.56" (64 mm)	4.88" (124 mm)	4.02" (102 mm)		
1606-XL240E	4.72" (120 mm)	4.88" (124 mm)	4.02" (102 mm)		
1606-XL240EP					
1606-XL240FP					
1606-XL480E					
1606-XL480EP	8.6" (220 mm)	4.88" (124 mm)	4.02" (102 mm)		
1606-XL480EPT					
1606-XL480GP					
1606-XL480F					
1606-XL120E-3	2.87" (73 mm)	4.88" (124 mm)	4.61" (117 mm)		<b>Input/Output ❷</b> Stranded 20...10 AWG (0.5...4 mm <sup>2</sup> ) Solid 20...10 AWG (0.5...6 mm <sup>2</sup> )
1606-XL240E-3	3.50" (89 mm)	4.88" (124 mm)	4.61" (117 mm)		
1606-XL480E-3	8.66" (220 mm)	4.88" (124 mm)	4.02" (102 mm)		
1606-XL480E-3W	5.91" (150 mm)	4.88" (124 mm)	4.76" (121 mm)		
1606-XL480F-3H	8.66" (220 mm)	4.88" (124 mm)	4.02" (102 mm)		
1606-XL720E-3	9.45" (240 mm)	4.88" (124 mm)	4.41" (112 mm)		
1606-XL960E-3	10.83" (275 mm)	4.88" (124 mm)	4.61" (117 mm)	<b>Input ❷</b> Stranded 20...10 AWG (0.5...4 mm <sup>2</sup> ) Solid 20...10 AWG (0.5...6 mm <sup>2</sup> )	
1606-XL960E-3S				<b>Output ❷</b> Stranded 22...8 AWG (0.5...10 mm <sup>2</sup> ) Solid 22...8 AWG (0.5...16 mm <sup>2</sup> )	
1606-XLBUFFER	2.56" (64 mm)	4.88" (124 mm)	4.02" (102 mm)	<b>Input/Output ❷</b> Stranded 20...10 AWG (0.5...4 mm <sup>2</sup> ) Solid 20...10 AWG (0.5...6 mm <sup>2</sup> )	
1606-XLDC40A	1.93" (49 mm)	4.88" (124 mm)	4.02" (102 mm)		
1606-XLDNET4	2.56" (64 mm)	4.88" (124 mm)	4.02" (102 mm)		
1606-XLDNET8	4.72" (120 mm)	4.88" (124 mm)	4.02" (102 mm)	<b>Input/Output ❷</b> Stranded 22...10 AWG (0.2...2.5 mm <sup>2</sup> ) Solid 22...10 AWG (0.2...2.5 mm <sup>2</sup> )	
1606-XL60DR	1.93" (49 mm)	4.88" (124 mm)	4.02" (102 mm)	<b>Input/Output ❷</b> Stranded 22...12 AWG (0.2...2.5 mm <sup>2</sup> ) Solid 22...12 AWG (0.2...2.5 mm <sup>2</sup> )	
1606-XL120DR	2.56" (64 mm)	4.88" (124 mm)	4.02" (102 mm)		
1606-XL240DR	4.72" (120 mm)	4.88" (124 mm)	4.02" (102 mm)		
1606-XLRED20-30	1.89" (48 mm)	4.88" (124 mm)	4.02" (102 mm)	<b>Input/Output ❷</b> Stranded 20...10 AWG (0.5...4 mm <sup>2</sup> ) Solid 20...10 AWG (0.5...6 mm <sup>2</sup> )	
1606-XLRED40	1.89" (48 mm)	4.88" (124 mm)	4.61" (117 mm)		



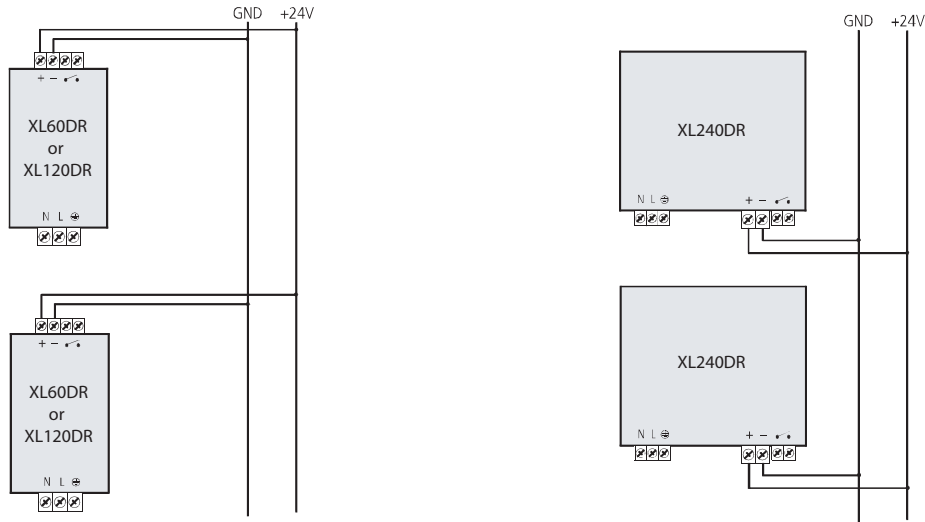
❶ Depth measurement does not include DIN rail.  
 ❷ The wire sizes indicated refer only to the connection capability of the terminal.  
 For proper operation, the correct wire size must be used (based on accurate determination of the electrical characteristics and loading of the system).



### 1606-XL Redundancy Capabilities

The 1606-XL family has two cost effective methods for providing redundancy to applications that are critical and can not risk failure.

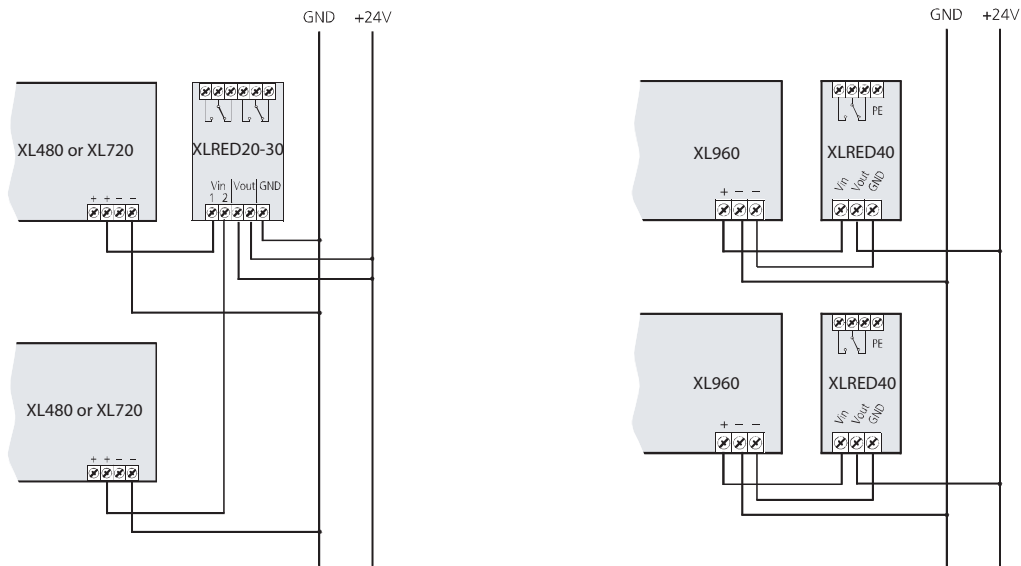
#### 1606-XL60DR, XL120DR and XL240DR Redundant Power Supplies



The 1606-XL60DR, XL120DR and XL240DR are enhanced versions of the standard power supplies.

- Each device has internal diodes which provide isolation against DC bus problems corrupting working supplies.
- Provides "DC ok" output relay to allow remote monitoring of DC power status.
- Utilizes pluggable terminals for easy installation.

#### 1606-XLRED20-30 and 1606-XLRED40 Redundancy Modules



The 1606-XLRED20-30 and 1606-XLRED40 allow redundant wiring of 20 to 40 amp power supplies.

- Devices provide isolation of power supplies via diodes.
- Provide remote monitoring of DC power status of each power supply.
- A single XLRED20-30 can be used per pair of identical 20 or 30 amp power supplies.
- One XLRED40 is required for every 40 amp power supply.

**1606-XLBuffer**

**1606-XLBuffer**

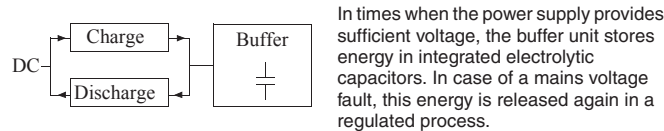
**Features**

- Buffering for 24V loads
- Guaranteed hold-up time: 0.2 s/20 A to 3.6 s/1 A
- Fit for industrial use: Energy storage in electrolytic caps.
- Clear status indication by Status LED and signalling terminals
- No batteries requiring replacement

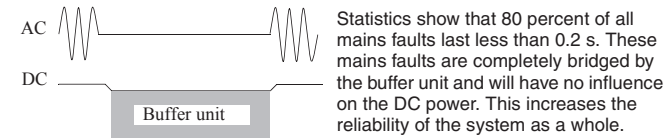
**Short Description**

The buffer unit is a supplementary device for regulated DC 24V power supplies. It buffers load currents during typical mains faults and switching events or load peaks.

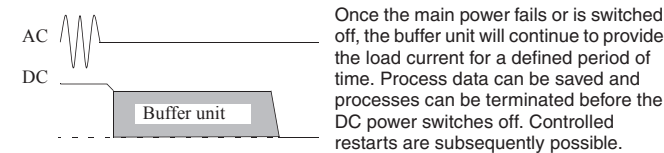
**Working principle**



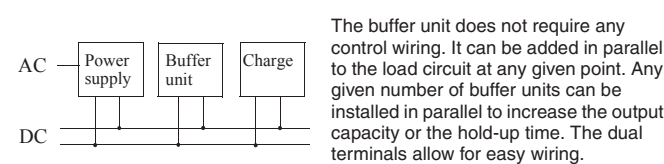
**Bridges mains faults without interruption**



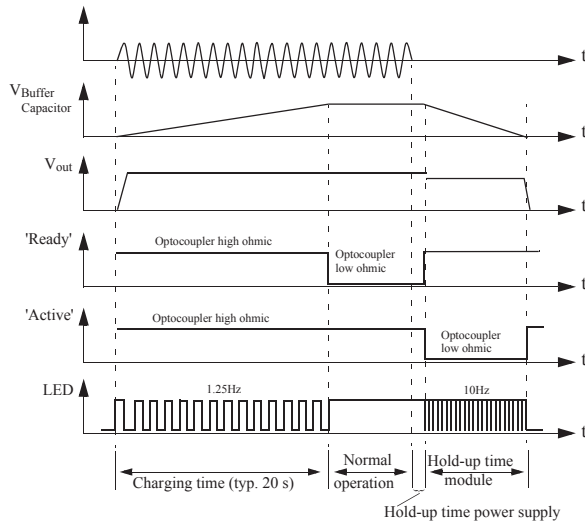
**Extended hold-up time**



**Easy to handle, expandable and maintenance-free**



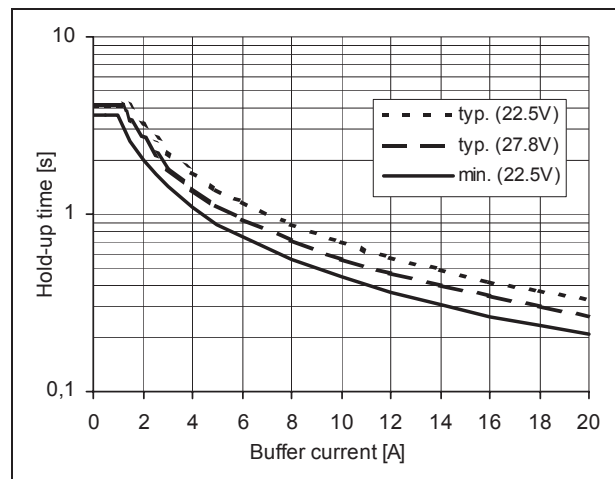
**Operating Modes**



**Activation Threshold**

"22.5V fixed"	Buffering starts if terminal voltage <22.5V, voltage is kept at 22.5V.
"V <sub>in</sub> -1V"	Buffering starts if terminal voltage decreases by more than 1V, faster than typ. 0.54V/s. Voltage is kept at that level. Buffering ends when voltage increases once more by 1V.
Noise (spikes)	<200mV <sub>pp</sub> (20 MHz bandwidth, 50 ohm measurement, buffer operation only)
Over voltage protection	limited to max. ±35V

**Hold-up Time**



**Operating Indicators and Elements**

**Signalling terminals:**

- 7 Active: unit is buffering
- 8 Ready: unit is on stand-by
- 9 Inhibit: initiates buffer discharging, inhibits recharging of capacitor array

**Jumper back-up threshold:**

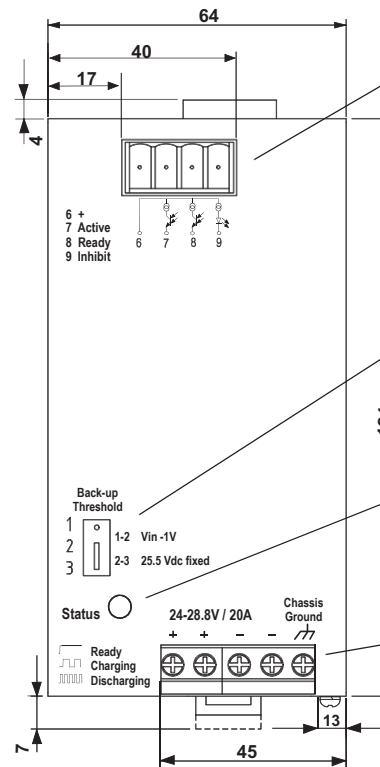
- Pos. 1-2: variable: V<sub>in</sub> -1V. Buffering if voltage decreases faster than typ. 0.54V/s and > 1V
- Pos. 2-3: DC22.5V fixed. Voltage buffering starts at V<sub>in</sub> <22.5V

**Status LED**

Indicates charge status of buffer capacitor array

**Power In/Out terminals:**

- dual terminals
- + (positive)
- - (negative)
- Housing connection 'Chassis Ground'



## The Ultimate in Reliability and Safety

Safety and reliability continue to gain increased importance in many industrial applications. The 1606-XL family of power supplies offers several solutions to increase the reliability and safety of the application. The N+1 redundancy modules provide a cost effective means for providing back-up power in the event the primary power supply fails. The "Buffer" module provides added reliability for conditions of "Brown-out" when input power is unreliable.



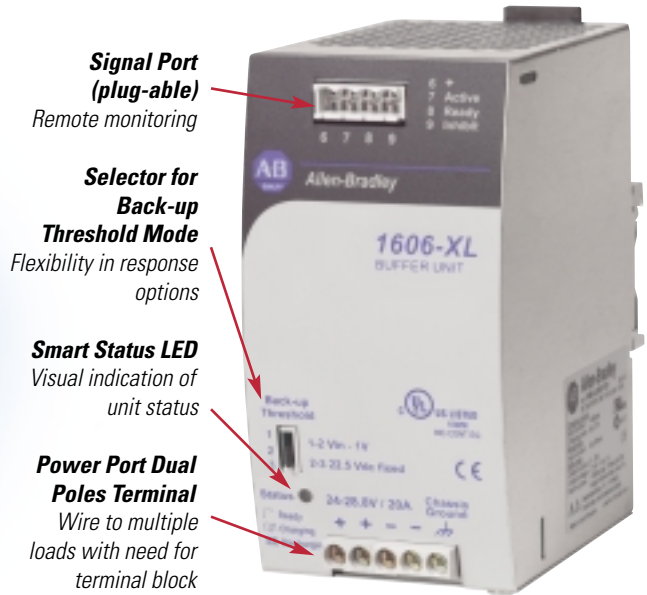
The **1606-XL60DR**, **XL120DR** and **XL240DR** power supplies have designed-in N+1 redundancy capability. When wired in parallel with an identical device, they provide N+1 redundancy with no need for any other hardware. They support 2.5, 5 and 10 A applications.



The **1606-XLRED40** provides N+1 redundancy for standard 40 A power supplies. It is designed for high load applications. One device used per power supply. "Dry" relay contact output available for remote monitoring.

## Maintenance-Free DC-UPS Alternative

The "Buffer" unit is a supplementary device, compatible with 5 to 40 A, single-phase and 3-phase supplies, that provides DC power back-up for all types of AC power faults. This unit is an excellent maintenance-free DC-UPS alternative over standard DC-UPS when the reliability of input power is marginal.



1606-XLBuffer

Applications are not interrupted due to voltage dips and drops up to 4s. The buffer unit provides remote monitoring capability that facilitates a controlled shutdown in the event of a complete power failure. It also provides additional power for short and heavy peak loads. Any number of units can be installed in parallel to increase power buffer or back-up time.



The **1606-XLRED20-30** provides N+1 redundancy for two standard 20 A or 30 A power supplies simultaneously. "Dry" relay contact outputs available for remote monitoring of each power supply.

## Excellent Performance in the Smallest Package

Compact power supplies feature the same advances in design and performance as the standard devices. In addition, our compact units provide an additional space and cost savings alternative for 25 to 100 watt applications. All units are exceptionally compact in a frame size that is 50% smaller than most other comparable units.

Though the package size of our compact unit is very small, there is no sacrifice in performance. Typical efficiencies for the entire line range from 85% to 90%. Because of the high efficiencies, the devices generate minimal heat to the cabinet. These units will operate in harsh environments that support full-load current up to 60 degrees C. On a single unit, AC or DC input is accepted. The compact units are designed for excellent performance when used in parallel with multiple units. Most units deliver up to 150% of nominal current continuously during overload with no hiccup interruption.



*All Allen-Bradley power supplies are burn-in tested to ensure reliability during system start-up.*

*Adjustable output voltage*

*Spring clamps  
no-tool installation*

*CE, UL 508 Listed, UL 60950,  
cUL/CSA-C22.2; NEC Class 2*

## Time Saving Installation

Our compact version has a patented DIN rail bracket that allows for easy snap in place installation. Virtually all compact versions are shipped with spring clamp terminations that require no tools to engage the clamp. All that is required is to strip and insert the wires and then deflect the actuating lever with your finger. It has been proven that spring clamps provide a very stable, consistent electrical connection over time and under conditions of vibration.

[www.rockwellautomation.com](http://www.rockwellautomation.com)

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