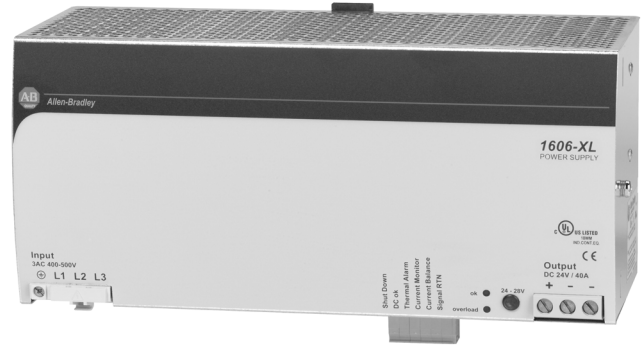





## Application Note

# 1606-XL960E-3S



- World-wide approvals (    ) for industry
- Input: 3 AC 400...500V
- Output: 24...28V/960 W (1080 W)

- No switch-off at overload
- Ideal for parallel operation
- Output for measurement and logical signals

### Input

Input voltage	3 AC 400...500V, - 15 %, + 15 % 47...63 Hz, Suitable for IT power systems
Rated Tolerances	
• Continuous operat.	340...575V AC
• Short term (1 min) at 24V/40 A	300...620V AC
Input current	3.0 A
Inrush current	< 30 A
Inrush current limiting done with a fixed 23R resistor (not a thermistor) which is bridged after the unit is running, so losses are minimized. That means no reset time even at a warm-start.	
Fuse loading	3 A <sup>2</sup> s
If you intend to protect the primary side of the power supply with fuses or circuit breakers, 10 A (x3) slow acting fuses (HBC) or a supplementary protectors 1492-SP3C100 are recommended. In order to meet local requirements, please consult local codes and regulations for proper installation.	
Harmonic current emissions acc. EN 61000-3-2 (PFC)	
Transient handling	Active transient filter incorporated, so transient resistance acc. to VDE 0160 / W2 (1300 V / 1.3 ms), for <i>all</i> load conditions.
Hold up time	min. 15 ms at 400V AC, 24V/40 A

### Construction / Mechanics

Housing dimensions and Weight	
• W x H x D	275 mm x 124 mm x 117 mm (+ DIN rail)
• Free space for ventilation	above/below each 70 mm recommended left/right each 25 mm recommended
• Weight	3.3kg
Connections	robust screw terminals Output: Minus terminal with 2 connectors, current handling per output: 40 A (max. acc. to UL) resp. 56 A (max. acc. to VDE)

#### Design advantages:

- All connection blocks mounted on front panel for ease of access.
- PVC insulated cable can be used for all connections, as the connection blocks are mounted in the cooler area on the underside of the unit.
- Power density: 230 W per litre housing volume.

Wire Size Input	Stranded 20...10 AWG (0.5...4 mm <sup>2</sup> ), Solid 20...10 AWG (0.5...6 mm <sup>2</sup> )
Wire Size Output	Stranded 22...8 AWG (0.5...10 mm <sup>2</sup> ), Solid 22...8 AWG (0.5...16 mm <sup>2</sup> )
Tightening Torque	10.6 lbs in. (1.2 Nm) recommended

### Output (signal outputs see)

Output voltage	24...28V DC, adjustable by (covered) front panel potentiometer. Adj. range guaranteed
Output noise suppression	Radiated EMI values below EN50081-1, even when using long, unshielded output cables.
Ambient temperature range	Operation: 0°C...+70°C (>60°C: Derating) T <sub>amb</sub> Storage: -25°C...+85°C
Rated continuous loading with convection cooling	
• T <sub>amb</sub> =0°C...60°C	24V/40 A (960 W) resp. 28V/35 A (980 W)
• T <sub>amb</sub> =0°C...45°C	24V/45 A (1080 W) resp. 28V/38 A (1064 W) short-term (< 1 min.) also at 60°C admissible
Derating	typ. 24 W/K (at T <sub>amb</sub> =+60°C...+70°C)
Voltage regulation	better than 2% over all
Ripple (incl. spikes)	< 50 mV <sub>pp</sub> (20 MHz bandwidth, 50 Ω measurement)
Over-voltage protection	At 32V ± 10%: switch to hiccup mode
Front panel indicators:	<ul style="list-style-type: none"> <li>• Green LED on, when V<sub>out</sub> &gt; U<sub>T</sub>, where U<sub>T</sub> is ca. 2 V below V<sub>out</sub> adjusted (24V...28V)</li> <li>• Red LED on, when V<sub>out</sub> &lt; U<sub>T</sub></li> </ul>
Parallel operation	Yes
Current sharing by balancing line (active sharing principle); switch-over by jumper without opening the unit)	
Power Back Immunity	< 35V

### Efficiency, Reliability etc.

Efficiency	typ. 92.5% (400V AC, 24V/40 A)
Losses	typ 78 W (400V AC, 24V/40 A)
MTBF	268,000 h acc. to Siemensnorm SN 29500 (24V/40 A, 400V AC, T <sub>amb</sub> = +40 °C)
Life cycle (electrolytics)	The unit exclusively uses longlife electrolytics, specified for +105°C. High reliability and lifetime, as <ul style="list-style-type: none"> <li>• only 6 aluminum electrolytics and</li> <li>• no small aluminum electrolytics are used.</li> </ul>

## Start / Overload Behavior

Startup delay	< 0.5 s
Rise time	< 0.1 s (40 A, 20,000 $\mu$ F)
Overload behavior	Overload Design (see diagram at the right), thus neither switch-off nor hiccup at overload

### Advantages:

- High short-circuit current, giving large ‘start-up window’: unit starts reliably even with awkward loads (DC-DC converters, motors). No ‘sticking’ as can occur with fold-back characteristics.
- Even longer overload possible as unit does not switch off.

## Output for measurements and signalling

‘Shut-Down’: Shut-down input: units switches off, if

- Input is connected to ‘Signal GND’ ( $\Delta U < 1V$ ) or
- +20...28V Voltage are applied to this input and ‘Signal GND’ (max. 20 mA).

‘DC OK’ output

- Signal: High (24V) at correct operation (no overload, over-temp., short-circuit). At ‘low’ signal and nominal load, output remains at nominal voltage for at least 5 ms.
- Corresponding ground is ‘Signal GND’ output (current source)
- Permissible load resistance:  $\geq 300 \Omega$ , e.g. 24V relays, control lamp (no dropping resistor needed for LED), scoring logic. To get 5V level: connect this output and ‘Signal GND’ via 5V zener diode (0.5W) + 1k $\Omega$  resistor switched in parallel

‘Thermal Alarm’: warning signal at over-temperature

- Signal: High (24V) at correct operation (no over-temperature). If signal switches to ‘low’ and temperature increases further, output current is lowered,
- Ground and permissible load resistance: see ‘DC OK’ output

‘Current Monitor’: Current measurement output, usable with

- Voltmeter 1V per 10 A output current (to ‘Signal GND’ output,  $R_{in}(\text{voltmeter}) > 100 \text{ k}\Omega$ )
- Ammeter 1 mA per 10 A output current (to ‘Signal GND’ output,  $R_{in}(\text{ammeter}) < 100 \Omega$ )

‘Current balance’: balancing output for current sharing

- For current sharing at parallel operation interconnect the ‘symmetry’ output of all units involved (here the corresponding ground is  $\ominus$  (minus) output; do not interconnect ‘Signal GND’ outputs.). Current sharing also works reliably with decoupling diodes (redundancy)

‘Signal GND’: Ground terminal for all signal outputs of this unit (not ‘Current Balance’)

- Do not connect this terminal to the  $\oplus$  (plus) terminal of this unit (not even across a load: risk of overload)
  - Do not connect this terminal to any output of another unit (not even with ‘Signal GND’ of another unit)
  - max. load current: 0.3 A
- Signal ground is internally fused by a self-curing fuse (polyswitch)

Specifications valid for 3x400V AC input voltage, +25°C ambient temperature, and 5 min run-in time, unless otherwise stated. They are subject to change without prior notice.

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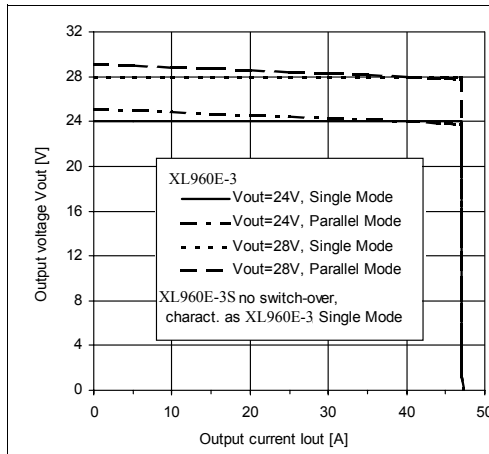
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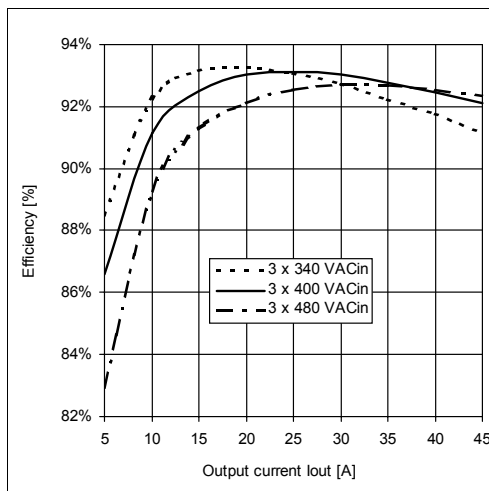
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## Output V/I characteristic (typ.)



## Efficiency (typ., at $V_{out}=24V$ )



## Hold-up time (min., at $V_{out}=24V$ )

