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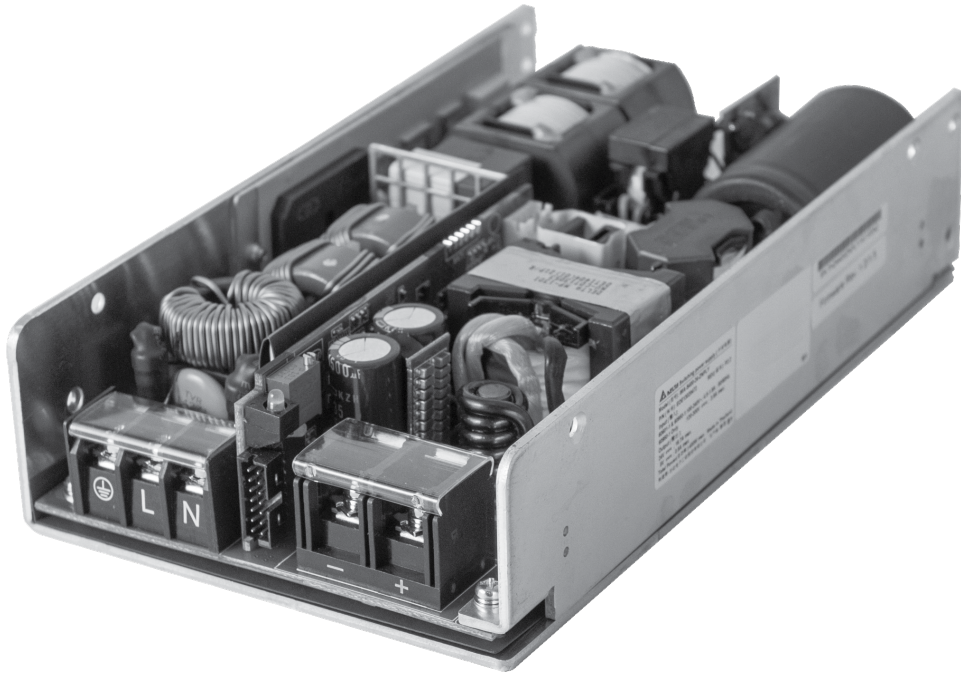
Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China





IMA 400 Watts Power Supply Series

for medical and industrial applications

Product data sheet

400 Watts Power Supply Series

for medical and industrial applications

Features

- Safety rated for Medical, Industrial and IT
- Wide operating input voltage range: 80 Vac to 275 Vac or 120 Vdc to 300 Vdc
- Wide adjustable output voltage range (+/- 20%)
- 5 Vdc standby output
- High efficiency: up to 94%
- Size: 4 x 6.96 x 1.6 in (1U design)
- Low acoustic noise level of less than 30 dB(A)
- Active current sharing
- 2 × MOPP
- PMBus™ compatible for control, programming and monitoring
- 500,000 hour MTBF
- Optional conformal coating
- 3 years warranty

Model variants

Model number ¹⁾	Input voltage range		Main DC Output		Auxiliary DC Output		Remote ON/OFF standard setting ²⁾
	AC (Vac)	DC (Vdc)	Voltage (Vdc)	Current (A)	Voltage (Vdc)	Current (A)	
IMA-x400-12-ZNPLI	80 to 275	120 to 300	12	33.3	5	0.5	OFF
IMA-x400-12-ZNPLY							ON
IMA-x400-24-ZNPLI			24	16.7			OFF
IMA-x400-24-ZNPLY							ON
IMA-x400-48-ZNPLI			48	8.33			OFF
IMA-x400-48-ZNPLY							ON

¹⁾ IMA-x400: x = S for standard version (e.g. IMA-S400-24-ZNPLY),
x = C for conformal coated version (e.g. IMA-C400-24-ZNPLY)

²⁾ Model ZNPLI and ZNPLY have different settings for Remote ON/OFF, see "Other features", p. 4

AC/DC input (J1)

	IMA-x400-12	IMA-x400-24	IMA-x400-48
Nominal input voltage	100 Vac to 240 Vac		
AC operating input voltage range	80 Vac to 275 Vac		
Nominal input frequency	50 / 60 Hz		
Input frequency range	47 Hz to 63 Hz		
DC Input voltage range	120 Vdc to 300 Vdc		
Maximum input current	6 A at 80 Vac / 3.8 A at 120 Vdc		
Efficiency @ 100% load	see Fig. 16 to Fig. 18, page 11		
@ 230 Vac	92%	94%	94%
@ 115 Vac	90%	92%	92%
Max inrush current ¹⁾	< 20 A		
Input fuse	DC input compliant, dual 10 A fuses used		
Power factor ²⁾	0.9 (typical)		

¹⁾ Hot and cold turn on

²⁾ EN 61000-3-2, Class A compliant

Main DC output (J2)

		IMA-x400-12	IMA-x400-24	IMA-x400-48
Nominal output voltage		12 V	24 V	48 V
Output voltage adjustment range		9.6 V to 14.4 V	19.2 V to 28.8 V	38.4 V to 56.0 V
Maximum output power		400 W		
Output voltage regulation				
Total		2.25%		
Over line	Full input range, full load	0.25%		
Over load	Nominal input, full load range	1%		
Over temperature	Nominal input, full load, full temperature	1%		
Maximum output current		33.3 A	16.7 A	8.3 A
Maximum output capacitive load		10,000 μ F		
Dynamic load regulation ¹⁾		< 5%		
PARD (20 MHz) ²⁾		< 1% peak to peak		
Turn on overshoot		< 2%		
Output rising time		< 150 ms		
Hold up time		20 msec nominal		
Start up time				
AC OFF --> ON	Nominal input, max. load	< 2.5 s		
REMOTE OFF --> ON	Nominal input, max. load	< 150 ms		
Output over voltage protection		YES, latch mode		
		15 V to 17.5 V	30 V to 35 V	58.5 V to 63 V
Output over current protection		YES, at 108% to 140% of nominal output current; auto recovery		
Short circuit protection		YES, auto recovery		
Over temperature protection		YES, auto recovery		
Remote sense ³⁾	Total voltage drop compensation for +V_SENSE and -V_SENSE connections (J3 Pins 13 and 14) to the output load	200 mV		

¹⁾ 50% step from 5% load, 1 A/ μ s, 10 μ F Tan and 1 μ F ceramic capacitor

²⁾ 10 μ F Tan and 1 μ F ceramic capacitor

³⁾ Do not short or reversely connect +V_SENSE and -V_SENSE. Doing this can cause damage to the power supply

Auxiliary DC output (J3)

		IMA-x400-xx
Connector type		Molex, Part number 87833-1420, 14 pin, see Fig. 19, page 12
Nominal output voltage		5 V
Output voltage adjustment range		–
Output voltage regulation		
Total		2.25%
Over line	Full input range, full load	0.25 %
Over load	Nominal input, full load range	1%
Over temperature	Nominal input, full load, full temperature	1%
Maximum output current		0.5 A
Maximum output capacitive load		1,000 μ F
Output over voltage protection		Yes, at 5.5 V to 6 V, latch mode
Output over current protection		Yes, at 1.0 A to 1.3 A, auto recovery
Short circuit protection		YES, auto recovery
Over temperature protection		YES, auto recovery

Galvanic isolation

		IMA-x400-xx
Input to Output	Reinforced	4000 Vac; 2 x MOPP
Input to Case	Basic	1500 Vac; 1 x MOPP
Output to Case	Basic	1500 Vac; 1 x MOPP

Leakage currents

		IMA-x400-xx			
AC Leakage current from Input to earth ground	Measured at mains voltage	at 60 Hz	at 63 Hz		
	Normal condition (low line)	132 Vac	< 150 µA	< 150 µA	
	Single fault condition (low line)	132 Vac	< 250 µA	< 260 µA	
	Normal condition (high line)	264 Vac	< 300 µA	< 300 µA	
	Single fault condition (high line)	264 Vac	< 500 µA	< 520 µA	
AC Leakage current from Output to earth ground	Measured at mains voltage	Typical at 60 Hz ¹⁾	Maximum value at 63 Hz ¹⁾		Limit per IEC 60601-1
	Normal condition	264 Vac	45 µA	< 60 µA	100 µA
	Single fault condition (neutral open)	264 Vac	45 µA	< 80 µA	500 µA
	Single fault condition (ground open)	264 Vac	114 µA	< 150 µA	500 µA
	AC Backdrive fault	264 Vac	< 450 µA	< 550 µA	5000 µA

¹⁾ Meets IEC 60601-1 BF leakage current limit

Other features

		IMA-x400-xx
Current Share Bus Pin	J3 Pin 11 (CURRENT_SHARE_V)	Voltage at CS Pin will vary linearly with load current on main output, and will be 6 V at rated load current, when the output voltage is at its rated value.
Power Good Pin	J3 Pin 9 (PWR_GOOD)	Open collector. As soon as AC input voltage and DC output voltage are in the predefined range, the PWR_GOOD signal is set to HIGH.
Green LED		Will turn ON as soon as PWR_GOOD signal is set to HIGH
Derating Guideline		Refer to IPC 9592B and Delta Internal Guideline
OR-ing		Redundant operation with active circuit sharing, see <i>Application Note "Redundant operation", p. 10</i>
SDA, SCL for I2C		Internal 10 kΩ pull-up resistor to internal 3.3 V

		IMA-x400-xx-ZNPLI		IMA-x400-xx-ZNPLY	
Remote On/Off Pin ¹⁾	J3 Pin 10 (REMOTE_ON/OFF)	REMOTE ON/OFF (J3 Pin 10) and 5VSB_RTN (J3 Pin 3 or J3 Pin 4 or J3 Pin 7)	Main DC Output	REMOTE ON/OFF (J3 Pin 10) and 5VSB_RTN (J3 Pin 3 or J3 Pin 4 or J3 Pin 7)	Main DC Output
		Shorted	OFF	Shorted	ON
		Open	ON	Open	OFF

¹⁾ Logic can be switched with PMBus™

Environmental conditions

	IMA-x400-12	IMA-x400-24	IMA-x400-48
Ambient operating temperature range ¹⁾	-20 °C ... +70 °C (-4°F to +158 °F) (see Fig. 7 to Fig. 8, page 10)		
Ambient storage temperature range	-40 °C ... +85 °C (-40 °F to +185 °F)		
Output power derating			
Versus input voltage	When AC input voltage is < 90 Vac, the output power will be reduced by 4 W per 1 V. (see Fig. 9, page 10)		
Versus ambient temperature	(see Fig. 9, page 10)	(see Fig. 8, page 10)	
Output current derating Versus output voltage	When output voltage is > 12 Vdc, the output current is reduced by 2.292 A per 1 V (see Fig. 10, page 10).	When output voltage is > 24 Vdc, the output current is reduced by 0.583 A per 1 V (see Fig. 11, page 10).	When output voltage is > 48 Vdc, the output current is reduced by 0.148 A per 1 V (see Fig. 13, page 11).
Relative humidity	< 95% (non-condensing)		
Operating altitude ^{1) 2)}	-200 m to 5,000 m (-650 ft to 16,400 ft)		
Shock test (non-operating)	IEC 60068-2-27 compliant, 50 g, 11 msec, 3 shocks for each direction		
Vibration (non-operating)	IEC 60068-2-6 compliant, 2.09 Grms, 5 Hz to 500 Hz, 20 minutes per side (3 planes)		
Pollution degree	2		

¹⁾ Ambient operating temperature decreases by 1 °C per 305 m (1000 ft) altitude increase

²⁾ Maximum operating altitude requirements for different types of products, see "Safety standards and directives 1)", p. 6

Reliability

	IMA-x400-xx
CMTBF ¹⁾	500,000 hours
Expected capacitor life time ²⁾	10 years
Warranty	3 years

¹⁾ Telecordia SR-332, Issue 3, 25 °C, 90% confidence level

²⁾ Nominal input voltage, 45 °C, 80% load

EMC

	IMA-x400-xx	
	Applied standards	Criteria
Radiated emissions ¹⁾	EN 55011, EN 55022 and FCC, Class B	
Conducted emissions ¹⁾	EN 55011, EN 55022 and FCC, Class B	
Power line harmonics	EN 61000-3-2, Class A	
Voltage flicker	EN 61000-3-3	
ESD	EN 61000-4-2, level 4, 8 kV contact, 15 kV air	A
Radiated immunity	EN 61000-4-3, level 3, 10 V/m	A
Electrical fast transient	EN 61000-4-4, level 4, ± 4 kV	A
Surge immunity	EN 61000-4-5, level 4, 2 kV DM, 4 kV CM	A
Conducted RF immunity	EN 61000-4-6, level 3, 10 Vrms	A
Power frequency magnetic field	EN 61000-4-8, level 3, 10 A/m	A
Voltage dips and sags	EN 61000-4-11, 30%, 500 ms EN 61000-4-11, 60%, 100 ms EN 61000-4-11, 100%, 10 ms EN 60601-1-2, 30%, 500 ms EN 60601-1-2, 60%, 100 ms EN 60601-1-2, 100%, 10 ms EN 60601-1-2, 100%, 5000 ms	A B A A B A B
Ring wave	EN 61000-4-12, level 3, 1 kV DM, 2 kV CM	A
Voltage fluctuations	EN 61000-4-14, Class 3	A

¹⁾ Power Supply Unit inside a dummy system

Safety standards and directives ¹⁾

	IMA-x400-xx
IEC/EN 60950-1, Edition 2 and all national deviations	UL 60950-1/CSA 22.2 No 60950-1, Edition 2; 5,000 m (16,400 ft) altitude, 120 V to 300 Vdc and 100 V to 240 $\pm 10\%$ Vac (UL File E191395)
IEC/EN 60601-1, Edition 3 (tested against Edition 2, too) and all national deviations	IEC 60601-1(2005), EN60601-1(2006) ANSI/AAMI ES 60601-1(2005) CAN/CSA C22.2 No. 60601-1 (2008); 3,000 m (9,800 ft) altitude, 100 V to 240 Vac $\pm 10\%$ (UL File E325662)
Protection class	I

¹⁾ Designed to support Type B Applied Part End Product Requirements

Ecological characteristics

	IMA-x400-xx
WEEE (Waste Electrical and Electronic Equipment Directive)	2012/19/EU
RoHS (Restriction of Hazardous Substances Directive)	2011/65/EU

Mechanical data

	IMA-x400-xx
Dimensions (L x W x D)	176.8 x 101.6 x 40.6 mm (6.96 x 4 x 1.6 in)
Weight	0.960 kg (2.12 lb)
Indicator	Green LED
Cooling system	System airflow cooling or natural convection cooling
AC/DC input port	Block M3.5 x 3 pins
Main DC output port	Block M5 x 2 pins
Auxiliary DC output + signals port	Connector x 14 pins
Noise ¹⁾	< 30 dB(A)

¹⁾ At 1 Hz to 20 kHz and a distance of 1 m. Test conditions: 100 Vac, 100% load, ambient temperature 30 °C (86 °F)

Options

Model	Main Output voltage	Standby Output	Leakage current	Main Output adjustable	Open frame	U channel	Enclosed	Convection cooling	Fan	Fan, airflow from end to front	Fan, airflow from front to end	Top FAN solution	Active current sharing	Remote ON/OFF	Coated ¹⁾
IMA-S400-12V	12 V	5 V/0.5 A	300 µA	●	○	●	○	●	○	○	○	○	●	●	-
IMA-S400-24V	24 V	5 V/0.5 A	300 µA	●	○	●	○	●	○	○	○	○	●	●	-
IMA-S400-48V	48 V	5 V/0.5 A	300 µA	●	○	●	○	●	○	○	○	○	●	●	-
IMA-C400-12V	12 V	5 V/0.5 A	300 µA	●	○	●	○	●	○	○	○	○	●	●	●
IMA-C400-24V	24 V	5 V/0.5 A	300 µA	●	○	●	○	●	○	○	○	○	●	●	●
IMA-C400-48V	48 V	5 V/0.5 A	300 µA	●	○	●	○	●	○	○	○	○	●	●	●

- included
- on request
- not available

Mounting orientations

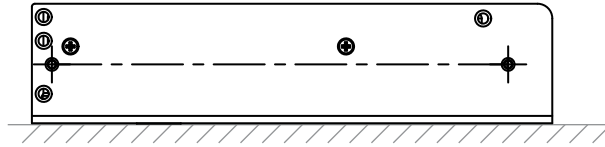


Fig. 1: Standard mounting orientation

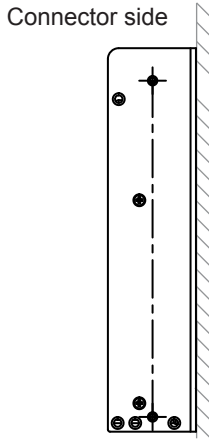


Fig. 2: Vertical mounting

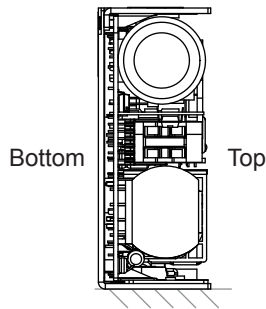


Fig. 3: Mounting on the left side

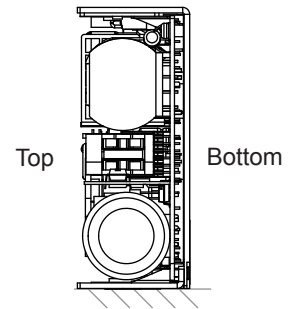
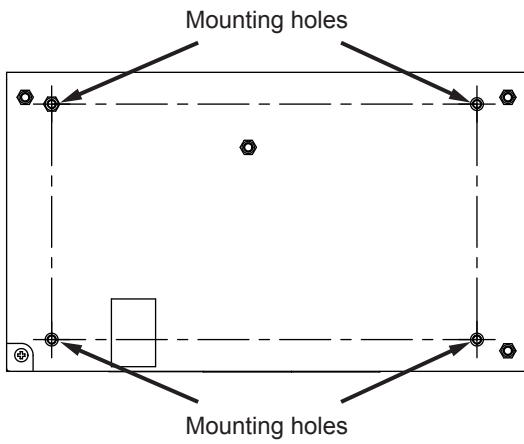


Fig. 4: Mounting on the right side

Bottom view



Side view

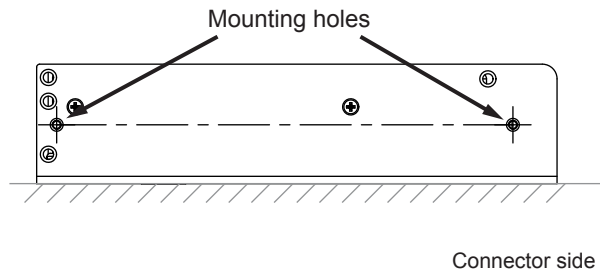


Fig. 5: Position of the mounting holes

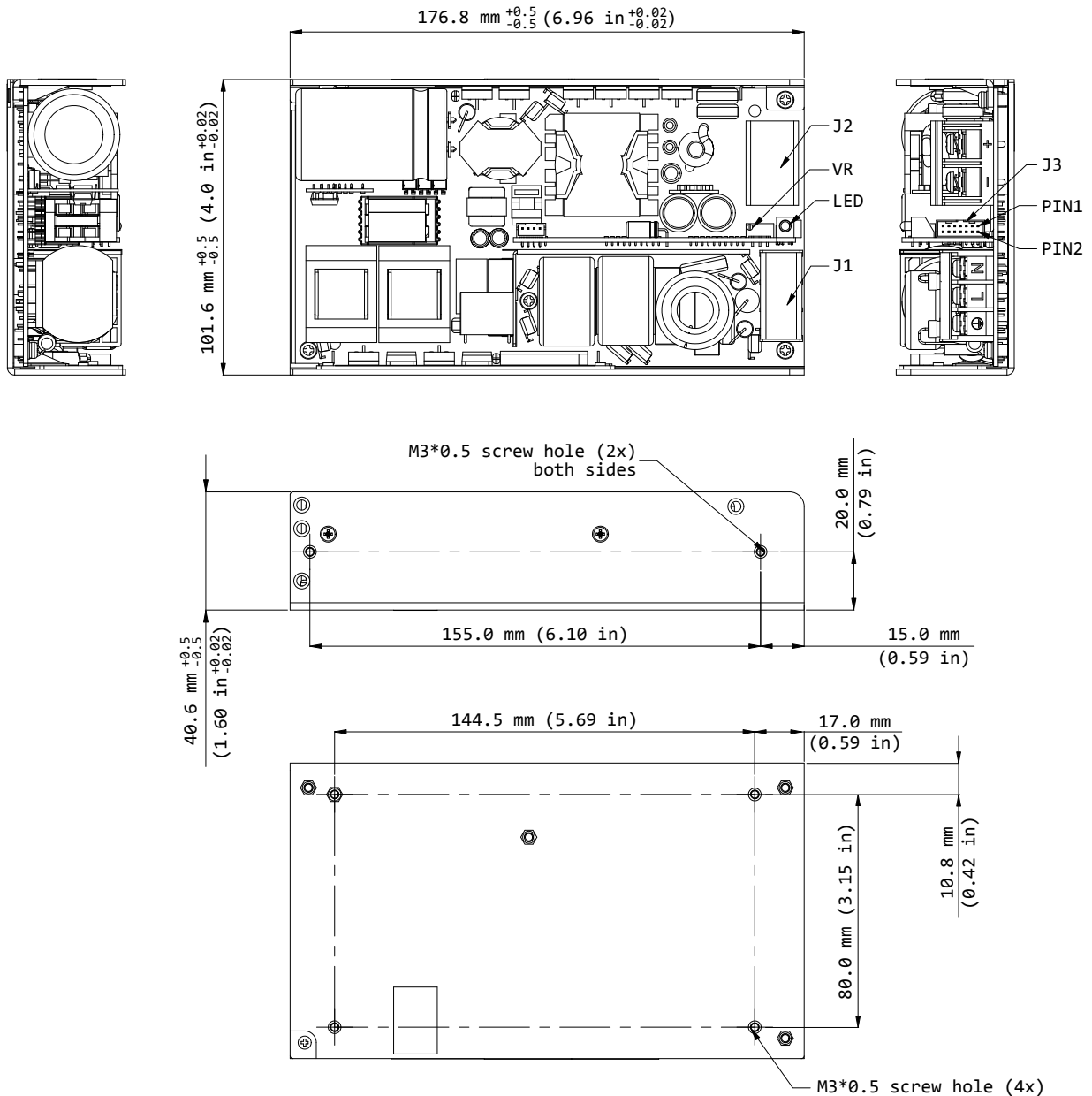
Dimensional drawings


Fig. 6: Dimensional drawing IMA-x400-xx

Notes:

- Base plate mounting, M3 thread holes, maximum penetration 4.0 mm (0.16 in) (from outside face of chassis), maximum torque 0.6 Nm (5.31 lb-in)
- (J1) Input terminal block, Switchlab T14-EMII03, M3.5 screw in 3 positions, maximum torque 1.3 Nm (11.5 lb-in)
- (J2) Output terminal block, Dinkle DT-7C-B01W-3943-02, M4 screw in 2 positions, maximum torque 1.5 Nm (13.28 lb-in)
- (J3) Signal connector and Auxiliary DC Output, Mating connector for J3 is either Molex, part number 51110-1450 (without locking ramp), or Molex part number 51110-1451 (with locking ramp). The connector is not shipped with the power supply unit.
- General tolerance: ± 0.3 mm (0.012 in)

Curves

IMA-x400-12

Tested at 90 Vac input

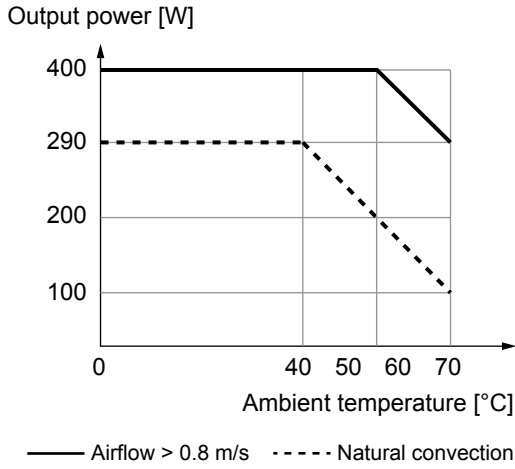


Fig. 7: Output power versus ambient temperature 12 V

IMA-x400-24/48

Tested at 90 Vac input

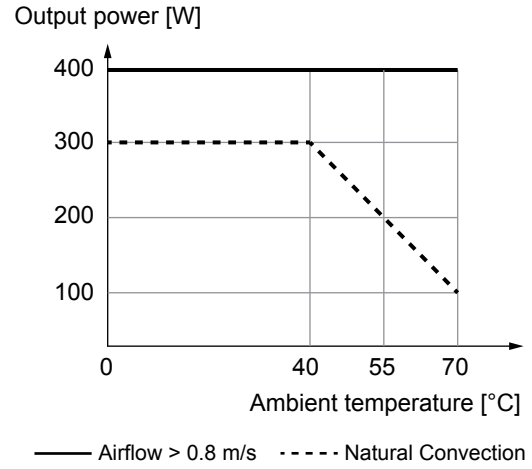


Fig. 8: Output power versus ambient temperature 24/48 V

IMA-x400-xx

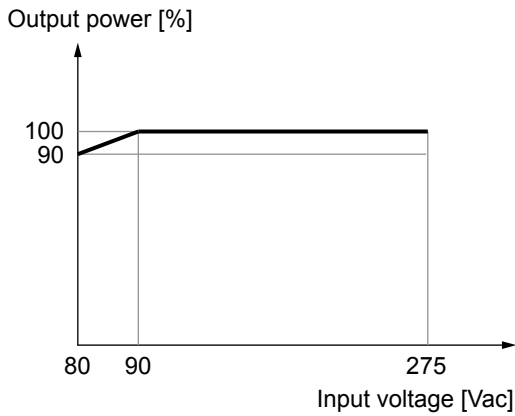


Fig. 9: Output power versus input voltage

IMA-x400-12

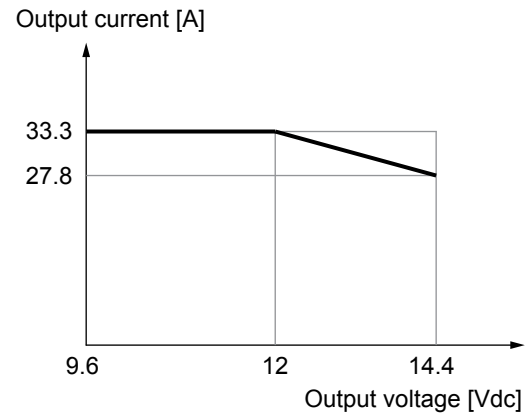


Fig. 10: Output current versus output voltage 12 V

IMA-x400-24

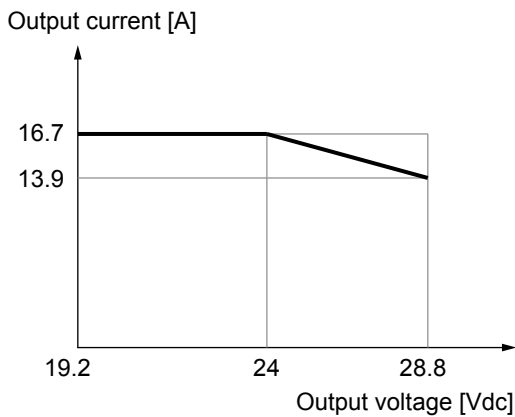


Fig. 11: Output current versus output voltage 24 V

IMA-x400-48

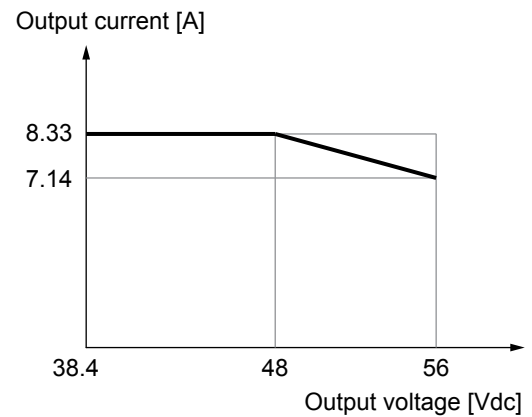


Fig. 12: Output current versus output voltage 48 V

Curves (continued)

IMA-x400-12

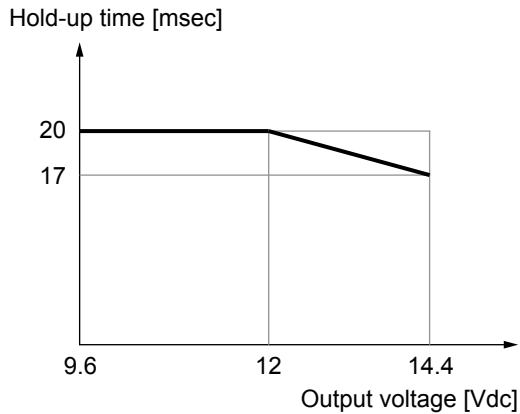


Fig. 13: Hold-up time versus output voltage 12 V

IMA-x400-24

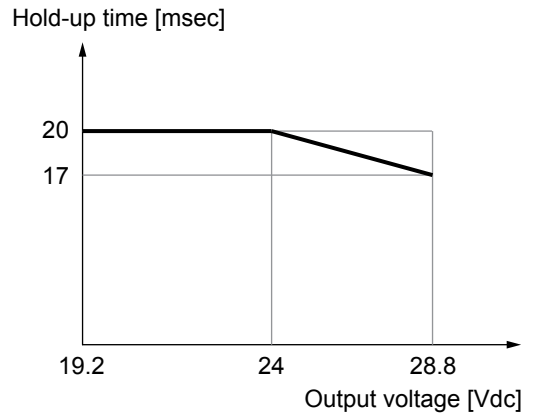


Fig. 14: Hold-up time versus output voltage 24 V

IMA-x400-48

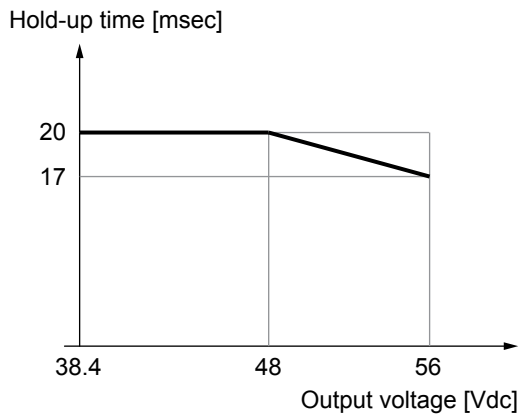


Fig. 15: Hold-up time versus output voltage 48 V

IMA-x400-12

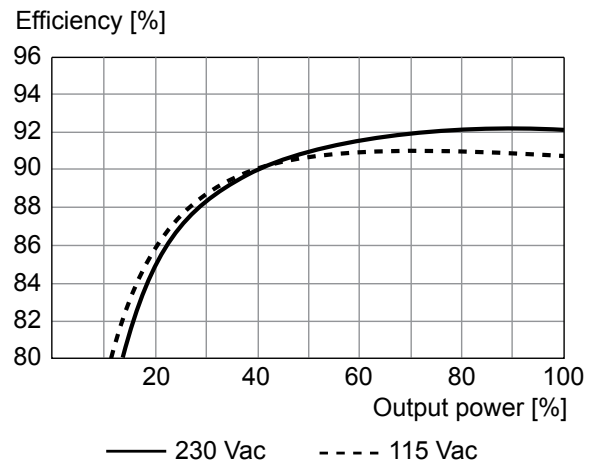


Fig. 16: Typical efficiency curves 12 V

IMA-x400-24

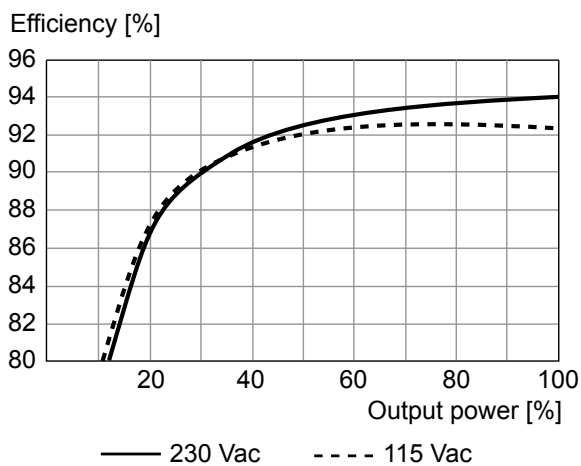


Fig. 17: Typical efficiency curves 24 V

IMA-x400-48

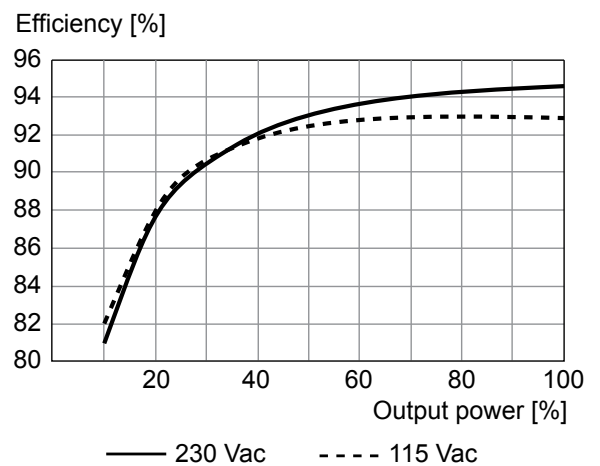
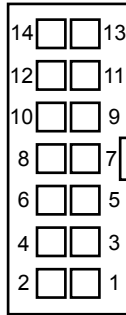


Fig. 18: Typical efficiency curves 48 V

Pin assignment (J3)

IMA-x400-xx



Pin	Assignment	Pin	Assignment
14	-V_SENSE	13	+V_SENSE
12	Address	11	Current_Share_V
10	Remote ON/OFF	9	PWR_GOOD
8	+5VSB	7	5VSB_RTN
6	SDA	5	SCL
4	5VSB_RTN	3	5VSB_RTN
2	+5VSB	1	+5VSB

Fig. 19: Pin assignment J3 terminal block

Mating connector type: Molex, Part number 51110-145x

Circuit diagrams

IMA-x400-xx

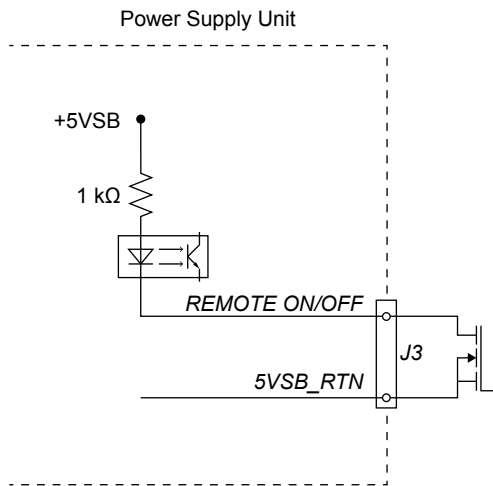


Fig. 20: Circuit diagram J3 Pin 10 (REMOTE ON/OFF)

IMA-x400-xx

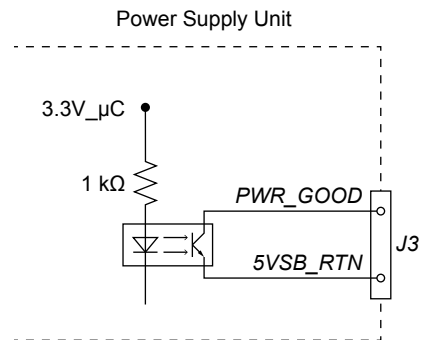


Fig. 21: Circuit diagram J3 Pin 9 (PWR_GOOD)

IMA-x400-xx

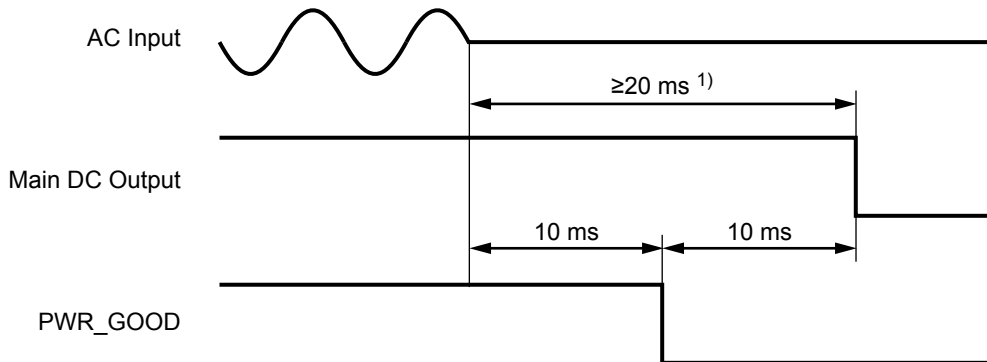


Fig. 22: Power Good function timing

¹⁾ For DC output voltage ≤ Nominal output voltage; will reduce at DC output voltages > Nominal output voltage.

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Sales Contact

Europe

Delta Electronics (Netherlands) BV
Zandsteen 15
2132 MZ Hoofddorp
The Netherlands
deu.sales@deltaww.com
www.deltaenergysystems.com

USA

Delta Products Corporation
46101 Fremont Blvd.
Fremont, CA 94538
USA
na.sales@deltaww.com
www.deltaenergysystems.com

Other regions

Delta Energy Systems (Germany) GmbH
Tscheulinstrasse 21
79331 Teningen
Germany
im.sales@deltaww.com
www.deltaenergysystems.com