

3-phase 3500 W AC/DC Industrial PSU



Key Features & Benefits

- World-Wide 3-phase Input Voltage Range (nom. 200 Vrms to 480 Vrms), PF > 0.94
- High Power Density 16 W/in³
- 94% Typical Efficiency
- Parallel Operation up to 16 Units (50.4 kW)
- Cold-Plate Cooling System
- -25 to 55°C of Case, -25 to 70°C of Ambient Temperature
- Possibility to Install 4 Units in 2U 19" Rack
- Advanced Performance for Fast Dynamic and Pulsed Load – up to 100 kHz (Optional)
- RS485 Interfaces
- Adjustable Output Voltage Range
- Fast Output Voltage Set Response (5 ms)
- Active Current Sharing

The TCP Series of AC-DC converters employ a PFC front end stage and an isolated DC-DC stage to convert world-wide 3-phase input voltage to a low DC O/P voltage.

Emphasis is given on reliability and long life. Parallel operation is possible up to 16 units (50.4 kW). Passive or active current share system can be selected.

The PSU includes DSP which enables monitoring of electrical parameters (including input voltage of all 3 phases) and controlling the PSU from system controller.

An RS485 bus is used for command, monitoring and diagnostic information that can be supplied to a system controller.

Applications

- Industrial PSU with universal input voltage range (180 – 528 VAC line to line) and configurable output voltage.

North America

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Asia-Pacific

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Europe, Middle East

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Model Selection

Model	TCP3500-1048S101G	TCP3500-1048G	TCP3500-1060G	TCP3500-1024G
Input Voltage Range	180 – 528 Vrms, 50/60 Hz	180 – 528 Vrms, 50/60 Hz	180 – 528 Vrms, 50/60 Hz	180 – 528 Vrms, 50/60 Hz
Nominal Output Voltage	48 V	48 V	60 V	24 V
Output Voltage Range	Adjustable 10 – 50 VDC	Adjustable 20 – 50 VDC	Adjustable 30 – 60 VDC	Adjustable 15 – 30 VDC
Max Output Current	73 ADC or pulse ¹	73 ADC	65 ADC	145 ADC
Max Output Power	3500 W	3500 W	3500 W	3500 W
Availability	Mass production Q2 2015	Engineering samples Q3 2015	Consult factory	Consult factory

¹ PSU model with pulse load operation capability 0 – 100 kHz, 0 – 100% Duty, 0/73 Apeak.

TECHNICAL DATA

Input

PARAMETER	DESCRIPTION / CONDITION
Input Voltage	Nominal: 200/208, 400/480 Vrms (line to line) Permitted variation: 180 – 528 Vrms
Input Frequency	50 – 60 Hz Permitted variation: 47 – 63 Hz
Input Current	≤14 Arms per Line at 3 x 180 Vrms
Fuse	3 x 20 A, Fast acting

Output

PARAMETER	DESCRIPTION / CONDITION
Output Voltage	Adjustable or fixed (see model selection tab.)
Output Power Rating	3500 W at High Line and Low Line
Output Current	Fixed or Adjustable (60 – 100%)
Efficiency	Typically 94% at High Line and load above 40%
Voltage Setting Accuracy	± 0.5%
Line regulation	±0.5% at $I_o=0.5 * I_{o_nom}$
Load Regulation	±0.3%
Thermal Drift	±0.02 %/°C
Transient Response	±5% at load variation 10-100% and back; recovery time <2 ms or ±3% at load variation 50-100% and back; recovery time <0.4 ms
Ripple	<1.5% of V_{out_nom} (BW 20 MHz)
Output Start Up / Rise Time	<2s / <250 ms

Other Technical Data

PARAMETER	DESCRIPTION / CONDITION
Protection	Over temperature protection Input under voltage protection Input over voltage protection

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	Reversed sense output protection Output under voltage protection Output over voltage protection Output over current / short circuit protection
Alarms	Input under voltage Input over voltage Output over voltage Output under voltage Output overload Over temperature
Humidity	According IEC 60068-2-78 operating range 10%RH - 90%RH
Operating Temperature	Cold-plate cooling: -25°C to +55°C of case, -25°C to +70°C of ambient air temperature
Storage Temperature	-40 to +85°C

Electromagnetic Compatibility

PARAMETER	DESCRIPTION / CONDITION
EMISSION REQUIREMENTS	
Radiated Emissions (EN55011)	Class A
Conducted Emissions (EN55011)	Class A
IMMUNITY REQUIREMENTS	
Electrostatic Discharge (IEC 61000-4-2)	Level 4: ±8 kV contact ±15 kV air Criterion B
Radiated Electromagnetic Field (IEC 61000-4-3)	10 V/m Criterion B
Electrical Fast Transient (EFT)/Burst (IEC 61000-4-4)	Level 3: ±2/1 kV Criterion B
Surge Immunity	Level 3: ±1kV DM ±2kV CM Criterion B
RF Conducted Immunity	Level 3: 10 V Criterion A
Useful Life Assessment	>5 years life at ambient temperature of +70°C and case temperature 55°C >10 years of predicted electrolytic capacitor life at 55°C of case temperature and 100% load.

Mechanical Specification

PARAMETER	DESCRIPTION / CONDITION
Dimensions (W x D x H)	400 x 103 x 85 mm / 15.7 x 4 x 3.3 in (see Fig.2)
Weight	~5 kg (single PSU)
Cooling	Liquid cooled cold-plate, power dissipation ~300W/PSU Recommended water flow rate: 2 – 4 liters/min. Maximal outlet water temperature: 35°C
Insulation	Input to output: 3.0 kVAC Input to chassis: 1.5 kVAC
Enclosure	IP20
Input Connector	4-pin, Pitch 7.62 mm (Weidmüller 1081850000, see Fig.1)
Output Connector	Bus bars, screw size M4, see Fig.1
Signal Input Connector	15-pin D-SUB Male (Würth Elektronik, 61801529221, see Fig.1)
Signal Output Connector	15-pin D-SUB Female (Würth Elektronik, 61801529321, see Fig.1)

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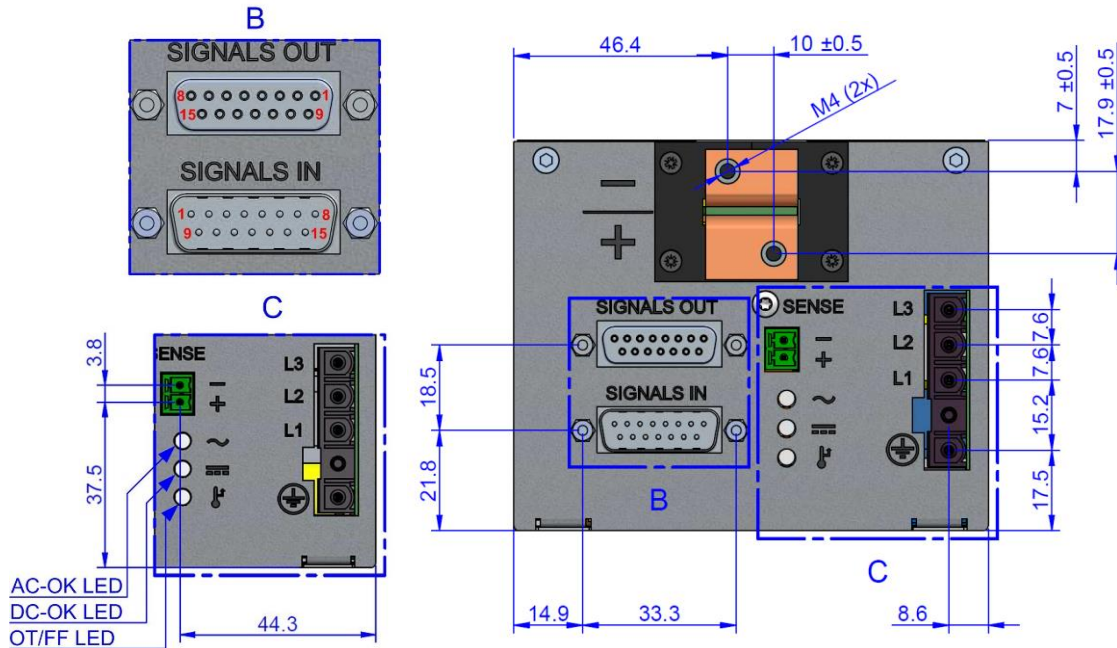


Fig. 1 Rear View - Connectors Position

Input Power Connector - Pinout

SIGNAL NAME	PIN #	TYPE	RECOMMENDED WIRES	V MAX I MAX
Earth		Earth / Chassis	Min. 2.5 mm ²	
AC Line 1	L1	Input Power AC Fused	Min. 2.5 mm ²	528 Vrms (line to line) 16 Arms (per line)
AC Line 2	L2	Input Power AC Fused	Min. 2.5 mm ²	
AC Line 3	L3	Input Power AC Fused	Min. 2.5 mm ²	

Connector type: Weidmüller 1081850000
Mating part: Weidmüller 1173520000

Power Outputs Connector - +/- Bus-Bars

SIGNAL NAME	PIN #	TYPE	SIGNAL REFERENCE	LOW LEVEL HIGH LEVEL	V MAX I MAX
Vout+	+	Output Power DC	Vout-	-	50 VDC
Vout-	-	Output Power DC	-	-	73 ADC

Connector type: Bus-bar see Fig.1
Mating part: Ring terminal for M4 screw, with appropriate cross section for wire.

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Signal Input Connector - Pinout

SIGNAL NAME	PIN #	TYPE	SIGNAL REFERENCE	LOW LEVEL HIGH LEVEL	V MAX I MAX
RS485-1A	1	RS485 Half Duplex, Differential pair 1	RS485-1B	+/-60 mA @ 60 Ω, 0 pF ²	-7 to 12 VDC 8 mA
RS485-2A	2	RS485 Half Duplex, Differential pair 2	RS485-2B	+/-60 mA @ 60 Ω, 50 pF ²	-7 to 12 VDC 8 mA
ADDR-INIT IN	3	The unit's address change required	SRTN	<0.4 VDC >2.5 VDC	3.6 VDC 0.2 mA
IN OK	4	AC Power Fail Warning - open collector, external pull-up needed to max. 7 V	SRTN	<0.4 VDC Pull up	7 VDC 20 mA
OUT OK	5	Output Voltage Fault - open collector, external pull-up needed to max. 7 V	SRTN	<0.4 VDC Pull up	7 VDC 20 mA
INHIBIT	6	Output Inhibit - Open circuit or "High" to SRTN shuts OFF Vout	SRTN	<0.4 VDC >2.5 VDC	3.6 VDC 0.2 mA
ENABLE	7	Power Supply Enable pin - for unit enable short this pin to SRTN	SRTN	<0.4 VDC >2.5 VDC	3.6 VDC 0.2 mA
SRTN ¹	8	Signal Return	-	-	-
RS485-1B	9	RS485 Half Duplex, Differential pair 1	RS485-1B	+/-60 mA @ 60 Ω, 50 pF ²	-7 to 12 VDC 8 mA
RS485-2B	10	RS485 Half Duplex, Differential pair 2	RS485-2B	+/-60 mA @ 60 Ω, 50 pF ²	-7 to 12 VDC 8 mA
Not Connected	11	-	-	-	-
OT/FAIL	12	Over Temperature /PSU Fail, open collector, external pull-up needed to max. 7 VDC	SRTN	<0.4 VDC Pull up	7 VDC 20 mA
PS-PRESENT	13	Power Supply Seated - signal internally connected through 10 Ohm resistor to SRTN	SRTN	-	1 VDC 100 mA
ACSH	14	Active Current Share	SRTN	0.2 VDC 5.0 VDC	7 VDC 0.7 mA
Margin	15	Optional - analog signal for Output Voltage adjustment - Not connected	-	-	-

¹ SRTN and Vout- are connected together inside the power supply

² 120Ω resistors connection required between RS485-xA and RS485-xB on both sides externally

Connector type: Würth Elektronik, 61801529221

Mating part: Würth Elektronik, 61801529321

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Signal Output Connector – Pinout

SIGNAL NAME	PIN #	TYPE	SIGNAL REFERENCE	LOW LEVEL HIGH LEVEL	V MAX I MAX
RS485-1A	1	RS485 Half Duplex, Differential pair 1	RS485-1B	+/-60 mA @ 60 Ω, 50 pF ²	-7 to 12 VDC 8 mA
RS485-2A	2	RS485 Half Duplex, Differential pair 2	RS485-2B	+/-60 mA @ 60 Ω, 50 pF ²	-7 to 12 VDC 8 mA
ADDR-INIT OUT	3	The unit's address change accepted	SRTN	<0.4 VDC Pull up	7 VDC 20 mA
IN OK	4	AC Power Fail Warning - open collector, external pull-up needed to max. 7 V	SRTN	<0.4 VDC Pull up	7 VDC 20 mA
OUT OK	5	Output Voltage Fault - open collector, external pull-up needed to max. 7 V	SRTN	<0.4 VDC Pull up	7 VDC 20 mA
INHIBIT	6	Output Inhibit - Open circuit or "High" to SRTN shuts OFF Vout	SRTN	<0.4 VDC >2.5 VDC	3.6 VDC 0.2 mA
NC	7	-	-	-	-
SRTN ¹	8	Signal Return	-	-	-
RS485-1B	9	RS485 Half Duplex, Differential pair 1	RS485-1B	+/-60 mA @ 60 Ω, 50 pF ²	-7 to 12 VDC 8 mA
RS485-2B	10	RS485 Half Duplex, Differential pair 2	RS485-2B	+/-60 mA @ 60 Ω, 50 pF ²	-7 to 12 VDC 8 mA
NC	11	-	-	-	-
OT/FAIL	12	Over Temperature /PSU Fail, open collector, external pull-up needed to max.7 VDC	SRTN	<0.4 VDC Pull up	7 VDC 20 mA
PS-PRESENT OUT	13	Power Supply Seated – last unit in string will pull down this signal (external short to SRTN) and informs Master Controller that all units in string are seated and connected	SRTN	<0.4 VDC >2.5 VDC	3.6 VDC 0.2 mA
ACSH	14	Active Current Share	SRTN	0.2 VDC 5.0 VDC	7 VDC 0.7 mA
Margin	15	Optional – analog signal for Output Voltage adjustment - Not Connected	SRTN	-	-

¹ SRTN and Vout- are connected together inside the power supply

Connector type: Würth Elektronik, 61801529321
Mating part: Würth Elektronik, 61801529221

Sense Lines Input Connector– Pinout

SIGNAL NAME	PIN #	TYPE	SIGNAL REFERENCE	LOW LEVEL HIGH LEVEL	V MAX I MAX
SENSE+	+	Sense line for Vout+ – voltage drop compensation for positive pole	Vout+	-	-
SENSE-	-	Sense line for Vout- – voltage drop compensation for positive pole	Vout-	-	-

Connector type: Phoenix Contact, MC 1.5/2-G-3.81
Mating part: Phoenix Contact, MC 1.5/2-ST-3.81

LED Signaling

LED NAME	COLOR	STATUS	OPERATING CONDITIONS
AC-OK	Green	ON Blinking	AC Input Voltage is within operation range FW upgrade via RS485-1
DC-OK	Green	ON	Output is Enabled and Operational
OT/FAIL	Orange	ON	Over Temperature conditions inside the unit or FAIL appeared (e.g. Overload)

GUI (Graphic User Interface) and RS485 Communication Protocol

Please see detail description in BCA.00129, for the GUI please contact sales representative of Bel Power Solutions.

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Mechanical Dimensions

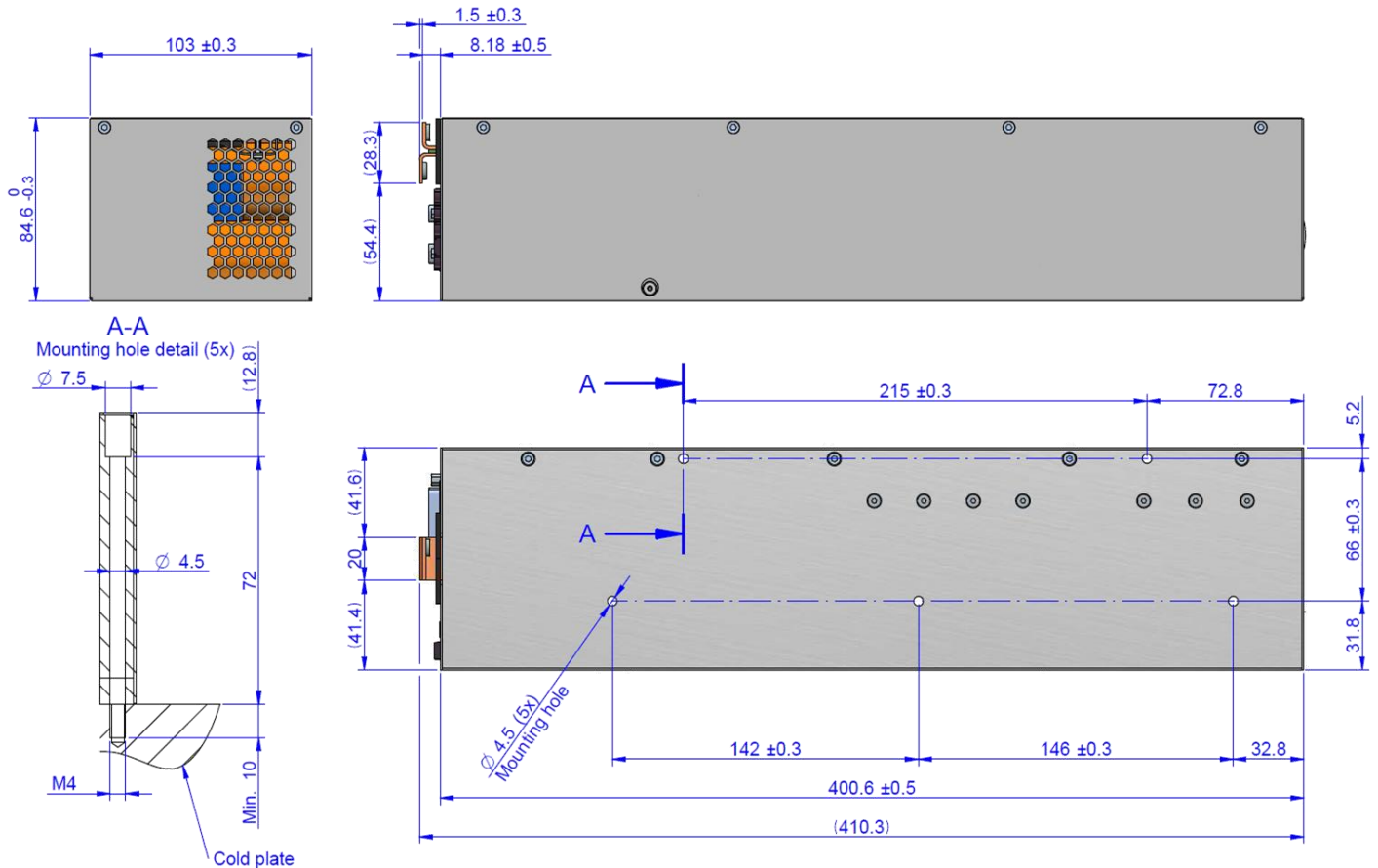


Fig. 2 Mechanical Dimensions

For more information on these products consult: tech.support@psbel.com

NUCLEAR AND MEDICAL APPLICATIONS - Products are not designed or intended for use as critical components in life support systems, equipment used in hazardous environments, or nuclear control systems.

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