

# TXP3500/4000 Series

## AC-DC Industrial PSU

The TXP3500/4000 series of fan cooled power supplies convert the universal 3 phase AC line to an adjustable, wide range output at 3.5/4 kW and a 12 V standby output. Thanks to active current share system up to 8 units may be operated in parallel (28/32 kW).

This industrial Power Supply Unit (PSU) includes DSP technology which enables monitoring of all electrical parameters and allowing control of the PSU from a system controller via RS485 / CAN bus communication interface. The output voltage is adjustable also by a resistor connected to Margin input.

The 2U package makes the unit suitable for using in workstations, storage systems, racks for industrial and many other applications.



### Key Features & Benefits

- World-Wide 3-phase Input Voltage Range (nom. 200 Vrms to 480 Vrms)
- Power Factor > 0.94
- High Power Density 16 W/in<sup>3</sup>
- 93% Typical Efficiency
- Parallel Operation of up to 8 Units (28/32 kW)
- Serial Operation of up to 4 Units
- Internal Fan Cooling System
- -25 to 55°C of Ambient Temperature
- Possibility to Install 3 Units in 2U 19" Rack
- RS485 / CAN bus Interfaces
- Adjustable Output Voltage Range
- Auxiliary Output 12 V / 0.8 A
- Active Current Sharing

### Applications

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

## 1. MODEL SELECTION

MODEL	INPUT VOLTAGE RANGE	NOMINAL OUTPUT VOLTAGE	OUTPUT VOLTAGE RANGE	MAX OUTPUT CURRENT	MAX OUTPUT POWER	AVAILABILITY
TXP3500-1048G	180 – 528 Vrms, 50/60 Hz	48 V	Adjustable 10 – 50 VDC	73 ADC	3500 W	Available
TXP4000-1110G	350 – 528 Vrms, 50/60 Hz	110 V	Adjustable 30 – 137.5 VDC	36.5 ADC	4000 W	Available

## 2. INPUT SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
Input Voltage *	Nominal (line to line)		200-480 400-480		Vrms
	Permitted variation:	180 350		528 528	Vrms
Input Frequency	Nominal		50/60		Hz
	Permitted variation:	47		63	Hz
Input Current *	Per Line	TXP3500-1048G	5	12	Arms
		TXP4000-1110G	5.2	7	
Inrush Current	Per Line			60 **	Apk
Power Factor		0.94			
Fuse	3 x 20 A, Fast acting				

\* Model dependent

\*\* After one minute cooling period

## 3. OUTPUT SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
Output Voltage	Adjustable (range see Model Selection table)				
Output Power Rating	@ High Line and Low Line / High Line		3500 /4000		W
Output Current	Fixed or Adjustable (60 – 100%)		See Model		
Efficiency	Typical, at High Line and nom. load		93		%
Voltage Setting Accuracy			± 0.5		%
Line Regulation	@ $I_o = 0.5 * I_{o\_nom}$		±0.5		%
Load Regulation			±0.3		%
Thermal Drift			±0.02		%/°C
Transient Response	@ Load variation 10-100% and back:		±5	2	% ms
	@ Load variation 50-100% and back:		±3	0.4	% ms
Ripple	Vout_nom (BW 20 MHz)			1.5	%
Output Start Up				2.5	s
Rise Time				250	ms

## 4. PROTECTION & ALARM SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITION	CRITERION
Protection / Vout_OFF	Over Temperature Protection (internal sensors)	>85°C Tamb, >90/110°C Ths1/2
	Input Under Voltage Protection	
	Input Over Voltage Protection	
	Reversed Sense Output Protection	
	Output Under Voltage Protection	
	Output Over Voltage Protection	
Warning / Alarm	Output Over Current / Short Circuit Protection	
	Input under voltage	
	Input over voltage	
	Output over voltage	
	Output under voltage	
	Output overload	
	Over temperature (internal sensors)	>70°C Tamb, >105°C Ths2

## 5. MONITORING AND CONTROL

### 5.1 GUI (GRAPHIC USER INTERFACE) SC UTILITY AND RS485/CAN COMMUNICATION PROTOCOL

Please see detailed description in document BCA.00186, for the GUI please contact a Bel Power Solutions sales representative.

### 5.2 LED SIGNALING

LED NAME	COLOR	STATUS	OPERATING CONDITIONS
AC-OK	Green	ON Blinking slowly	AC Input Voltage is within operation range Over/under voltage
DC-OK	Green/Chartreuse/Yellow	Green ON	Output current 0-33 %
		Chartreuse ON	Output current 33-66 %
		Yellow ON	Output current 66-100 %
OT/FAIL	Yellow	Blinking slowly	Over/under voltage
		ON	Over Temperature
		Blinking slowly Blinking fast	Fan fail Communication error / no communication

## 6. SAFETY, REGULATORY AND EMI SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITION	CRITERION	
Insulation	Input to output:	1.5 kVAC (factory tested) <sup>1</sup>	
	Input to chassis:	1.5 kVAC	
	Output to chassis:	353 VAC	
	Signals to chassis:	177 VAC	
Safety Standards	Latest edition of the following standards: CSA/UL 62368-1 3rd, EN 62368-1 3rd and IEC 62368-1 3rd		
Radiated Emission	EN55011	Class A	
Conducted Emissions	EN55011	Class A	
<b>IMMUNITY REQUIREMENTS</b>			
Electrostatic Discharge	EN61000-4-2	Level 4: ±6 kV contact, ±8 kV air	Criterion B
Radiated Electromagnetic Field	EN61000-4-3	80 – 6000 MHz	Criterion A
Electrical Fast Transient (EFT)/Burst	EN61000-4-4	Level 3: ±2 kV	Criterion A
Surge Immunity	EN61000-4-5	Level 3: ±1 kV DM, ±2 kV CM	Criterion B
RF Conducted Immunity	EN61000-4-6	Level 3: 10 Vac, 0.15 – 80 MHz	Criterion A
Useful Life Assessment	>5 years life at ambient temperature of +55°C >10 years of predicted electrolytic capacitor life at T <sub>A</sub> = 55°C of and 100% load.		

<sup>1</sup> According to IEC/EN 60950 subassemblies connecting input to output are pre-tested with 3 kVAC

## 7. ENVIRONMENTAL SPECIFICATIONS

PARAMETER	DESCRIPTION / CONDITION	MIN	NOM	MAX	UNIT
Humidity	Operating range according IEC 60068-2-78	10		90	RH
Operating Temperature	Ambient air temperature	-25		+55	°C
Storage Temperature		-40		+85	°C

## 8. CONNECTORS

PARAMETER	DESCRIPTION / CONDITION
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 / Output Connector	15-pin D-SUB Male / Female (E-TEC, SDD-1515-2-95-FMS; see Fig.1)

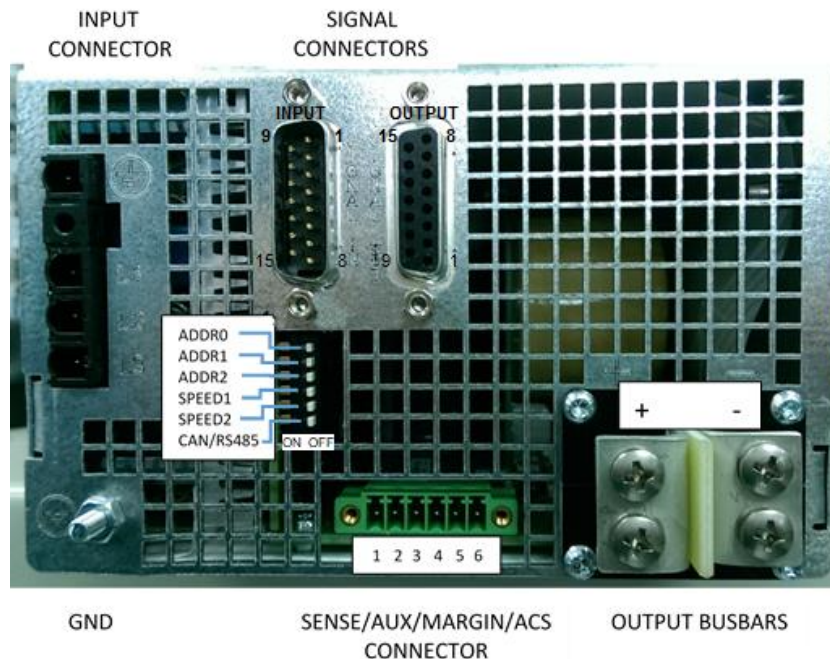


Figure 1. Rear View - Connector Positions

### 8.1 INPUT POWER CONNECTOR: PINOUT

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

Connector type: Weidmüller 1081850000  
Mating part: Weidmüller 1173520000



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## 8.2 POWER OUTPUT CONNECTOR: +/- BUS BARS

SIGNAL NAME	PIN #	TYPE	SIGNAL REFERENCE	LOW LEVEL HIGH LEVEL	V MAX I MAX
Vout+	+	Output Power DC	Vout-	-	50 / 137.5 VDC
Vout-	-	Output Power DC	-	-	73 / 36.5 ADC

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

## 8.3 SIGNAL INPUT CONNECTOR: PINOUT

SIGNAL NAME	PIN #	TYPE	SIGNAL REFERENCE	LOW LEVEL HIGH LEVEL	V MAX I MAX
RS485-A	1	RS485 Half Duplex, Differential pair	RS485-B	+/-60 mA @ 60 $\Omega$ , 0 pF <sup>2</sup>	-7 to 12 VDC 8 mA
CAN_H	2	CAN Bus	CAN_L	- -	-27 to 40 VDC 15 mA
RESERVED	3	Do not connect	DRTN	-	-
IN OK	4	AC Power Fail Warning – open collector, low by fail	DRTN	<0.4 VDC 5 VDC	5.1 VDC 15 mA
OUT OK	5	Output Voltage Fault – open collector, low by fail	DRTN	<0.4 VDC 5 VDC	5.1 VDC 15 mA
INHIBIT	6	Output Inhibit - Open circuit or “High” to DRTN shuts OFF Vout	DRTN	<0.4 VDC >2.5 VDC	5.1 VDC -
ENABLE	7	Power Supply Enable pin – for unit enable short this pin to DRTN	DRTN	<0.4 VDC >2.5 VDC	5.1 VDC -
DRTN <sup>1</sup>	8	Digital Ground / Return	-	-	-
RS485-B	9	RS485 Half Duplex, Differential pair	RS485-A	+/-60 mA @ 60 $\Omega$ , 50 pF <sup>2</sup>	-7 to 12 VDC 8 mA
CAN_L	10	CAN Bus	CAN_H	- -	-27 to 40 VDC 15 mA
N.C.	11	Do not connect	-	-	-
OT/FAIL	12	Over Temperature / PSU Fail - open collector, low by fail	DRTN	<0.4 VDC 5 VDC	5.1 VDC 15 mA
PS-PRESENT	13	Power Supply Seated – signal internally connected through 10 Ohm resistor to DRTN	DRTN	-	1 VDC 100 mA
N.C.	14	Do not connect	-	-	-
N.C.	15	Do not connect	-	-	-

<sup>1</sup> DRTN and SRTN / Vout- are galvanically separated, SRTN and Vout- are internally connected together

<sup>2</sup> Connect 120  $\Omega$  resistors between RS485-A and RS485-B on both sides of the line externally

Connector type: E-TEC, SDD-1515-2-95-FMS  
 Mating part: Würth Elektronik, 61801529321

### 8.4 SIGNAL OUTPUT CONNECTOR: PINOUT

SIGNAL NAME	PIN #	TYPE	SIGNAL REFERENCE	LOW LEVEL HIGH LEVEL	V MAX I MAX
RS485-A	1	RS485 Half Duplex, Differential pair	RS485-B	+/-60 mA @ 60 Ω, 50 pF <sup>2</sup>	-7 to 12 VDC 8 mA
CAN_H	2	CAN Bus	CAN_L	-	-27 to 40 VDC 15 mA
RESERVED	3	Do not connect	DRTN	-	-
IN OK	4	AC Power Fail Warning – open collector, low by fail	DRTN	<0.4 VDC 5 VDC	5.1 VDC 15 mA
OUT OK	5	Output Voltage Fault – open collector, low by fail	DRTN	<0.4 VDC 5 VDC	5.1 VDC 15 mA
INHIBIT	6	Output Inhibit - Open circuit or “High” to DRTN shuts OFF Vout	DRTN	<0.4 VDC >2.5 VDC	5.1 VDC -
ENABLE_MULTI	7	Power Supply Enable pin for all units enable (in serial or parallel operation)	DRTN	<0.4 VDC >2.5 VDC	5.1 VDC -
DRTN <sup>1</sup>	8	Signal Return	-	-	-
RS485-B	9	RS485 Half Duplex, Differential pair	RS485-A	+/-60 mA @ 60 Ω, 50 pF <sup>2</sup>	-7 to 12 VDC 8 mA
CAN_L	10	CAN Bus	CAN_H	-	-27 to 40 VDC 15 mA
N.C.	11	Do not connect	-	-	-
OT/FAIL	12	Over Temperature / PSU Fail – open collector, low by fail	DRTN	<0.4 VDC 5 VDC	5.1 VDC 15 mA
PS-PRESENT OUT	13	Power Supply Seated – last unit in a string will pull down this signal (external short to DRTN) and informs the Master Controller that all units in the string are seated and connected	DRTN	<0.4 VDC 5 VDC	5.1 VDC 15 mA
N.C.	14	Do not connect	-	-	-
N.C.	15	Do not connect	-	-	-

<sup>1</sup> DRTN and SRTN / Vout- are galvanically separated, SRTN and Vout- are internally connected together

<sup>2</sup> Connect 120 Ω resistors between RS485-A and RS485-B on both sides of the line externally

Connector type: E-TEC, SDD-1515-2-95-FMS  
Mating part: Würth Elektronik, 61801529221

### 8.5 SENSE/AUX/MARGIN/ACS LINES INPUT/OUTPUT CONNECTOR: PINOUT

SIGNAL NAME	PIN #	TYPE	SIGNAL REFERENCE	LOW LEVEL HIGH LEVEL	V MAX I MAX
SENSE+	1	Sense line for Vout+ – voltage drop compensation for positive pole		-	-
SENSE-	2	Sense line for Vout- – voltage drop compensation for negative pole		-	-
+Vaux	3	Auxiliary output voltage	SRTN	12.15 VDC 11.85 VDC	0.8 ADC
SRTN <sup>1</sup>	4	Return for +Vaux, Margin, ACS	-	-	-
MARGIN	5	Adjust output voltage by ext. resistor connected between this pin and SRTN	SRTN	0 Ohms 37k Ohms	5.1 VDC
ACS	6	Active Current Share	SRTN	0.2 VDC 5.0 VDC	7 VDC 0.7 mA

<sup>1</sup> SRTN and Vout- are internally connected together

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

## 8.6 DIP SWITCH FUNCTION

SWITCH 1 ADR0	SWITCH 2 ADR1	SWITCH 3 ADR2	UNIT ADDRESS (hex/dec)	
OFF	OFF	OFF	0xB7	183
ON	OFF	OFF	0xB6	182
OFF	ON	OFF	0xB5	181
ON	ON	OFF	0xB4	180
OFF	OFF	ON	0xB3	179
ON	OFF	ON	0xB2	178
OFF	ON	ON	0xB1	177
ON	ON	ON	0xB0	176

SWITCH 4 SPEED SEL1	SWITCH 5 SPEED SEL2	SWITCH 6 RS485/CAN	RS485 BUS SPEED [baud]	CAN BUS SPEED [baud]
OFF	OFF	OFF	460 800	-
ON	OFF	OFF	115 200	-
OFF	ON	OFF	19 200	-
ON	ON	OFF	9 600	-
OFF	OFF	ON	-	1 000 000
ON	OFF	ON	-	500 000
OFF	ON	ON	-	250 000
ON	ON	ON	-	125 000

## 8.7 PARALLEL OPERATION

In case of parallel operation all SENSE/AUX/MARGIN/ACS connectors of units in parallel (pins 1, 2, 4, 6) need to be interconnected:

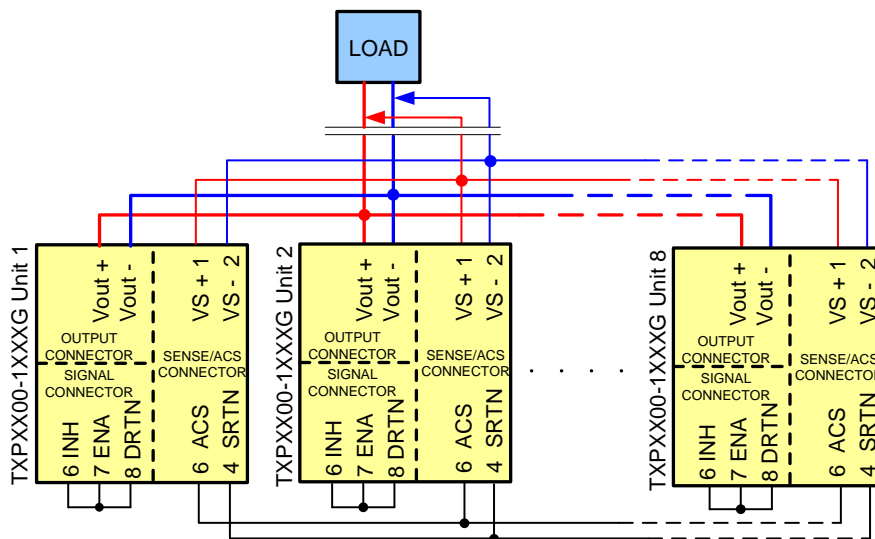


Figure 2. Parallel Operation Schematic

**CAUTION:** DO NOT connect neither two different models nor same model units, when they have a different output voltage setting, together in parallel!



8.8 SERIAL OPERATION

**CAUTION:** In case of serial operation the pins SRTN of particular units must not be connected together!

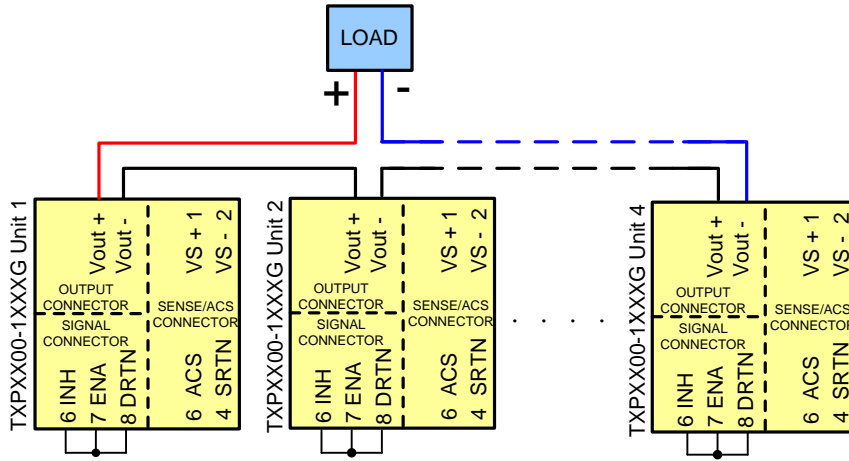


Figure 3. Serial Operation Schematic

9. MECHANICAL SPECIFICATIONS

PARAMETER	CONDITIONS / DESCRIPTION
Dimensions (W x H x D)	135 x 85 (2U) x 465 mm (see Fig.4)
Weight	6.5 kg (single PSU)
Cooling	Externally accessible serviceable fan
Enclosure	IP20

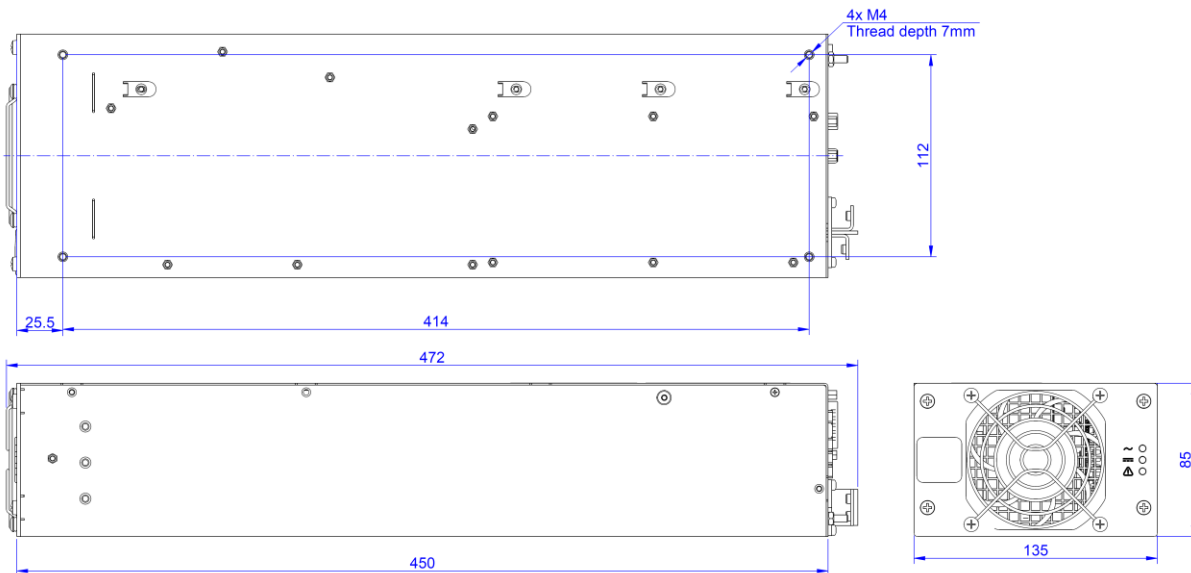


Figure 4. Mechanical Dimensions



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