

# 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.



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Please read our datasheet & drawing disclaimer [here](#).

## 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<br>400-480 |            | Vrms |
|                 | Permitted variation:    | 180<br>350 |                    | 528<br>528 | Vrms |
| Input Frequency | Nominal                 |            | 50/60              |            | Hz   |
|                 | Permitted variation:    | 47         |                    | 63         | Hz   |
| Input Current * | Per Line                |            |                    | 12<br>7    | Arms |
|                 |                         |            | 5<br>5.2           |            |      |
| 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<br>/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            |     | %    |
|                          | @ Load variation 50-100% and back:           | Recovery time: | ±3            | 2   | ms   |
|                          |                                              | Recovery time: |               | 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                                                     |
|-----------------------|-----------------------------------------------------------------------------|
| 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<br>Blinking slowly | AC Input Voltage is within operation range<br>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 %                                          |
|          |                         | Blinking slowly       | Over/under voltage                                               |
| OT/FAIL  | Yellow                  | ON                    | Over Temperature                                                 |
|          |                         | Blinking slowly       | Fan fail                                                         |
|          |                         | Blinking fast         | 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:<br>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      |
| Radiated Electromagnetic Field        | EN61000-4-3                                                                                                                                    | 80 – 6000 MHz                          |
| Electrical Fast Transient (EFT)/Burst | EN61000-4-4                                                                                                                                    | Level 3: ±2 kV                         |
| Surge Immunity                        | EN61000-4-5                                                                                                                                    | Level 3: ±1 kV DM, ±2 kV CM            |
| RF Conducted Immunity                 | EN61000-4-6                                                                                                                                    | Level 3: 10 Vac, 0.15 – 80 MHz         |
| Useful Life Assessment                | >5 years life at ambient temperature of +55°C<br>>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) |

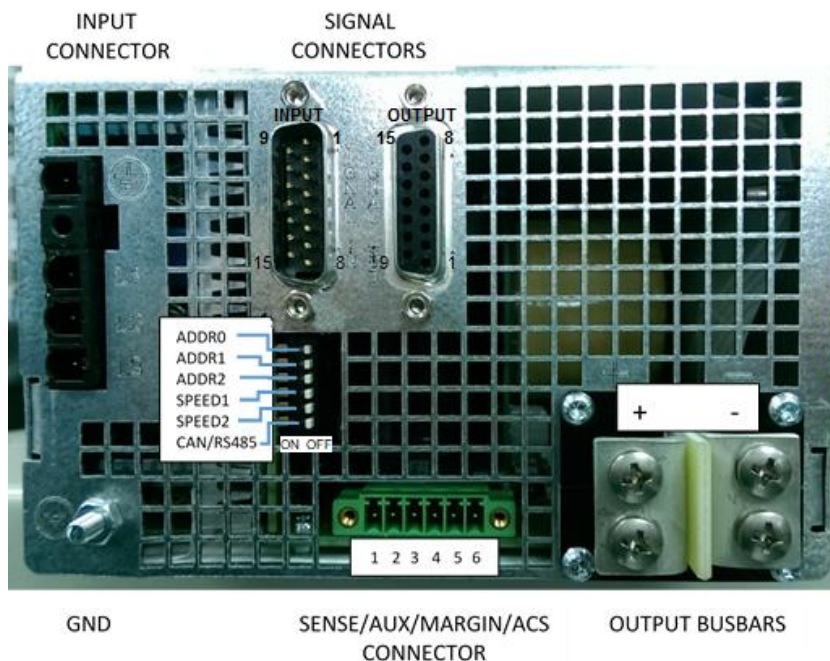


Figure 1. Rear View - Connector Positions

### 8.1 INPUT POWER CONNECTOR: PINOUT

| SIGNAL NAME | PIN # | TYPE                 | RECOMMENDED WIRES        | V MAX<br>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)<br>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

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

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

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<br>HIGH LEVEL                        | V MAX<br>I MAX         |
|-------------------|-------|-----------------------------------------------------------------------------------|------------------|------------------------------------------------|------------------------|
| RS485-A           | 1     | RS485 Half Duplex, Differential pair                                              | RS485-B          | +/-60 mA<br>@ 60 $\Omega$ , 0 pF <sup>2</sup>  | -7 to 12 VDC<br>8 mA   |
| CAN_H             | 2     | CAN Bus                                                                           | CAN_L            | -                                              | -27 to 40 VDC<br>15 mA |
| RESERVED          | 3     | Do not connect                                                                    | DRTN             | -                                              | -                      |
| IN OK             | 4     | AC Power Fail Warning – open collector, low by fail                               | DRTN             | <0.4 VDC<br>5 VDC                              | 5.1 VDC<br>15 mA       |
| OUT OK            | 5     | Output Voltage Fault – open collector, low by fail                                | DRTN             | <0.4 VDC<br>5 VDC                              | 5.1 VDC<br>15 mA       |
| INHIBIT           | 6     | Output Inhibit - Open circuit or “High” to DRTN shuts OFF Vout                    | DRTN             | <0.4 VDC<br>>2.5 VDC                           | 5.1 VDC<br>-           |
| ENABLE            | 7     | Power Supply Enable pin – for unit enable short this pin to DRTN                  | DRTN             | <0.4 VDC<br>>2.5 VDC                           | 5.1 VDC<br>-           |
| DRTN <sup>1</sup> | 8     | Digital Ground / Return                                                           | -                | -                                              | -                      |
| RS485-B           | 9     | RS485 Half Duplex, Differential pair                                              | RS485-A          | +/-60 mA<br>@ 60 $\Omega$ , 50 pF <sup>2</sup> | -7 to 12 VDC<br>8 mA   |
| CAN_L             | 10    | CAN Bus                                                                           | CAN_H            | -                                              | -27 to 40 VDC<br>15 mA |
| N.C.              | 11    | Do not connect                                                                    | -                | -                                              | -                      |
| OT/FAIL           | 12    | Over Temperature / PSU Fail - open collector, low by fail                         | DRTN             | <0.4 VDC<br>5 VDC                              | 5.1 VDC<br>15 mA       |
| PS-PRESENT        | 13    | Power Supply Seated – signal internally connected through 10 Ohm resistor to DRTN | DRTN             | -                                              | 1 VDC<br>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<br>HIGH LEVEL                        | V MAX<br>I MAX         |
|-------------------|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|------------------------------------------------|------------------------|
| RS485-A           | 1     | RS485 Half Duplex, Differential pair                                                                                                                                                    | RS485-B          | +/-60 mA<br>@ 60 $\Omega$ , 50 pF <sup>2</sup> | -7 to 12 VDC<br>8 mA   |
| CAN_H             | 2     | CAN Bus                                                                                                                                                                                 | CAN_L            | -                                              | -27 to 40 VDC<br>15 mA |
| RESERVED          | 3     | Do not connect                                                                                                                                                                          | DRTN             | -                                              | -                      |
| IN OK             | 4     | AC Power Fail Warning – open collector, low by fail                                                                                                                                     | DRTN             | <0.4 VDC<br>5 VDC                              | 5.1 VDC<br>15 mA       |
| OUT OK            | 5     | Output Voltage Fault – open collector, low by fail                                                                                                                                      | DRTN             | <0.4 VDC<br>5 VDC                              | 5.1 VDC<br>15 mA       |
| INHIBIT           | 6     | Output Inhibit - Open circuit or “High” to DRTN shuts OFF Vout                                                                                                                          | DRTN             | <0.4 VDC<br>>2.5 VDC                           | 5.1 VDC<br>-           |
| ENABLE_MULTI      | 7     | Power Supply Enable pin for all units enable (in serial or parallel operation)                                                                                                          | DRTN             | <0.4 VDC<br>>2.5 VDC                           | 5.1 VDC<br>-           |
| DRTN <sup>1</sup> | 8     | Signal Return                                                                                                                                                                           | -                | -                                              | -                      |
| RS485-B           | 9     | RS485 Half Duplex, Differential pair                                                                                                                                                    | RS485-A          | +/-60 mA<br>@ 60 $\Omega$ , 50 pF <sup>2</sup> | -7 to 12 VDC<br>8 mA   |
| CAN_L             | 10    | CAN Bus                                                                                                                                                                                 | CAN_H            | -                                              | -27 to 40 VDC<br>15 mA |
| N.C.              | 11    | Do not connect                                                                                                                                                                          | -                | -                                              | -                      |
| OT/FAIL           | 12    | Over Temperature / PSU Fail – open collector, low by fail                                                                                                                               | DRTN             | <0.4 VDC<br>5 VDC                              | 5.1 VDC<br>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<br>5 VDC                              | 5.1 VDC<br>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  $\Omega$  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, 61801529221

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

| SIGNAL NAME       | PIN # | TYPE                                                                       | SIGNAL REFERENCE | LOW LEVEL<br>HIGH LEVEL | V MAX<br>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<br>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<br>37k Ohms      | 5.1 VDC         |
| ACS               | 6     | Active Current Share                                                       | SRTN             | 0.2 VDC<br>5.0 VDC      | 7 VDC<br>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<br>ADR0 | SWITCH 2<br>ADR1 | SWITCH 3<br>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<br>SPEED SEL1 | SWITCH 5<br>SPEED SEL2 | SWITCH 6<br>RS485/CAN | RS485 BUS SPEED<br>[baud] | CAN BUS SPEED<br>[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:

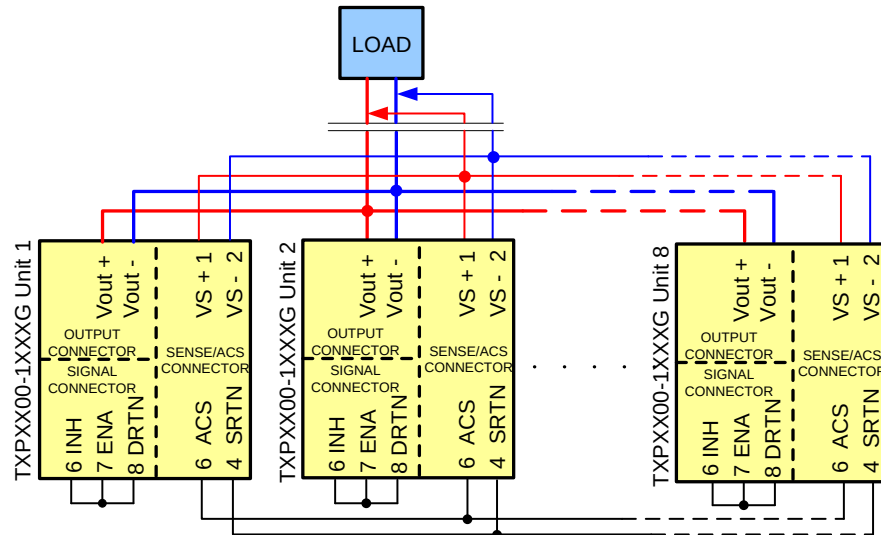


Figure 2. Parallel Operation Schematic

**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!

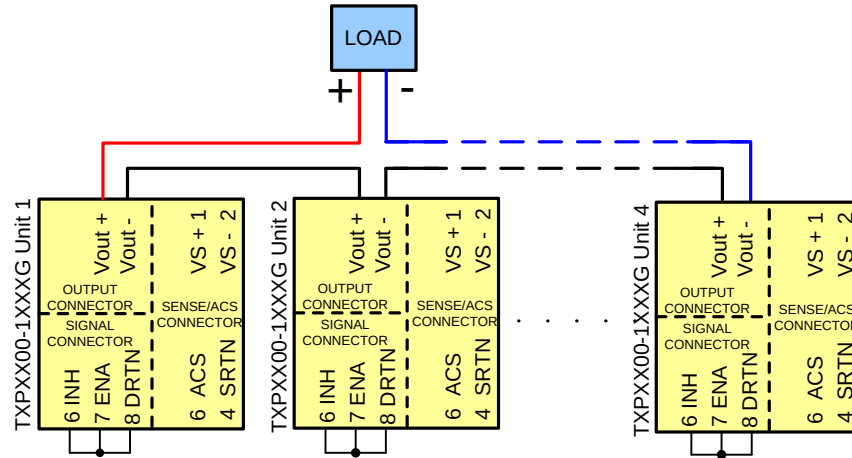


Figure 3. Serial Operation Schematic

## 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                                  |

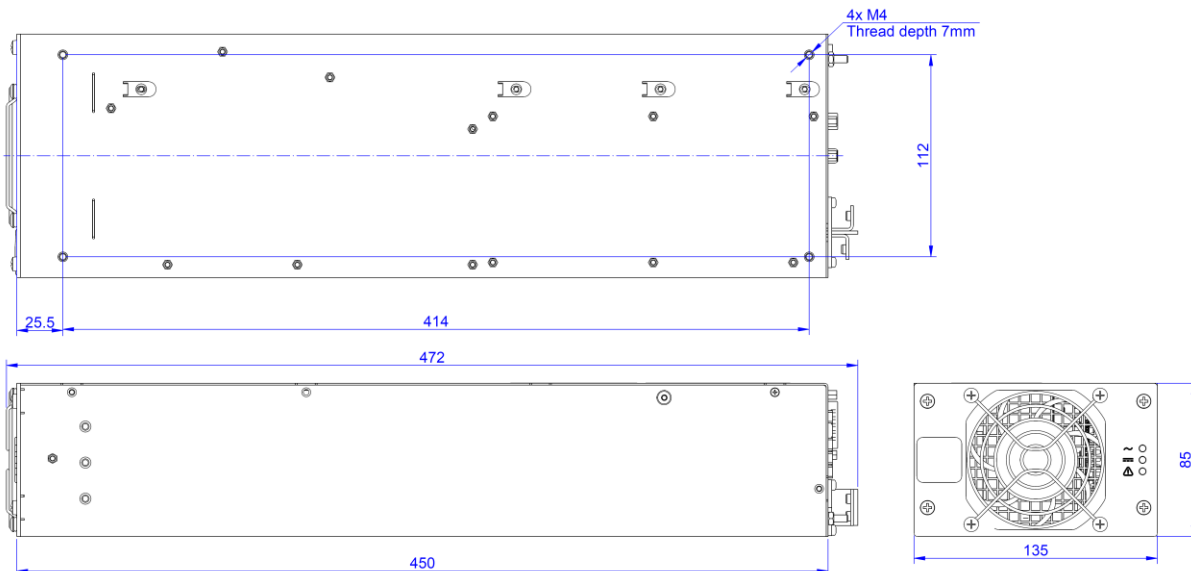


Figure 4. Mechanical Dimensions

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