# GCU500 Series

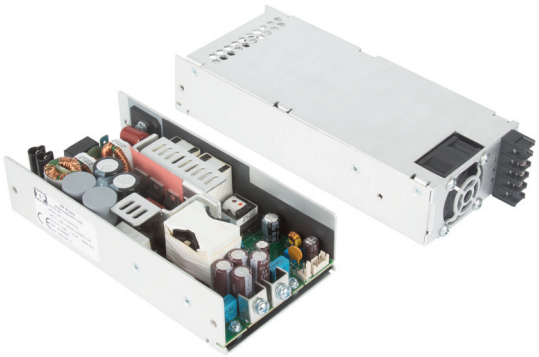
AC-DC Power Supplies

XP Power

## 500 Watts

- 250 W Convection & 500 W Forced-cooled Ratings
- 5 V Standby Output
- Universal 80 - 264 VAC Input
- IT & Medical Safety Approvals
- -40° C to +70° C Operation
- Power Fail, Remote On/Off & Remote Sense
- Class B Emissions
- 3 Year Warranty

GREEN XP POWER



The GCU500 is packaged in a 3.3" x 6.5" x 1.55" package and achieves EN55011/32 Level B conducted emissions compliance whilst maintaining very low earth leakage currents, making it suitable for a wide range of 1U and other industrial, IT and medical applications.

**Dimensions:**

**GCU500:**
3.30 x 6.50 x 1.55" (83.8 x 165.1 x 39.3 mm)
**GCU500-EF:**
3.30 x 8.24 x 1.64" (83.8 x 209.3 x 41.7 mm)

The series has single output versions from 12 V to 48 VDC, dual-fusing for compliance with IEC60601-1 and features minimal waste heat as efficiencies reach 93%. The GCU500 delivers up to 500 W of power over an operating range of -40 °C to +70 °C and offers remote on/off control and power fail signal along with 5 V standby and fan supplies.

## Models & Ratings

| Output Voltage V1 | Output Current V1 | | V Standby Output | V Fan Output[1] | Max Output Power | Model Number[2] |
|---|---|---|---|---|---|---|
| | Convection-cooled | Forced-cooled & End Fan Version[3] | | | | |
| 12.0 VDC | 20.8 A | 41.7 A | 5.0 VDC/0.2 A | 12.0 VDC/0.5 A | 500 W | GCU500PS12 |
| 15.0 VDC | 16.7 A | 33.4 A | 5.0 VDC/0.2 A | 12.0 VDC/0.5 A | 500 W | GCU500PS15 |
| 18.0 VDC | 12.5 A | 27.8 A | 5.0 VDC/0.2 A | 12.0 VDC/0.5 A | 500 W | GCU500PS18 |
| 24.0 VDC | 10.4 A | 20.8 A | 5.0 VDC/0.2 A | 12.0 VDC/0.5 A | 500 W | GCU500PS24 |
| 36.0 VDC | 6.9 A | 13.9 A | 5.0 VDC/0.2 A | 12.0 VDC/0.5 A | 500 W | GCU500PS36 |
| 48.0 VDC | 5.2 A | 10.4 A | 5.0 VDC/0.2 A | 12.0 VDC/0.5 A | 500 W | GCU500PS48 |

### Notes

1. Overall Vfan tolerance 10.8-13.2 V
2. For end fan version add suffix -EF to model number.
3. Forced cooling requires 10CFM.

## Summary

| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---|---|---|---|---|---|
| Input Voltage - Operating | 80 | 115/230 | 264 | VAC | Derate output power <90 VAC. See fig 1, 300 VAC for 5 s |
| No Load Input Power | | | 1 | W | 115 VAC (when inhibited) |
| | | | 6 | | 230 VAC |
| Efficiency | | 92 | | % | 230 VAC Full load |
| Operating Temperature | -40 | | +70 | °C | See derating curve, fig. 9 & 10 |
| EMC | EN55032 Level B Conducted & Radiated | | | | |
| Safety Approvals | IE60950-1, IEC62638-1, EN62368-1, UL62368-1, CSA 22.2 No.6238-1, IEC60601-1, EN60601-1, ANSI/AAMI ES60601-1, CSA22.2 No.60601-1, LVD & RoHS, Equipment Protection Class I | | | | |
| Weight | | 1.35 (612) | | lb (g) | U Channel |
| | | 1.65 (748) | | | End Fan |

## Input

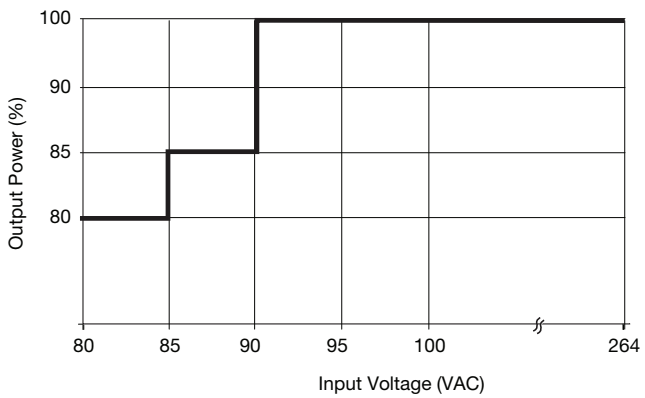
| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---|---|---|---|---|---|
| Input Voltage - Operating | 80 | 115/230 | 264 | VAC | Derate output power <90 VAC. See fig 1, 300 VAC for 5 s |
| Input Frequency | 47 | 50/60 | 63 | Hz | |
| Power Factor | | >0.9 | | | 230 VAC, 100% load |
| Input Current - Full Load | | 5.2/2.7 | | A | 115/230 VAC |
| Inrush Current | | | 60 | A | 264 VAC cold start 25 °C |
| No Load Input Power | | | 1 | W | 115 VAC (when inhibited) |
| | | | 6 | | 230 VAC |
| Earth Leakage Current | | | 270 | µA | 264 VAC/60 Hz |
| Input Protection | F8A/250V internal fuse in both lines. | | | | |

## Output

| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---|---|---|---|---|---|
| Output Voltage - V1 | 12 | | 48 | VDC | See Models and Ratings table |
| Initial Set Accuracy | | | ±1 (V1) & ±3(VStby) | % | 50% load, 115/230 VAC |
| Output Voltage Adjustment -V1 | ±2 | | | % | Via potentiometer. See mech. details, Vfan will track |
| Minimum Load | 0 | | | A | No minimum load required |
| Start Up Delay | | 1 | 2 | s | 115/230 VAC full load |
| Hold Up Time | 10 | | | ms | 115/230 VAC full load |
| Drift | | | ±0.2 | % | After 20 min warm up |
| Line Regulation | | | ±0.5 | % | 90-264 VAC |
| Load Regulation | | | ±0.5 | % | 0-100% load |
| Transient Response | | | 4 | % | Recovery within 1% in less than 500 µs for a 50-75% and 75-50% load step |
| Over/Undershoot | | | 5 | % | Turn On/Turn Off |
| Ripple & Noise - V1 & V Standby | | | 1 | % pk-pk | 20 MHz bandwidth |
| Overvoltage Protection - V1 | 110 | | 140 | % | Vnom DC. Output 1, recycle input to reset |
| Overload Protection | 110 | | 150 | % I nom | V1 - Trip and Restart / Hiccup mode |
| | 0.8 | | 1.2 | A | VStandby - Trip and Restart / Hiccup mode |
| | | | | | VFan - Reseting. Fuse rated at 1.3 A at 25 °C |
| Short Circuit Protection | | | | | Continuous, no damage |
| Temperature Coefficient | | | 0.02 | %/°C | |
| Overtemperature Protection | | | | °C | Measured internally, auto resetting |
| Remote Sense | Compensates for 0.25V per lead, 0.5V total. | | | | |

### Input Voltage Derating Curve

Figure 1



## General

| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---|---|---|---|---|---|
| Efficiency | | 92 | | % | 230 VAC Full load |
| Isolation: Input to Output | 4000 | | | VAC | 2 x MOPP |
| Input to Ground | 1500 | | | VAC | 1 x MOPP |
| Output to Ground | 500 | | | VDC | |
| Switching Frequency | 50 | | 500 | kHz | PFC Converter |
| | 65 | | 150 | | Main Converter |
| Power Density | | | 15 | W/in³ | |
| Mean Time Between Failure | | 370 | | kHrs | MIL-HDBK-217F, Notice 2 +25 °C GB |
| Weight | | 1.35 (612) | | lb (g) | U Channel |
| | | 1.65 (748) | | | End Fan |

### Efficiency Vs Load

Figure 2
12 V Models

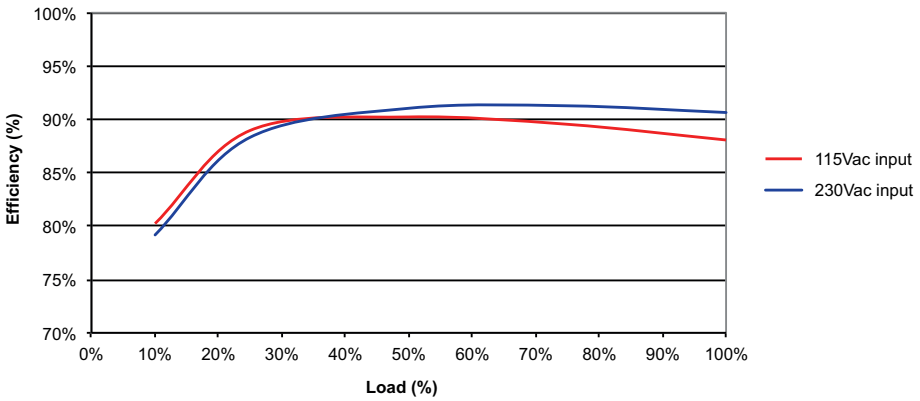



Figure 3
24 V Models

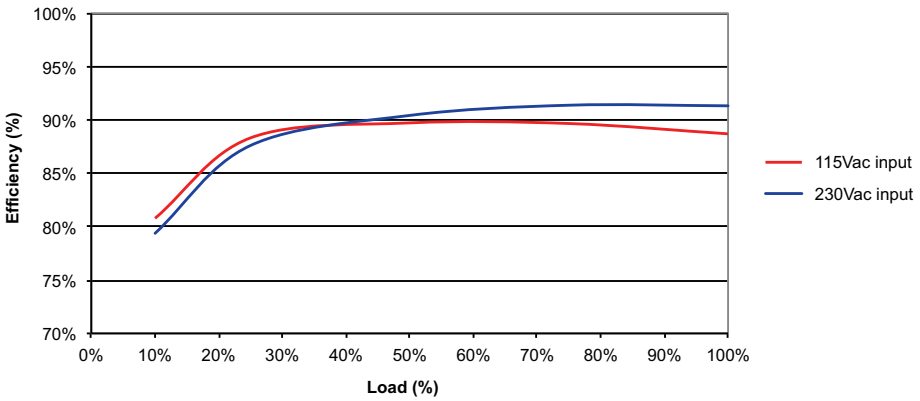
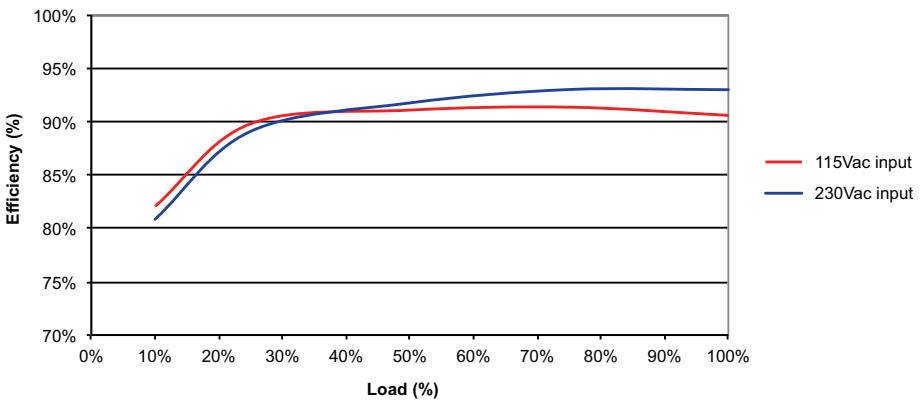



Figure 4
48 V Models

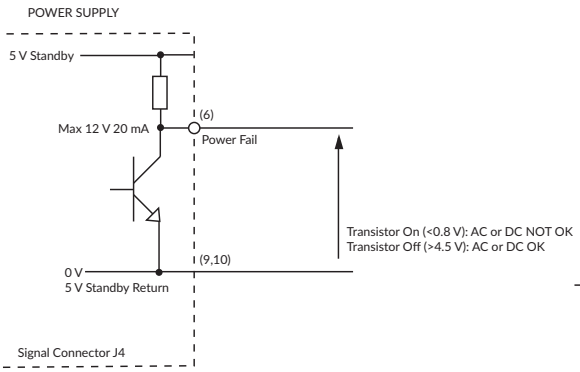


## Signals & Controls

| Characteristic | | Notes & Conditions |
|---|---|---|
| Power Fail | | TTL Compatible, pin 6<br>Provides ≥5 ms warning of loss of output from AC failure. |
| Standby Supply | | 5 VDC/0.2 A referenced to -Vout supply present when AC applied. |
| Remote On/Off | Inhibit | The inhibit lo, should be pulled below 0.4 V to switch V1 & Vfan off. Open circuit or >4 V to switch on (see fig. 7) |
| | Enable | With the inhibit lo (pin 4) pulled low as detailed above, connecting inhibit HI to inhibit LO will enable V1 & V fan output. (see fig. 8) |
| Remote Sense | | Compensates for 0.25V per lead, 0.5V total |

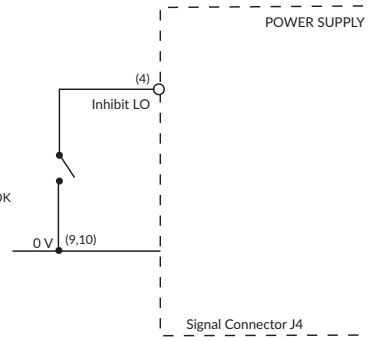
### Power Fail

Figure 6



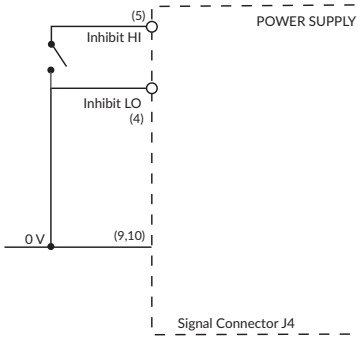

### Remote On/Off (Inhibit)

Figure 7




### Remote On/Off (Enable)

Figure 8




## Environmental

| Characteristic | Minimum | Typical | Maximum | Units | Notes & Conditions |
|---|---|---|---|---|---|
| Operating Temperature | -40 | | +70 | °C | See derating curve, fig. 9 & 10 |
| Storage Temperature | -40 | | +85 | °C | |
| Cooling | 10 | | | CFM | Forced Cooled >180 W |
| Humidity | 5 | | 95 | %RH | Non-condensing |
| Operating Altitude | | | 4000/5000 | m | Medical/ITE |
| Transport Altitude | | | 10000 | m | |
| Shock | | | | | ±3 x 30g shocks in each plane, total 18 shocks. 30g = 11ms (+/-0.5msec), half sine. Conforms to EN60068-2-27 & EN60068-2-47 |
| Vibration | | | | | Single axis 10 - 500 Hz at 2g sweep and endurance at resonance in all 3 planes. Conforms to EN60068-2-6 |

### Thermal Derating Curve

Figure 9 - Convection-cooled

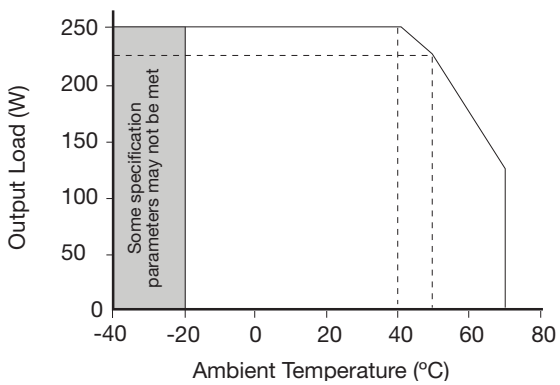
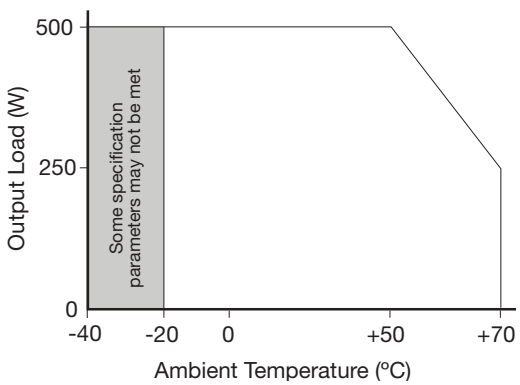



Figure 10 - Forced-cooled 10 CFM & -EF versions



## EMC: Emissions

| Phenomenon | Standard | Test Level | Criteria | Notes & Conditions |
|---|---|---|---|---|
| Conducted | EN55011/32 | Class B | | |
| Radiated | EN55011/32 | Class A | | Class B with 2T on Fair-Rite 2643800502 on output cable |
| Harmonic Currents | EN61000-3-2 | Class A | | |
| Voltage Flicker | EN61000-3-3 | | | |

## EMC: Immunity

| Phenomenon | Standard | Test Level | Criteria | Notes & Conditions |
|---|---|---|---|---|
| Low Voltage PSU EMC | EN61204-3 | High severity level | as below | |
| Harmonic Current | EN61000-3-2 | Class A | | All models |
| | | Class C | | > 270 W |
| Radiated | EN61000-4-3 | 3 | A | |
| EFT | EN61000-4-4 | 3 | A | |
| Surges | EN61000-4-5 | Installation class 3 | A | |
| | | | | |
| Conducted | EN61000-4-6 | 3 | A | |
| Dips and Interruptions | EN61000-4-11 (100 VAC) | Dip 100% (0 VAC), 8.4ms | A | |
| | | Dip 100% (0 VAC), 16.7ms | B | |
| | | Dip 60% (40 VAC), 200ms | B | |
| | | Dip 30% (70 VAC), 500ms | B | |
| | | Dip 20% (80 VAC), 5000ms | B | |
| | | Int 100% (0 VAC), 5000ms | B | |
| | EN61000-4-11 (240 VAC) | Dip 100% (0 VAC), 10ms | A | |
| | | Dip 100% (0 VAC), 20ms | B | |
| | | Dip 60% (96 VAC), 200ms | B | |
| | | Dip 30% (168 VAC), 500ms | B | |
| | | Dip 20% (192 VAC), 5000ms | B | |
| | | Int 100% (0 VAC), 5000ms | B | |
| | EN60601-1-2 (100 VAC) | Dip 100% (0 VAC), 10ms | A | |
| | | Dip 60% (40 VAC), 100ms | A | <180 W |
| | | Dip 30% (70 VAC), 500ms | A | |
| | | Int 100% (0 VAC), 5000ms | B | |
| | EN60601-1-2 (240 VAC) | Dip 100% (0 VAC), 10ms | A | |
| | | Dip 60% (96 VAC), 100ms | A | |
| | | Dip 30% (168 VAC), 500ms | A | |
| | | Int 100% (0 VAC), 5000ms | B | |
| | SEMI F47 (100 VAC) | Dip 33% (70 VAC), 500ms | A | |

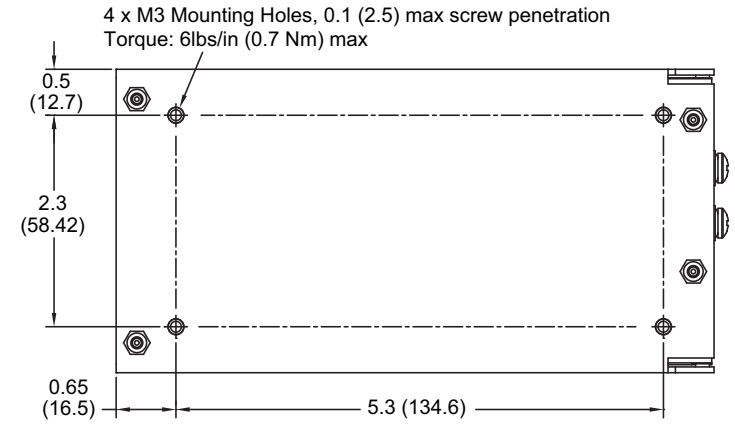
## Safety Approvals

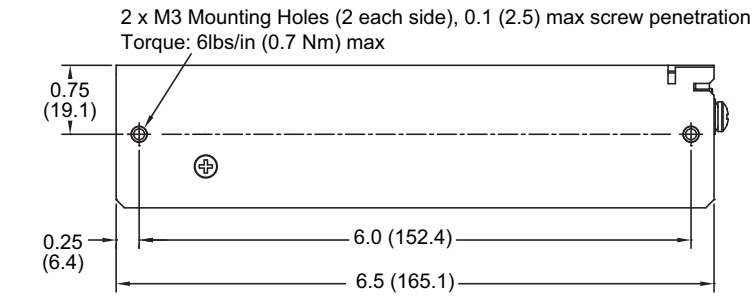
| Safety Agency | Safety Standard | Notes & Conditions |
|---|---|---|
| CB Report | IEC62368-1 Ed 2 | Information Technology |
| | IEC60950-1 | Information Technology |
| | IEC60601-1 Ed 3 Including Risk Management | Medical |
| UL | UL62368-1, CSA 22.2, No.62368-1 | Information Technology |
| | ANSI/AAMI ES60601-1:2005 & CSA C22.2, No.60601-1:08 | Medical |
| TUV | EN62368-1 | Information Technology |
| | EN60601-1/2006 | Medical |
| Equipment Protection Class | Class I | |
| CE | Meets all applicable directives | |
| UKCA | Meets all applicable legislation | |

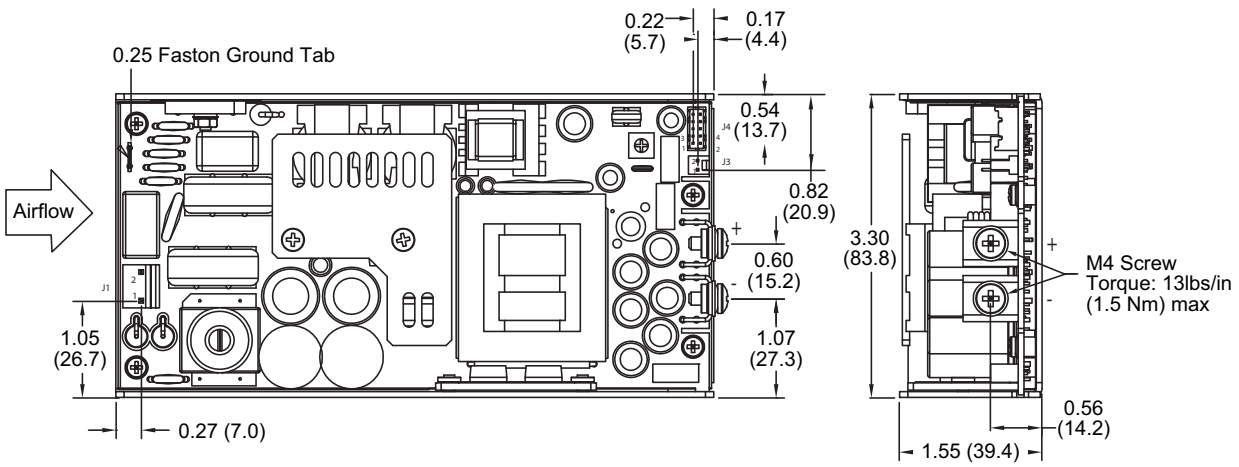
| | Means of Protection | Category |
|---|---|---|
| Primary to Secondary | 2 x MOPP (Means of Patient Protection) | IEC60601-1 Ed 3 |
| Primary to Earth | 1 x MOPP (Means of Patient Protection) | |
| Secondary to Earth | N/A | |

## Mechanical Details

### GCU500PS12–PS18 U-Channel




| Output Connector Screw Terminal Bus Bar M4 Screw | |
|---|---|
| Bar | Function |
| + | +V1 |
| - | RTN |

| Fan Connector J3 Molex pn. 22-04-1021 | |
|---|---|
| Pin | Function |
| 1 | Fan +(12 V) |
| 2 | Fan - |

| Signal Connector J4 JST PN S10B-PHDSS | |
|---|---|
| Pin | Function |
| 1 | +Sense |
| 2 | -Sense |
| 3 | N/C |
| 4 | Inhibit LO |
| 5 | Inhibit HI |
| 6 | P OK |
| 7 | +V Standby |
| 8 | +V Standby |
| 9 | -V Standby |
| 10 | -V Standby |

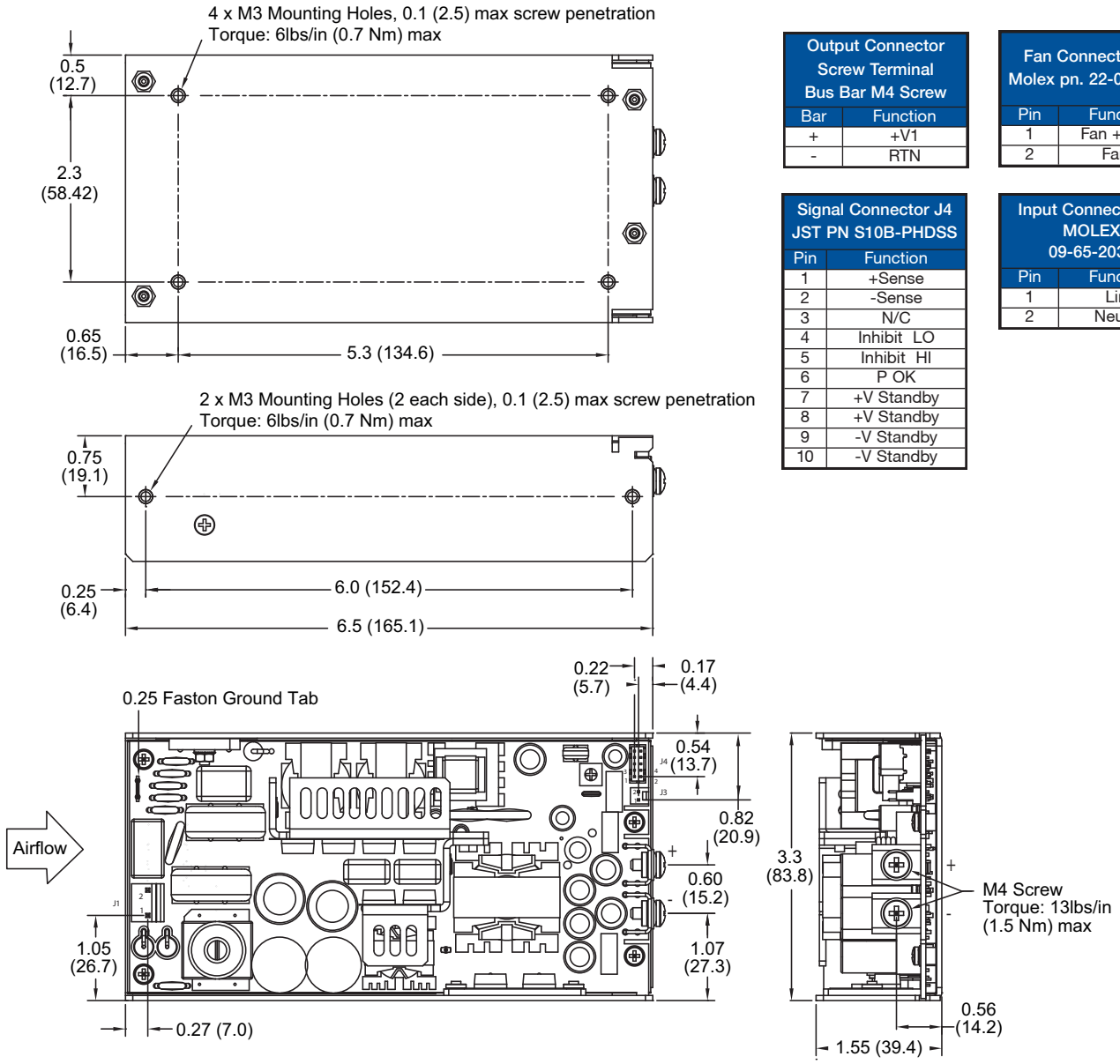
| Input Connector J1 MOLEX p/n: 09-65-2038 | |
|---|---|
| Pin | Function |
| 1 | Line |
| 2 | Neutral |

### Notes

1. All dimensions in inches (mm).
2. Tolerance .xx = ±0.02 (0.50); .xxx = ±0.01 (0.25)
3. J1 mates with MOLEX housing PN 09-50-1031 and with MOLEX series 5194 crimp terminals. J4 mates with JST housing pn PHDR-10VS and with JST SPHD-001T-P0.5 crimp terminals. J3 mates with MOLEX housing pn 22-01-1024 and with MOLEX series 5103 crimp terminals.

## Mechanical Details

### GCU500PS24-PS48 U-Channel




| Output Connector Screw Terminal Bus Bar M4 Screw | |
|---|---|
| Bar | Function |
| + | +V1 |
| - | RTN |

| Fan Connector J3 Molex pn. 22-04-1021 | |
|---|---|
| Pin | Function |
| 1 | Fan +(12 V) |
| 2 | Fan - |

| Signal Connector J4 JST PN S10B-PHDSS | |
|---|---|
| Pin | Function |
| 1 | +Sense |
| 2 | -Sense |
| 3 | N/C |
| 4 | Inhibit LO |
| 5 | Inhibit HI |
| 6 | P OK |
| 7 | +V Standby |
| 8 | +V Standby |
| 9 | -V Standby |
| 10 | -V Standby |

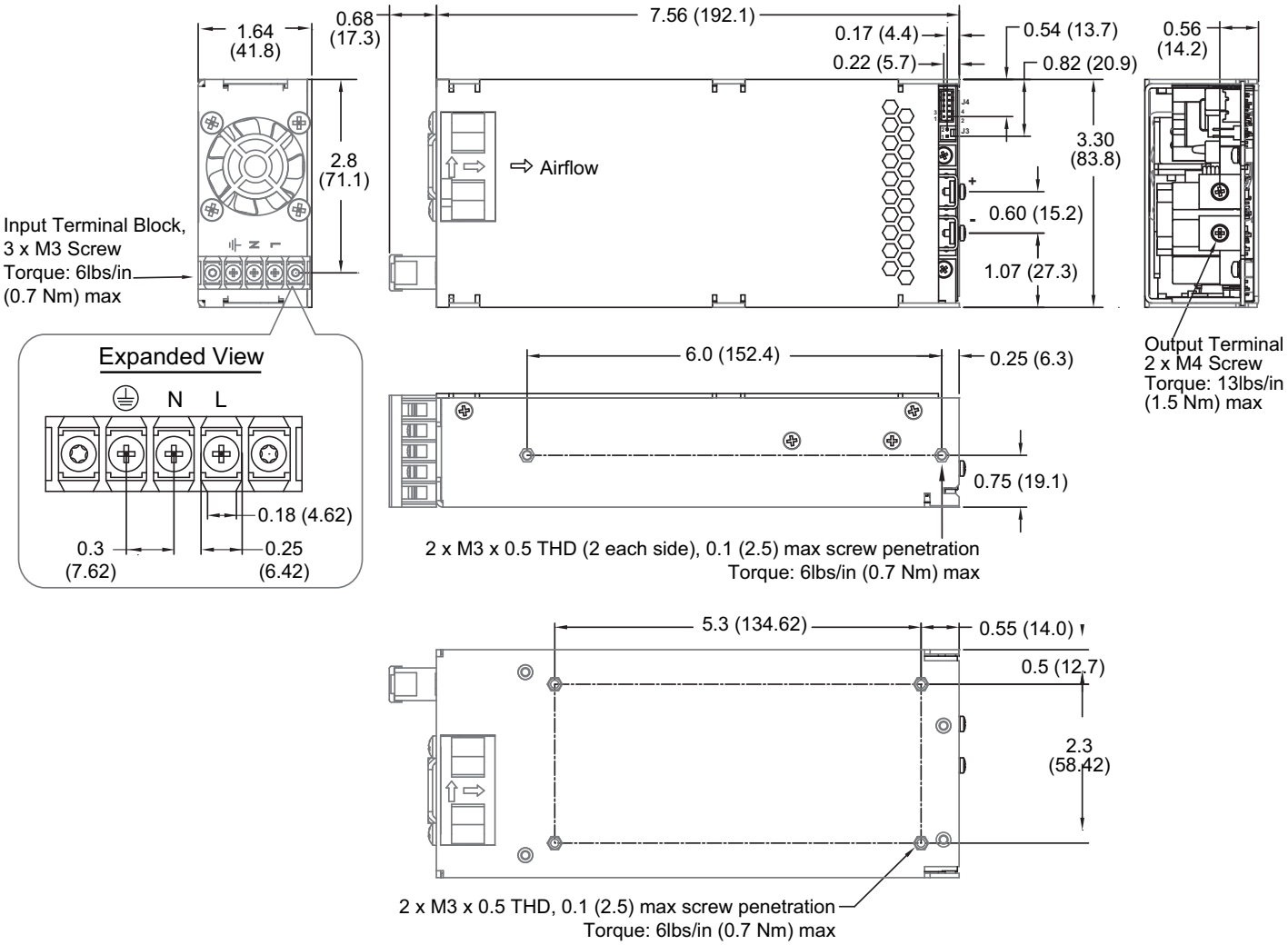
| Input Connector J1 MOLEX 09-65-2038 | |
|---|---|
| Pin | Function |
| 1 | Line |
| 2 | Neutral |

### Notes

1. All dimensions in inches (mm).
2. Tolerance .xx = ±0.02 (0.50); .xxx = ±0.01 (0.25)
3. J1 mates with MOLEX housing PN 09-50-1031 and with MOLEX series 5194 crimp terminals. J4 mates with JST housing pn PHDR-10VS and with JST SPHD-001T-P0.5 crimp terminals. J3 mates with MOLEX housing pn 22-01-1024 and with MOLEX series 5103 crimp terminals.

## Mechanical Details

### End-Fan




| Input Terminal Block Dinkle P/N DT-2C-A02W-03 | |
|---|---|
| | Function |
| L | Line |
| N | Neutral |
| ⏚ | Ground |

| Output Connector Screw Terminal Bus Bar M4 Screw | |
|---|---|
| Bar | Function |
| + | +V1 |
| - | RTN |

| Signal Connector J4 JST PN S10B-PHDSS | |
|---|---|
| Pin | Function |
| 1 | +Sense |
| 2 | -Sense |
| 3 | N/C |
| 4 | Inhibit LO |
| 5 | Inhibit HIS |
| 6 | P OK |
| 7 | +V Standby |
| 8 | +V Standby |
| 9 | -V Standby |
| 10 | -V Standby |

### Notes

1. All dimensions in inches (mm).
2. Tolerance .xx = ±0.02 (0.50); .xxx = ±0.01 (0.25)
3. J4 mates with JST housing pn PHDR-10VS and with JST SPHD-001T-P0.5 crimp terminals.

## Thermal Considerations

In order to ensure safe operation of the PSU in the end-use equipment, the temperature of the components listed in the table below must not be exceeded. Temperature should be monitored using K type thermocouples placed on the hottest part of the component (out of direct air flow). See below for component locations.

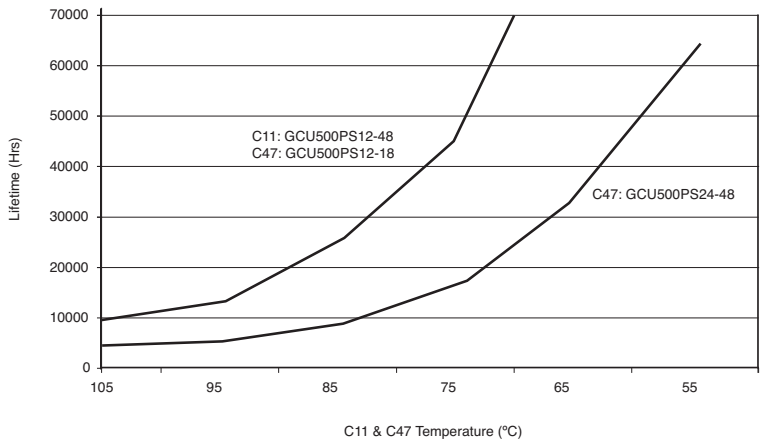
| Temperature Measurements (At Maximum Ambient) | |
|---|---|
| Component | Max Temperature °C |
| T1 Coil | 120°C |
| L3 Coil | 120°C |
| Heatsink | 110°C |
| C11 | 105°C |
| C47 | 105°C |

## Service Life

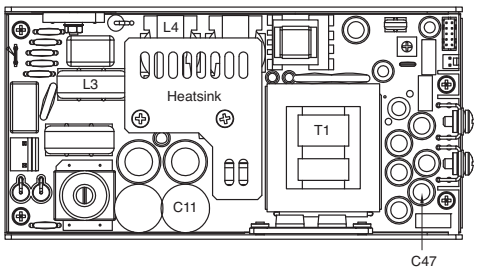
The estimated service life of the GCU500 is determined by the cooling arrangements and load conditions experienced in the end application. Due to the uncertain nature of the end application this estimated service life is based on the actual measured temperature of a key capacitor within the product when installed by the end application,

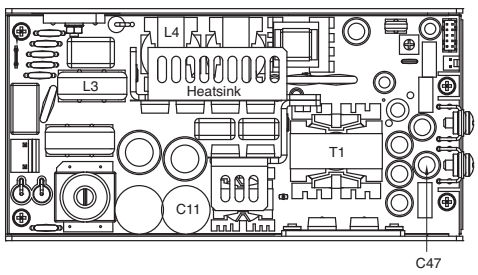
The graph below expresses the estimated lifetime of a given component temperature and assumes continuous operation at this temperature.

### Estimated Service Life vs Component Temperature




### GCU500PS12-18




### GCU500PS24-48