

FEATURES

- ▶ Fully Encapsulated Plastic Case for PCB, Chassis and DIN-Rail Mounting Version
- ▶ Universal Input 85-264VAC, 47-440Hz
- ▶ Single, Dual and Triple Outputs
- ▶ I/O Isolation 3000VAC with Reinforced Insulation
- ▶ Operating Ambient Temp. Range -25°C to +70°C
- ▶ Overload/Voltage and Short Circuit Protection
- ▶ EMI Emission EN55011/32 Class B Approved
- ▶ EMC Immunity EN 61000-4-2,3,4,5,6,8,11 Approved
- ▶ UL508 Safety Approval (Option) Specifically for Industrial Application
- ▶ UL/cUL/IEC/EN 62368-1(60950-1) Safety Approval & CE Marking


PRODUCT OVERVIEW

The MINMAX AQF-30 series is a range of fully encapsulated AC-DC power supply modules. The product features EMI emission EN 55011/32 Class B approved and EMS compliance to EN 61000-4 standard. This series comply with international standard pinout and input voltage range of 85-264VAC for worldwide markets. For industrial applications, the models for chassis mounting can also be supplied as option with UL508 approval. The AQF-30 series provide a cost effective solution for many space critical applications in commercial and industrial electronic equipment.

Model Selection Guide

| Model Number | Output Voltage | Output Current | | Input Current | | Max. capacitive Load | Efficiency (typ.) |
|--------------|----------------|----------------|----------|---------------|----------|----------------------|-------------------|
| | | Max. | Peak | 115VAC, 60Hz | | | |
| | | | | @Max. Load | @No Load | | |
| VDC | mA | mA | mA(typ.) | mA(typ.) | μF | @Max. Load | |
| AQF-30S05 | 5 | 6000 | --- | 557 | 60 | 8000 | 78 |
| AQF-30S12 | 12 | 2500 | --- | 543 | 60 | 3900 | 80 |
| AQF-30S15 | 15 | 2000 | --- | 543 | 60 | 3900 | 80 |
| AQF-30S24 | 24 | 1250 | --- | 543 | 60 | 1500 | 80 |
| AQF-30S48 | 48 | 625 | --- | 543 | 60 | 1000 | 80 |
| AQF-30D12 | ±12 | ±1300 | --- | 565 | 60 | #1500 | 80 |
| AQF-30D15 | ±15 | ±1000 | --- | 543 | 60 | #1500 | 80 |
| AQF-30D512 | *5 | 3000 | 4500 | 572 | 60 | 3900 | 76 |
| | *12 | 1250 | 1800 | | | 1500 | |
| AQF-30T512 | *5 | 3000 | 4500 | 572 | 60 | 2200 | 76 |
| | 12 | 600 | 900 | | | 1500 | |
| | -12 | -600 | 900 | | | 1500 | |
| AQF-30T512A | *5 | 3000 | 4500 | 572 | 60 | 2200 | 76 |
| | 12 | 1000 | 1500 | | | 1500 | |
| | -12 | -250 | 500 | | | 1500 | |
| AQF-30T515 | *5 | 3000 | 4500 | 572 | 60 | 2200 | 76 |
| | 15 | 500 | 750 | | | 1500 | |
| | -15 | -500 | 750 | | | 1500 | |
| AQF-30T5312P | *5 | 4500 | 6000 | 588 | 60 | 2200 | 71 |
| | +3.3 | 1000 | 1500 | | | 2200 | |
| | +12 | 250 | 500 | | | 1500 | |
| AQF-30T3512P | *3.3 | 4000 | 5300 | 483 | 60 | 2200 | 71 |
| | +5 | 1500 | 2000 | | | 2200 | |
| | +12 | 250 | 500 | | | 1500 | |

* Output floating (note 6)

For each output

| Input Specifications | | | | | | |
|-----------------------|--------------------|--------------------|------|------|------|------|
| Parameter | Conditions / Model | | Min. | Typ. | Max. | Unit |
| Input Voltage Range | All Models | | 85 | --- | 264 | VAC |
| Input Frequency Range | | | 47 | --- | 440 | Hz |
| Input Voltage Range | | | 120 | --- | 370 | VDC |
| Inrush Current | 115VAC | Cold Start at 25°C | --- | --- | 20 | A |
| | 230VAC | | --- | --- | 40 | A |

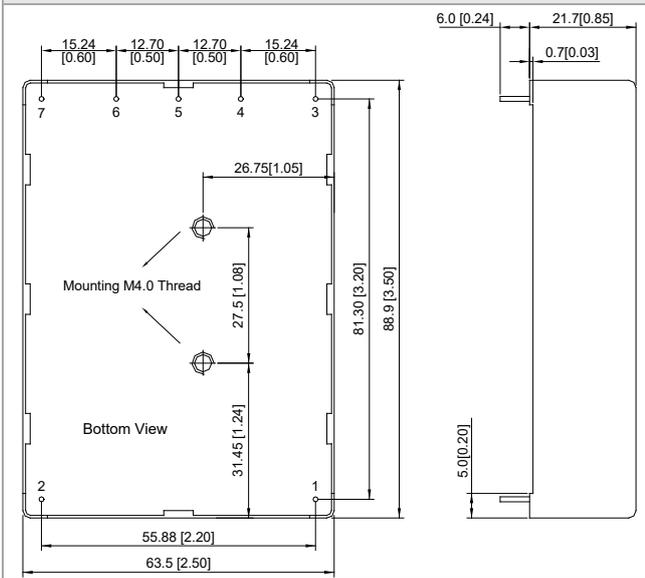
| Output Specifications | | | | | | | |
|--|--|--|-----------|-------|------|------------------------|---|
| Parameter | Conditions / Model | | Min. | Typ. | Max. | Unit | |
| Output Voltage Setting Accuracy | Single / Dual Output | | --- | ±1.0 | ±2.0 | %Vnom. | |
| | Dual Positive / Triple Output | Vo1 | --- | ±1.0 | ±2.0 | %Vnom. | |
| | | Vo2 & Vo3 | --- | ±3.0 | --- | %Vnom. | |
| Line Regulation | Vin=Min. to Max. @Full Load | | --- | ±0.2 | ±1.0 | % | |
| Load Regulation | Iout=Min. to Max. | Single Output Models | --- | ±0.5 | ±1.0 | % | |
| | | Dual Output Models | --- | ±2.5 | ±5.0 | % | |
| | | Triple Output Models | Vo1 | --- | ±2.5 | ±5.0 | % |
| | | | Vo2 & Vo3 | --- | ±4.0 | --- | % |
| Cross Regulation- Dual / Triple Output Models | Vo1 | Measured output Io = 20% to 100% of rated load Other output(s) set at 50% of rated load | --- | ±2.0 | --- | % | |
| | Vo2 | | --- | ±5.0 | --- | % | |
| | Vo3 | | --- | ±5.0 | --- | % | |
| Ripple & Noise | 0-20 MHz Bandwidth | 3.3V & 5VDC Output Models | --- | 1.5 | 1.8 | %V _{PP} of Vo | |
| | | Other Output Models | --- | 1.0 | 1.3 | %V _{PP} of Vo | |
| Minimum Load | Single, Dual-Output Models and Main Output Triple Output Models | | --- | 10 | --- | %Inom. | |
| | Auxiliary Outputs of Triple Output Models | | --- | 20 | --- | %Inom. | |
| Over Voltage Protection | Zener diode clamp | | --- | 120 | --- | % of Vo | |
| Temperature Coefficient | | | --- | ±0.02 | --- | %/°C | |
| Overshoot | | | --- | --- | 5 | % Vout | |
| Over Load Protection | Hiccup mode, auto-recovery | | 105 | --- | --- | % Inom. | |
| | (long term overload condition may cause damage) | | | | | | |
| Short Circuit Protection | Hiccup mode, Automatic Recovery | | | | | | |

| General Specifications | | | | | | |
|--------------------------|---|--|---------|------|------|-------|
| Parameter | Conditions | | Min. | Typ. | Max. | Unit |
| I/O Isolation Voltage | Input to Output, 60 Seconds | | 3000 | --- | --- | VAC |
| I/O Isolation Resistance | 500 VDC | | 100 | --- | --- | MΩ |
| Switching Frequency | | | --- | 100 | --- | kHz |
| Hold-up Time | | | --- | 20 | --- | ms |
| MTBF (calculated) | MIL-HDBK-217F@25°C, Ground Benign | | 200,000 | | | Hours |
| Safety Approvals | UL/cUL 60950-1 recognition(UL certificate), IEC/EN 60950-1(CB-report) | | | | | |
| | UL/cUL 62368-1 recognition(UL certificate), IEC/EN 62368-1(CB-report) | | | | | |
| | UL/cUL 508 listed certificate | | | | | |

| EMC Specifications | | | | |
|--------------------|--------------------------------------|---|--|-------------|
| Parameter | Standards & Level | | | Performance |
| EMI | Conduction | EN 55011, EN 55032, EN 61000-6-4, | | Class B |
| | Radiation | EN 61000-6-3 | | |
| EMS | EN 55035, EN 61000-6-2, EN 61000-6-1 | | | |
| | ESD | EN 61000-4-2 air \pm 8kV, Contact \pm 4kV | | B |
| | Radiated immunity | EN 61000-4-3 10V/m | | A |
| | Fast transient | EN 61000-4-4 \pm 2kV | | B |
| | Surge | EN 61000-4-5 \pm 1kV | | B |
| | Conducted immunity | EN 61000-4-6 10Vrms | | B |
| | PFMF | EN 61000-4-8 30A/m | | A |
| | Dips | EN 61000-4-11 30% 10ms | | B |
| | Interruptions | EN 61000-4-11 >95% 5000ms | | C |

| Environmental Specifications | | | | | |
|---|--|------|-------|------|----------|
| Parameter | Conditions | Min. | Typ. | Max. | Unit |
| Operating Ambient Temperature Range | | -25 | --- | +70 | °C |
| Power Derating | +50°C to +70°C | | 1.125 | | W / °C |
| Storage Temperature Range | | -40 | --- | +85 | °C |
| Thermal Shutdown | Shutdown, Internal IC Junction Temperature | --- | 140 | --- | °C |
| | Automatic Recovery, Internal IC Junction Temperature | --- | 65 | --- | °C |
| Humidity (non condensing) | | --- | --- | 95 | % rel. H |
| Lead Temperature (1.5mm from case for 10Sec.) | | --- | --- | 260 | °C |

| Notes | |
|-------|---|
| 1 | All specifications typical at Ta=+25°C, resistive load, 115VAC, 60Hz input voltage and after warm-up time rated output current unless otherwise noted. |
| 2 | We recommend to protect the converter by a slow blow fuse in the input supply line. |
| 3 | These power modules require a minimum output loading to maintain specified regulation, operation under no-load conditions will not damage the power supplies however they may not meet all listed specifications. |
| 4 | Other input and output voltage may be available, please contact MINMAX. |
| 5 | Peak current can't be drawn from all output at the same time. |
| 6 | Floating (or isolated) output of a power supply that is not connected to any other output. |
| 7 | Specifications are subject to change without notice. |
| 8 | The repeated high voltage isolation testing of the converter can degrade isolation capability, to a lesser or greater degree depending on materials, construction, environment and reflow solder process. Any material is susceptible to eventual chemical degradation when subject to very high applied voltages thus implying that the number of tests should be strictly limited. We therefore strongly advise against repeated high voltage isolation testing, but if it is absolutely required, that the voltage be reduced by 20% from specified test voltage. Furthermore, the high voltage isolation capability after reflow solder process should be evaluated as it is applied on system. |

Package Specifications PCB Mounting
Mechanical Dimensions

Pin Connections

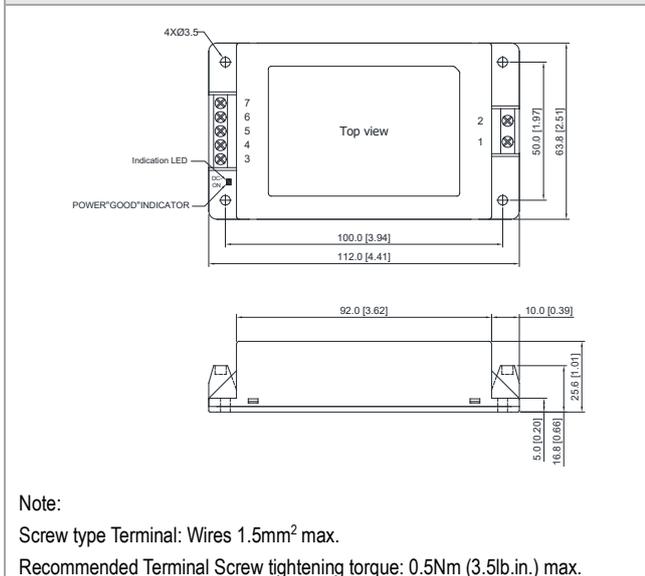
| Pin | Single | Dual (D12, D15) | Dual (D512) | Triple | Triple (T5312P, T3512P) | Diameter mm (inches) |
|-----|--------------------|-----------------|-------------|----------|-------------------------|----------------------|
| 1 | AC(N) – AC Neutral | | | | | Ø 1.0 [0.04] |
| 2 | AC(L) – AC Line | | | | | Ø 1.0 [0.04] |
| 3 | +Vout | +Vout | +Vout2 | +Vout2 | +Vout2 | Ø 1.0 [0.04] |
| 4 | No Pin | | +Vout1 | +Vout1 | +Vout1 | Ø 1.0 [0.04] |
| 5 | -Vout | Common | -Vout2 | Com. 2/3 | Com. 2/3 | Ø 1.0 [0.04] |
| 6 | No Pin | | -Vout1 | -Vout1 | -Vout1 | Ø 1.0 [0.04] |
| 7 | NC | -Vout | NC | -Vout3 | +Vout3 | Ø 1.0 [0.04] |

NC: No Connection

- ▶ All dimensions in mm (inches)
- ▶ Tolerance: ± 0.5 (± 0.02)
- ▶ Pin pitch tolerance: ± 0.25 (± 0.01)
- ▶ Pin diameter tolerance: $X.X \pm 0.1$ ($X.XX \pm 0.004$)

Physical Characteristics

| | |
|---------------|--|
| Case Size | : 88.9x63.5x21.7mm (3.50x2.50x0.85 inches) |
| Case Material | : Plastic resin (flammability to UL 94V-0 rated) |
| Pin Material | : Copper Alloy |
| Weight | : 211g |

Package Specifications Chassis Mounting with screw terminal (order code suffix C)
Mechanical Dimensions

Connections

| Terminal | Single | Dual (D12, D15) | Dual (D512) | Triple | Triple (T5312P, T3512P) |
|----------|--------------------|-----------------|-------------|----------|-------------------------|
| 1 | AC(N) – AC Neutral | | | | |
| 2 | AC(L) – AC Line | | | | |
| 3 | +Vout | +Vout | +Vout2 | +Vout2 | +Vout2 |
| 4 | NC | | +Vout1 | +Vout1 | +Vout1 |
| 5 | -Vout | Common | -Vout2 | Com. 2/3 | Com. 2/3 |
| 6 | NC | | -Vout1 | -Vout1 | -Vout1 |
| 7 | NC | -Vout | NC | -Vout3 | +Vout3 |

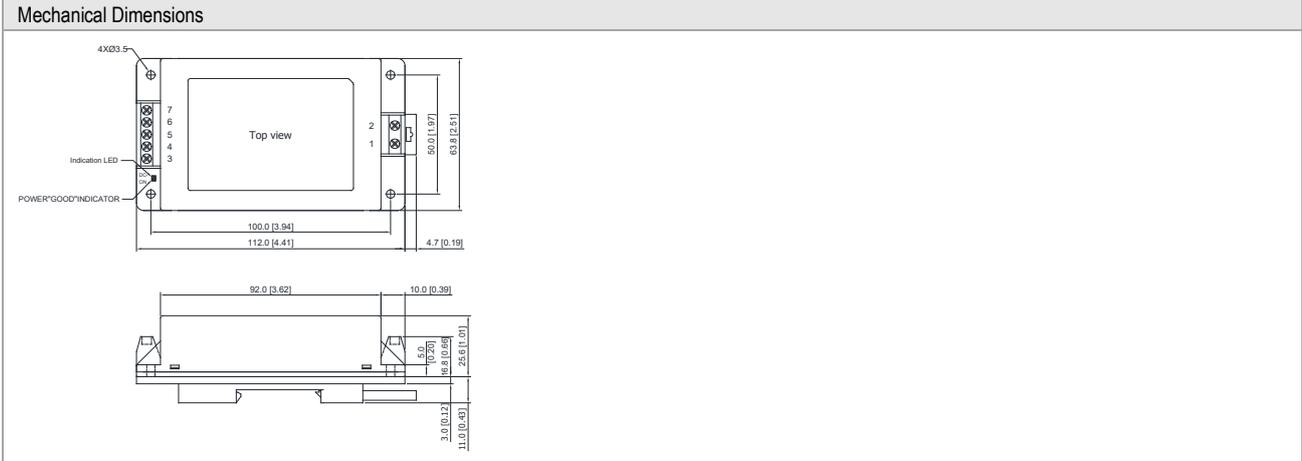
NC: No Connection

- ▶ All dimensions in mm (inches)
- ▶ Tolerance: $X.X \pm 0.5$ ($X.XX \pm 0.02$)
 $X.XX \pm 0.25$ ($X.XXX \pm 0.01$)

Physical Characteristics

| | |
|---------------|--|
| Case Size | : 112.0x63.8x25.6mm (4.41x2.51x1.01 inches) |
| Case Material | : Plastic resin (flammability to UL 94V-0 rated) |
| Weight | : 208g |

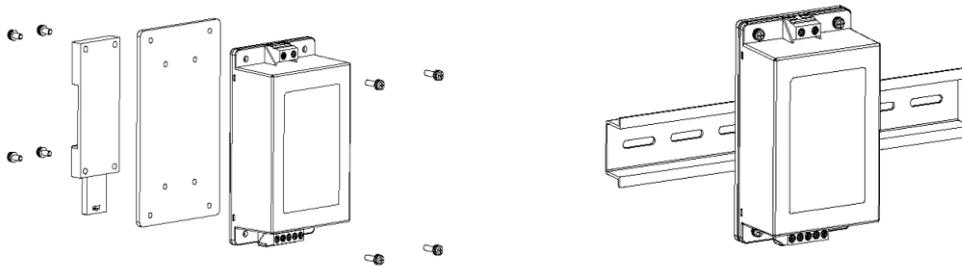
Package Specifications for screw terminal with DIN Rail Mounting (order code suffix AC-DIN-02)



Physical Characteristics

| | |
|---------------|--|
| Case Size | : 112.0x63.8x25.6mm (4.41x2.51x1.01 inches) |
| Case Material | : Plastic resin (flammability to UL 94V-0 rated) |
| Weight | : 262g |

Screw terminal with DIN Rail Mounting



Note:

Recommended tightening torque: 0.35Nm (3.1lb.in.) max.

Order Code Table

| PCB Mounting | Chassis Mounting | PCB Mounting With UL508 | Chassis Mounting With UL508 | With DIN Rail Mounting by two Order Code | | Chassis Mounting with UL508 & DIN Rail Mounting by two Order Code | |
|--------------|------------------|-------------------------|-----------------------------|--|-----------|---|-----------|
| AQF-30S05 | AQF-30S05C | AQF-30S05ICE | AQF-30S05CICE | AQF-30S05C | AC-DIN-02 | AQF-30S05CICE | AC-DIN-02 |
| AQF-30S12 | AQF-30S12C | AQF-30S12ICE | AQF-30S12CICE | AQF-30S12C | AC-DIN-02 | AQF-30S12CICE | AC-DIN-02 |
| AQF-30S15 | AQF-30S15C | AQF-30S15ICE | AQF-30S15CICE | AQF-30S15C | AC-DIN-02 | AQF-30S15CICE | AC-DIN-02 |
| AQF-30S24 | AQF-30S24C | AQF-30S24ICE | AQF-30S24CICE | AQF-30S24C | AC-DIN-02 | AQF-30S24CICE | AC-DIN-02 |
| AQF-30S48 | AQF-30S48C | AQF-30S48ICE | AQF-30S48CICE | AQF-30S48C | AC-DIN-02 | AQF-30S48CICE | AC-DIN-02 |
| AQF-30D12 | AQF-30D12C | AQF-30D12ICE | AQF-30D12CICE | AQF-30D12C | AC-DIN-02 | AQF-30D12CICE | AC-DIN-02 |
| AQF-30D15 | AQF-30D15C | AQF-30D15ICE | AQF-30D15CICE | AQF-30D15C | AC-DIN-02 | AQF-30D15CICE | AC-DIN-02 |
| AQF-30D512 | AQF-30D512C | --- | --- | AQF-30D512C | AC-DIN-02 | --- | --- |
| AQF-30T512 | AQF-30T512C | --- | --- | AQF-30T512C | AC-DIN-02 | --- | --- |
| AQF-30T512A | AQF-30T512AC | --- | --- | AQF-30T512AC | AC-DIN-02 | --- | --- |
| AQF-30T515 | AQF-30T515C | --- | --- | AQF-30T515C | AC-DIN-02 | --- | --- |
| AQF-30T5312P | AQF-30T5312PC | --- | --- | AQF-30T5312PC | AC-DIN-02 | --- | --- |
| AQF-30T3512P | AQF-30T3512PC | --- | --- | AQF-30T3512PC | AC-DIN-02 | --- | --- |