

# ADVANCED ENERGY FCM30K SERIES MODULE

30,000 W Bulk Front End  
Narrow Trim



## PRODUCT DESCRIPTION

Advanced Energy's FCM30K Narrow Trim Series provides for a wide range of AC-DC embedded power requirement. Featuring high build quality with robust screw terminals, long life, and typical full-load efficiency of greater than 95.5%, these units are ideal for use in industrial applications. They are backed by a comprehensive set of industrial safety approvals and certificates. Variable-speed "smart fans" draw on software controls developed by Advanced Energy to match fan speed to the unit's cooling requirement and load current. Slowing the fan not only saves power but also reduces wear, thus extending its life.

## SPECIAL FEATURES

- 30,000 W output power
- 85.2 mm x 448 mm x 595 mm
- -40 to +50°C, for variants capable of operating up to 70°C, (+50°C to 70°C) power is derated
- 5 V at 1 A housekeeping
- High efficiency: >95.5% typical at full load
- Supports Read-Only NFC Tag Application
- Semi F47 compliance (Tested at 480 VAC, 54.5 VDC, 30 kW)
- Five-year warranty

## SAFETY

- UL 62368-1, 3<sup>rd</sup> Ed
- CAN/CSA C22.2 No. 62368-1:19, 3<sup>rd</sup> Ed
- EN IEC 62368-1:2020/A11:2020
- IEC 62368-1: 2018 3<sup>rd</sup> Ed
- CB Certificate and Report (IEC 62368-1 3<sup>rd</sup> Ed)
- CE (LVD+RoHS), EN 62368-1 3<sup>rd</sup> Edition

## COMPLIANCE

- EMI Class B, with 6 dB margin
- EN61000 Immunity

## AT A GLANCE

### Total Power

30,000 W

### Input Voltage

187 to 528 VAC, 3 Phase 3 Wire + PE

### Nominal Output Voltage

54.5 VDC

### # of Outputs

Single



RoHS

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## SECTION 1 MODEL NUMBERS

| Standard   | Nominal Output Voltage | Trim Range   | Max Current | Standby Output | Efficiency                  |
|------------|------------------------|--------------|-------------|----------------|-----------------------------|
| FCM30KSHNW | 54.5 VDC               | 48 to 60 VDC | 550.5A      | 5V at 1A       | 95.5%<br>(480VAC / 54.5VDC) |

| FCM30K-SHF MODEL NUMBER SCHEME |                 |                                              |                |                 |                    |                 |
|--------------------------------|-----------------|----------------------------------------------|----------------|-----------------|--------------------|-----------------|
| FCM30KSHYX                     | -               | A                                            | B              | C               | D                  | 4XX             |
|                                |                 |                                              |                |                 |                    |                 |
| Shelf Size (mm)                |                 | Input Connector Option                       | Interface Type | Input Codes     | Option Codes       | Hardware Code   |
|                                |                 |                                              |                |                 |                    |                 |
| 30000W = 85.2 x 448 x 595      |                 | T = Input Terminal Block                     | R = MODBUS RTU | M = PMI Added   | Blank = No Options | 4XX = Mod Codes |
|                                |                 | P = Input Connection Plug (Pluggable module) |                | N = PMI Removed | 1 = Conformal Coat |                 |
|                                |                 |                                              |                |                 | 2 = Future Option  |                 |
|                                |                 |                                              |                |                 |                    |                 |
| Module Trim Range Y =          |                 |                                              |                |                 |                    |                 |
| Code                           | Volts           |                                              |                |                 |                    |                 |
| N                              | Narrow/Std Trim |                                              |                |                 |                    |                 |
| Module Output Code X =         |                 |                                              |                |                 |                    |                 |
| Code                           | Volts           |                                              |                |                 |                    |                 |
| W                              | 54.5V           |                                              |                |                 |                    |                 |

Example - FCM30KSHNW-PRM = FCM30K Shelf 54V Narrow Trim, Pluggable AC input, MODBUS RTU, with PMI

## SECTION 2 ELECTRICAL SPECIFICATIONS

### 2.1 Absolute Maximum Ratings

Stress in excess of those listed in the “Absolute Maximum Ratings” may cause permanent damage to the power supply. These are stress ratings only and functional operation of the unit is not implied at these or any other conditions above those given in the operational sections of this TRN. Exposure to any absolute maximum rated condition for extended periods may adversely affect the power supply’s reliability.

| Table 1. Absolute Maximum Ratings                                                                                                                                                                                                                                |             |             |                            |                            |                                           |                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|----------------------------|----------------------------|-------------------------------------------|----------------------------------------|
| Parameter                                                                                                                                                                                                                                                        | Model       | Symbol      | Min                        | Typ                        | Max                                       | Unit                                   |
| Input Voltage<br>AC continuous operation                                                                                                                                                                                                                         | All modules | $V_{IN,AC}$ | 187                        | -                          | 528                                       | VAC                                    |
| Maximum Output Power<br>60VDC<br>54.5VDC<br>48VDC                                                                                                                                                                                                                | All modules | $P_{O,max}$ | -<br>-<br>-                | -<br>-<br>-                | 30000<br>30000<br>26400                   | W                                      |
| Isolation Voltage<br>Primary to Protective Earth (PE)<br>Primary to Secondary<br>Primary to Isolated Secondary<br>Secondary to Isolated Secondary<br>Secondary to Protective Earth (PE) <sup>1</sup><br>Isolated Secondary to Protective Earth (PE) <sup>1</sup> | All modules |             | -<br>-<br>-<br>-<br>-<br>- | -<br>-<br>-<br>-<br>-<br>- | 2500<br>5000<br>5000<br>500<br>100<br>100 | VDC<br>VDC<br>VDC<br>VDC<br>VDC<br>VDC |
| Ambient Operating Temperature <sup>2</sup>                                                                                                                                                                                                                       | All modules | $T_A$       | -40                        | -                          | +50                                       | °C                                     |
| Storage Temperature                                                                                                                                                                                                                                              | All modules | $T_{STG}$   | -40                        | -                          | +85                                       | °C                                     |
| Humidity (non-condensing)<br>Operating<br>Non-operating                                                                                                                                                                                                          | All modules |             | 10<br>10                   | -<br>-                     | 90<br>95                                  | %<br>%                                 |
| Altitude<br>Operating<br>Non-operating                                                                                                                                                                                                                           | All modules |             | -<br>-                     | -<br>-                     | 3000<br>9144                              | m<br>m                                 |
| MTBF <sup>3</sup>                                                                                                                                                                                                                                                | All modules |             | 200                        | -                          | -                                         | kHours                                 |

Note 1 - 100 VDC applies to PSU variant with output voltage 60V. During production test, remove SPD connect or disconnect screw for both shelf and module before Hi-pot test; During safety test, lift GDT and remove SPD connect or disconnect Screw before conducting safety level test.

Note 2 - Start at -40°C requires a 5 minutes operating warm-up. Above 50°C to 70°C power is derated.

Note 3 - Using Telcordia specifications @ 25°C ambient at full load, nominal line of 220V/240V AC. With the power supply installed in a system in a 35°C ambient environment and operating at full load, capacitor life shall be 5 years, minimum, for all electrolytic capacitors contained within this power supply.

## SECTION 2 ELECTRICAL SPECIFICATIONS

### 2.2 Input Specifications

| Table 2. Input Specifications                                        |                                                                                                                                                                  |                  |               |       |     |          |
|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------|-------|-----|----------|
| Parameter                                                            | Condition                                                                                                                                                        | Symbol           | Min           | Typ   | Max | Unit     |
| Operating Input Voltage, AC                                          | All                                                                                                                                                              | $V_{IN,AC}$      | 187           | 208   | 229 | VAC      |
|                                                                      |                                                                                                                                                                  |                  | 216           | 240   | 264 | VAC      |
|                                                                      |                                                                                                                                                                  |                  | 311           | 346   | 381 | VAC      |
|                                                                      |                                                                                                                                                                  |                  | 324           | 360   | 396 | VAC      |
|                                                                      |                                                                                                                                                                  |                  | 342           | 380   | 418 | VAC      |
|                                                                      |                                                                                                                                                                  |                  | 360           | 400   | 440 | VAC      |
|                                                                      |                                                                                                                                                                  |                  | 396           | 440   | 484 | VAC      |
|                                                                      |                                                                                                                                                                  |                  | 432           | 480   | 528 | VAC      |
| Input AC Frequency                                                   | All                                                                                                                                                              | $f_{IN}$         | 47            | 50/60 | 63  | Hz       |
| Maximum Input Current<br>( $I_O = I_{O,max}$ )                       | $V_{IN,AC} = 480 \text{ VAC}$<br>$V_O = 54.5 \text{ VDC}$<br>$P_O = 30,000 \text{ W}$                                                                            | $I_{IN,max}$     | -             | -     | 45  | A        |
| No Load Input Current<br>( $V_O = \text{On}$ , $I_O = 0 \text{ A}$ ) | $V_{IN,AC} = 480 \text{ VAC}$                                                                                                                                    | $P_{IN,no-load}$ | -             | 2.29  | -   | A        |
| Harmonic Line Currents                                               | All                                                                                                                                                              | THD              | EN 61000-3-12 |       |     |          |
| Power Factor                                                         | $V_{IN,AC} = 480 \text{ VAC}$<br>$V_O = 54.5 \text{ V}$<br>$I_O = 10\% I_{O,max}$<br>$I_O = 25\% I_{O,max}$<br>$I_O = 50\% I_{O,max}$<br>$I_O = 100\% I_{O,max}$ | PF               | -             | 0.78  | -   | -        |
|                                                                      |                                                                                                                                                                  |                  | -             | 0.90  | -   | -        |
|                                                                      |                                                                                                                                                                  |                  | -             | 0.98  | -   | -        |
|                                                                      |                                                                                                                                                                  |                  | -             | 0.98  | -   | -        |
|                                                                      |                                                                                                                                                                  |                  | -             | 0.98  | -   | -        |
| Startup Surge Current (Inrush)                                       | All                                                                                                                                                              | $I_{IN,surge}$   | -             | -     | 180 | $A_{PK}$ |
| Efficiency                                                           | $V_{IN,AC} = 480 \text{ VAC}$<br>$I_O = 10\% I_{O,max}$<br>$I_O = 20\% I_{O,max}$<br>$I_O = 50\% I_{O,max}$<br>$I_O = 80\% I_{O,max}$<br>$I_O = 100\% I_{O,max}$ | $\eta$           | -             | 91.0  | -   | %        |
|                                                                      |                                                                                                                                                                  |                  | -             | 93.0  | -   | %        |
|                                                                      |                                                                                                                                                                  |                  | -             | 96.0  | -   | %        |
|                                                                      |                                                                                                                                                                  |                  | -             | 95.8  | -   | %        |
|                                                                      |                                                                                                                                                                  |                  | -             | 95.5  | -   | %        |
| System Stability                                                     | Phase Margin<br>Gain Margin                                                                                                                                      |                  | 45            | -     | -   | $\phi$   |
|                                                                      |                                                                                                                                                                  |                  | -6            | -     | -   | dB       |

## SECTION 2 ELECTRICAL SPECIFICATIONS

### 2.3 Output Specifications

| Table 3. Output - Module In Voltage Source Mode |                                                     |                            |        |                |            |          |
|-------------------------------------------------|-----------------------------------------------------|----------------------------|--------|----------------|------------|----------|
| Parameter                                       | Condition                                           | Symbol                     | Min    | Typ            | Max        | Unit     |
| Nominal Output Voltage                          | All                                                 | $V_O$                      | -      | 54.5           | -          | VDC      |
| Standby Output Voltage                          | All                                                 | $V_{Standby}$              | 4.7    | 5 <sup>1</sup> | 5.25       | VDC      |
| Output Current                                  | All                                                 | $I_O$                      | 0      | -              | 551        | A        |
| Standby Output Current                          | All                                                 | $I_{Standby}$              | 0      | -              | 1          | A        |
| Output Voltage Adjustment Range                 | All                                                 | $V_O$                      | 48     | -              | 60         | VDC      |
| Programming Accuracy                            | Via digital command                                 | $\pm\%V_O$                 | -      | -              | 1          | %        |
| Output Static Regulation                        | At steady state line                                | $V_O$<br>$\pm V_{Standby}$ | -<br>- | -<br>-         | +1/-2<br>5 | %        |
|                                                 | At steady state load                                | $V_O$<br>$\pm V_{Standby}$ | -<br>- | -<br>-         | +1/-2<br>5 | %        |
|                                                 | At no load                                          | $V_O$<br>$\pm V_{Standby}$ | -<br>- | -<br>-         | +2/-2<br>5 | %        |
| Line Transient Regulation<br>Peak Deviation     | All                                                 | $\pm V_O$                  | -      | -              | 3          | %        |
| Load Transient Regulation<br>Peak Deviation     | 25% load change<br>1A/us slew rate                  | $\pm\%V_O$                 | -      | -              | 5          | %        |
| Output Ripple, pk-pk                            |                                                     | $V_O$<br>$V_{Standby}$     | -<br>- | -<br>-         | 1<br>100   | %<br>mV  |
| Output Load Capacitance <sup>2</sup>            | All                                                 | $C_O$                      | 0      | -              | 66,000     | uF       |
| Output Rise Time                                | All                                                 | $t_{Rise}$                 | -      | -              | 100        | ms       |
| Hold Up Time                                    | $V_O = 54.5$ VDC<br>$P_O = 18$ kW,<br>$P_O = 30$ kW | $t_{Hold-up}$              | -<br>- | -<br>-         | 20<br>12   | ms<br>ms |

Note 1 - 5V standby guaranteed with three FCM10k PSUs.

Note 2 - The maximum capacitive load at system level is 22,000 uF per module (66000uF max).

## SECTION 2 ELECTRICAL SPECIFICATIONS

### 2.4 FCM30K Performance Curves



Figure 1: FCM30K Turn-on delay via AC mains  
 Vin = 208VAC Load: Io = 251A  
 Ch 1: Vin Ch 2: Vo Ch 3: Io<sub>1</sub> Ch 4: Io<sub>2</sub>

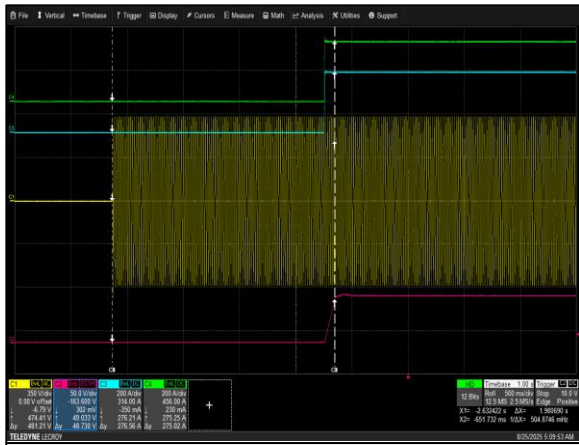


Figure 2: FCM30K Turn-on delay via AC mains  
 Vin = 480VAC Load: Io = 551A  
 Ch 1: Vin Ch 2: Vo Ch 3: Io<sub>1</sub> Ch 4: Io<sub>2</sub>



Figure 3: FCM30K Hold-up Time  
 Vin = 408VAC Load: Io = 330A  
 Ch 1: Vin Ch 2: Vo Ch 3: Io<sub>1</sub> Ch 4: Io<sub>2</sub>

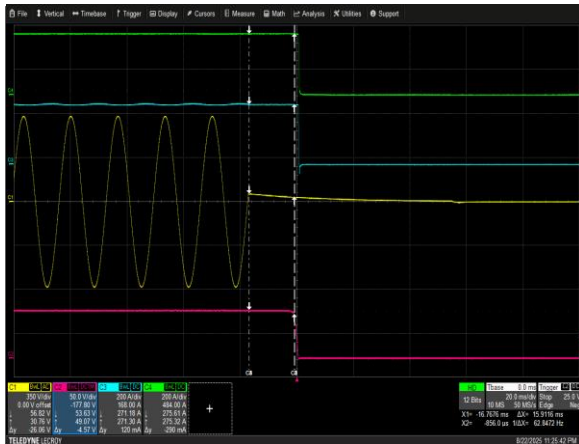


Figure 4: FCM30K Hold-up Time  
 Vin = 480VAC Load: Io = 551A  
 Ch 1: Vin Ch 2: Vo Ch 3: Io<sub>1</sub> Ch 4: Io<sub>2</sub>



Figure 5: FCM30K Turn-on Overshoot  
 Vin = 480VAC Load: Io = 551A  
 Ch 1: Vo

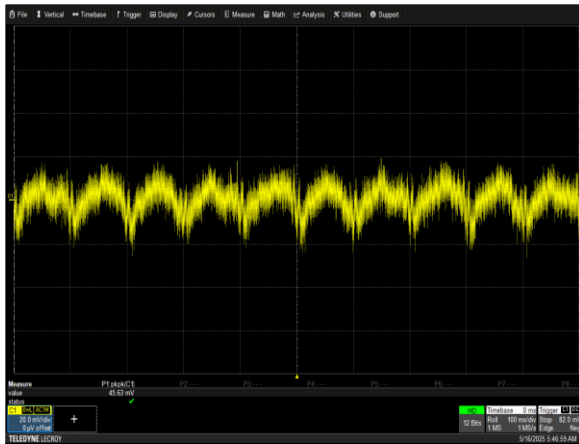


Figure 6: FCM30K Ripple and Noise Measurement  
 Vin = 480VAC Load: Io = 551A  
 Ch 1: Vo

## SECTION 2 ELECTRICAL SPECIFICATIONS

### 2.4 FCM30K Performance Curves

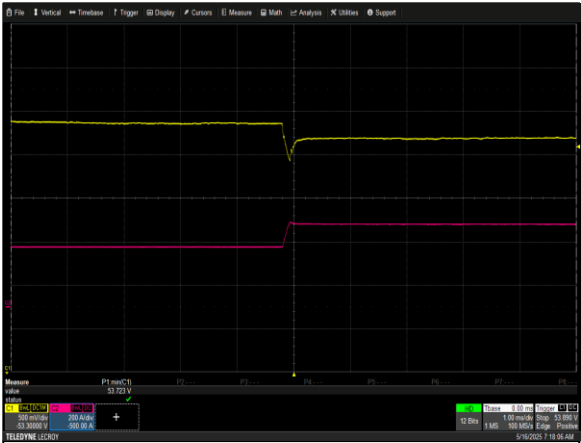


Figure 7: FCM30K Transient Response - Vo Deviation  
50% to 100% load change, 1A/uS slew rate Vin = 480VAC  
Ch 1: Vo Ch 2: Io

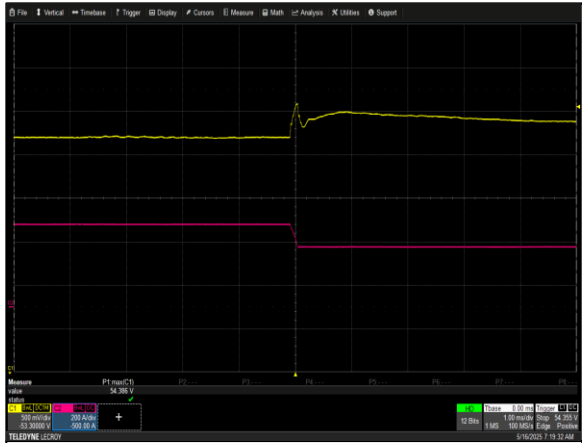


Figure 8: FCM30K Transient Response - Vo Deviation  
100% to 50% load change, 1A/uS slew rate Vin = 480VAC  
Ch 1: Vo Ch 2: Io

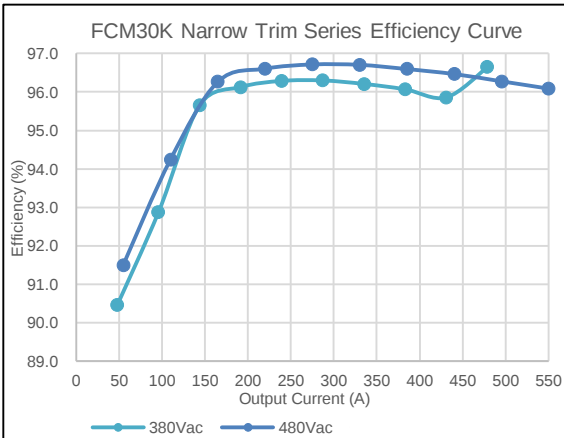


Figure 9: FCM30K Efficiency Curve @ 25°C  
Vin = 380/480 VAC  
Loading: Io = 10% ~ 100% Io,max

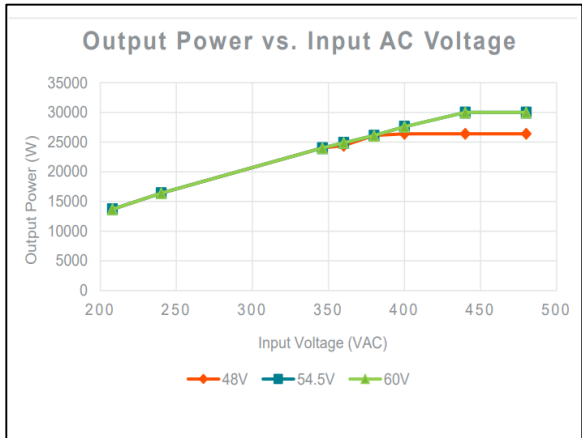


Figure 10: FCM30K Input Voltage vs. Output Power (-40°C to 50°C)

## SECTION 2 ELECTRICAL SPECIFICATIONS

### 2.4 FCM30K Performance Curves

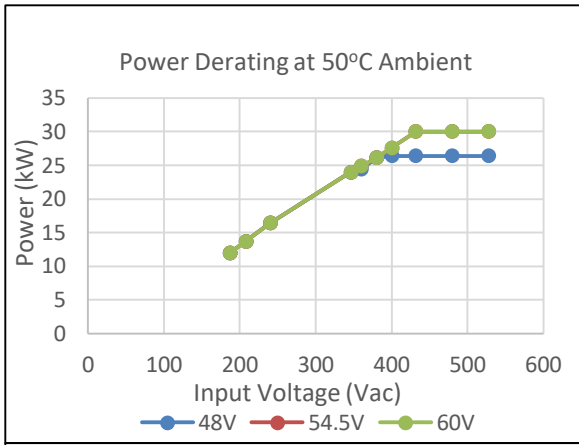


Figure 11: FCM30K Power Derating at 50°C  
Note: The power derating is the same for 54.5V and 60V.

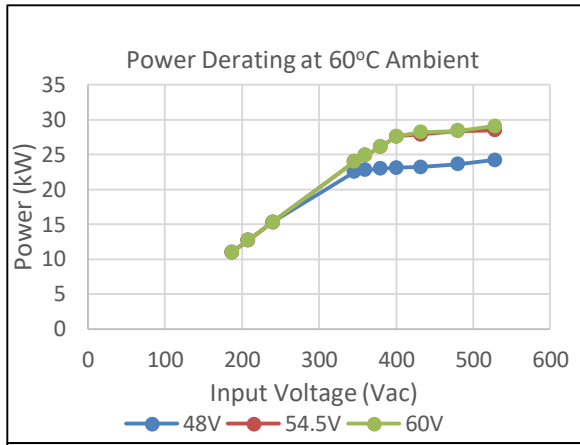


Figure 12: FCM30K Power Derating at 60°C  
Note: 60°C and 70°C ambient are applicable only for variants without PML FCM30KSHNW-PRN and FCM30KSHNW-TRN

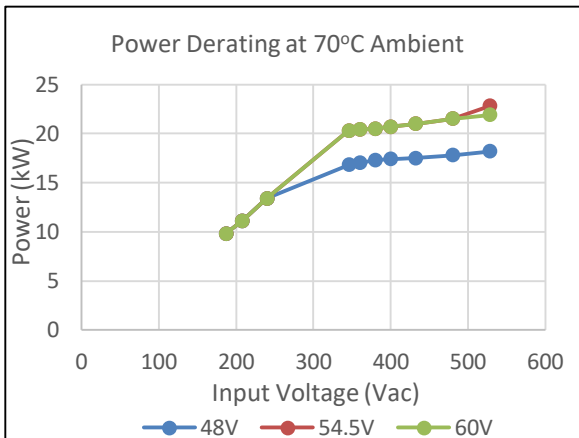


Figure 13: FCM30K Power Derating at 70°C  
Note: 60°C and 70°C ambient are applicable only for variants without PML FCM30KSHNW-PRN and FCM30KSHNW-TRN

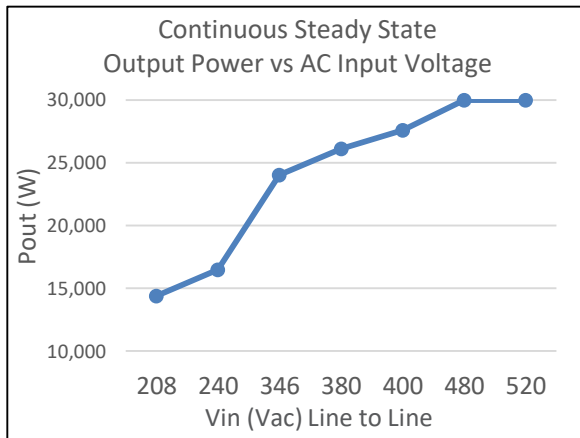


Figure 14: Steady State :FCM10K Output Power vs AC Input Voltage

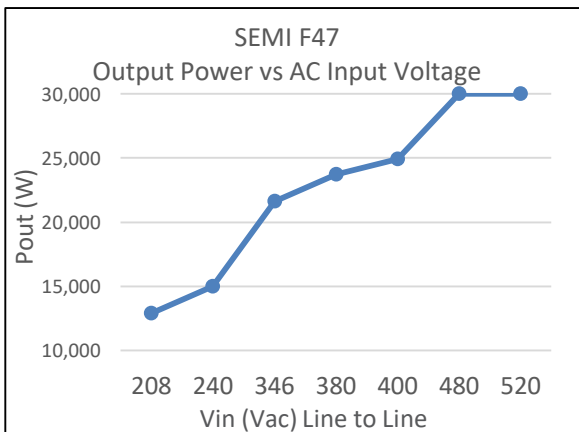


Figure 15: SEMI F47 : FCM30K Output Power vs AC Input Voltage

## SECTION 2 ELECTRICAL SPECIFICATIONS

### 2.5 Protection Function Specifications

#### Over Voltage Protection (OVP)

The FCM30K Narrow Trim Series power supply is internally protected against output overvoltage.

| Parameter        | Main Output                                                                                                                                                                                                                                                                  |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| First level OVP  | <ul style="list-style-type: none"> <li>Tracking OVP</li> <li>Scales with output voltage</li> <li>Threshold should be 115% (+/- 2%) of voltage set-point</li> <li>Protection response is latch</li> <li>Output can be reset/turned on using MODBUS, and AC recycle</li> </ul> |
| Second level OVP | <ul style="list-style-type: none"> <li>Threshold should be 65V</li> <li>Protection response is Latch</li> <li>Output can be reset/turned on using MODBUS, and AC recycle</li> </ul>                                                                                          |

#### Over Current Protection (OCP)

The FCM30K Narrow Trim Series power supply is internally protected against output overcurrent.

Main Output:

| Parameter        | Main Output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| First level OCP  | <ul style="list-style-type: none"> <li>Fixed setting at typical of 200A (109% of 183.5A) per module</li> <li>Output voltage droops down to 87.5% of Vout or 44V whichever comes first</li> <li>Once the output voltage reaches, 87.5% of Vout or 44V, the unit detects it as a fault and the main output turns off</li> <li>During voltage droop, if the output load was removed (no load) expect a 5% - 115% overshoot on the main output voltage</li> <li>Main output will continue to do a slow 10-time retry (2s off, 10ms on validation of fault), if the output fault is still present then unit main output remains off</li> <li>Output can be reset/turned on using MODBUS and AC recycle</li> </ul> |
| Second level OCP | <ul style="list-style-type: none"> <li>Tracking with respect to maximum output current set</li> <li>Set at 124% of maximum output current set</li> <li>If the current exceeds then immediate output shutdown</li> <li>Main output will continue to do a slow 10-time retry (2s off, 10ms ON validation of fault), if the output fault is still present then the unit main output remains off</li> <li>Output can be reset/turned on using MODBUS and AC recycle</li> </ul>                                                                                                                                                                                                                                   |

Standby Output:

| Parameter      | Standby Output                                                                                                                                                                                                                                                                                                                                                                                                                   |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5V Standby OCP | <ul style="list-style-type: none"> <li>OCP is 230%-280% of its full load current for single module and 400% for 2 to 3 modules</li> <li>5V standby output will continue to do slow 10 time retry, if the output fault is still present then latch 5V standby</li> <li>Can be reset/turned on using AC recycle</li> <li>PSM will turn off and modules will go to standby mode when 5V OCP is triggered or has latched.</li> </ul> |

## SECTION 2 ELECTRICAL SPECIFICATIONS

### Short Circuit Protection (SCP)

The FCM30K Narrow Trim Series outputs are protected from continuous output shorted conditions (no damage or reliability issues).

| Parameter                 | Main Output                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Main Output Short Circuit | <ul style="list-style-type: none"> <li>Immediate shutdown</li> <li>Main output will continue to do slow 10-time retry, if the output fault is still present then unit main o/p remains off(latch)</li> <li>Output can be reset/turned on using PSON, PSKILL, MODBUS, and AC recycle.</li> </ul>                                                               |
| 5V Standby Short Circuit  | <ul style="list-style-type: none"> <li>Immediate shutdown. Will continue to do slow 10-time retry, if the output fault is still present after 10 retries then unit 5Vstandby o/p remains off(latch)</li> <li>AC recycle to recover</li> <li>PSM will turn off and modules will go to standby mode when 5V standby SCP is triggered or has latched.</li> </ul> |

### Over Temperature Protection (OTP)

The power supply is protected against overheating to prevent damage or degradation. The power supply may overheat for several reasons; internal parts failing conditions, environmental factors, and improper use due to airflow restriction.

If only a single power supply is at fault then it should shut down its own output due to over temperature protection (OTP) and in order to resume operations, the temperature will need to fall below OTP limit with hysteresis.

The OTP limit for each module shall be set high enough to maintain safe operation. No components shall be over stressed at the temperature shutdown threshold level. There shall be enough temperature sensors within the power supply to guarantee safe operation.

The shelf has a temperature sensor on the output backplane (power supply exhaust) which will be used for internal ambient sensing. This sensor clamps at 0°C so any negative temperatures will not be read.

Criteria

- PSM shall be able to provide shelf temperature through thermal sense board.
- PSM LED shall turn blinking amber once shelf temperature reaches the set limit.
- If temperature is < 0°C, reported temperature clamps at 0-5°C.

| Shelf Temperature                       | Address | Performance     | PSM LED                |
|-----------------------------------------|---------|-----------------|------------------------|
| -5°C < Shelf Temp ≤ 80°C                | 0xB7    | Normal          | Blue                   |
| Shelf Temp > 86°C<br>(Recovery at 76°C) |         | Output shutdown | Blinking Amber (500ms) |

## SECTION 3 MECHANICAL SPECIFICATIONS

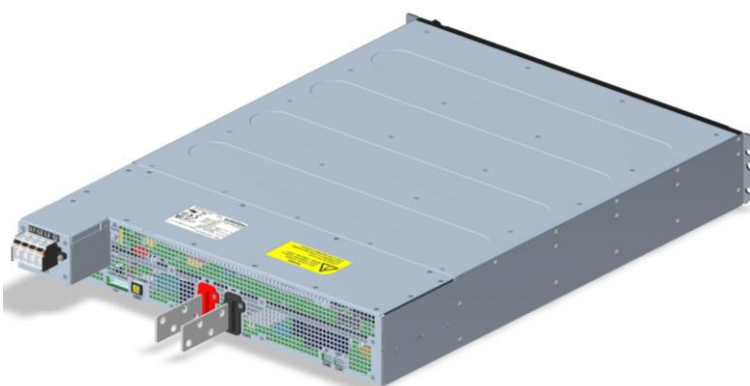
### 3.1 Mechanical Outlines (unit: mm)

FCM30K: 85.2 mm Hx 448 mm W x 595 mm L

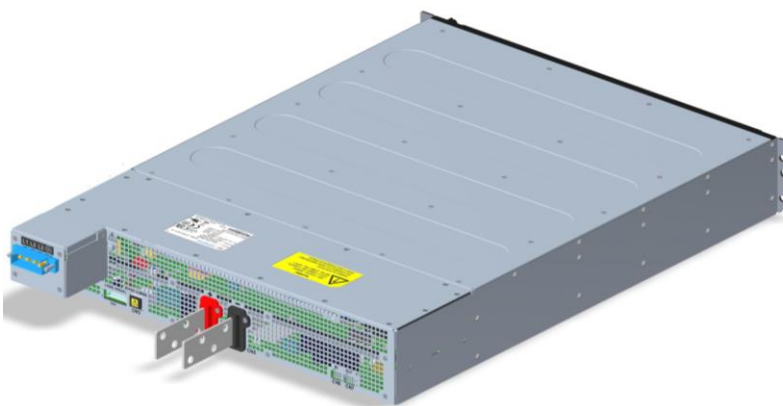
FRONT 3D View



Input Terminal Block Version REAR 3D View



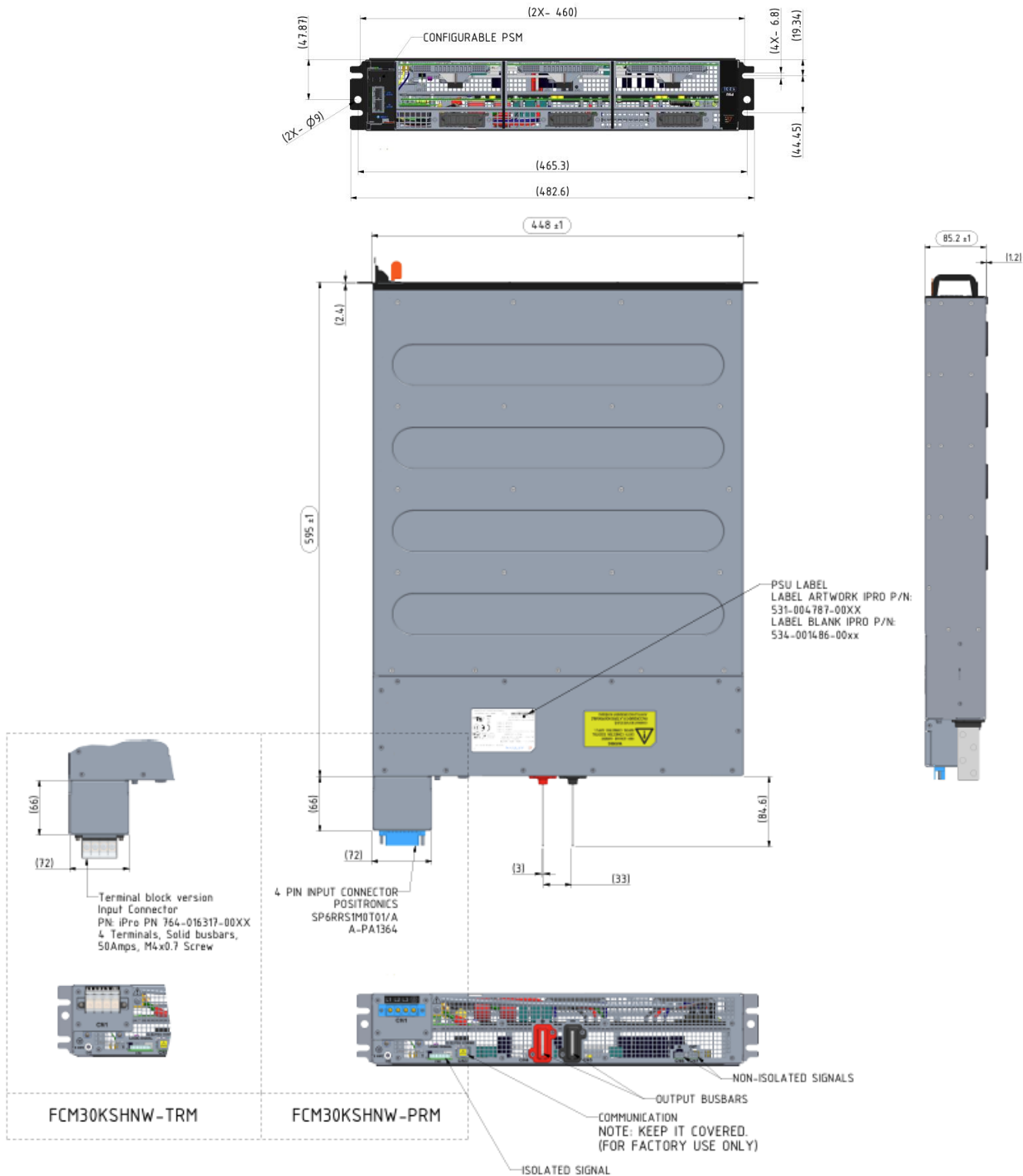
Input Pluggable Version REAR 3D View



## SECTION 3 MECHANICAL SPECIFICATIONS

### 3.1 Mechanical Outlines (unit: mm)

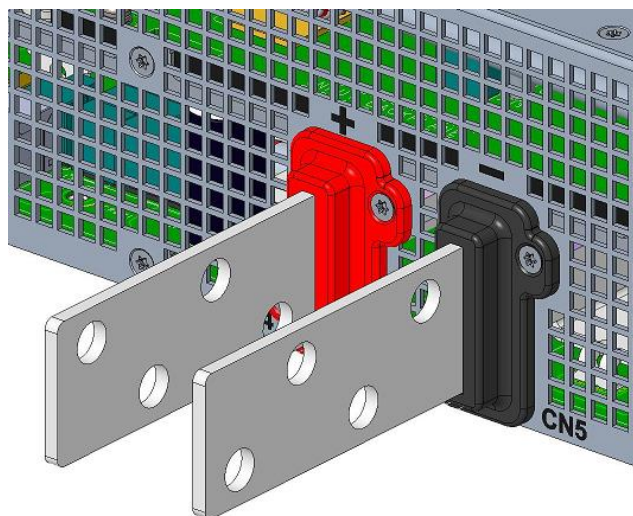
FCM30K: 85.2 mm H x 448 mm W x 595 mm L



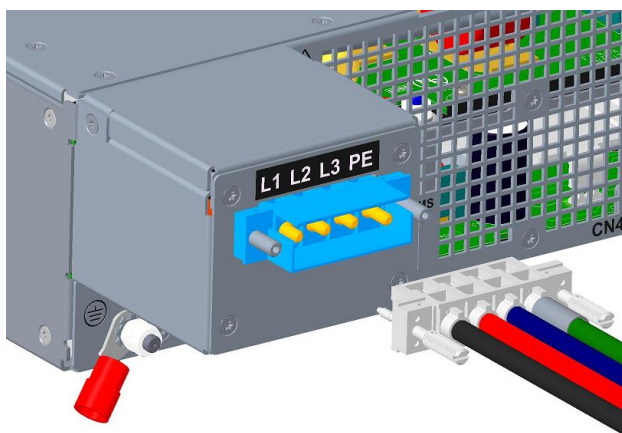
## SECTION 3 MECHANICAL SPECIFICATIONS

### 3.1 Mechanical Outlines (unit: mm)

FCM30K: 85.2 mm H x 448 mm W x 595 mm L

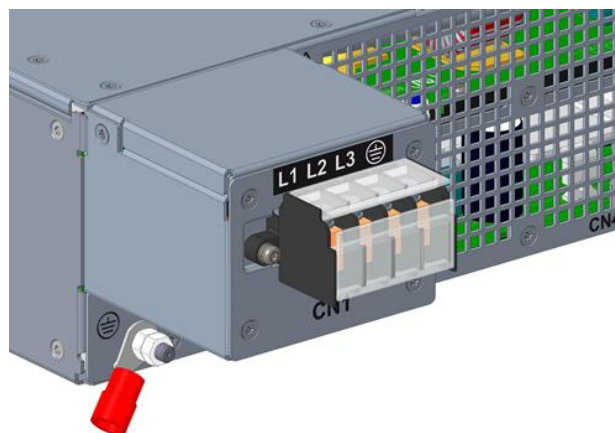


Contact [productsupport.ep@aei.com](mailto:productsupport.ep@aei.com) for CN5 busbar weight bearing capacity.



Pluggable version details:  
MFR: Positronics  
MPN: SP6RRS1M0T01/AA-PA1364  
Scorpion series, 4 Pins, 50Amps, w/ FMLB

Note: Wiring colors will depend on country of use

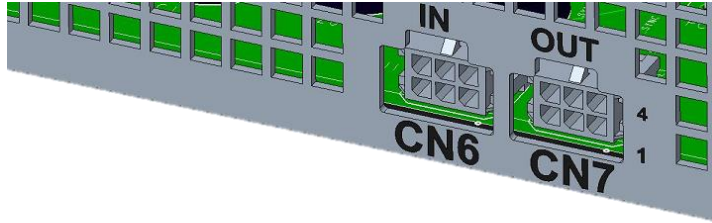


Terminal block version details:  
4 terminals, solid busbars, 50Amps, M4x0.7 screw  
M4 terminal block screw torque requirement:  
8.0Kgf-cm (min) - 10.0Kgf-cm (max)

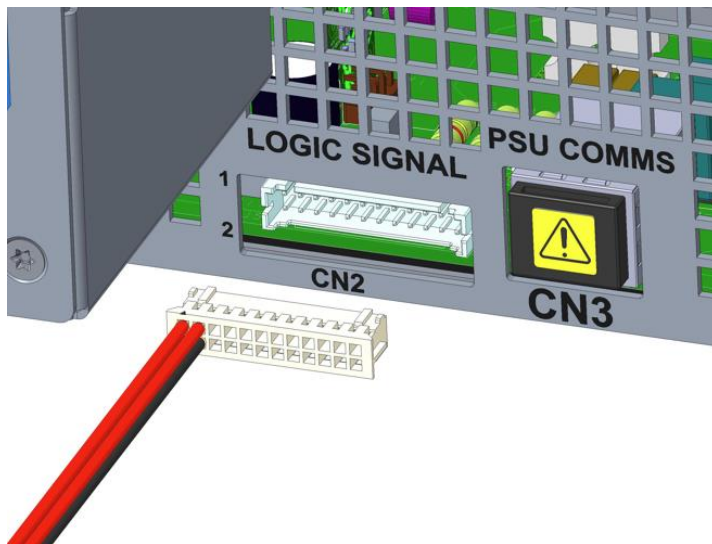
## SECTION 3 MECHANICAL SPECIFICATIONS

### 3.1 Mechanical Outlines (unit: mm)

FCM30K: 85.2 mm Hx 448 mm W x 595 mm L



Note - CN6 and CN7 are used for parallel connection of shelves. Connect CN7 of 1 shelf to CN6 of next shelf using 750-011955-0000



Weight:

FCM10K module: 5.3kg

FCM30K shelf: 9.7kg

FCM30k shelf with three modules: 25.6kg

Note - PSU COMMS pin CN3 is intended only for AE internal debugging inside the shelf and for Factory use only. For Modbus communication, use the RJ45 at the front side located at the PSM (Power Shelf Monitoring).

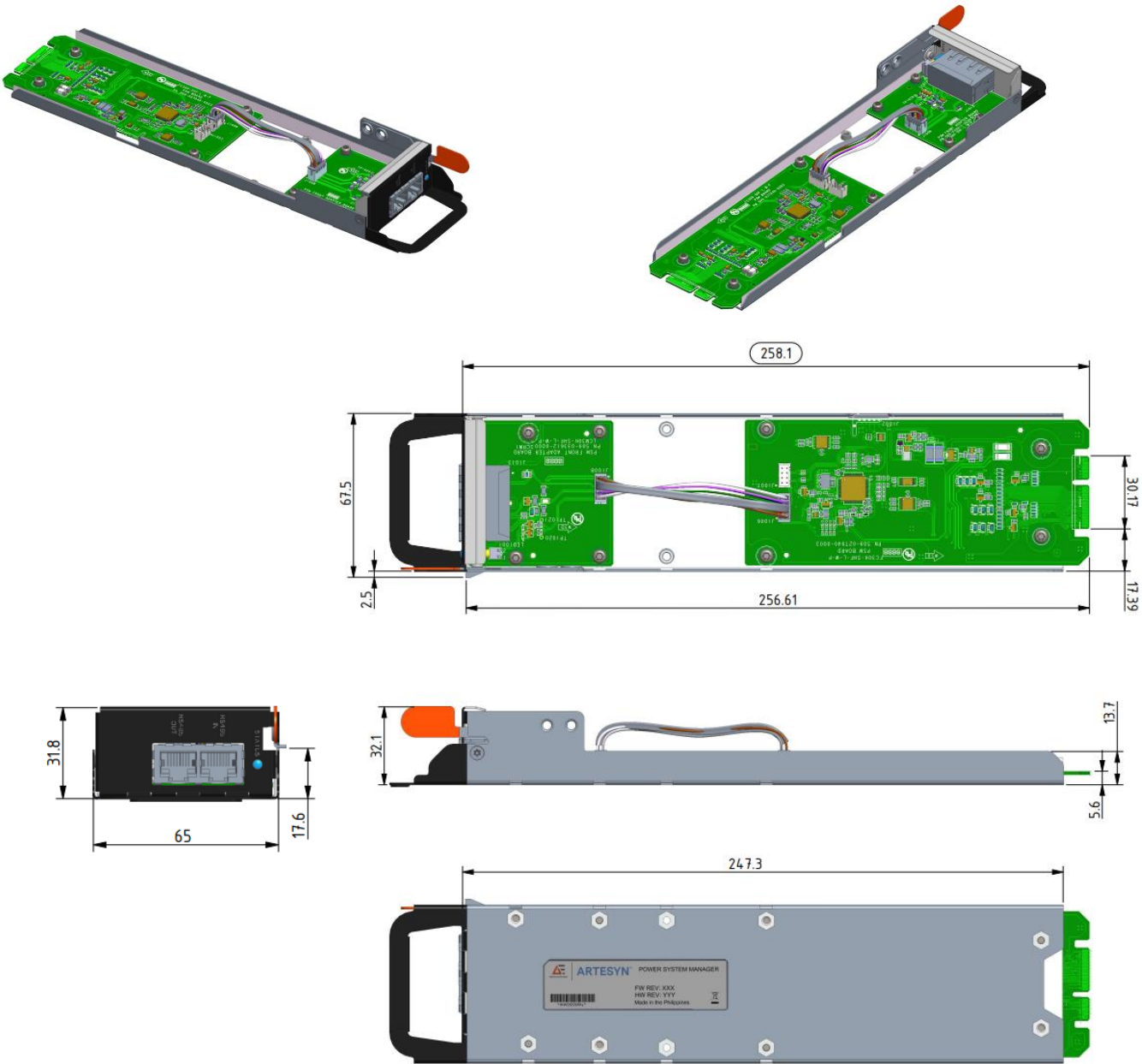
## SECTION 3 MECHANICAL SPECIFICATIONS

### 3.1 Mechanical Outlines (unit: mm)

Power Shelf Monitoring: 31.8 mm Hx 67.5 mm W x 258.1 mm L

Front View

Rear View



## SECTION 3 MECHANICAL SPECIFICATIONS

### 3.2 Connector Definitions

#### RJ45 Communication Signals

##### RJ45 (RS485 IN )

Supports Modbus RTU

Pin 1 – RS485\_A\_SHLF

Pin 2 – RS485\_B\_SHLF

Pin 3 – N/A

Pin 4 – N/A

Pin 5 – N/A

Pin 6 – N/A

Pin 7 – 5VSB

Pin 8 – 5VSB\_GND



RJ45 Communication Signals Port

##### RJ45 (RS485 OUT)

Supports Modbus /RS485

Pin 1 – RS485\_A\_SHLF

Pin 2 – RS485\_B\_SHLF

Pin 3 – N/A

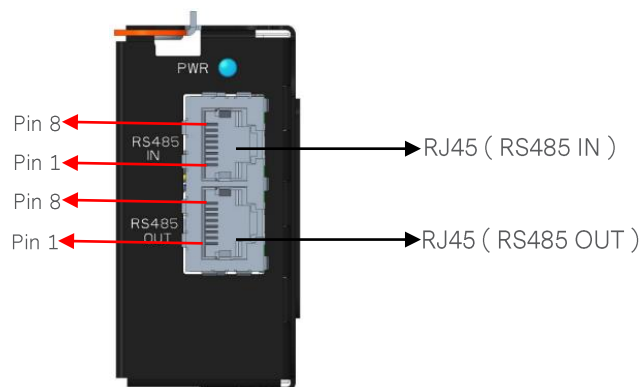
Pin 4 – N/A

Pin 5 – N/A

Pin 6 – N/A

Pin 7 – N/A

Pin 8 – N/A



## SECTION 3 MECHANICAL SPECIFICATIONS

### 3.2 Connector Definitions

#### Input Connector – CN1

- L1 – Line1
- L2 – Line2
- L3 – Line3
- PE – Earth Ground

#### Output Busbars

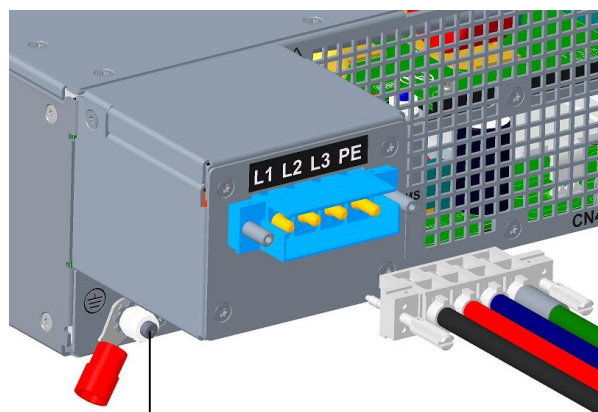
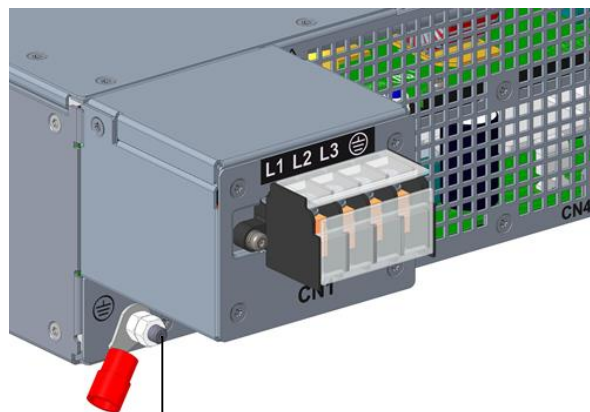
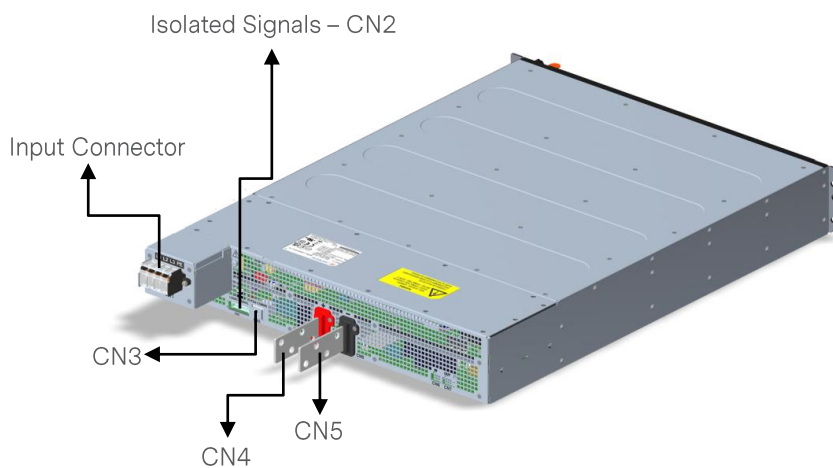
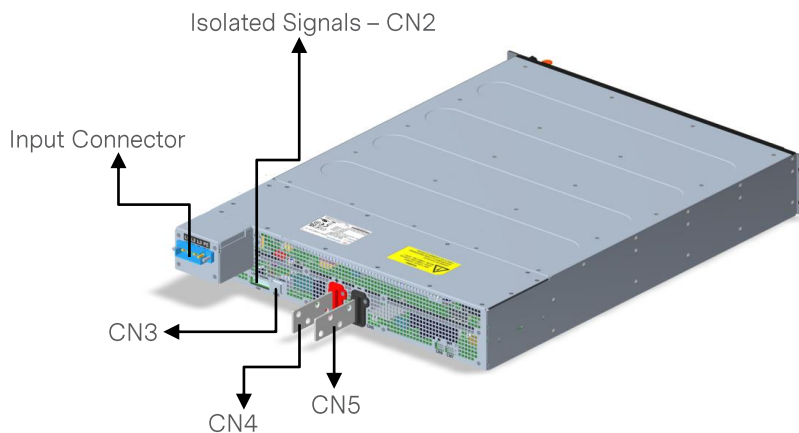
- CN4 - Main Output (+)
- CN5 - Main Output Return (-)

#### Isolated Signals – CN2

- Pin 1 – 5V Standby
- Pin 2 – 5V Standby\_GND\_SHLF
- Pin 3 – 5V Standby
- Pin 4 – 5V Standby\_GND\_SHLF

#### CN3

Note: CN3 is intended only for AE internal use only. For Modbus communication, use the RJ45 at the front side located at the PSM (Power shelf Monitoring)



Ground Stud

## SECTION 3 MECHANICAL SPECIFICATIONS

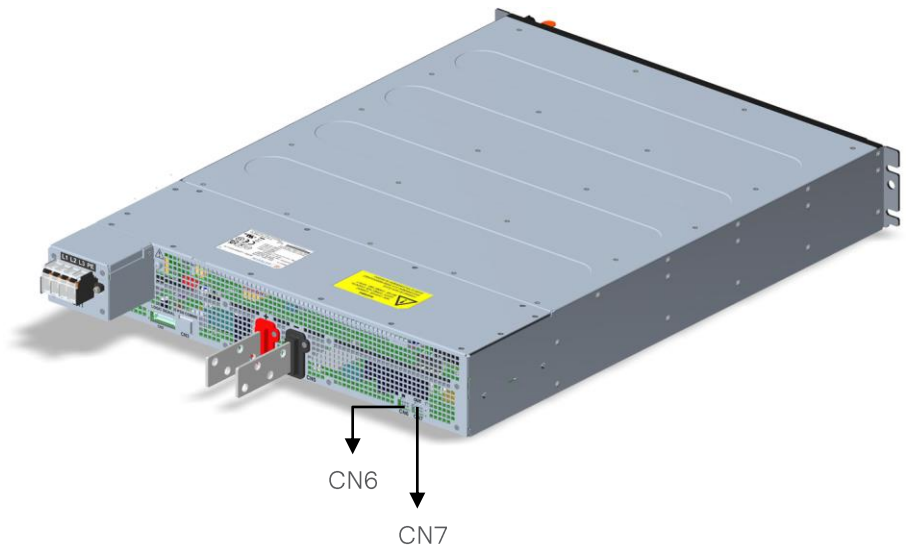
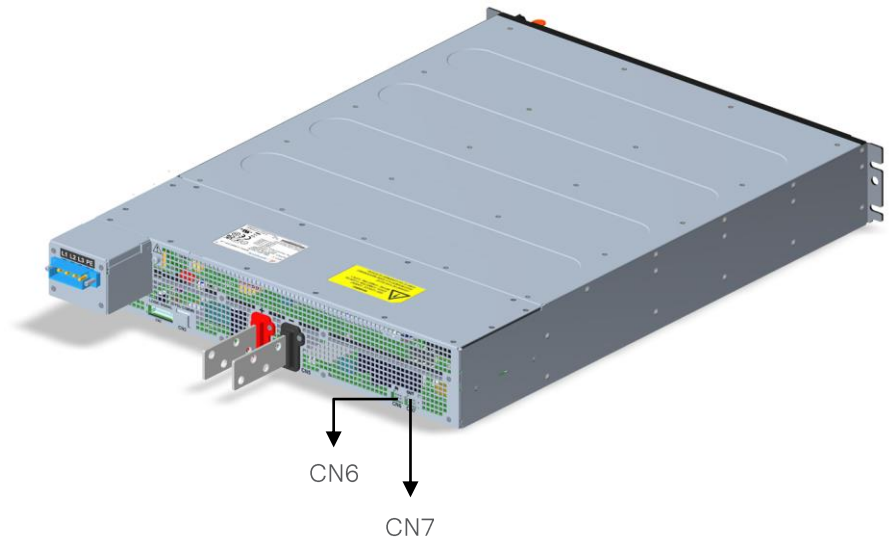
### 3.2 Connector Definitions

#### Non-Isolated Signals IN- CN6

- Pin 1 – SYS\_GND\_SHLF
- Pin 2 – N/A
- Pin 3 – ISHARE\_SHLF\_RTN
- Pin 4 – ISHARE\_SHLF\_IO
- Pin 5 – N/A
- Pin 6 – PSU\_SYNC\_IO

#### Non-Isolated Signals OUT- CN7

- Pin 1 – PROVISION/RESERVED
- Pin 2 – N/A
- Pin 3 – ISHARE\_SHLF\_RTN
- Pin 4 – ISHARE\_SHLF\_IO
- Pin 5 – N/A
- Pin 6 – PSU\_SYNC\_IO



## SECTION 3 MECHANICAL SPECIFICATIONS

### 3.3 Power / Signal Mating Connectors and Pin Types

| Table 4. Mating Connectors                                                 |                                                                                  |                                   |
|----------------------------------------------------------------------------|----------------------------------------------------------------------------------|-----------------------------------|
| Reference                                                                  | On Power Supply                                                                  | Mating Connector or Equivalent    |
| Input Connector <sup>1</sup> – CN1<br>FCM30K-SHF-L-W-P<br>FCM30K-SHF-L-W-T | Positronics: SP6RRS1M0T01/AA-PA1364 <sup>2</sup><br>764-016317-0000 <sup>3</sup> | Positronics: SP6RRS1F0E01/AA-2566 |
| Ground Stud                                                                | Ring terminal AWG 8                                                              | Molex: 19067-0008                 |
| Output Connector – CN4, CN5                                                | CT50-10                                                                          |                                   |
| Isolated Signals – CN2                                                     | Landwin: 2052P2400T-01<br>CVILUX: C10124P1HDC-NH                                 | Landwin: 2050S24 00               |
| Non-isolated Signals – CN6, CN7                                            |                                                                                  | Molex: 43025-0600                 |
| Communication Signals – CN3                                                | RJ45                                                                             |                                   |

Note 1 - L1, L2, L3, and PE are AWG 8. Protective Earth (PE) wire (green or striped green and yellow) must always be terminated to the corresponding system Earth connection.

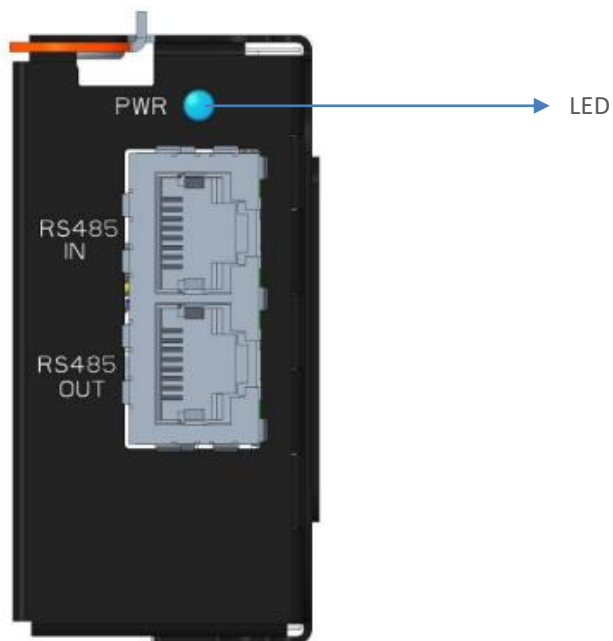
Note 2 - Scorpion Series, 4 Pins, 50Amps, w/ FMLB

Note 3 - Terminals, Solid busbars, 50Amps, M4x0.7 Screw

## SECTION 3 MECHANICAL SPECIFICATIONS

### 3.4 PSM LED Indicator Definitions

One bi-color (blue/amber) LED is provided on the top of the PSM on the power shelf. The status LED conditions is shown on the table below.



| Conditions                                                        | LED Status                         |
|-------------------------------------------------------------------|------------------------------------|
| Normal operation (INT_SUPPLY state is ON<br>3V3_INT_SUPPLY is ON) | Solid Blue                         |
| Module firmware update in progress                                | Blinking Blue (0.5s ON; 0.5s OFF)  |
| Module config error*                                              | Solid Amber                        |
| Shelf internal comm error                                         | Blinking Amber (0.2s ON; 0.2s OFF) |
| Shelf over temperature protection                                 | Blinking Amber (0.5s ON; 0.5s OFF) |
| No AC input power                                                 | OFF                                |

## SECTION 3 MECHANICAL SPECIFICATIONS

### 3.5 PSU LED Indicator Definitions

One bi-color (blue/amber) LED is provided on the power supply chassis at the end opposite to the input-output connectors. The status LED conditions is shown on the table below.



| Conditions                                                                                 | LED Status                             |
|--------------------------------------------------------------------------------------------|----------------------------------------|
| AC present, main output ON, standby output ON                                              | Solid Blue                             |
| Standby mode                                                                               | Blinking Blue (1s ON; 1s OFF)          |
| Any kind of fault<br>(output over voltage/over current/over temperature/<br>short circuit) | Solid Amber                            |
| In system programming                                                                      | Fast Blinking Blue (0.5s ON; 0.5s OFF) |
| Wrong installation/connection of L1, L2 or L3 on the<br>PSU AC input connector or Shelf    | Blinking Amber (1s ON; 1s OFF)         |
| AC input under voltage/over voltage/out of operating<br>condition                          | Blinking Amber (3s ON; 3s OFF)         |

## SECTION 4 ENVIRONMENTAL SPECIFICATIONS

### 4.1 EMC Immunity

FCM30K Narrow Trim Series power supply is designed to meet the following EMC immunity specifications.

| Table 5. Environmental Specifications           |                                |                                                                                              |                       |
|-------------------------------------------------|--------------------------------|----------------------------------------------------------------------------------------------|-----------------------|
| Test Items                                      | Standard                       | Test Level                                                                                   | Criteria <sup>1</sup> |
| Conducted Emissions                             | CISPR 32/EN 55032              | Class A. 150k to 30MHz                                                                       | 6dB Margin, average   |
| Radiated Emissions                              | CISPR 32/EN 55032              | Class A. 30M to 1GHz                                                                         | 6dB Margin, average   |
|                                                 | FCC CFR 47, Part 15, Subpart B | Class A. 30M to 1GHz                                                                         | 6dB Margin, average   |
| Voltage Fluctuations                            | IEC 61000-3-11                 | -                                                                                            | -                     |
| Harmonic Current Emissions                      | EN 61000-3-12                  | -                                                                                            | -                     |
| Electro Static Discharge (ESD) Immunity         | EN/IEC 61000-4-2               | Typical test points:<br>6kV contact, 8kV air                                                 | A                     |
|                                                 |                                | Non-typical test points:<br>6kV contact, 8kV air                                             | A                     |
| Radiated RF EM Fields Susceptibility            | EN/IEC 61000-4-3               | 80MHz-1GHz, Level 3 (10V/m)                                                                  | A                     |
| Electrical Fast Transients (EFT) / Bursts       | EN/IEC 61000-4-4               | AC Power Port: +/-4kV<br>I/O Signal Port: +/-0.5kV                                           | A<br>B                |
| Surges - Line to Line (DM) and Line to GND (CM) | EN/IEC 61000-4-5               | 2kV DM (line to line), 4kV CM(line to Earth)                                                 | A                     |
|                                                 | IEEE C62.41                    | 2kV DM (line to line), 2kV CM(line to Earth)                                                 | A                     |
| Conducted Immunity                              | EN/IEC 61000-4-6               | 150kHz-80MHz, Level 3 (10V/m)                                                                | A                     |
| Power Frequency Magnetic Field Immunity         | EN 61000-4-8                   | 50kHz, Level 3 (10A/m)                                                                       | A                     |
| Voltage Dips and Interruptions                  | IEC 61000-4-34                 | 10ms, >95% Reduction<br>500ms, >30% Reduction<br>5s, >95% Reduction<br>500ms, >95% Reduction | A<br>A<br>C<br>C      |

Note 1 - Performance criteria of EN61000-4-X standards as defined by EN55035. According to the standards, performance criteria are defined as following:

A - During and after the test, no degradation of performance or loss of function is allowed below a minimum performance level in the EUT specifications.

B - During the test, temporary degradation of performance is allowed which is self-recoverable, without change in operating state. After the application of the disturbance, no degradation of performance or loss of function is allowed.

C - Loss of function is allowed, provided the function is self-recoverable, or can be restored by the operation of the controls by the user. A reboot or re-start is allowed.

## SECTION 4 ENVIRONMENTAL SPECIFICATIONS

### 4.2 Safety Certifications

The FCM30K Narrow Trim Series is intended for system use and must be installed by a qualified person. The installer must ensure that the product is compliant with end application requirements.

| Table 6. Safety Certifications for FCM30K Narrow Trim Series Power Supply System |        |                                           |
|----------------------------------------------------------------------------------|--------|-------------------------------------------|
| Standard                                                                         | Agency | Description                               |
| UL 62368-1, 3 <sup>rd</sup> Ed Recognized                                        | UL     | US Requirement                            |
| CAN/CSA C22.2 No. 62368-1:19, 3 <sup>rd</sup> Ed                                 | CSA    | Canada Requirement                        |
| EN IEC 62368-1: 2020/A11:2020                                                    |        | European Requirements                     |
| IEC 62368-1: 2018 3 <sup>rd</sup> Edition                                        |        | International Electrotechnical Commission |
| CE (LVD + RoHS), EN 62368-1 3 <sup>rd</sup> Edition                              |        | European Requirements                     |
| CB Certifications and Report (IEC 62368-1 3 <sup>rd</sup> Edition)               |        | All CENELEC Countries                     |

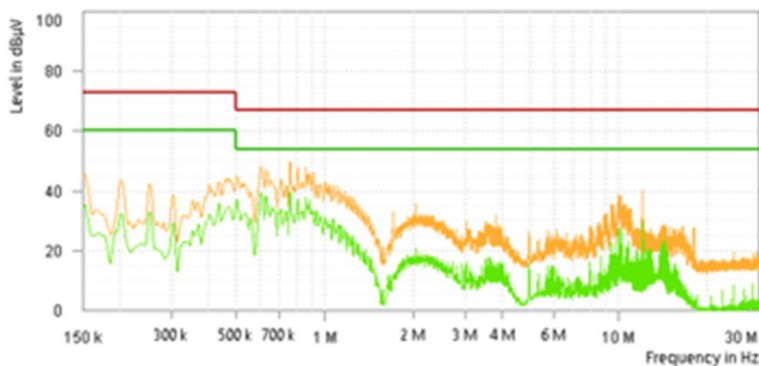
## SECTION 4 ENVIRONMENTAL SPECIFICATIONS

### 4.3 EMI Emissions

The FCM30K Narrow Trim Series has been designed to comply with the Class A limits of EMI requirements of EN55032 for emissions and relevant sections of EN61000 (IEC 61000) for immunity. The unit is tested at 30kW load.

#### Conducted Emissions

The applicable standard for conducted emissions is EN55032. Conducted noise can appear as both differential mode and common mode noise currents. Differential mode noise is measured between the two input lines, with the major components occurring at the supply fundamental switching frequency and its harmonics. Common mode noise, a contributor to both radiated emissions and input conducted emissions, is measured between the input lines and system ground and can be broadband in nature.



The FCM30K Narrow Trim Series has internal EMI filters to ensure the converters' conducted EMI levels comply with EN55032 Class A limits. The EMI measurements are performed with resistive loads at maximum rated loading.

Sample of EN55032 Conducted EMI Measurement at 480 VAC three phase input.

Conducted EMI emissions specifications of the FCM30K Narrow Trim Series power system:

| Parameter                    | Model | Symbol | Min | Typ | Max | Unit |
|------------------------------|-------|--------|-----|-----|-----|------|
| FCC CFR 47, Part 15, class A | All   | Margin | 6   | –   | –   | dB   |
| CISPR 32 (EN55032), class A  | All   | Margin | 6   | –   | –   | dB   |

## SECTION 4 ENVIRONMENTAL SPECIFICATIONS

### Radiated Emissions

Unlike conducted EMI, radiated EMI performance in a system environment may differ drastically from that in a stand-alone power supply. The shielding effect provided by the system enclosure may bring the EMI level from Class A to Class B. It is thus recommended that radiated EMI be evaluated in a system environment. The applicable standard is EN55032 Class A. Testing ac-dc convertors as a stand-alone component to the exact requirements of EN55032 can be difficult, because the standard calls for 1 m leads to be attached to the input and outputs and aligned such as to maximize the disturbance. In such a set-up, it is possible to form a perfect dipole antenna that very few AC-DC convertors could pass. However, the standard also states that an attempt should be made to maximize the disturbance consistent with the typical application by varying the configuration of the test sample.

## SECTION 4 ENVIRONMENTAL SPECIFICATIONS

### 4.4 Operating Temperature

The FCM30K Narrow Trim Series power supplies can start and operate within the stated specifications at an ambient temperature from -40°C to 50°C under all load conditions with an internal fan (full performance). Above 50°C to 70°C, the output power will be derated linearly. The FCM30K Narrow Trim Series power supplies is able to start at -40°C rated full load.

### 4.5 Forced Air Cooling

The power supply will operate with forced air. Worst case fan noise shall not exceed 83dBA. Test method as per ISO 3744.

### 4.6 Output Power Derating with respect to Input Voltage

| Output Voltage <sup>1</sup> | Input Voltage (Nominal) | Max Continuous Power (Steady State) | Semi F47 |
|-----------------------------|-------------------------|-------------------------------------|----------|
| 54.5V to 60V                | 480 VAC                 | 30,000 W                            | 30,000 W |
|                             | 400 VAC                 | 27,600 W                            | 24,900 W |
|                             | 380 VAC                 | 26,100 W                            | 23,700 W |
|                             | 346 VAC                 | 24,000 W                            | 21,600 W |
|                             | 240 VAC                 | 16,500 W                            | 15,000 W |
|                             | 208 VAC                 | 14,400 W                            | 12,900 W |

Note 1 – For output voltage below 54.5V, please contact [productsupport.ep@aei.com](mailto:productsupport.ep@aei.com).

### 4.7 Storage Temperature

The FCM30K Narrow Trim Series can be stored or shipped at temperatures between -40°C to +85°C.

### 4.8 Altitude

The FCM30K Narrow Trim Series will operate within specifications at altitudes up to 9,842.52 feet (3,000 meters) above sea level. The power supply shall not be damaged when stored at altitudes of up to 30,000 feet (9,144 meters) above sea level.

### 4.9 Humidity

The FCM30K Narrow Trim Series will operate within specifications when subjected to a relative humidity from 10% to 90% non-condensing. The FCM30K Narrow Trim Series can be stored in a relative humidity from 10% to 95% non-condensing.

## SECTION 4 ENVIRONMENTAL SPECIFICATIONS

### 4.10 Vibration

The FCM30K Narrow Trim Series will pass the following vibration specifications:

Non-operating sine vibration shelf stand alone

|                 |         |                                    |
|-----------------|---------|------------------------------------|
| Acceleration    | 1       | gRMS                               |
| Amplitude       | 3       | mm                                 |
| Frequency Range | 5 - 500 | Hz                                 |
| Duration        | 10      | Sweeps for each of the three axes. |
| Sweep Rate      | 1       | Oct/min                            |

Non-operating sine vibration shelf stand alone

|                 |         |                                    |
|-----------------|---------|------------------------------------|
| Acceleration    | 0.5     | gRMS                               |
| Amplitude       | 1.5     | mm                                 |
| Frequency Range | 5 - 500 | Hz                                 |
| Duration        | 10      | Sweeps for each of the three axes. |
| Sweep Rate      | 1       | Oct/min                            |

### 4.11 Shock

The FCM30K Narrow Trim Series will pass the following shock specifications:

Non-Operating Half-Sine Shock (Shelf without three power supplies)

|                 |                                     |    |
|-----------------|-------------------------------------|----|
| Acceleration    | 12                                  | G  |
| Duration        | 11                                  | ms |
| Pulse           | Half-Sine                           |    |
| Number of Shock | 10 shocks for each of the six faces |    |

Operating Half-Sine Shock (Shelf with three power supplies)

|                 |                                     |    |
|-----------------|-------------------------------------|----|
| Acceleration    | 4                                   | G  |
| Duration        | 22                                  | ms |
| Pulse           | Half-Sine                           |    |
| Number of Shock | 3 shocks for each of the three axes |    |

## SECTION 5 POWER AND CONTROL SIGNAL DESCRIPTIONS

### 5.1 Input Terminal

This connector supplies the AC Mains to the FCM30K Narrow Trim Series power supply.

- L1 – Line1
- L2 – Line2
- L3 – Line3
- PE – Earth Ground

| Power Supply Input Voltage |                   |                                                  |
|----------------------------|-------------------|--------------------------------------------------|
| Nominal                    | Range             | Remarks                                          |
| 208VAC                     | 187VAC to 229 VAC | Derived from 3 phase 208VAC Mains (Line-to-Line) |
| 240VAC                     | 216VAC to 264 VAC | Derived from 3 phase 240VAC Mains (Line-to-Line) |
| 346VAC                     | 311VAC to 381 VAC | Derived from 3 phase 346VAC Mains (Line-to-Line) |
| 360VAC                     | 324VAC to 396 VAC | Derived from 3 phase 380VAC Mains (Line-to-Line) |
| 380VAC                     | 342VAC to 418 VAC | Derived from 3 phase 380VAC Mains (Line-to-Line) |
| 400VAC                     | 360VAC to 480 VAC | Derived from 3 phase 400VAC Mains (Line-to-Line) |
| 440VAC                     | 396VAC to 484 VAC | Derived from 3 phase 480VAC Mains (Line-to-Line) |
| 480VAC                     | 432VAC to 528 VAC | Derived from 3 phase 480VAC Mains (Line-to-Line) |

### 5.2 Output Terminal

This connector provides the main output for the FCM30K Narrow Trim Series power supply.

- CN4 - Main Output (+)
- CN5 - Main Output Return (-)

## SECTION 5 POWER AND CONTROL SIGNAL DESCRIPTIONS

### 5.3 Isolated Signals – CN2

#### 5V Standby (Pin1, Pin3)

1A max 5V standby load. 5V load is power shelf monitoring plus other external circuits where 5V standby is accessible.

#### 5V Standby\_GND\_SHLF (Pin2, Pin4)

5V Standby return point.

Do not connect to SYS\_GND\_SHLF, 5VSB\_GND\_SHLF, ISHARE\_SHLF\_RTN, and main output return.

## SECTION 5 POWER AND CONTROL SIGNAL DESCRIPTIONS

### 5.4 Non- Isolated Signals – CN6, CN7

#### SYS\_GND\_SHLF (Pin 1 of CN6)

Dedicated non-isolated signal return (or ground). Do not connect to GNDL\_SHLF (isolated signal return), 5V Standby\_GND\_SHLF, ISHARE\_SHLF\_RTN, SHELF\_DET, and main output return.

#### ISHARE\_SHLF\_RTN (Pin 3 of CN6 & CN7)

Dedicated return for ISHARE\_SHLF\_IO bus. Do not connect to GNDL\_SHLF (isolated signal return), 5V Standby\_GND\_SHLF, SYS\_GND\_SHLF, SHELF\_DET, and main output return.

#### ISHARE\_SHLF\_IO (Pin 4 of CN6 & CN7)

Provides active current sharing feature for main output using single wire loop signal connection.

#### PSU\_SYNC\_IO (Pin 6 of CN6 & CN7)

This signal allows multiple Shelf in parallel to synchronize start-up. This signal is connected together in the backplane/ shelf.

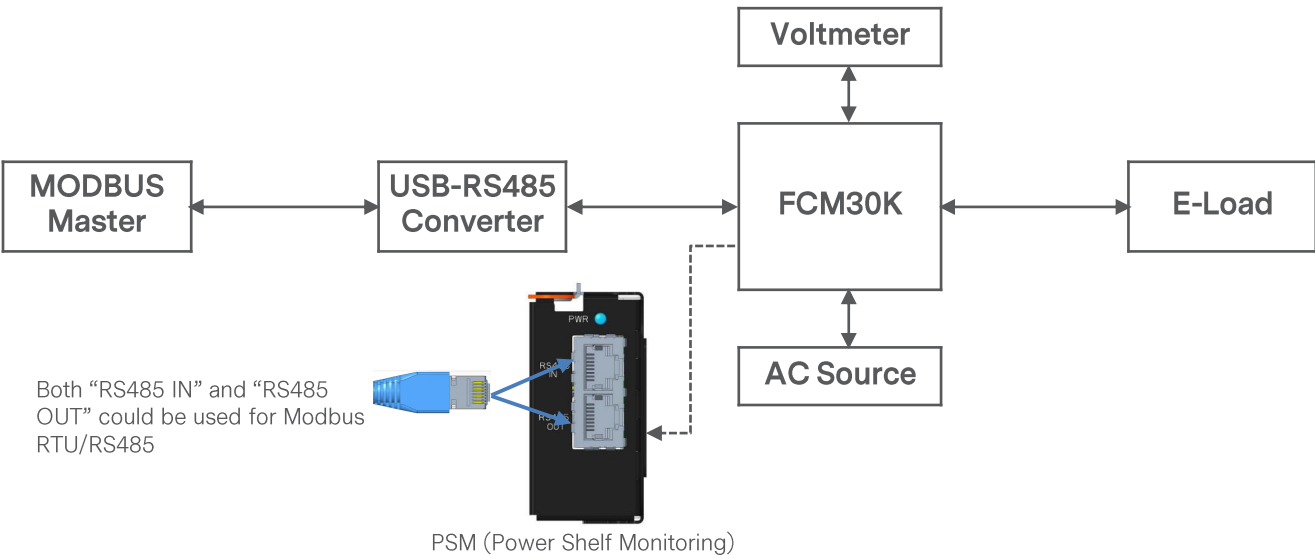
# SECTION 6 MODBUS SPECIFICATIONS

The FCM30K Narrow Trim Series is compliant with the MODBUS application protocol for monitoring and control of the power supply via the RS485 communication port.

## 6.1 FCM30K Narrow Trim Series MODBUS General Instructions

### Equipment Setup

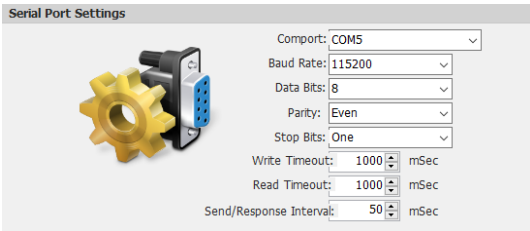
The following is typical RS485 MODBUS communication setup:



### Serial Configuration

The Baud Rate (Data Rate) can be set by the MODBUS register (0xAB).

| Parameter | Settings         |
|-----------|------------------|
| Data Rate | 115200 (Default) |
| Data Bits | 8                |
| Parity    | Even             |
| Stop Bits | 1                |



The Data Rate is configurable using the Baud Rate Config Register (0xAB).

| Register Address 0xAB |                         |
|-----------------------|-------------------------|
| Value (Hex)           | Baud Rate Configuration |
| 0                     | 9600                    |
| 1                     | 19200                   |
| 2                     | 38400                   |
| 3                     | 115200 (Default)        |

Note: The PSM is not hot swappable and must remain within the shelf whenever the shelf is turned on.  
The PSM can be replaced while the shelf is off.

Note: It is recommended that the USB to RS485 converter must always have a 120Ω terminating resistor.  
Another terminating resistor will also be placed at the RS485 OUT port of the last connected PSM in the communications path.  
Stewart Connector, ASY39100-001

## SECTION 6 MODBUS SPECIFICATIONS

### External Device Addressing

The default PSM Modbus address is 0xB0 and configurable via the register 0xAA.

Configurable from address 0x02 to 0xFF.

If there are two or more shelf PSMs in parallel, each must have it's own unique address.

### Internal Device Addressing

The power system manager (PSM) will use the high byte of the Modbus register to address individual power supplies connected.

The table below lists the addresses of each power supply:

| Register Address 0xAA |      |         |
|-----------------------|------|---------|
| Device                | Hex  | Decimal |
| Power Supply 1        | 0x10 | 16      |
| Power Supply 2        | 0x20 | 32      |
| Power Supply 3        | 0x30 | 48      |

To access the STATUS\_WORD (0x70) of power supply 2 for instance, the register address would be 0x2070.

### CRC Checking

The power supply includes an error-checking field that is based on a Cyclical Redundancy Checking (CRC) method performed on the message contents. Details are found in "MODBUS over Serial Line Specification and Implementation Guide" V1.02 document section 2.5.1.2 CRC Checking.

## SECTION 6 MODBUS SPECIFICATIONS

### Error Handling

The power supply will report MODBUS error codes if the request command is invalid. Details are found in “MODBUS over Serial Line Specification and Implementation Guide” V1.02 document SECTION 6 MODBUS Exception Responses.

| Error Code | Description          |
|------------|----------------------|
| 01         | Illegal Function     |
| 02         | Illegal Data Address |
| 03         | Illegal Data Value   |
| 04         | Slave Device Failure |

## SECTION 6 MODBUS SPECIFICATIONS

### Input Reporting Accuracy with PMI

| Parameter Type | Reporting Function | Hex Address | Command Name                         | Accuracy Range  |                 |                  |
|----------------|--------------------|-------------|--------------------------------------|-----------------|-----------------|------------------|
|                |                    |             |                                      | 0% to 100% Load |                 |                  |
| Input          | Input Voltage      | 0xB4        | PMI-<br>INPUT_LINE_NEUTRAL_VOLTAGE_A | ± 1%            |                 |                  |
|                |                    | 0xD7        | PMI-<br>INPUT_LINE_NEUTRAL_VOLTAGE_B | ± 1%            |                 |                  |
|                |                    | 0xD8        | PMI-<br>INPUT_LINE_NEUTRAL_VOLTAGE_C | ± 1%            |                 |                  |
|                |                    | 0xD9        | PMI-INPUT_LINE_LINE_VOLTAGE_A_B      | ± 1%            |                 |                  |
|                |                    | 0xDA        | PMI-INPUT_LINE_LINE_VOLTAGE_B_C      | ± 1%            |                 |                  |
|                |                    | 0xDB        | PMI-INPUT_LINE_LINE_VOLTAGE_C_A      | ± 1%            |                 |                  |
|                |                    |             |                                      | 0% to 15% Load  | 15% to 30% Load | 30% to 100% Load |
|                | Input Current      | 0xB5        | PMI_INPUT_CURRENT_A                  | ± 0.5 A         | ± 2%            | ± 1%             |
|                |                    | 0xDC        | PMI_INPUT_CURRENT_B                  | ± 0.5 A         | ± 2%            | ± 1%             |
|                |                    | 0xDD        | PMI_INPUT_CURRENT_C                  | ± 0.5 A         | ± 2%            | ± 1%             |
|                |                    |             |                                      | 15% to 20% Load |                 | 20% to 100% Load |
|                | Input Power        | 0xB6        | PMI_ACTIVE_POWER_TOTAL               | ± 5%            |                 | ± 3%             |
|                |                    | 0xDE        | PMI_ACTIVE_POWER_A                   | ± 5%            |                 | ± 3%             |
|                |                    | 0xDF        | PMI_ACTIVE_POWER_B                   | ± 5%            |                 | ± 3%             |
|                |                    | 0xE0        | PMI_ACTIVE_POWER_C                   | ± 5%            |                 | ± 3%             |
|                | Input Frequency    | 0xE1        | PMI_INPUT_FREQUENCY                  | ± 1%            |                 |                  |
|                |                    |             |                                      | 15% to 30% Load |                 | 30% to 100% Load |
|                | Power Factor       |             | PMI_POWER_FACTOR_A                   | ± 0.05          |                 | ± 0.01           |
|                |                    |             | PMI_POWER_FACTOR_B                   | ± 0.05          |                 | ± 0.01           |
|                |                    |             | PMI_POWER_FACTOR_C                   | ± 0.05          |                 | ± 0.01           |

### Temperature Reporting Accuracy

|         |             |  |                          |       |
|---------|-------------|--|--------------------------|-------|
| Thermal | Temperature |  | SHELF_READ_TEMPERATURE_1 | ± 5°C |
|---------|-------------|--|--------------------------|-------|

## SECTION 6 MODBUS SPECIFICATIONS

### 6.2 The FCM30K Narrow Trim Series Supported Modbus Command List

This section summarizes all Modbus Registers that are supported which can be read by either Read Holding Register (function code 03h) or Read Input Register (function code 04h), and can be write by Write Single Register (function code 06h).

| Command Code | Command Name                       | Default Value | Access Type | Data Bytes | Data Format | Description                                                                   |
|--------------|------------------------------------|---------------|-------------|------------|-------------|-------------------------------------------------------------------------------|
| 70h          | STATUS_WORD                        | -             | R           | 2          | Bitmapped   | Summary of the unit's fault condition                                         |
|              | b15 - VOUT                         |               |             |            |             | Asserts when any of the bit is set in STATUS_VOUT register                    |
|              | b14 - IOUT                         |               |             |            |             | Asserts when any of the bit is set in STATUS_IOUT register                    |
|              | b13 - INPUT                        |               |             |            |             | Asserts when any of the bit is set in STATUS_INPUT register                   |
|              | b12 - MFR_SPECIFIC                 |               |             |            |             | Asserts when any of the bit is set in STATUS_MFR_SPECIFIC register            |
|              | B11 - STANDBY                      |               |             |            |             | Asserts when any of the bit is set in STATUS_STANDBY register.                |
|              | b10 - FANS                         |               |             |            |             | Asserts when any of the bit is set in STATUS_FAN_1_2 register                 |
|              | b9:3                               |               |             |            |             |                                                                               |
|              | b2 - TEMPERATURE                   |               |             |            |             | Asserts when any of the bit is set in STATUS_TEMPERATURE register             |
|              | b1:0                               |               |             |            |             |                                                                               |
| 71h          | STATUS_INPUT                       | -             | R           | 2          | Bitmapped   |                                                                               |
|              | B15 - INPUT_FREQUENCY_OUT_OF_RANGE |               |             |            |             | Asserts when there is an input line frequency out of range. Auto recoverable. |
|              | B14 - INPUT_LINE_MIXED_UP_FAULT    |               |             |            |             | Asserts when there is an input line mixed up fault.                           |
|              | b13:8                              |               |             |            |             |                                                                               |
|              | b7 - VIN_OV_FAULT                  |               |             |            |             | Asserts when there is an input overvoltage fault. Auto recoverable            |
|              | b6:5                               |               |             |            |             |                                                                               |
|              | b4 - VIN_UV_FAULT                  |               |             |            |             | Asserts when there is an input under voltage fault. Auto recoverable          |
|              | b3                                 |               |             |            |             |                                                                               |
|              | b2 - IIN_OC_FAULT                  |               |             |            |             | Asserts when there is an input overcurrent fault. Auto recoverable            |
|              | b1 - IIN_POWER_DERATING            |               |             |            |             | Asserts when there is an input power derating. Auto recoverable               |
|              | b0                                 |               |             |            |             |                                                                               |

## SECTION 6 MODBUS SPECIFICATIONS

The FCM30K Narrow Trim Series Supported Modbus Command List

| Command Code | Command Name               | Default Value | Access Type | Data Bytes | Data Format | Description                                                                                                                  |
|--------------|----------------------------|---------------|-------------|------------|-------------|------------------------------------------------------------------------------------------------------------------------------|
| 72h          | STATUS_VOUT                | -             | R           | 2          | Bitmapped   |                                                                                                                              |
|              | b15 - VOUT_SC_FAULT        |               |             |            |             | Asserts when there is an output short circuit fault. This can be cleared by input power recycle.                             |
|              | b14:8                      |               |             |            |             |                                                                                                                              |
|              | b7 - VOUT_OV_FAULT         |               |             |            |             | Asserts when there is an output overvoltage fault. This can be cleared by Input Power Recycle.                               |
|              | b6:5                       |               |             |            |             |                                                                                                                              |
|              | b4 - VOUT_UV_FAULT         |               |             |            |             | Asserts when there is an output under voltage fault at voltage source mode. This can be cleared by input power recycle.      |
|              | b3                         |               |             |            |             |                                                                                                                              |
|              | b2 - TON_MAX_FAULT         |               |             |            |             | Device is unable to reach the target output within the stated power up time. This can be cleared by input power recycle.     |
|              | b1                         |               |             |            |             |                                                                                                                              |
|              | b0                         |               |             |            |             |                                                                                                                              |
| 73h          | STATUS_IOUT                | -             | R           | 2          | Bitmapped   |                                                                                                                              |
|              | b15 - SECONDARY_RAIL_FAULT |               |             |            |             |                                                                                                                              |
|              | b8:14                      |               |             |            |             |                                                                                                                              |
|              | b7 - IOUT_OC_FAULT         |               |             |            |             | Asserts when there is an output overcurrent fault. Input power and PSON, PSKILL recycle can clear this.                      |
|              | b6 - IOUT_OC_LV_FAULT      |               |             |            |             | Asserts when there is an output overpower fault at current source mode. Input power and PSON, PSKILL recycle can clear this. |
|              | b5:0                       |               |             |            |             |                                                                                                                              |

## SECTION 6 MODBUS SPECIFICATIONS

The FCM30K Narrow Trim Series Supported Modbus Command List

| Command Code | Command Name              | Default Value | Access Type | Data Bytes | Data Format | Description                                                                                                                       |
|--------------|---------------------------|---------------|-------------|------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------|
| 74h          | STATUS_MFR_SPECIFIC       | -             | R           | 2          | Bitmapped   |                                                                                                                                   |
|              | b15 - PRIMARY_RAIL_FAULT  |               |             |            |             |                                                                                                                                   |
|              | b14 - BOOST_SCP           |               |             |            |             | Any of the two bulk output voltage below short circuit protection level. This can be cleared by input power recycle.              |
|              | b13 - BOOST_TON_MAX_FAULT |               |             |            |             | Device is unable to reach the target bulk voltage within the stated power up time.                                                |
|              | b12 - BOOST_OVP           |               |             |            |             | Bulk voltage is above overvoltage protection level. This can be cleared by input power recycle.                                   |
|              | b11 - BOOST_DIFF_PROT     |               |             |            |             | An event when there is a significant difference between VBulk1 and VBulk2 regulation. This can be cleared by input power recycle. |
|              | b10                       |               |             |            |             |                                                                                                                                   |
|              | b9 - BOOST_UVP            |               |             |            |             | Bulk voltage is below under voltage protection level. This can be cleared by Input Power recycle.                                 |
|              | b8 - BOOST_BAD            |               |             |            |             | A bulk voltage is below nominal voltage threshold.                                                                                |
|              | b7 - BOOST_OVP_NEGATIVE   |               |             |            |             | Bulk voltage on negative rail is above overvoltage protection level. This can be cleared by input power recycle.                  |
|              | b6 - BOOST_OVP_POSITIVE   |               |             |            |             | Bulk voltage on positive rail is above overvoltage protection level. This can be cleared by input power recycle.                  |
|              | b5                        |               |             |            |             |                                                                                                                                   |
|              | b4                        |               |             |            |             |                                                                                                                                   |
|              | b3                        |               |             |            |             |                                                                                                                                   |
|              | b2 - PRIMARY_OC_FAULT     |               |             |            |             | Primary Overcurrent Fault. Latch                                                                                                  |
|              | b1 - SECONDARY_STUCK_ISP  |               |             |            |             | The SECONDARY_STUCK_ISP is a status if secondary controller is stuck in ISP Mode.                                                 |
|              | b0 - PRIMARY_STUCK_ISP    |               |             |            |             | The PRIMARY_STUCK_ISP is a status if primary controller is stuck in ISP Mode.                                                     |

## SECTION 6 MODBUS SPECIFICATIONS

The FCM30K Narrow Trim Series Supported Modbus Command List

| Command Code | Command Name               | Default Value | Access Type | Data Bytes | Data Format | Description                                                                                    |
|--------------|----------------------------|---------------|-------------|------------|-------------|------------------------------------------------------------------------------------------------|
| 75h          | MODULE_DETECTION           | -             | R           | 2          | Bitmapped   | Returns module detected per slot.                                                              |
|              | b15:3                      |               |             |            |             |                                                                                                |
|              | b2 - MODULE 3              |               |             |            |             | Module is present on slot 3                                                                    |
|              | b1 - MODULE 2              |               |             |            |             | Module is present on slot 2                                                                    |
|              | b0 - MODULE 1              |               |             |            |             | Module is present on slot 1                                                                    |
| 76h          | STATUS_TEMPERATURE         | -             | R           | 2          | Bitmapped   |                                                                                                |
|              | b15 - BOOST_LLC_OT_FAULT   |               |             |            |             | Primary boost temperature is above over temperature fault limit.<br>Auto recoverable.          |
|              | b14 - BOOST_PFC_OT_FAULT   |               |             |            |             | Primary boost temperature is above over temperature fault limit.<br>Auto recoverable.          |
|              | b13 - DCDC_OR_OT_FAULT     |               |             |            |             | Secondary DCDC oring temperature is above over temperature fault limit.<br>Auto recoverable.   |
|              | b12 - DCDC_SYNC_A_OT_FAULT |               |             |            |             | Secondary DCDC SYNC_A temperature is above over temperature fault limit.<br>Auto recoverable.  |
|              | b11 - DCDC_SYNC_B_OT_FAULT |               |             |            |             | Secondary DCDC SYNC_B temperature is above over temperature fault limit.<br>Auto recoverable.  |
|              | b10 - DCDC_SYNC_C_OT_FAULT |               |             |            |             | Secondary DCDC SYNC_C temperature is above over temperature fault limit.<br>Auto recoverable.  |
|              | b9 - AMBIENT_OT_FAULT      |               |             |            |             | Logic ambient temperature is above over temperature fault limit.<br>Auto recoverable.          |
|              | b8                         |               |             |            |             |                                                                                                |
|              | b7 - OT_FAULT              |               |             |            |             | Asserts when any of the bit [15:9] in STATUS_TEMPERATURE register is set.<br>Auto recoverable. |
|              | b6:0                       |               |             |            |             |                                                                                                |

## SECTION 6 MODBUS SPECIFICATIONS

The FCM30K Narrow Trim Series Supported Modbus Command List

| Command Code | Command Name                   | Default Value | Access Type | Data Bytes | Data Format | Description                                                                                                                                  |
|--------------|--------------------------------|---------------|-------------|------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| 77h          | STATUS_FANS_1_2                | -             | R           | 2          | Bitmapped   |                                                                                                                                              |
|              | b15:8                          |               |             |            |             |                                                                                                                                              |
|              | b7 - FAN_1_FAULT               |               |             |            |             | Fan 1 failed completely or not able to provide the target RPM to cool the device.<br>Auto recoverable.                                       |
|              | b6 - FAN_2_FAULT               |               |             |            |             | Fan 2 failed completely or not able to provide the target RPM to cool the device.<br>Auto recoverable.                                       |
|              | b5:4                           |               |             |            |             |                                                                                                                                              |
|              | b3 - FAN_1_SPEED_OVERRIDDEN    |               |             |            |             |                                                                                                                                              |
|              | b2 - FAN_2_SPEED_OVERRIDDEN    |               |             |            |             |                                                                                                                                              |
|              | b1:0                           |               |             |            |             |                                                                                                                                              |
| 7Dh          | STATUS_SPD                     | -             | R           | 2          | Bitmapped   | Shows the status of the SPD block.                                                                                                           |
|              | b15:1                          |               |             |            |             |                                                                                                                                              |
|              | b0 - SPD_FAIL_DETECT           |               |             |            |             | 0: SPD block is functional<br>1: SPD block is for replacement                                                                                |
| 7Eh          | SHELF_STATUS_TEMPERATURE       | -             | R           | 2          | Bitmapped   |                                                                                                                                              |
|              | b15:7                          |               |             |            |             |                                                                                                                                              |
|              | b6 - OT_FAULT                  |               |             |            |             | Shelf temperature is above over temperature fault limit.<br>Auto recoverable.                                                                |
|              | b5:0                           |               |             |            |             |                                                                                                                                              |
| 7Fh          | STATUS_PMI                     | -             | R           | 2          | Bitmapped   |                                                                                                                                              |
|              | b15:1                          |               |             |            |             |                                                                                                                                              |
|              | b0 - PMI_PRESENT               |               |             |            |             | Asserts when there is PMI available on the shelf.                                                                                            |
| 84h          | OPERATION                      | -             | R/W         | 2          | Bitmapped   | Used to turn the device on and off.                                                                                                          |
|              | b15:9                          |               |             |            |             |                                                                                                                                              |
|              | b8 - CLEAR_FAULT_LATCH_COMMAND |               |             |            |             | 0 – Disabled (default)<br>1 – Will clear the latching faults (for module main output-related faults)                                         |
|              | b7 - ON                        |               |             |            |             | 0 – PSM Off<br>(This will turn OFF all power supplies connected)<br>1 – PSM On (default)<br>(This will turn ON all power supplies connected) |
|              | b6:0                           |               |             |            |             |                                                                                                                                              |

## SECTION 6 MODBUS SPECIFICATIONS

The FCM30K Narrow Trim Series Supported Modbus Command List

| Command Code | Command Name                     | Default Value | Access Type | Data Bytes | Data Format | Description                                                                                                                                          |
|--------------|----------------------------------|---------------|-------------|------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| 87h          | MODULE_CONFIG                    | -             | R/W         | 4          |             | Used to configure the module.                                                                                                                        |
|              | b15:4                            |               |             |            |             |                                                                                                                                                      |
|              | b3 - OPERATION MODE              |               |             |            |             | 0 – Voltage source mode (Default)<br>1 – current source mode                                                                                         |
|              | b2                               |               |             |            |             |                                                                                                                                                      |
|              | b1 - PSU OUTPUT CONTROL MODE     |               |             |            |             | 0 – Digital mode (Default)<br>1 – Analog mode                                                                                                        |
|              | b0                               |               |             |            |             |                                                                                                                                                      |
| 88h          | MODULE_OPERATION                 | -             | R/W         | 4          |             | Used to enable/disable the module configuration.                                                                                                     |
|              | b15:3                            |               |             |            |             |                                                                                                                                                      |
|              | b2 – NFC Write Disable           |               |             |            |             | 1 – Disable NFC Write<br>0 – Enable NFC Write (default)                                                                                              |
|              | b1 - MODULE SYNC START OVERRIDE  |               |             |            |             | 1 – Enable override for sync start (Not ready for Sync)<br>0 – Disable override for sync start (Do Sync)                                             |
|              | b0 – ENABLE MODULE CONFIGURATION |               |             |            |             | 0 – Disable configuration (Default)<br>(This will turn on all power supplies)<br>1 – Enable configuration<br>(This will turn off all power supplies) |
| AFh          | SHELF_FAIL_SAFE_CONFIG           |               |             |            |             |                                                                                                                                                      |
|              | b15:2                            |               |             |            |             |                                                                                                                                                      |
|              | b1 - FAIL SAFE IO POLARITY       |               |             |            |             | 1 – Active High<br>0 - Active Low (Default)                                                                                                          |
|              | b0 – FAIL SAFE ENABLE            |               |             |            |             | 0 – Disable Fail Safe (default)<br>1 – Enable Fail Safe                                                                                              |

## SECTION 6 MODBUS SPECIFICATIONS

The FCM30K Narrow Trim Series Supported Modbus Command List

| Command Code | Command Name             | Default Value | Access Type | Size in Word | Data Format | Description                                                       |
|--------------|--------------------------|---------------|-------------|--------------|-------------|-------------------------------------------------------------------|
| 0000h        | MRF_ID                   | -             | R           | 2            | ASCII       | Default: "S077"                                                   |
| 0002h        | MFR_MODEL                | -             | R           | 10           | ASCII       | Default: "FCM30K-SHF-L-W-P"                                       |
| 000Ch        | MFR_LOCATION             | -             | R           | 10           | ASCII       | Default: "LAGUNA"<br>Refer to S/N MFR Location (Laguna or Cavite) |
| 0016h        | SHELF_MFR_DATE           | -             | R           | 4            | ASCII       | Default: "WW/YYYY"<br>Retrieved from Shelf EEPROM                 |
| 001Ah        | SHELF_MFR_SERIAL         | -             | R           | 10           | ASCII       | Default: "SSSS"<br>Retrieved from Shelf EEPROM                    |
| 0024h        | SHELF_HW_REVISION        | -             | R           | 2            | ASCII       | Default: "ZZ"<br>Retrieved from Shelf EEPROM                      |
| 003Bh        | PMI_FW_REVISION          | -             | R           | 9            | ASCII       | Default: "00.00"<br>Retrieved from Shelf EEPROM                   |
| 003Eh        | PSM_MFR_DATE             | -             | R           | 4            | ASCII       | Default: "WW/YYYY"<br>Retrieved from PSM                          |
| 0040h        | PSM_MFR_MODEL            | -             | R           | 5            | ASCII       | Default: "83-788-011"<br>Retrieved from PSM                       |
| 0045h        | PSM_MFR_LOCATION         | -             | R           | 2            | ASCII       | Default: "L"<br>Retrieved from PSM                                |
| 0046h        | PSM_MFR_DATE             | -             | R           | 4            | ASCII       | Default: "WW/YYYY"<br>Retrieved from PSM                          |
| 004Ah        | PSM_MFR_SERIAL           | -             | R           | 3            | ASCII       | Default: "SSSSS"<br>Retrieved from PSM                            |
| 004Dh        | PSM_HW_REVISION          | -             | R           | 1            | ASCII       | Default: "ZZ"<br>Retrieved from PSM                               |
| 004Eh        | PSM_FW_REVISION          | -             | R           | 3            | ASCII       | Default: "00.00"<br>Retrieved from PSM                            |
| 0070h        | STATUS_WORD              | -             | R           | 1            | Bitmapped   |                                                                   |
| 0071h        | STATUS_INPUT             | -             | R           | 1            | Bitmapped   |                                                                   |
| 0072h        | STATUS_VOUT              | -             | R           | 1            | Bitmapped   |                                                                   |
| 0073h        | STATUS_IOUT              | -             | R           | 1            | Bitmapped   |                                                                   |
| 0074h        | STATUS_MFR_SPECIFIC      | -             | R           | 1            | Bitmapped   |                                                                   |
| 0075h        | MODULE_DETECTION         | -             | R           | 1            | Bitmapped   |                                                                   |
| 0076h        | STATUS_TEMPERATURE       | -             | R           | 1            | Bitmapped   |                                                                   |
| 0077h        | STATUS_FAN_1_2           | -             | R           | 1            | Bitmapped   |                                                                   |
| 007Dh        | STATUS_SPD               | -             | R           | 1            | Bitmapped   |                                                                   |
| 007Eh        | SHELF_STATUS_TEMPERATURE | -             | R           | 1            | Bitmapped   |                                                                   |
| 007Fh        | STATUS_PMI               | -             | R           | 1            | Bitmapped   |                                                                   |
| 0084h        | OPERATION                | -             | R/W         | 1            | Bitmapped   |                                                                   |
| 0085h        | VREF_TRIM                | -             | R/W         | 1            | x100        | Default: 54.5V<br>Range: 48.0V to 60.0V<br>(VREF_MAX_LIMIT)       |

## SECTION 6 MODBUS SPECIFICATIONS

The FCM30K Narrow Trim Series Supported Modbus Command List

| Command Code | Command Name                     | Default Value | Access Type | Size in Word | Data Format | Description                                                                                                                                                                     |
|--------------|----------------------------------|---------------|-------------|--------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0086h        | IREF_TRIM                        | -             | R/W         | 1            | x100        | Voltage Source Mode:<br>Default: 183.5A<br>Range: 9.175A to 183.5A<br>(IREF_MAX_LIMIT)<br>Current Source Mode:<br>Default 9.175A<br>Range: 9.175A to 183.5A<br>(IREF_MAX_LIMIT) |
| 0087h        | MODULE_CONFIG                    | -             | R/W         | 1            | Bitmapped   |                                                                                                                                                                                 |
| 0088h        | MODULE_OPERATION                 | -             | R/W         | 1            | Bitmapped   |                                                                                                                                                                                 |
| 0089h        | SHELF_MODULE_COUNT               | -             | R/W         | 1            | Bitmapped   | Default: 3<br>Range: 0 to 3                                                                                                                                                     |
| 00AAh        | DEVICE_ADDRESS                   | -             | R/W         | 1            | Bitmapped   |                                                                                                                                                                                 |
| 00ABh        | BAUD_RATE_CONFIG                 | -             | R/W         | 1            | Bitmapped   |                                                                                                                                                                                 |
| 00AFh        | SHELF_FAIL_SAFE_CONFIG           | -             | R/W         | 1            | Bitmapped   |                                                                                                                                                                                 |
| 00B0h        | OUTPUT_VOLTAGE                   | -             | R           | 1            | x100        | (Parallel; Highest or Average)<br>Read from Modules                                                                                                                             |
| 00B1h        | OUTPUT_CURRENT                   | -             | R           | 1            | x100        | (Accumulated)<br>Read from Modules                                                                                                                                              |
| 00B2h        | OUTPUT_POWER                     | -             | R           | 1            | x1          | (Accumulated)<br>Read from Modules                                                                                                                                              |
| 00B4h        | PMI-INPUT_LINE_NEUTRAL_VOLTAGE_A | -             | R           | 1            | x1          | Varies                                                                                                                                                                          |
| 00B5h        | PMI-INPUT_CURRENT_A              | -             | R           | 1            | x100        | Varies                                                                                                                                                                          |
| 00B6h        | PMI_ACTIVE_POWER_TOTAL           | -             | R           | 1            | x1          | Varies                                                                                                                                                                          |
| 00B7h        | SHELF_READ_TEMPERATURE_1         | -             | R           | 1            | x100        | Varies                                                                                                                                                                          |
| 00D7h        | PMI-INPUT_LINE_NEUTRAL_VOLTAGE_B | -             | R           | 1            | x1          | Varies                                                                                                                                                                          |
| 00D8h        | PMI-INPUT_LINE_NEUTRAL_VOLTAGE_C | -             | R           | 1            | x1          | Varies                                                                                                                                                                          |
| 00D9h        | PMI-INPUT_LINE_LINE_VOLTAGE_A_B  | -             | R           | 1            | x1          | Varies                                                                                                                                                                          |
| 00DAh        | PMI-INPUT_LINE_LINE_VOLTAGE_B_C  | -             | R           | 1            | x1          | Varies                                                                                                                                                                          |
| 00DBh        | PMI-INPUT_LINE_LINE_VOLTAGE_C_A  | -             | R           | 1            | x1          | Varies                                                                                                                                                                          |
| 00DCh        | PMI-INPUT_CURRENT_B              | -             | R           | 1            | x100        | Varies                                                                                                                                                                          |
| 00DDh        | PMI-INPUT_CURRENT_C              | -             | R           | 1            | x100        | Varies                                                                                                                                                                          |
| 00DEh        | PMI_ACTIVE_POWER_A               | -             | R           | 1            | x1          | Varies                                                                                                                                                                          |
| 00DFh        | PMI_ACTIVE_POWER_B               | -             | R           | 1            | x1          | Varies                                                                                                                                                                          |
| 00E0h        | PMI_ACTIVE_POWER_C               | -             | R           | 1            | x1          | Varies                                                                                                                                                                          |
| 00E1h        | PMI-INPUT_FREQUENCY              | -             | R           | 1            | x1          | Varies                                                                                                                                                                          |
| 00E2h        | PMI_POWER_FACTOR_A               | -             | R           | 1            | x10000      | Varies                                                                                                                                                                          |
| 00E3h        | PMI_POWER_FACTOR_B               | -             | R           | 1            | x10000      | Varies                                                                                                                                                                          |
| 00E4h        | PMI_POWER_FACTOR_C               | -             | R           | 1            | x10000      | Varies                                                                                                                                                                          |
| 00E8h        | PSM_TIMEOUT                      | -             | R/W         | 1            | x1          | Default: 0 (Disabled)<br>Range: 1 to 32767 (seconds)                                                                                                                            |
| 0600h        | PSU_BLACKBOX_PAGE                | -             | R/W         | 1            | -           | Default Value: 0<br>Value: 0-9                                                                                                                                                  |

## SECTION 6 MODBUS SPECIFICATIONS

The FCM30K Narrow Trim Series Supported Modbus Command List

| Command Code | Command Name                                | Default Value | Access Type | Size in Word | Data Format | Description                                   |
|--------------|---------------------------------------------|---------------|-------------|--------------|-------------|-----------------------------------------------|
| 0601h        | PSM_BLACKBOX_PAGE                           | -             | R/W         | 1            | -           | Default Value: 0<br>Value: 0-9                |
| 0604h        | PSM_FAULT_RECORD_STATUS_WORD                | -             | R           | 1            | Bitmapped   | Varies                                        |
| 0605h        | PSM_FAULT_RECORD_STATUS_INPUT               | -             | R           | 1            | Bitmapped   | Varies                                        |
| 0606h        | PSM_FAULT_RECORD_STATUS_VOUT                | -             | R           | 1            | Bitmapped   | Varies                                        |
| 0607h        | PSM_FAULT_RECORD_STATUS_IOUT                | -             | R           | 1            | Bitmapped   | Varies                                        |
| 0608h        | PSM_FAULT_RECORD_STATUS_MFR_SPECIFIC        | -             | R           | 1            | Bitmapped   | Varies                                        |
| 0609h        | PSM_FAULT_RECORD_SHELF_STATUS_TEMPERATURE   | -             | R/W         | 1            | Bitmapped   |                                               |
| 060Ah        | PSM_FAULT_RECORD_SHELF_READ_TEMPERATURE     | -             | R/W         | 1            | Bitmapped   |                                               |
| 060Bh        | PSM_FAULT_RECORD_OUTPUT_VOLTAGE             | -             | R/W         | 1            | x100        | (Parallel; Highest Voltage)<br>Read from PSUs |
| 060Ch        | PSM_FAULT_RECORD_OUTPUT_CURRENT             | -             | R           | 1            | x100        | (Accumulated)<br>Read from PSUs               |
| 060Dh        | PSM_FAULT_RECORD_OUTPUT_POWER               | -             | R           | 1            | x1          | (Accumulated)<br>Read from PSUs               |
| 060Eh        | PSM_FAULT_RECORD_TOTAL_TIME                 | -             | R           | 1            | Raw         | In seconds                                    |
| 0610h        | PMI-INPUT_LINE_NEUTRAL_VOLTAGE_A            | -             | R           | 1            | Raw         | In seconds                                    |
| 1610h        | MODULE1_FAULT_RECORD_STATUS_WORD            | -             | R           | 1            | Bitmapped   |                                               |
| 1611h        | MODULE1_FAULT_RECORD_STATUS_INPUT           | -             | R           | 1            | Bitmapped   |                                               |
| 1612h        | MODULE1_FAULT_RECORD_STATUS_OUTPUT          | -             | R           | 1            | Bitmapped   |                                               |
| 1613h        | MODULE1_FAULT_RECORD_STATUS_IOUT            | -             | R           | 1            | Bitmapped   |                                               |
| 1614h        | MODULE1_FAULT_RECORD_STATUS_MFR_SPECIFIC    | -             | R           | 1            | Bitmapped   |                                               |
| 1615h        | MODULE1_FAULT_RECORD_STATUS_STANDBY         | -             | R           | 1            | Bitmapped   |                                               |
| 1616h        | MODULE1_FAULT_RECORD_STATUS_TEMPERATURE     | -             | R           | 1            | Bitmapped   |                                               |
| 1617h        | MODULE1_FAULT_RECORD_STATUS_FAN_1_2         | -             | R           | 1            | Bitmapped   |                                               |
| 1618h        | MODULE1_FAULT_RECORD_PSU_OUTPUT_VOLTAGE     | -             | R           | 1            | x100        |                                               |
| 1619h        | MODULE1_FAULT_RECORD_PSU_OUTPUT_CURRENT     | -             | R           | 1            | x100        |                                               |
| 161Ah        | MODULE1_FAULT_RECORD_PSU_OUTPUT_POWER       | -             | R           | 1            | x1          |                                               |
| 161Bh        | MODULE1_FAULT_RECORD_PSU_OUTPUT_VOR_VOLTAGE | -             | R           | 1            | x100        |                                               |
| 161Ch        | MODULE1_FAULT_RECORD_PSU_INPUT_VOLTAGE_A    | -             | R           | 1            | x1          |                                               |

## SECTION 6 MODBUS SPECIFICATIONS

The FCM30K Narrow Trim Series Supported Modbus Command List

| Command Code | Command Name                                            | Default Value | Access Type | Size in Word | Data Format | Description |
|--------------|---------------------------------------------------------|---------------|-------------|--------------|-------------|-------------|
| 161Dh        | MODULE1_FAULT_RECORD_PSU_INTPUT_CURRENT_A               | -             | R           | 1            | x100        |             |
| 161Eh        | MODULE1_FAULT_RECORD_PSU_INPUT_VOLTAGE_B                | -             | R           | 1            | x1          |             |
| 161Fh        | MODULE1_FAULT_RECORD_PSU_INTPUT_CURRENT_B               | -             | R           | 1            | x100        |             |
| 1620h        | MODULE1_FAULT_RECORD_PSU_INPUT_VOLTAGE_C                | -             | R           | 1            | x1          |             |
| 1621h        | MODULE1_FAULT_RECORD_PSU_INTPUT_CURRENT_C               | -             | R           | 1            | x100        |             |
| 1622h        | MODULE1_FAULT_RECORD_PSU_INTPUT_POWER_TOTAL             | -             | R           | 1            | x1          |             |
| 1623h        | MODULE1_FAULT_RECORD_TEMP1-PRI                          | -             | R           | 1            | x100        |             |
| 1624h        | MODULE1_FAULT_RECORD_TEMP2-SEC                          | -             | R           | 1            | x100        |             |
| 1625h        | MODULE1_FAULT_RECORD_TEMP3-BUCK                         | -             | R           | 1            | x100        |             |
| 1626h        | MODULE1_FAULT_RECORD_TEMP4-AMBIENT                      | -             | R           | 1            | x100        |             |
| 1627h        | MODULE1_FAULT_RECORD_TEMP5-NFC                          | -             | R           | 1            | x100        |             |
| 1628h        | MODULE1_FAULT_RECORD_PSU_FAN1                           | -             | R           | 1            | x100        |             |
| 1629h        | MODULE1_FAULT_RECORD_PSU_FAN2                           | -             | R           | 1            | x100        |             |
| 162Ah        | MODULE1_FAULT_RECORD_PSU_STANDBY_VOLTAGE                | -             | R           | 1            | x100        |             |
| 162Bh        | MODULE1_FAULT_RECORD_PSU_STANDBY_CURRENT                | -             | R           | 1            | x10000      |             |
| 162Ch        | MODULE1_FAULT_RECORD_PSU_MODULE_CONFIG                  | -             | R           | 1            | Bitmapped   |             |
| 162Dh        | MODULE1_FAULT_RECORD_PSU_VREF_TRIM                      | -             | R           | 1            | x100        |             |
| 162Eh        | MODULE1_FAULT_RECORD_PSU_IREF_TRIM                      | -             | R           | 1            | x100        |             |
| 162Fh        | MODULE1_FAULT_RECORD_PSU_BAUD_RATE_CONFIG               | -             | R           | 1            | -           |             |
| 1630h        | MODULE1_FAULT_RECORD_PSU_VREF_MAX_LIMIT                 | -             | R           | 1            | x100        |             |
| 1631h        | MODULE1_FAULT_RECORD_PSU_IREF_MAX_LIMIT                 | -             | R           | 1            | x100        |             |
| 1632h        | MODULE1_FAULT_RECORD_PSU_PRI_ADP_UART_ERROR_COUNT       | -             | R           | 1            | x1          |             |
| 1633h        | MODULE1_FAULT_RECORD_PSU_SEC_PRI_ADP_UART_ERROR_COUNT   | -             | R           | 1            | x1          |             |
| 1634h        | MODULE1_FAULT_RECORD_PSU_SEC_LOGIC_ADP_UART_ERROR_COUNT | -             | R           | 1            | x1          |             |
| 1635h        | MODULE1_FAULT_RECORD_PSU_LOGIC_ADP_UART_ERROR_COUNT     | -             | R           | 1            | x1          |             |
| 1636h        | MODULE1_FAULT_RECORD_PSU_TOTAL_TIME                     | -             | R           | 1            | -           |             |

## SECTION 6 MODBUS SPECIFICATIONS

The FCM30K Narrow Trim Series Supported Modbus Command List

| Command Code | Command Name                                | Default Value | Access Type | Size in Word | Data Format | Description |
|--------------|---------------------------------------------|---------------|-------------|--------------|-------------|-------------|
| 1638h        | MODULE1_FAULT_RECORD_PSU_TIME_SINCE_LAST_ON | -             | R           | 1            | -           |             |
| 2610h        | MODULE2_FAULT_RECORD_STSTATUS_WORD          | -             | R           | 1            | Bitmapped   |             |
| 2611h        | MODULE2_FAULT_RECORD_STSTATUS_INPUT         | -             | R           | 1            | Bitmapped   |             |
| 2612h        | MODULE2_FAULT_RECORD_STSTATUS_OUTPUT        | -             | R           | 1            | Bitmapped   |             |
| 2613h        | MODULE2_FAULT_RECORD_STSTATUS_IOUT          | -             | R           | 1            | Bitmapped   |             |
| 2614h        | MODULE2_FAULT_RECORD_STSTATUS_MFR_SPECIFIC  | -             | R           | 1            | Bitmapped   |             |
| 2615h        | MODULE2_FAULT_RECORD_STSTATUS_STANDBY       | -             | R           | 1            | Bitmapped   |             |
| 2616h        | MODULE2_FAULT_RECORD_STSTATUS_TEMPERATURE   | -             | R           | 1            | Bitmapped   |             |
| 2617h        | MODULE2_FAULT_RECORD_STSTATUS_FAN_1_2       | -             | R           | 1            | Bitmapped   |             |
| 2618h        | MODULE2_FAULT_RECORD_PSU_OUTPUT_VOLTAGE     | -             | R           | 1            | x100        |             |
| 2619h        | MODULE2_FAULT_RECORD_PSU_OUTPUT_CURRENT     | -             | R           | 1            | x100        |             |
| 261Ah        | MODULE2_FAULT_RECORD_PSU_OUTPUT_POWER       | -             | R           | 1            | x1          |             |
| 261Bh        | MODULE2_FAULT_RECORD_PSU_OUTPUT_VOR_VOLTAGE | -             | R           | 1            | x100        |             |
| 261Ch        | MODULE2_FAULT_RECORD_PSU_INPUT_VOLTAGE_A    | -             | R           | 1            | x1          |             |
| 261Dh        | MODULE2_FAULT_RECORD_PSU_INTPUT_CURRENT_A   | -             | R           | 1            | x100        |             |
| 261Eh        | MODULE2_FAULT_RECORD_PSU_INPUT_VOLTAGE_B    | -             | R           | 1            | x1          |             |
| 261Fh        | MODULE2_FAULT_RECORD_PSU_INTPUT_CURRENT_B   | -             | R           | 1            | x100        |             |
| 2620h        | MODULE2_FAULT_RECORD_PSU_INPUT_VOLTAGE_C    | -             | R           | 1            | x1          |             |
| 2621h        | MODULE2_FAULT_RECORD_PSU_INTPUT_CURRENT_C   | -             | R           | 1            | x100        |             |
| 2622h        | MODULE2_FAULT_RECORD_PSU_INTPUT_POWER_TOTAL | -             | R           | 1            | x1          |             |
| 2623h        | MODULE2_FAULT_RECORD_TEMP1-PRI              | -             | R           | 1            | x100        |             |
| 2624h        | MODULE2_FAULT_RECORD_TEMP2-SEC              | -             | R           | 1            | x100        |             |
| 2625h        | MODULE2_FAULT_RECORD_TEMP3-BUCK             | -             | R           | 1            | x100        |             |
| 2626h        | MODULE2_FAULT_RECORD_TEMP4-AMBIENT          | -             | R           | 1            | x100        |             |
| 2627h        | MODULE2_FAULT_RECORD_TEMP5-NFC              | -             | R           | 1            | x100        |             |
| 2628h        | MODULE2_FAULT_RECORD_PSU_FAN1               | -             | R           | 1            | x100        |             |
| 2629h        | MODULE2_FAULT_RECORD_PSU_FAN2               | -             | R           | 1            | x100        |             |

## SECTION 6 MODBUS SPECIFICATIONS

The FCM30K Narrow Trim Series Supported Modbus Command List

| Command Code | Command Name                                             | Default Value | Access Type | Size in Word | Data Format | Description |
|--------------|----------------------------------------------------------|---------------|-------------|--------------|-------------|-------------|
| 262Ah        | MODULE2_FAULT_RECORD_PSU_STANDBY_VOLTAGE                 | -             | R           | 1            | x100        |             |
| 262Bh        | MODULE2_FAULT_RECORD_PSU_STANDBY_CURRENT                 | -             | R           | 1            | x10000      |             |
| 262Ch        | MODULE2_FAULT_RECORD_PSU_MODULE_CONFIG                   | -             | R           | 1            | Bitmapped   |             |
| 262Dh        | MODULE2_FAULT_RECORD_PSU_VREF_TRIM                       | -             | R           | 1            | x100        |             |
| 262Eh        | MODULE2_FAULT_RECORD_PSU_IREF_TRIM                       | -             | R           | 1            | x100        |             |
| 262Fh        | MODULE2_FAULT_RECORD_PSU_BAUD_RATE_CONFIG                | -             | R           | 1            | -           |             |
| 2630h        | MODULE2_FAULT_RECORD_PSU_VREF_MAX_LIMIT                  | -             | R           | 1            | x100        |             |
| 2631h        | MODULE2_FAULT_RECORD_PSU_IREF_MAX_LIMIT                  | -             | R           | 1            | x100        |             |
| 2632h        | MODULE2_FAULT_RECORD_PSU_PRI_ADAP_UART_ERROR_COUNT       | -             | R           | 1            | x1          |             |
| 2633h        | MODULE2_FAULT_RECORD_PSU_SEC_PRI_ADAP_UART_ERROR_COUNT   | -             | R           | 1            | x1          |             |
| 2634h        | MODULE2_FAULT_RECORD_PSU_SEC_LOGIC_ADAP_UART_ERROR_COUNT | -             | R           | 1            | x1          |             |
| 2635h        | MODULE2_FAULT_RECORD_PSU_LOGIC_ADAP_UART_ERROR_COUNT     | -             | R           | 1            | x1          |             |
| 2636h        | MODULE2_FAULT_RECORD_PSU_TOTAL_TIME                      | -             | R           | 1            | -           |             |
| 2638h        | MODULE2_FAULT_RECORD_PSU_TIME_SINCE_LAST_ON              | -             | R           | 1            | -           |             |
| 3610h        | MODULE3_FAULT_RECORD_STSTATUS_WORD                       | -             | R           | 1            | Bitmapped   |             |
| 3611h        | MODULE3_FAULT_RECORD_STSTATUS_INPUT                      | -             | R           | 1            | Bitmapped   |             |
| 3612h        | MODULE3_FAULT_RECORD_STSTATUS_OUTPUT                     | -             | R           | 1            | Bitmapped   |             |
| 3613h        | MODULE3_FAULT_RECORD_STSTATUS_IOUT                       | -             | R           | 1            | Bitmapped   |             |
| 3614h        | MODULE3_FAULT_RECORD_STSTATUS_MFR_SPECIFIC               | -             | R           | 1            | Bitmapped   |             |
| 3615h        | MODULE3_FAULT_RECORD_STSTATUS_STANDBY                    | -             | R           | 1            | Bitmapped   |             |
| 3616h        | MODULE3_FAULT_RECORD_STSTATUS_TEMPERATURE                | -             | R           | 1            | Bitmapped   |             |
| 3617h        | MODULE3_FAULT_RECORD_STSTATUS_FAN_1_2                    | -             | R           | 1            | Bitmapped   |             |
| 3618h        | MODULE3_FAULT_RECORD_PSU_OUTPUT_VOLTAGE                  | -             | R           | 1            | x100        |             |
| 3619h        | MODULE3_FAULT_RECORD_PSU_OUTPUT_CURRENT                  | -             | R           | 1            | x100        |             |
| 361Ah        | MODULE3_FAULT_RECORD_PSU_OUTPUT_POWER                    | -             | R           | 1            | x1          |             |
| 361Bh        | MODULE3_FAULT_RECORD_PSU_OUTPUT_VOR_VOLTAGE              | -             | R           | 1            | x100        |             |

## SECTION 6 MODBUS SPECIFICATIONS

The FCM30K Narrow Trim Series Supported Modbus Command List

| Command Code | Command Name                                            | Default Value | Access Type | Size in Word | Data Format | Description |
|--------------|---------------------------------------------------------|---------------|-------------|--------------|-------------|-------------|
| 361Ch        | MODULE3_FAULT_RECORD_PSU_INPUT_VOLTAGE_A                | -             | R           | 1            | x1          |             |
| 361Dh        | MODULE3_FAULT_RECORD_PSU_INTPUT_CURRENT_A               | -             | R           | 1            | x100        |             |
| 361Eh        | MODULE3_FAULT_RECORD_PSU_INPUT_VOLTAGE_B                | -             | R           | 1            | x1          |             |
| 361Fh        | MODULE3_FAULT_RECORD_PSU_INTPUT_CURRENT_B               | -             | R           | 1            | x100        |             |
| 3620h        | MODULE3_FAULT_RECORD_PSU_INPUT_VOLTAGE_C                | -             | R           | 1            | x1          |             |
| 3621h        | MODULE3_FAULT_RECORD_PSU_INTPUT_CURRENT_C               | -             | R           | 1            | x100        |             |
| 3622h        | MODULE3_FAULT_RECORD_PSU_INTPUT_POWER_TOTAL             | -             | R           | 1            | x1          |             |
| 3623h        | MODULE3_FAULT_RECORD_TEMP1-PRI                          | -             | R           | 1            | x100        |             |
| 3624h        | MODULE3_FAULT_RECORD_TEMP2-SEC                          | -             | R           | 1            | x100        |             |
| 3625h        | MODULE3_FAULT_RECORD_TEMP3-BUCK                         | -             | R           | 1            | x100        |             |
| 3626h        | MODULE3_FAULT_RECORD_TEMP4-AMBIENT                      | -             | R           | 1            | x100        |             |
| 3627h        | MODULE3_FAULT_RECORD_TEMP5-NFC                          | -             | R           | 1            | x100        |             |
| 3628h        | MODULE3_FAULT_RECORD_PSU_FAN1                           | -             | R           | 1            | x100        |             |
| 3629h        | MODULE3_FAULT_RECORD_PSU_FAN2                           | -             | R           | 1            | x100        |             |
| 362Ah        | MODULE3_FAULT_RECORD_PSU_STANDBY_VOLTAGE                | -             | R           | 1            | x100        |             |
| 362Bh        | MODULE3_FAULT_RECORD_PSU_STANDBY_CURRENT                | -             | R           | 1            | x10000      |             |
| 362Ch        | MODULE3_FAULT_RECORD_PSU_MODULE_CONFIG                  | -             | R           | 1            | Bitmapped   |             |
| 362Dh        | MODULE3_FAULT_RECORD_PSU_VREF_TRIM                      | -             | R           | 1            | x100        |             |
| 362Eh        | MODULE3_FAULT_RECORD_PSU_IREF_TRIM                      | -             | R           | 1            | x100        |             |
| 362Fh        | MODULE3_FAULT_RECORD_PSU_BAUD_RATE_CONFIG               | -             | R           | 1            | -           |             |
| 3630h        | MODULE3_FAULT_RECORD_PSU_VREF_MAX_LIMIT                 | -             | R           | 1            | x100        |             |
| 3631h        | MODULE3_FAULT_RECORD_PSU_IREF_MAX_LIMIT                 | -             | R           | 1            | x100        |             |
| 3632h        | MODULE3_FAULT_RECORD_PSU_PRI_ADP_UART_ERROR_COUNT       | -             | R           | 1            | x1          |             |
| 3633h        | MODULE3_FAULT_RECORD_PSU_SEC_PRI_ADP_UART_ERROR_COUNT   | -             | R           | 1            | x1          |             |
| 3634h        | MODULE3_FAULT_RECORD_PSU_SEC_LOGIC_ADP_UART_ERROR_COUNT | -             | R           | 1            | x1          |             |

## SECTION 6 MODBUS SPECIFICATIONS

The FCM30K Narrow Trim Series Supported Modbus Command List

| Command Code | Command Name                                                | Default Value | Access Type | Size in Word | Data Format | Description |
|--------------|-------------------------------------------------------------|---------------|-------------|--------------|-------------|-------------|
| 3635h        | MODULE3_FAULT_RECORD<br>_PSU_LOGIC_ADP_<br>UART_ERROR_COUNT | -             | R           | 1            | x1          |             |
| 3636h        | MODULE3_FAULT_RECORD<br>_PSU_TOTAL_TIME                     | -             | R           | 1            | -           |             |
| 3638h        | MODULE3_FAULT_RECORD<br>_PSU_TIME_SINCE_LAST_<br>ON         | -             | R           | 1            | -           |             |

## SECTION 7 APPLICATION NOTES

### 7.1 Mode of Operation

There will be two operating modes with respect to how a system may communicate with the PSM: (1) MAP Mode and (2) ISP Mode.

#### 7.1.1 MAP Mode

The MAP (Main Application Program) Mode is the normal operating mode of the PSM. In this mode, readable parameters are available. However, only commands under the Basic Write Protection can be written. New values written to any command in MAP mode are volatile (values will be reset to original if power is recycled).

#### 7.1.2 ISP Mode

In ISP (In-System Programming) Mode, the firmware can be updated through the Modbus communication interface. The MAP Mode function is inhibited in ISP Mode with the exception of some Modbus commands related to the ISP operation. Only the MAP firmware will be affected by any firmware update in ISP mode. All data (except those that should change along with a firmware update, e.g. FW version) and configuration registered in the non-volatile memory will not be altered in ISP mode.

In case of a problem during firmware update (e.g. loss of power, communication error, corrupted MAP firmware, etc.) the product will remain or boot up in ISP mode to be able to reinitiate and complete the firmware update process. After a successful firmware update the PSM shall operate normally again.

During firmware update, conducting PSM or power supply module hotswap is prohibited whether it is from the same shelf or from another shelf within the same parallel connection.

## SECTION 7 APPLICATION NOTES

### 7.2 Current Sharing

Outputs shall be treated and connected to a common load.

The over current protection threshold for 1 shelf allows 30kW peak power and protects no less than 550.5A.

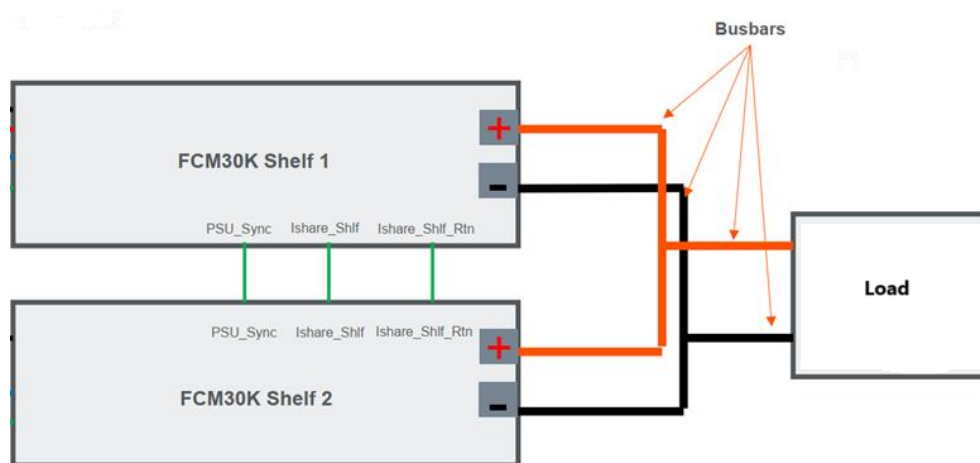
For multi-shelf power system max start-up power limited to 30KW.

No guaranteed sharing on 5Vsb output

Contact AE technical support team for the number of shelves that can be paralleled.

#### Parallel Shelf Set-up

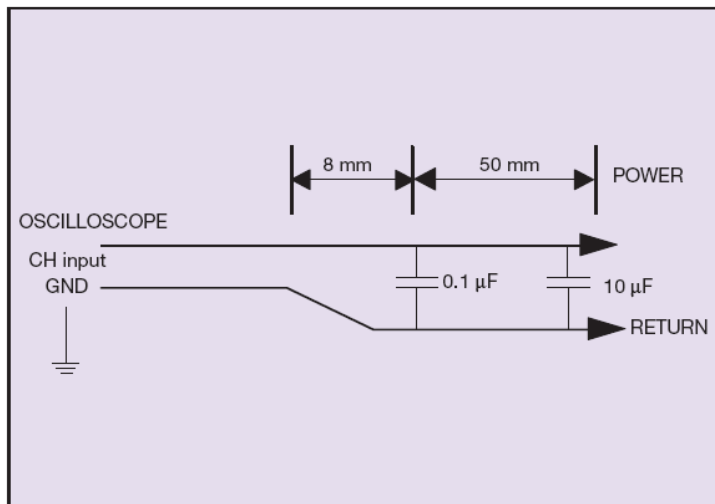
The ISHARE\_SHLF, ISHARE\_SHLF\_RTN and PSU\_SYNC should be connected as shown on diagram below.



## SECTION 7 APPLICATION NOTES

### 7.3 Output Ripple and Noise Measurement

The setup outlined in the diagram below has been used for output ripple and noise measurements on the FCM30K Narrow Trim Series (Voltage Source Mode). When measuring output ripple and noise, a scope jack in parallel with a 0.1 $\mu$ F ceramic chip capacitor, and a 10 $\mu$ F tantalum capacitor should be used. Oscilloscope should be set to 20MHz bandwidth for this measurement.



SECTION 7 APPLICATION NOTES

7.4 Accessories

Pluggable Version Order Test Kit number 83-788-004P.

| Description                | Diagram |
|----------------------------|---------|
| Input Mating Connector     |         |
| Isolated Signal Mating     |         |
| Non-isolated Signal Mating |         |

SECTION 7 APPLICATION NOTES

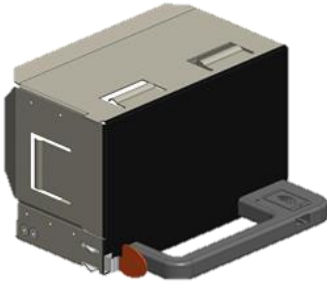
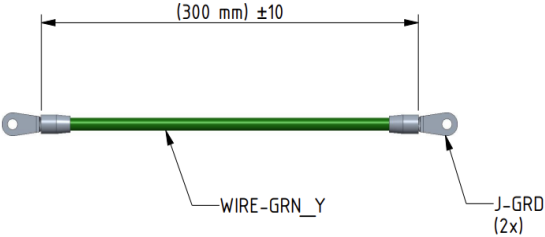
7.4 Accessories

Terminal Block Version Order Test Kit number 83-788-004T.

| Description                | Diagram                                                                                                                                                                                                                                                                                         |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input Mating Connector     | <p>The diagram shows a cable with four wires: WIRE-BLU, WIRE-GRN, WIRE-BLK, and WIRE-RED. The total length is (2 Meters) ±0.05M. A section of (0.2 Meters) ±0.03M is indicated. The wires are terminated with OTHR-LUG (4x) and HTSH-LUG (4x) L=17mm. A (10 mm) (4x) section is also shown.</p> |
| Isolated Signal Mating     | <p>The diagram shows a terminal block with pins P1, P2, P3, P4, P16, and P18. The wire length is 915±10.</p>                                                                                                                                                                                    |
| Non-isolated Signal Mating | <p>The diagram shows a cable with six wires (WIRE (refer to BOM)) terminated with J11-CRIMP (6x) and J11. The length is 240±5. The length is also indicated as Length: mm.</p>                                                                                                                  |

SECTION 7 APPLICATION NOTES

7.4 Accessories

| Description                              | Diagram                                                                              |
|------------------------------------------|--------------------------------------------------------------------------------------|
| FCM30K Shelf Filler<br>83-788-007        |    |
| FCM30K 2U Parallel<br>83-788-008         |   |
| Ground Connector Wire Assy<br>83-788-009 |  |

SECTION 8 RECORD OF REVISION AND CHANGES

| Issue | Date     | Description | Originators |
|-------|----------|-------------|-------------|
| 1.0   | 08.24.26 | First Issue | Z. Yasheng  |



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## ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than four decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

Our products enable customer innovation in complex applications for a wide range of industries including semiconductor equipment, industrial, manufacturing, telecommunications, data center computing, and medical. With deep applications know-how and responsive service and support across the globe, we build collaborative partnerships to meet rapid technological developments, propel growth for our customers, and innovate the future of power.

**PRECISION | POWER | PERFORMANCE | TRUST**

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