AVEOX
POWER TO MOTION

Model:

MMC4423-080-100
80V, 100A

DESCRIPTION

Aveox's Modular Motion Control platform is an interchangeable family of COTS power stages and logic boards for motor control.

Modular motor controllers (MMC) represent a revolutionary advancement in the field of motor control systems. These sophisticated devices are designed to provide unparalleled flexibility and scalability to meet the diverse needs.

This modular approach allows for cost-effective customization, reduced downtime during maintenance or upgrades, and simplified troubleshooting. AVEOX modular motor controllers consist of interchangeable components that can be easily configured and expanded as required.

Features benefits of MMC Power Board

- Ruggedized universal 3-phase power stage with isolated inputs and outputs
- Direct connection to application with high-vibration connectors

Features benefits of FOC Controller (MMC4423-080-100-F1)

- Sensorless FOC Sine wave control of PMAC or Induction Motors in Speed, Torque or VBUS Regulation Mode
- Auto-tuning of Motor and control parameters
- Three Interfaces:
  - Isolated CAN bus per SAE J1939
  - Analog Interface
  - RC pulse Interface (60-400Hz)
- Two platinum RTD interfaces (PT100)
- Configurable and operational with a Windows based GUI

Features benefits of Analog Controller (MMC4423-080-100-A1)

- Hall sensor based commutation of BLDC Motors
- Meets definition of Simple Electronics per RTCA DO-254 (No complex programable devices). Simplifies certification for safety critical applications in Aerospace
- 4-Quadrant high-bandwidth current and velocity loops, tunable to specific applications
- Proprietary zero-deadband current loop allows accurate torque control around zero current while minimizing quiescent motor current
- Differential +/-10V command for torque or velocity
- Two platinum PT100 RTD interfaces
- DC-Link monitor and shunt interface
- System monitor with external fault handling
- Independent adjustable current limits for positive and negative current

SPECIFICATIONS:

Model Number	MMC4423-080-100
Voltage (Max)	80V
Peak Current	100A
Output Power Max	6.9kW
Storage Temperature	-55°C to 125°C
Operating Temperature Range	-40°C to 70°C
Weight (g)	183
Size (Inches) Mounting Plate	5.25" x 3.00" X 0.90"
Motor Types	Permanent Magnet Brushless or Induction (FOC Only)
Electrical Frequency (Max)	1500Hz

Absolute Maximum Ratings

		Min.	Max	Unit
Voltage (1)	VM, Phase	-0.7	100	V
Voltage (2)	F/$\overline{R}$, ENABLE, VIN	-0.1	3.3	V
Voltage (3)	R/C PULSE IN	-0.3	5.0	V
Voltage (3)	CAN-H, CAN-L	-58	58	V
Voltage	Differential voltage on bus pins (CANH-CANL)	-45	45	V
Voltage (4)	RUN/$\overline{STOP}$, CMD_SOURCE, $\overline{MR}$, EXT_$\overline{FAULT}$, EXT_$\overline{OT}$, SHUNT_$\overline{OT}$, HALL-x	-0.3	5.5	V
Voltage (4)	CMD+, CMD-	-12	12	V
T_{stg}	Storage Temperature	-55	105	°C
T_{op}	Operating Temperature	-40	70	°C

(1) Referenced to VM-RTN
(2) Referenced to GND on FOC Controller (MMC-4423-080-80-F1)
(3) Referenced to CAN-GND on FOC Controller (MMC-4423-080-80-F1)
(4) Referenced to GND on Analog Controller (MMC-4423-080-80-A1)

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Recommended Operating Conditions

Parameter	Type	Minimum	Maximum	Units
V-Bus	Motor Voltage	10	80	V
Peak Phase Current	Output Current	0	100	A (Peak)
RMS Phase Current	Output Current	0	70.7	A (RMS)
RTDx+ to RTDx-	Resistance	77	180	Ω
CAN Update Rate [5]	Baud Rate	40	1,000	kBit/sec
CMD+ to CMD- [6]	Voltage	-20	20	V

(5) MMC4423-080-100-F1 Only
(6) MMC4423-080-100-A1 Only

Pin Functions

Power Board Connections for MMC4423-080-100-A1			
Pin	**Name**	**I/O**	**Description / Notes**
J2	Phase A	O	Motor Phase A
J3	Phase B	O	Motor Phase B
J4	Phase C	O	Motor Phase C
J5	+VM	I	DC Power Input
J6	VM-RTN	PWR-GND	POWER GND (Isolated From All Other Grounds)

Logic Board Connections for MMC4423-080-100-F1			
Pin	**Name**	**I/O**	**Description / Notes**
J3-1	+12V	O	Low power supply for customer use, limit current to 50mA. Referenced to GND.
J3-2	+3.3V	O	Low power supply for customer use, limit current to 10mA. Referenced to GND.
J3-3	+5V	O	Low power supply for customer use, limit current to 100mA. Referenced to GND.
J3-4	VIN	I	Single-ended analog input (0-3.3V) for command in analog mode. Referenced to GND
J3-5	F/$\overline{R}$	I	Single-ended Digital input (0, 3.3V) for direction command in analog mode. Internally Pulled high to 3.3V.
J3-6	ENABLE	I	Single-ended Digital input (0, 3.3V) for inhibit input in all modes of operation. Internally Pulled high to 3.3V. Pull to ground to disable motor operation.
J3-7	GND	GND	Signal reference
J3-8	TACH OUT	O	Single-ended Digital Output (0, 5V) pulse for every electrical rotation. Referenced to CAN-GND
J3-9	R/C PULSE IN	I	Single-ended Digital Output (0, 5V) 1-2ms Pulse for R/C input mode. Referenced to CAN-GND
J3-10	CAN-H	I	Differential CAN Bus input per SAE J1939
J3-11	CAN-L	I	
J3-12	CAN-GND	CAN-GND	CAN Ground reference

Pin Functions – Continued

Logic Board Connections for MMC4423-080-100-F1			
Pin	**Name**	**I/O**	**Description / Notes**
J5-1	RTD1+	I	PT100 connection 1. Optionally connect a 100 ohm platinum RTD to this input
J5-2	RTD1-	I	
J5-3	RTD2+	I	PT100 connection 2. Optionally connect a 100 ohm platinum RTD to this input
J5-4	RTD2-	I	
J5-5	N/C		No Connect
J5-6	N/C		

Logic Board Connections for MMC4423-080-100-A1			
Pin	**Name**	**I/O**	**Description / Notes**
J1-1	+5V	O	Low power supply for customer use, limit current to 100mA. Referenced to GND.
J1-2	GND	GND	Signal Ground
J1-3	HALL-A	I	Single-ended digital inputs for Hall Sensors. Referenced to GND. Internally pulled high to +5V.
J1-4	HALL-B	I	
J1-5	HALL-C	I	
J1-6	N/C		
J1-7	RTD1+	I	PT100 connection 1. Optionally connect a 100 ohm platinum RTD to this input*
J1-8	RTD1-	I	
J1-9	RTD2+	I	PT100 connection 2. Optionally connect a 100 ohm platinum RTD to this input*
J1-10	RTD2-	I	

* Short together if not used

Pin Functions – Continued

Logic Board Connections for MMC4423-080-100-A1			
Pin	**Name**	**I/O**	**Description / Notes**
J3-1	+5V	O	Low power supply for customer use, limit current to 100mA. Referenced to GND.
J3-2	OP_FAIL$\overline{}$	O	TTL level (+5V) output becomes low when power devises are disabled due to at least one of the following conditions: Inverter Over-Temp, RTD Over-Temp, External Over-Temp, Shunt-Over Temp. These faults are non-latching
J3-3	SYS_FAIL$\overline{}$	O	TTL level (+5V) output becomes low when power devises are disabled due to at least one of the following conditions: DC-BUS Over-Voltage, Hall-Effect input error, Internal Amplifier Fault or Ext-Fault being pulled low. These faults are latches and can be reset by pulling M$\overline{R}$ to GND.
J3-4	DC-BUS_MON	O	Single Ended Analog DC-Link Monitor (0-5V)
J3-5	RUN/STO$\overline{P}$	I	Single-ended Digital input (0, 5V). Internally pulled high to +5V. Pull to ground to inhibit drive.
J3-6	CUR_MON	O	Current Monitor. Analog output signal proportional to actual motor phase current. Signal output swings from -10V to +10V
J3-7	CMD+	I	Differential command input, +/-10V nominal input range
J3-8	CMD-	I	
J3-9	CMD_SOURCE	I	Single-ended Digital input (0, 5V). Internally pulled high to +5V. Leave open to enable Current Mode, Pull to GND to enable Velocity Mode.
J3-10	VEL_MON	O	Velocity Monitor. Analog output signal proportional to motor speed and is derived from the hall sensor inputs. Signal output swings from -10V to +10V
J3-11	M$\overline{R}$	I	Single-ended digital input for Master Reset. Internally pulled high to +5V. Pull to GND to reset latching faults

Logic Board Connections for MMC4423-080-100-A1			
Pin	**Name**	**I/O**	**Description / Notes**
J3-12	EXT_FAUL$\overline{T}$	I	Single-ended digital input for Fault. Internally pulled high to +5V. Pull to ground to indicate Fault. Referenced to GND.
J3-13	EXT_O$\overline{T}$	I	Single-ended digital input for external over-temperature switch. Internally pulled high to +5V. Pull to ground to indicate over-temp. Referenced to GND.
J3-14	+12V	O	Low power supply for customer use, limit current to 50mA. Referenced to GND.
J3-15	-12V	O	Low power supply for customer use, limit current to 10mA. Referenced to GND.
J3-16	GND	GND	Signal Ground

Pin Functions – Continued

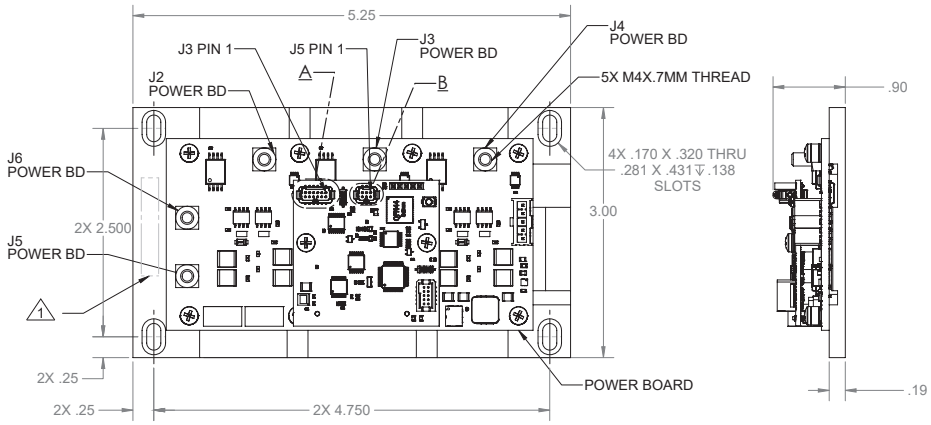
Logic Board Connections for MMC4423-080-100-A1			
Pin	**Name**	**I/O**	**Description / Notes**
J4-1	+12V	O	Low power supply for customer use, limit current to 10mA. Referenced to GND.
J4-2	SHUNT-ANODE	O	The Shunt Anode and Shunt Cathode pins are meant to drive an isolated LED driven switch when the DC-Link exceeds the Shunt Turn on Voltage threshold
J4-3	SHUNT-CATHODE	O	
J4-4	+5V	O	Low power supply for customer use, limit current to 100mA. Referenced to GND.
J4-5	SHUNT_$\overline{OT}$	I	Single-ended digital input for external over-temperature switch. Internally pulled high to +5V. Pull to ground to indicate over-temp. Referenced to GND.
J4-6	GND	GND	Signal Ground

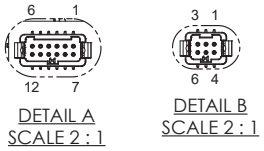
Dielectric Information

Isolation Voltage	HV Group (+VM, VM-RTN, Motor Phases)	LV Group (GND Referenced Signals)	CAN Group (CAN-GND Referenced Signals)	Chassis
HV Group (+VM, VM-RTN, Motor Phases)	N/A	1000VAC	1000VAC	1000VAC
LV Group (GND Referenced Signals)	1000VAC	N/A	500VDC	1000VAC
CAN Group (CAN-GND Referenced Signals)	1000VAC	500VDC	N/A	1000VAC
Chassis	1000VAC	1000VAC	1000VAC	N/A

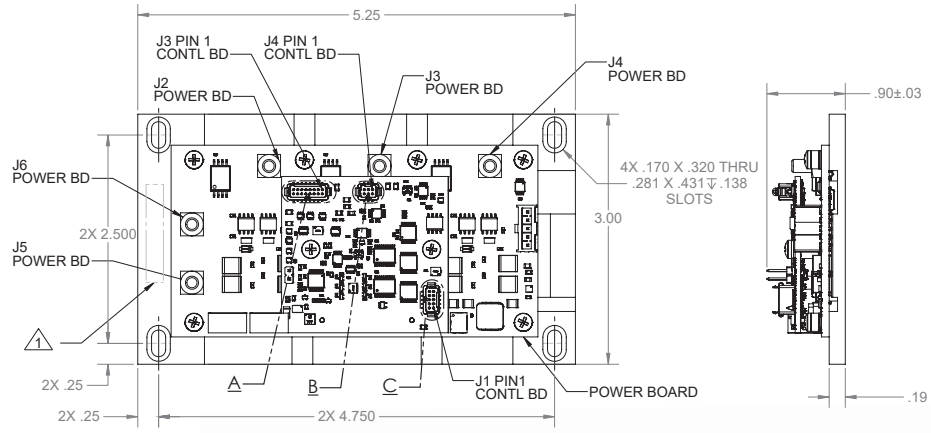
Dimensions – Power Board and Controller

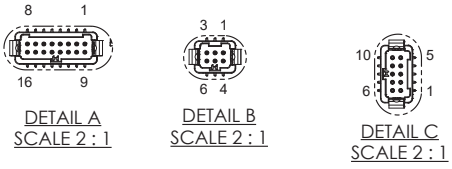
MMC4423-080-100-F1

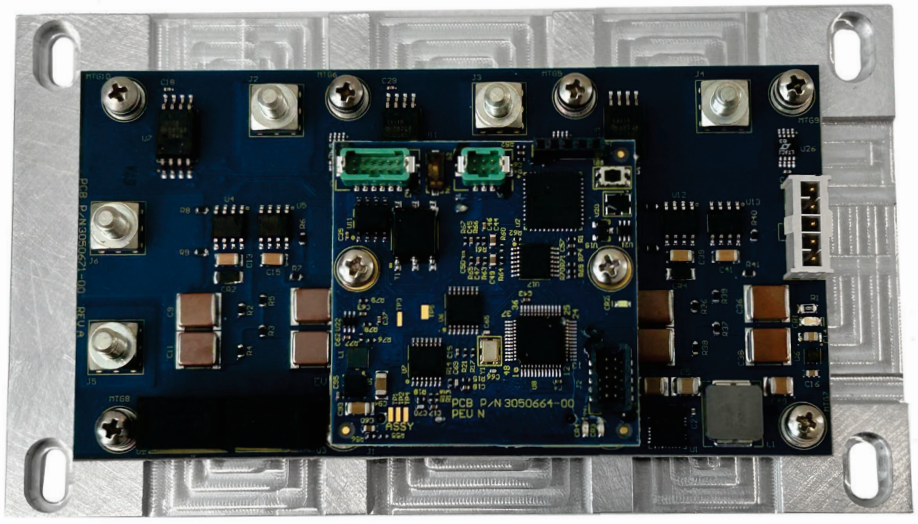




MMC4423-080-100-A1







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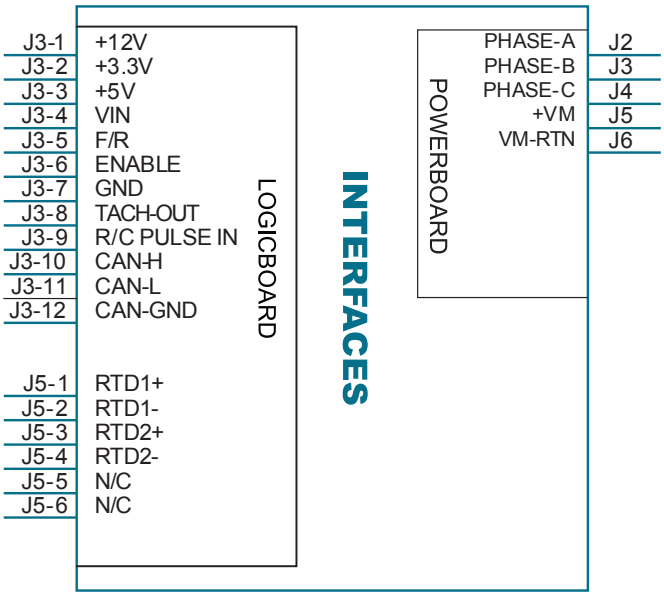
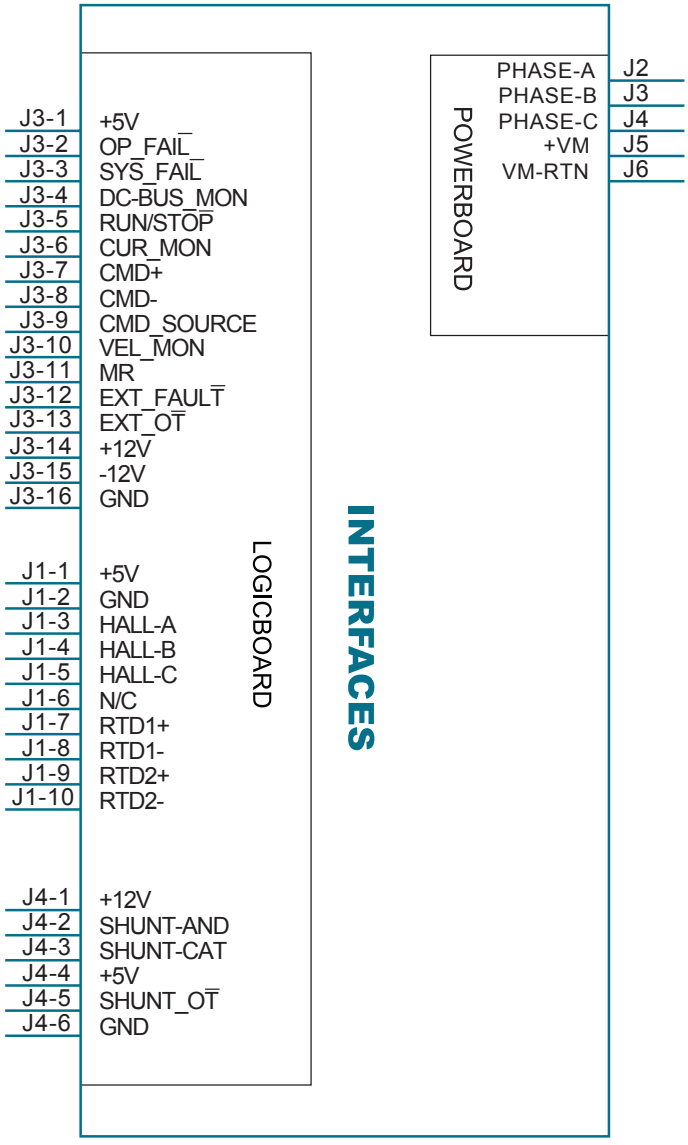
MMC4423-080-100-F1 System Diagram



MMC4423-080-100-A1 System Diagram



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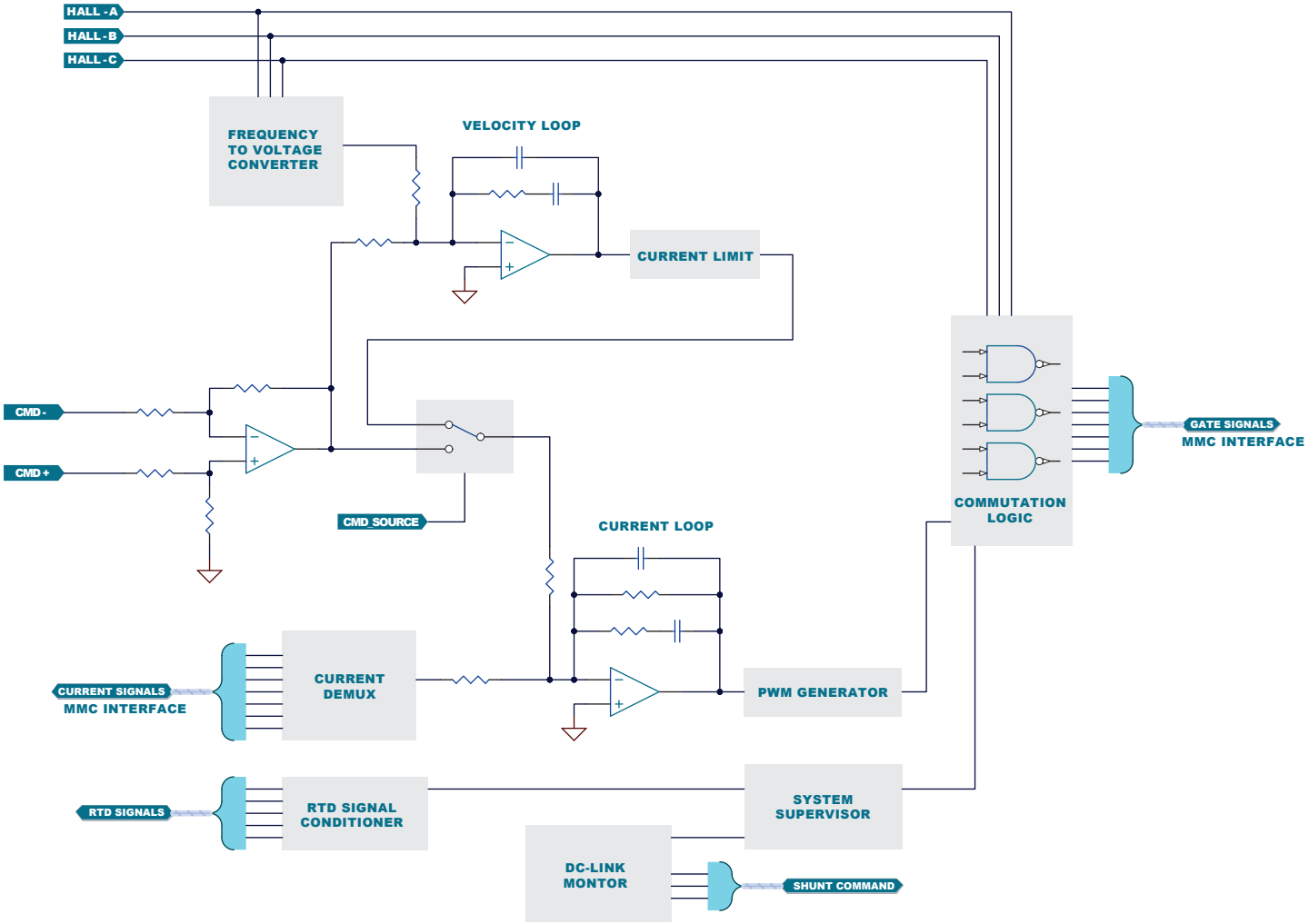
MMC4423-080-100-A1 Block Diagram



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Part Number System*

Controller Series	Board Size X by Y	Voltage	Peak Phase Current	Controller Type	Cooling	Packaging	Factory Modification
MMC	4423	080	10	A1 = Analog, Generation 1	C = Conduction Cooled Base Plate or IMS Board	B=Board Level	00 = Base Configuration
		400	15	F1 = FOC, Generation 1	L = Liquid Cooling	E=Enclosure	
		800	20				
			25				
			30				
			40				
			50				
			60				
			66				
			80				
			100				
			120				
			150				
			200				

*Data is subject to change in the future to accommodate the introduction of new or modified logic boards, reflecting advancements in controller technology across different generations

Orderable Part Numbers

Existing Configurations	OPN
MMC4423-80-100-F1-C-B-00	6100373-00
MMC4423-80-100-F1-L-B-00	6100291-00
MMC4423-80-100-A1-C-B-00	6100373-01

Disclaimer

For full terms and condition please visit www.Aveox.com

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