

# FD060-5-CM

FlexPro® Series

**Product Status:** Active

### **SPECIFICATIONS**

Current Peak
Current Continuous
DC Supply Voltage
Network Communication

10 A
5 A
10 - 55 VDC
CANopen



The **FD060-5-CM** is a servo drive and development board assembly for a FE060-5-CM FlexPro® series servo drive with IMPACT<sup>TM</sup> architecture. Connections to the controller, motor, power, and feedback are simplified through the standard connectors featured on the board. The **FD060-5-CM** is ideal for prototyping and can be used in production and industrial environments as well.

The **FD060-5-CM** offers full tuning control of all servo loops and is designed to drive brushed and brushless servo motors, stepper motors, and AC induction motors. The drive assembly accepts a variety of external command signals, or can use the built-in Motion Engine, an internal motion controller used with Sequencing and Indexing commands. Programmable digital and analog I/O are included to enhance interfacing with external controllers and devices.

The **FD060-5-CM** utilizes CANopen network communication and is configured via USB. All drive and motor parameters are stored in non-volatile memory.

IMPACT™ (Integrated Motion Platform And Control Technology) combines exceptional processing capability and high-current components to create powerful, compact, feature-loaded servo solutions. IMPACT™ is used in all FlexPro® drives and is available in custom products as well.

#### **FEATURES**

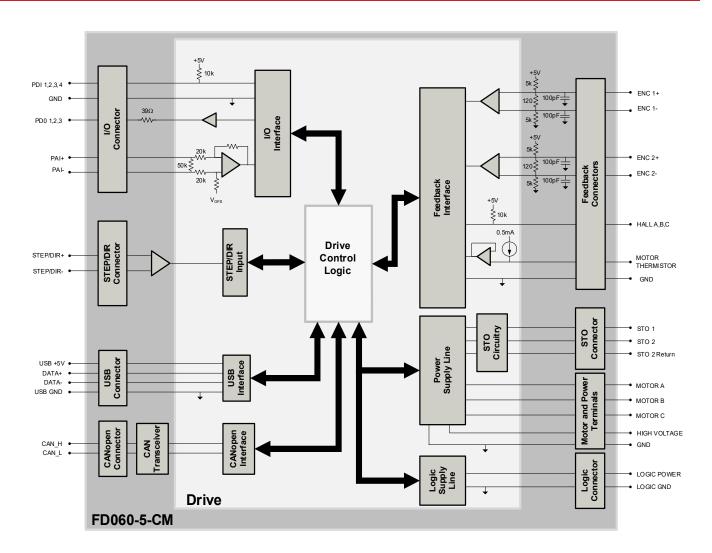
- Follows the CAN in Automation (CiA) 301 Communications Profile and 402 Device Profile
- Four Quadrant Regenerative Operation
- Programmable Gain Settings
- PIDF Velocity Loop

- On-the-Fly Mode Switching
- On-the-Fly Gain Set Switching
- Dedicated Safe Torque Off (STO) Inputs
- Bridge Status, Fault and Network Status LEDs
- I/O Status LEDs
- Standard Connections for Easy Setup

Feedback Supported	Absolute Encoder     BiSS C-Mode     EnDat 2.2     Incremental Encoder     Hall Sensors     Aux Incremental Encoder     Tachometer (±10V)	Motors Supported	<ul><li> Three Phase</li><li> Single Phase</li><li> Stepper</li><li> AC Induction</li></ul>	Modes of Operation	<ul> <li>Profile Modes</li> <li>Cyclic Synchronous Modes</li> <li>Current</li> <li>Velocity</li> <li>Position</li> <li>Interpolated Position Mode (PVT)</li> </ul>
Command Sources	* Indoxing	Inputs / Outputs	<ul> <li>4 Programmable Digital Inputs</li> <li>3 Programmable Digital Outputs</li> <li>1 Programmable Analog Input</li> </ul>	Agency Approvals	<ul><li>RoHS</li><li>UL (Pending)</li><li>CE (Pending)</li><li>TUV Rheinland (STO) (Pending)</li></ul>



## **BLOCK DIAGRAM**



## **INFORMATION ON APPROVALS AND COMPLIANCES**



The RoHS Directive restricts the use of certain substances including lead, mercury, cadmium, hexavalent chromium and halogenated flame retardants PBB and PBDE in electronic equipment.



Description   State   Specifications   Units   Value	SPECIFICATIONS		
Nominal DC Supply Input Range		Electric	al Specifications
Nominal DC Supply Inguil Range	Description		
DC Supply Indexendinge         VDC         10 − 55           DC Supply Overvoltage         VDC         8           DC Supply Overvoltage         VDC         58           Logic Supply Input Range (optional)         VDC         5           Safe Torque Off Voltage (Default)         VDC         5           Subscropacione         µF         500           Maximum Peak Current Output?         A (Arms)         10 (207)           Maximum Continuous Current Output?         A (Arms)         15 (5)           Efficiency at Rated Power         %         99           Maximum Continuous Output Power         W         22           Maximum Continuous Output Power         W         3           Minimum Load Inductance (line to line)?         µH         150 (8 48VDC supply); 75 (824VDC supply); 40 (8 12VDC supply)           Switching Frequency         ½HZ         20           Maximum Control (line to line)?         µH         150 (8 48VDC supply); 75 (824VDC supply); 40 (8 12VDC supply)           Switching Frequency         ½HZ         20           Maximum Control (line to line)?         µH         20           Switching Frequency         ½HZ         20           Maximum Control (line to line)?         µM         3           Milli		-	
DC Supply Undervoltage VDC 8 Logic Supply Input Ronge (optional) VDC 10 - 55 Sofe Torque Off Woltage (Defoutil) VDC 5 Bus Capacitance		VDC	10 – 55
DC Supply Overvoltage Logic Supply hout Range (potionol) VDC Sofe Torque Off Voltage (Default) Sofe Sofe Sofe Torque Off Voltage (Default) Sofe Sofe Sofe Sofe Sofe Sofe Sofe Sofe		VDC	8
Logic Supply Input Range (optional)  Sole Torque Of Varlage (Detauti)  Bus Capacilance  Juf Sol  Ruscapacilance  Juf Sol  Alamma I 10 (7,07)  Maximum Continuous Current Output!  Alamma I 10 (8,08)  Maximum Continuous Current Output!  Maximum Continuous Current Output!  Maximum Continuous Current Output!  Maximum Continuous Current Output Power  Minimum Load Inductance filine-10-line s  Maximum Output Pown Dut Cycle  Maximum Output Pown Dut Pown Dut Cycle  Maximum Output Pown Dut Pown Dut Cycle  Maximum Output Pown		VDC	58
Sofe Torque Off Voltage (Default)  Bus Capacitorice  JF 500  Maximum Reak Gurrent Output!  A [Arms], 10 (707)  Maximum Continuous Current Output!  A [Arms], 10 (707)  Maximum Continuous Current Output!  A [Arms], 10 (707)  Maximum Continuous Output Power  Maximum Load Inductance (ime to line)  Minimum Load Inductance (ime to line)  Minimum Load Inductance (ime to line)  Maximum Output PWM Duty Cycle  Maximum Output P			10 – 55
Bus Capacillance		VDC	5
Maximum Peak Current Output!  A [Arms] I 10 (707)  Maximum Continuous Current Output!  A [Arms] I 15 (5)  Efficiency at Rated Power  Maximum Continuous Current Output!  W 272  Maximum Power Dissipation at Rated Power  Minimum Load Inductance (line-to-line) <sup>3</sup> Maximum Output PWM Duty Cycle  S 8  Control Specification  Description  A Should Fine-dec (RSS C-Mode, EnDat 2.2), Incremental Encoder, Hall Sensors, Audiliary Incremental Encoder, Hall Sensors, Audiliary Incremental Encoder, Hall Sensors, Audiliary Incremental Encoder, Include Programmation  Modes of Operation  Motors Supported  A Should Fine-dec (RSS C-Mode, EnDat 2.2), Incremental Encoder, Include Programmation  Modes of Operation  Motors Supported  A Should Fine-dec (RSS C-Mode, EnDat 2.2), Incremental Encoder, Hall Sensors, Audiliary Incremental Encoder, Technometer (£10V)  Motors Supported  A Should Fine-decided Position Mode (£VT)  Three Phase (Brushless Senvo), Single Phase (Brushled Servo, Voice Coll, Include Load), Stepper 12 or 3-Phase (Steval Loap), AC induction (Closed Loap) Section  A College Programmable Digital Inputs/Outputs  - 478  Programmable Digital Inputs/Outputs  - 478  Programmable Digital Inputs/Outputs  - 478  Programmable Analog Inputs/Outputs  - 478  Programmable Analog Inputs/Outputs  - 478  Programmable Description  Maximum Encoder Frequency  Maxim		μF	500
Maximum Continuous Current Oulpul?  Efficiency of taked Power  Selficiency of taked Power  Maximum Fower Dissipation of Rated Power  Maximum Fower Dissipation of Rated Power  Minimum Load Inductance (line-to-line)*  W 272  Maximum Power Dissipation of Rated Power  W 33  Minimum Load Inductance (line-to-line)*  W 150 (@ 48VDC supply); 75 (@24VDC supply); 40 (@ 12VDC supply)  Withing Frequency  W 35  Minimum Load Inductance (line-to-line)*  W 127  Switching Frequency  W 36  Minimum Load Inductance (line-to-line)*  W 127  Switching Frequency  W 37  Minimum Load Inductance (line-to-line)*  W 127  Switching Frequency  W 36  Minimum Load Inductance (line-to-line)*  W 127  Control Specifications  Value  - Control Specifications  - Control Coop Specifications  - Control Explaints  - Control Specifications  - Control Specifications  -			
Efficiency of Roted Power         %         99           Moximum Continuous Output Power         W         3           Maximum Power Dissipation at Rated Power         W         3           Minimum Load Inductance (line-10-line)*         μH         150 (@ 48VDC supply); 75 (@24VDC supply); 40 (@12VDC supply)           Switching Frequency         kHz         20           Maximum Output PWM Doty Cycle         %         83           Control Specifications           Units         Value           Commond Surces           Command Sources         - CANopen (USB for confliguration)           Feedback Supported         - Line Notes (Power to Note to No	·		
Maximum Continuous Output Power         W         272           Monimum Load Inductance (line-to-line)?         μH         150 (@ 48VDC supply); 75 (@24VDC supply); 40 (@12VDC supply)           Switching Frequency         kHz         20           Aminum Output PWM Duty Cycle         %         83           Control Specifications         Value           Communication Interfaces         -         CANopen (USB for configuration)           Command Sources         -         All O V Analog, Over the Network, Sequencing, Indexing, Jogging, Step & Direction, Encoder (Following)           Feedback Supported         -         Absolute Encoder (BSS C-Mode, EnDat 2.2), Incremental Encoder, Tachometer (±10V)           Commutation Methods         -         -         Sinusoidal, Trapezoidal           Modes of Operation         -         Profile Modes, Cyclic Synchronous Modes, Current, Velocity, Position, Interpolated Position Mode (PV1)           Motors Supported*         -         -         Profile Modes, Cyclic Synchronous Modes, Current, Velocity, Position, Inductive Load), Stepper (2- or 3-Phase Closed Loop), AC Induction (Closed Loop Vector)           Hardware Protection         -         AM Too (PV)         Too (PV)           Motory, Over Voitage, Short Circuit (Phase-Phase & Phase-Ground), Under Voitage         AVIS (Phase-Phase & Phase-Ground), Under Voitage           Programmable Digital Inputs/Outputs         - <td>·</td> <td></td> <td></td>	·		
Maximum Power Dissipation at Rated Power         W Jawa Hall (a 48VDC supply): 75 (@24VDC supply): 40 (@12VDC supply)           Minimum Load Inductance (line-to-fine):3         μH         150 (@ 48VDC supply): 75 (@24VDC supply): 40 (@12VDC supply)           Switching Frequency         kHz 2         20           Maximum Output PWM Duty Cycle         % 8         83           Common Specifications Units         Value           Common Succes         - CANopen (USB for configuration)           Common Succes         - Elifo V Analog, Over the Network, Sequencing, Indexing, Jogging, Step & Disciplion, Encoder Following           Feedback Supported         - Absolute Encoder (BSS C-Mode, EnDat 2.2), Incremental Encoder, Holl Sensors, Auxiliary Incremental Encoder, Tachometer (±10V)           Commutation Methods         - Sinuscidal, Trapezoidal           Modes of Operation         - Profile Modes, Cyclic Synchronous Modes, Current, Velocity, Position, Interpolated Position Mode (PVT)           Motors Supported*         - Profile Modes, Cyclic Synchronous Modes, Current, Velocity, Position, Interpolated Position Mode (PVT)           Motors Supported*         - Time Phase (Bushless Servo), Single Phase (Bushled Servo, Voice Coil, Induction (Closed Loop) Vector)           Hardware Protection         - Motor), Over Voitage, Short Circuit (Phase-Phase & Phase-Ground), Under Voitage           Programmable Digital Inputs/Outputs         - 4/3           Programmable Digital Inputs/Ou	·	+	272
Minimum Load Inductance (line-to-line)3		W	3
Switching frequency Maximum Output PWM Duty Cycle  Description  Communication Interfaces  Communication Interfaces  Command Sources  Eedback Supported  Absolute Encoder (BiSS C-Mode, EnDat 22), Incremental Encoder, Incremental Encoder, Technometer (£10V)  Commutation Methods  Commutation Methods  Description  Modes of Operation  Three Phase (Brushless Servo), Single Phase (Brushl	·		1.50 (@ 48VDC supply): 75 (@24VDC supply): 40 (@12VDC supply)
Description   Control Specifications   Value			
Communication Interfaces			
Description   Units   Value			
Command Sources  - 8. Direction, Encoder Following Feedback Supported - Absolute Encoder Following Commutation Methods - Sinuscidal, Trapezoidal Modes of Operation - Profile Modes, Cyclic Synchronous Modes, Current, Velocity, Position, Interpolated Position Mode (PVT) - Inductive Load), Stepper (2- or 3-Phase (Brushed Servo, Voice Coil, Inductive Load), Stepper (2- or 3-Phase Closed Loop), AC Induction (Closed Loop Vector) - Inductive Load), Stepper (2- or 3-Phase Closed Loop), AC Induction (Closed Loop Vector) - Motors Supported - 40+ Configurable Functions, Over Current, Over Temperature (Drive & Motor), Over Voltage, Short Circuit (Phase-Phase & Phase-Ground), Under Voltage - Motor), Over Voltage, Short Circuit (Phase-Phase & Phase-Ground), Under Voltage - Voltage, Short Circuit (Phase-Phase & Phase-Ground), Under Voltage - Stopper (2- or 3-Phase Closed Loop), AC Induction (Closed Loop Vector) - Motory, Over Voltage, Short Circuit (Phase-Phase & Phase-Ground), Under Vo	Description		
Feedback Supported  Feedback Supported  Absolute Encoder (BiSS C-Mode, EnDat 2.2), Incremental Encoder, Hall Sensors, Auxiliary Incremental Encoder, Hall Sensors, Auxiliary Incremental Encoder, Tachometer (±10V)  Commutation Methods  - Sinusoidal, Trapezoidal  Profile Modes, Cyclic Synchronous Modes, Current, Velocity, Position, Interpolated Position Mode (PVT)  Motors Supported4  - Intree Phase (Brushless Servo), Single Phase (Brushed Servo, Voice Coil, Inductive Load), Stepper (2- or 3-Phase Closed Loop), AC Induction (Closed Loop Vector)  40+ Configurable Functions, Over Current, Over Temperature (Drive & Motor), Over Voltage, Short Circuit (Phase-Phase & Phase-Ground), Under V	Communication Interfaces	-	CANopen (USB for configuration)
Absolute Encoder (BISS C-Mode, EnDat 2.2), Incremental Encoder, Hall Sensors, Auxiliary Incremental Encoder, Tachometer (±10V)   Commutation Methods   - Sinusoidal, Trapezoidal     Modes of Operation   - Profile Modes, Cyclic Synchronous Modes, Current, Velocity, Position, Interpolated Position Mode (PVT)     Motors Supported4   - Interpolated Position Mode (PVT)     Motors Supported4   - Interpolated Position Mode (PVT)     Three Phase (Brushless Servo), Single Phase (Brushed Servo, Voice Coil, Inductive Load), Stepper (2- or 3-Phase Closed Loop), AC Induction (Closed Loop Vector)     Closed Loop Vector)   - Motor), Over Voltage, Short Circuit (Phase-Phase & Phase-Ground), Under Voltage     Programmable Digital Inputs/Outputs   - 1/0     Primary I/O Logic Level   - 5 VDC, not isolated     Current Loop Sample Time   μs 50     Velocity Loop Sample Time   μs 100     Position Loop Sample Time   μs 100     Maximum Encoder Frequency   MHz 20 (5 pre-quadrature)     Mechanical Specifications   Value     Postifice Humidity   - 0-65 (32 - 149)     Storage Temperature Range   °C (°F)   40 - 85 (40 - 185)     Relative Humidity   - 0,95%, non-condensing     P2 LOGIC POWER CONNECTOR   - 2-port Screw Terminal     P3 USB COMMUNICATION CONNECTOR   - 3-pin, Mini USB B Type port     P5 GANOpen COMMUNICATION CONNECTOR   - 3-pin, Journal power of the province o	Command Sources	-	
Commutation Methods   -   Sinusoidal, Trapezoidal	Feedback Supported	-	Absolute Encoder (BiSS C-Mode, EnDat 2.2), Incremental Encoder,
Profile Modes, Cyclic Synchronous Modes, Current, Velocity, Position, Interpolated Position Mode (PVT)	Commutation Methods	-	
Three Phase (Brushless Servo), Single Phase (Brushed Servo, Voice Coil, Inductive Load), Stepper (2- or 3-Phase Closed Loop), AC Induction (Closed Loop Vector)   Hardware Protection			
Inductive Load), Stepper (2- or 3-Phase Closed Loop), AC Induction (Closed Loop Vector)	Modes of Operation	-	Interpolated Position Mode (PVT)
Hardware Protection	Motors Supported <sup>4</sup>	-	Inductive Load), Stepper (2- or 3-Phase Closed Loop), AC Induction (Closed Loop Vector)
Programmable Analog Inputs/Outputs       -       1/0         Primary I/O Logic Level       -       5 VDC, not isolated         Current Loop Sample Time       μs       100         Position Loop Sample Time       μs       100         Maximum Encoder Frequency       MHz       20 (5 pre-quadrature)         Mechanical Specifications         Units       Value         Size (H x W x D)       mm (in)       114.3 x 91.4 x 26.0 (4.50 x 3.60 x 1.03)         Weight       g (oz)       178.5 (6.3)         Ambient Operating Temperature Ranges       °C (°F)       0 - 65 (32 - 149)         Storage Temperature Range       °C (°F)       0 - 65 (32 - 149)         Storage Temperature Range       °C (°F)       0 - 65 (32 - 149)         Relative Humidity       -       0 - 95%, non-condensing         P2 LOGIC POWER CONNECTOR       -       2-port Screw Terminal         P3 USB COMMUNICATION CONNECTOR       -       2-port Screw Terminal         P5 CANopen COMMUNICATION CONNECTOR       -       8-pin, dual row, 2.00 mm spaced plug terminal         P6 STO CONNECTOR       -       8-pin 2.00 mm spaced dual-row plug terminal         P8 STEP/DIR CONNECTOR	Hardware Protection	-	Motor), Over Voltage, Short Circuit (Phase-Phase & Phase-Ground),
Primary I/O Logic Level - 5 VDC, not isolated  Current Loop Sample Time	Programmable Digital Inputs/Outputs	-	4/3
Current Loop Sample Time	Programmable Analog Inputs/Outputs	-	1/0
Velocity Loop Sample Time μs 100  Position Loop Sample Time μs 100  Maximum Encoder Frequency MHz 20 (5 pre-quadrature)  **Mechanical Specifications**  **Description**  Description**  Size (H x W x D) mm (in) 114.3 x 91.4 x 26.0 (4.50 x 3.60 x 1.03)  Weight g (οz) 178.5 (6.3)  Ambient Operating Temperature Ranges °C (°F) 0 - 65 (32 - 149)  Storage Temperature Range °C (°F) - 40 - 85 (-40 - 185)  Relative Humidity - 0.95%, non-condensing  P2 LOGIC POWER CONNECTOR - 2-port Screw Terminal  P3 USB COMMUNICATION CONNECTOR - 5-pin, Mini USB B Type port  P5 CANopen COMMUNICATION CONNECTORS - 8-pin, dual row, 2.00 mm spaced plug terminal  P6 STO CONNECTOR - 8-pin 2.00 mm spaced, enclosed, friction lock header  P7 IO CONNECTOR - 12-pin 2.00 mm spaced dual-row plug terminal  P8 STEP/DIR CONNECTOR - 8-pin 2.00 mm spaced dual-row plug terminal  P8 STEP/DIR CONNECTOR - 15-pin vertical D-Sub  P10 FEEDBACK 1 CONNECTOR - 15-pin vertical D-Sub  P11/12/13 MOTOR POWER TERMINALS - 3x Hex Screw Lug  P14/15 DC POWER TERMINALS - 2x Hex Screw Lug	Primary I/O Logic Level	-	5 VDC, not isolated
Position Loop Sample Time  Maximum Encoder Frequency  MHz  20 (5 pre-quadrature)  Mechanical Specifications  Units  Value  Size (H x W x D)  Meight  Mey (9 (2)  Mey (9 (2)  Mere (9 (4)  Mechanical Specifications  Units  Value  Mechanical Specifications  Value  Neture Specifications  Neture Specifications  Neture Specifications  Neture Specifications  Neture Specifications  Neture Specifications  Neture Specification Posts  Neture Specifications  Neture Specifications  Neture Specifications  Neture Specifications  Neture Specifications  Neture Specification Posts  Neture Specification Posts  Neture Specification  Netu	Current Loop Sample Time	μS	50
Maximum Encoder Frequency  MHz  Description  Mechanical Specifications  Units  Value  Meight  Ambient Operating Temperature Range <sup>5</sup> Storage Temperature Range  P2 LOGIC POWER CONNECTOR  P5 CANopen COMMUNICATION CONNECTORS  P6 STO CONNECTOR  P7 IO CONNECTOR  P7 IO CONNECTOR  P8 STEP/DIR CONNECTOR  P9 FEEDBACK 2 CONNECTOR  P10 FEEDBACK 1 CONNECTOR  P11/12/13 MOTOR POWER TERMINALS  P14/15 DC POWER TERMINALS  Mechanical Specifications  Value  Nechanical Specifications  Nechanical Spe	Velocity Loop Sample Time	μS	100
Mechanical SpecificationsDescriptionUnitsValueSize (H x W x D)mm (in)114.3 x 91.4 x 26.0 (4.50 x 3.60 x 1.03)Weightg (oz)178.5 (6.3)Ambient Operating Temperature Range⁵°C (°F)0 − 65 (32 − 149)Storage Temperature Range°C (°F)-40 − 85 (-40 − 185)Relative Humidity- 0.95%, non-condensingP2 LOGIC POWER CONNECTOR- 2-port Screw TerminalP3 USB COMMUNICATION CONNECTOR- 5-pin, Mini USB B Type portP5 CANopen COMMUNICATION CONNECTORS- 8-pin, dual row, 2.00 mm spaced plug terminalP6 STO CONNECTOR- 8-pin 2.00 mm spaced, enclosed, friction lock headerP7 IO CONNECTOR- 12-pin 2.00 mm spaced dual-row plug terminalP8 STEP/DIR CONNECTOR- 12-pin 2.00 mm spaced dual-row plug terminalP9 FEEDBACK 2 CONNECTOR- 15-pin vertical D-SubP10 FEEDBACK 1 CONNECTOR- 15-pin vertical D-SubP11/12/13 MOTOR POWER TERMINALS- 3x Hex Screw LugP14/15 DC POWER TERMINALS- 2x Hex Screw Lug	Position Loop Sample Time	μS	100
Description   Units   Value	Maximum Encoder Frequency	MHz	20 (5 pre-quadrature)
Size (H x W x D)mm (in)114.3 x 91.4 x 26.0 (4.50 x 3.60 x 1.03)Weightg (oz)178.5 (6.3)Ambient Operating Temperature Ranges°C (°F)0 - 65 (32 - 149)Storage Temperature Range°C (°F)-40 - 85 (-40 - 185)Relative Humidity-0-95%, non-condensingP2 LOGIC POWER CONNECTOR-2-port Screw TerminalP3 USB COMMUNICATION CONNECTOR-5-pin, Mini USB B Type portP5 CANopen COMMUNICATION CONNECTORS-8-pin, dual row, 2.00 mm spaced plug terminalP6 STO CONNECTOR-8-pin 2.00 mm spaced, enclosed, friction lock headerP7 IO CONNECTOR-12-pin 2.00 mm spaced dual-row plug terminalP8 STEP/DIR CONNECTOR-8-pin 2.00 mm spaced dual-row plug terminalP9 FEEDBACK 2 CONNECTOR-15-pin vertical D-SubP10 FEEDBACK 1 CONNECTOR-15-pin vertical D-SubP11/12/13 MOTOR POWER TERMINALS-3x Hex Screw LugP14/15 DC POWER TERMINALS-2x Hex Screw Lug		Mechani	cal Specifications
Weight       g (oz)       178.5 (6.3)         Ambient Operating Temperature Ranges       °C (°F)       0 − 65 (32 − 149)         Storage Temperature Range       °C (°F)       −40 − 85 (−40 − 185)         Relative Humidity       −       0-95%, non-condensing         P2 LOGIC POWER CONNECTOR       −       2-port Screw Terminal         P3 USB COMMUNICATION CONNECTOR       −       5-pin, Mini USB B Type port         P5 CANopen COMMUNICATION CONNECTORS       −       8-pin, dual row, 2.00 mm spaced plug terminal         P6 STO CONNECTOR       −       8-pin 2.00 mm spaced, enclosed, friction lock header         P7 IO CONNECTOR       −       12-pin 2.00 mm spaced dual-row plug terminal         P8 STEP/DIR CONNECTOR       −       8-pin 2.00 mm spaced dual-row plug terminal         P9 FEEDBACK 2 CONNECTOR       −       15-pin vertical D-Sub         P10 FEEDBACK 1 CONNECTOR       −       15-pin vertical D-Sub         P11/12/13 MOTOR POWER TERMINALS       −       3x Hex Screw Lug         P14/15 DC POWER TERMINALS       −       2x Hex Screw Lug	•		
Ambient Operating Temperature Range <sup>5</sup> °C (°F) 0 - 65 (32 - 149)  Storage Temperature Range  °C (°F) -40 - 85 (-40 - 185)  Relative Humidity - 0-95%, non-condensing  P2 LOGIC POWER CONNECTOR - 2-port Screw Terminal  P3 USB COMMUNICATION CONNECTOR - 5-pin, Mini USB B Type port  P5 CANOPER CONNECTOR - 8-pin, dual row, 2.00 mm spaced plug terminal  P6 STO CONNECTOR - 8-pin 2.00 mm spaced, enclosed, friction lock header  P7 IO CONNECTOR - 12-pin 2.00 mm spaced dual-row plug terminal  P8 STEP/DIR CONNECTOR - 8-pin 2.00 mm spaced dual-row plug terminal  P9 FEEDBACK 2 CONNECTOR - 15-pin vertical D-Sub  P10 FEEDBACK 1 CONNECTOR - 15-pin vertical D-Sub  P11/12/13 MOTOR POWER TERMINALS - 3x Hex Screw Lug  P14/15 DC POWER TERMINALS - 2x Hex Screw Lug		+	i
Storage Temperature Range °C (°F) -40 – 85 (-40 – 185)  Relative Humidity - 0-95%, non-condensing  P2 LOGIC POWER CONNECTOR - 2-port Screw Terminal  P3 USB COMMUNICATION CONNECTOR - 5-pin, Mini USB B Type port  P5 CANOPEN COMMUNICATION CONNECTORS - 8-pin, dual row, 2.00 mm spaced plug terminal  P6 STO CONNECTOR - 8-pin 2.00 mm spaced, enclosed, friction lock header  P7 IO CONNECTOR - 12-pin 2.00 mm spaced dual-row plug terminal  P8 STEP/DIR CONNECTOR - 8-pin 2.00 mm spaced dual-row plug terminal  P9 FEEDBACK 2 CONNECTOR - 15-pin vertical D-Sub  P10 FEEDBACK 1 CONNECTOR - 15-pin vertical D-Sub  P11/12/13 MOTOR POWER TERMINALS - 3x Hex Screw Lug  P14/15 DC POWER TERMINALS - 2x Hex Screw Lug			
Relative Humidity - 0-95%, non-condensing  P2 LOGIC POWER CONNECTOR - 2-port Screw Terminal  P3 USB COMMUNICATION CONNECTOR - 5-pin, Mini USB B Type port  P5 CANopen COMMUNICATION CONNECTORS - 8-pin, dual row, 2.00 mm spaced plug terminal  P6 STO CONNECTOR - 8-pin 2.00 mm spaced, enclosed, friction lock header  P7 IO CONNECTOR - 12-pin 2.00 mm spaced dual-row plug terminal  P8 STEP/DIR CONNECTOR - 8-pin 2.00 mm spaced dual-row plug terminal  P9 FEEDBACK 2 CONNECTOR - 15-pin vertical D-Sub  P10 FEEDBACK 1 CONNECTOR - 15-pin vertical D-Sub  P11/12/13 MOTOR POWER TERMINALS - 3x Hex Screw Lug  P14/15 DC POWER TERMINALS - 2x Hex Screw Lug			
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P3 USB COMMUNICATION CONNECTOR - 5-pin, Mini USB B Type port P5 CANopen COMMUNICATION CONNECTORS - 8-pin, dual row, 2.00 mm spaced plug terminal P6 STO CONNECTOR - 8-pin 2.00 mm spaced, enclosed, friction lock header P7 IO CONNECTOR - 12-pin 2.00 mm spaced dual-row plug terminal P8 STEP/DIR CONNECTOR - 8-pin 2.00 mm spaced dual-row plug terminal P9 FEEDBACK 2 CONNECTOR - 15-pin vertical D-Sub P10 FEEDBACK 1 CONNECTOR - 15-pin vertical D-Sub P11/12/13 MOTOR POWER TERMINALS - 3x Hex Screw Lug P14/15 DC POWER TERMINALS - 2x Hex Screw Lug		-	
P5 CANopen COMMUNICATION CONNECTORS - 8-pin, dual row, 2.00 mm spaced plug terminal  P6 STO CONNECTOR - 8-pin 2.00 mm spaced, enclosed, friction lock header  P7 IO CONNECTOR - 12-pin 2.00 mm spaced dual-row plug terminal  P8 STEP/DIR CONNECTOR - 8-pin 2.00 mm spaced dual-row plug terminal  P9 FEEDBACK 2 CONNECTOR - 15-pin vertical D-Sub  P10 FEEDBACK 1 CONNECTOR - 15-pin vertical D-Sub  P11/12/13 MOTOR POWER TERMINALS - 3x Hex Screw Lug  P14/15 DC POWER TERMINALS - 2x Hex Screw Lug		-	
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P8 STEP/DIR CONNECTOR - 8-pin 2.00 mm spaced dual-row plug terminal  P9 FEEDBACK 2 CONNECTOR - 15-pin vertical D-Sub  P10 FEEDBACK 1 CONNECTOR - 15-pin vertical D-Sub  P11/12/13 MOTOR POWER TERMINALS - 3x Hex Screw Lug  P14/15 DC POWER TERMINALS - 2x Hex Screw Lug		-	
P9 FEEDBACK 2 CONNECTOR - 15-pin vertical D-Sub P10 FEEDBACK 1 CONNECTOR - 15-pin vertical D-Sub P11/12/13 MOTOR POWER TERMINALS - 3x Hex Screw Lug P14/15 DC POWER TERMINALS - 2x Hex Screw Lug		-	
P10 FEEDBACK 1 CONNECTOR - 15-pin vertical D-Sub P11/12/13 MOTOR POWER TERMINALS - 3x Hex Screw Lug P14/15 DC POWER TERMINALS - 2x Hex Screw Lug		-	· · · ·
P11/12/13 MOTOR POWER TERMINALS - 3x Hex Screw Lug P14/15 DC POWER TERMINALS - 2x Hex Screw Lug		-	·
P14/15 DC POWER TERMINALS - 2x Hex Screw Lug		-	
		-	
Notes		-	2x Hex Screw Lug

- Capable of supplying drive rated peak current for 2 seconds with 10 second foldback to continuous value. Longer times are possible with lower current limits.
   Continuous Arms value attainable when RMS Charge-Based Limiting is used.
   Lower inductance is acceptable for bus voltages well below maximum. Use external inductance to meet requirements.

- Maximum motor speed for stepper motors is 600 RPM. Consult the hardware installation manual for 2-phase stepper wiring configuration.
   Additional cooling and/or heatsink may be required to achieve rated performance.



PIN F	UNCTIONS				
			P2 – Logi	ic Power Connector	
Pin	No	ame		Description / Notes	I/O
1	LOGIC PWR		Logic Supply Input (10 -	- 55VDC) (optional)	I
2	LOGIC GND		Ground		GND
Conr	nector Information	2-port Screw Term	inal		
Mating	Mating Connector Details N/A			LOGIC PWR 1	
Mating	Connector Included	N/A		LOGIC GND 2	

	P3 – USB Communication Connector								
Pin	No	ime		Description / Notes	I/O				
1	VBUS		Supply Voltage		0				
2	DATA-		Data -		I/O				
3	DATA+		Data +		I/O				
4	RESERVED		Reserved.		-				
5	GND		Ground		GND				
Conr	nector Information	5-pin, Mini USB B T	ype port	GND 5— RESERVED 4— DATA+ 3— DATA- 2—					
Mating	g Connector Details	A55Y)							
Mating	Connector Included								

			P5 – CANopen (	Communication Connector	
Pin	No	ame		Description / Notes	I/O
1	RESERVED		Reserved.		-
2	RESERVED		Reserved.		-
3	RESERVED		Reserved.		-
4	RESERVED		Reserved.		-
5	GND		Ground		GND
6	GND		Ground		GND
7	CAN_H		CAN_H bus line (dominant high)		I/O
8	CAN_L		CAN_L bus line (dominant low)		I/O
Conn			00 mm spaced plug	GND 6 4 RESERVED CAN_L 8 2 RESERVED	
Mating	Connector Details	Molex: P/N 51353-0800 (housing); 56134-9100 (contacts)			
Mating	Mating Connector Included Yes			CAN_H 7 1 RESERVED GND 5 3 RESERVED	



			P6 –	STO Connector	
Pin	No	ame		Description / Notes	I/O
1	RESERVED		Reserved.		-
2	RESERVED		Reserved.		-
3	STO RETURN		Safe Torque Off Return		STORET
4	STO-1 INPUT		Safe Torque Off – Input	1	I
5	STO RETURN		Safe Torque Off Return		STORET
6	STO-2 INPUT		Safe Torque Off – Input :	I	
7	RESERVED		Reserved.		-
8	RESERVED		Reserved.		-
Conn	Connector Information  8-port, 2.00 mm sy friction lock head			STO RETURN 5 - 3 STO RETURN RESERVED 7 - 1 RESERVED	
Mating	Mating Connector Details Molex: P/N 51110 8051 (pins)		D860 (housing); 50394-		
Mating	Connector Included	Yes		RESERVED 8 - 2 RESERVED STO-2 INPUT 6 - 4 STO-1 INPUT	

			P7 – IO Connector	
Pin	No	ame	Description / Notes	I/O
1	PDI-1		General Purpose Programmable Digital Input	I
2	PDI-2		General Purpose Programmable Digital Input	I
3	PDI-3		General Purpose Programmable Digital Input	I
4	PDI-4		General Purpose Programmable Digital Input	I
5	PDO-1		General Purpose Programmable Digital Output (TTL/8mA)	0
6	PDO-2		General Purpose Programmable Digital Output (TTL/8mA)	0
7	PDO-3		General Purpose Programmable Digital Output (TTL/8mA)	0
8	+5V USER		+5V Supply Output. Short-circuit protected. (300ma total load capacity shared between P7-8, P8-7, P9-13, and P10-	.13)
9	GND		Ground.	GND
10	GND		Ground.	GND
11	PAI-1+		General Purpose Differential Programmable Analog Input or Reference	Signal Input.
12	PAI-1-		±10VDC Range (12-bit Resolution)	1
Conr	nector Information	12-pin, dual row terminal	GND 10 — 4	0-2 PB-4 2 PB-2
Mating	g Connector Details	Molex: P/N 5135 56134-9100 (cor	PAI-1+ 11 — 1	1 PDI-1 PDI-3 0-1

			P8 – S	TEP/DIR Connector		
Pin	No	ame		Description / Notes	I/O	
1 2	STEP +		Differential Step Input.		I	
3 4	DIR +		Differential Direction In	put.	I I	
5 6	RESERVED RESERVED		Reserved.	eserved.		
7	+5V USER		+5V Supply Output. Short-circuit protected. (300ma total load capacity shared between P7-8, P8-7, P9-13, and P10-13)		0	
8	GND		Ground.		GND	
Conr	Connector Information  8-pin, dual row, 2. terminal		.00 mm spaced plug	RESERVED 6 4 DIR - 2 STEP -		
Mating Connector Details Molex: P/N 51353-0 56134-9100 (contact						
Mating	Connector Included	Yes		RESERVED 5 3 DR+		

Mating Connector Included

Yes



			P9 – Feed	back 2 Connector	
Pin	Increme	ntal Encoder		Description / Notes	I/O
1 2 3	HALL A HALL B HALL C			ation Sensor Inputs. Signals shared with Feedback 1 connector. Use only her Feedback 1 or Feedback 2.	 
4 5	ENC 2 A+		Differential Incrementa	l Encoder A.	
6 7	ENC 2 B+ ENC 2 B-		Differential Incrementa	I Encoder B.	l I
8 9 10	ENC 2 INDEX+ ENC 2 INDEX-		Differential Incrementa	I Encoder Index.	l
11	RESERVED RESERVED		Reserved. Reserved.		-
12	GND +5V USER		Ground. +5V Supply Output. Short-circuit protected. (300ma total load capacity shared between P7-8, P8-7, P9-13, and P10-13)		GND O
14	THERMISTOR		Motor Thermal Protection. Select which Thermistor pin is active using DIP Switch SW6 (see Board Configuration section below). Only one Thermistor pin between Feedback 1 and Feedback 2 Connector can be active.		I
15	RESERVED		Reserved.		-
Conn	ector Information	15-pin, high-density,	female D-sub	ENC 2B+ 6 5 ENC 2A+ ENC 2INDEX+ 8 4 ENC 2A+ ENC 2INDEX+ 9 3 HALL C ENC 2INDEX- 9 2 HALL B RESERVED 10 1 HALL A	
Mating	g Connector Details	TYCO: Plug P/N 748364-1; Housing P/N 5748677-2; Terminals P/N 1658670-2 (loose) or 1658670-1 (strip)		11 RESERVED 12 SOND	
Mating	Connector Included	No		13 +5V USER 14 THERMISTOR 15 RESERVED	

			P10 – Feedback 1 Connector			
Pin	Absolute Encoder	Incremental Encoder	Description / Notes	I/O		
1	HALL A	HALL A	Circula and ad Carrent dedicar Carrent land to Circula de manda di the Fandle and Carrent de la contra	I		
2	HALL B	HALL B	Single-ended Commutation Sensor Inputs. Signals shared with Feedback 2 connector. Use only	I		
3	HALL C	HALL C	lall connections on either Feedback 1 or Feedback 2.			
4	ENC 1 DATA+	ENC 1 A+	Differential Data Line for Absolute Encoders (BiSS: SLO+/-) or Differential Incremental Encoder	1		
5	ENC 1 DATA-	ENC 1 A-	Α.	I		
6	ENC 1 CLOCK+	ENC 1 B+	Differential Clock Line for Absolute Encoders (BiSS: MA+/-) or Differential Incremental Encoder	1		
7	ENC 1 CLOCK-	ENC 1 B-	В.	I		
8	ENC 1 REF MARK+	ENC 1 I+	Differential Reference Mark for Absolute Encoders (Leave open for BiSS and EnDat 2.2) or	I		
9	ENC 1 REF MARK-	ENC 1 I-	Differential Incremental Encoder Index.	I		
10	RESERVED	RESERVED	Reserved.			
11	RESERVED	RESERVED	Reserved.			
12	GND	GND	Ground.	GND		
13	+5V USER	+5V USER	+5V Supply Output. Short-circuit protected. (300ma total load capacity shared between P7-8, P8-7, P9-13, and P10-13)	0		
14	THERMISTOR	THERMISTOR	Motor Thermal Protection. Select which Thermistor pin is active using DIP Switch SW6 (see Board Configuration section below). Only one Thermistor pin between Feedback 1 and Feedback 2 Connector can be active.	I		
15	RESERVED	RESERVED	Reserved.	-		
Cor	nnector Information	15-pin, high-density	ENC 1CLOCK+/B+ 6 5 ENC 1DATA-/A- ENC 1CLOCK-/B- 7 4 ENC 1DATA-/A+ ENC 1REFMARK-/I+ 8 3 HALL C ENC 1REFMARK-/I- 9 2 HALL B RESERVED 10 1 HALL A			
Matir	Mating Connector Details  TYCO: Plug P/N 748 5748677-2; Terminal or 1658670-1 (strip)		ls P/N 1658670-2 (loose)			
Mating	g Connector Included	No	13 +5V USER 14 THERMISTOR 15 RESERVED			



	P11/12/13 - Motor Power Terminals								
Pin	No	ame		Description / Notes	I/O				
1	MOTOR A		Motor Phase A.		0				
2	MOTOR B		Motor Phase B.		0				
3	MOTOR C		Motor Phase C.		0				
Conr	nector Information	Bushings with M4 Screw		MOTOR C MOTOR B MOTOR A					
Mating	g Connector Details	N/A							
Mating	Connector Included	N/A							

	P14/15 - DC Power Terminals							
Pin	No	ame		Description / Notes				
1	HV		DC Supply Input (10-55	VDC).		I		
2	POWER GND		Ground.			GND		
Conn	Connector Information Bushings with M4		Screw HV POWER GND		POWER GND			
Mating	Connector Details	N/A						
Mating	Connector Included	N/A						



## **BOARD CONFIGURATION**

#### **Status LED Functions**

LED	Description				
STAT	Indicates drive power bridge status. GREEN when DC bus power is applied and the drive is enabled. RED when the drive is in a fault state.				
LOGIC PWR	Indicates that +5V logic power is available to the drive. GREEN when +5V logic power is available.				
EMA	MA Indicates whether the Emulated Encoder Output functionality is active. GREEN for Emulated Encoder Output active.  OFF for Step & Direction Input or PWM & Direction Input.				
SEL	Indicates whether CANopen communication is selected. GREEN for CANopen.				

#### Input/Output LED Functions

LED	Description			
DI1 – DI4	Indicates digital input status. GREEN when the corresponding digital input is active.			
DO1 – DO3	Indicates digital output status. BLUE when the corresponding digital output is active			

## **CANopen Node ID Switches**

Switch Diagram	Description				
SW3  SW4  SW4  SW4  SW4  SW4  SW4	Node ID range setup softw	e using the ro are or netwo	otary switch rk comman	nd to the CANopen Node ID. Allowers is 1 - 63. Node IDs above 63 can be done and stored to NVM (up to a Node in Node ID)  Node ID  Address stored in NVM  001  002   61  62  63	be set via ACE le ID of 127).

#### **DIP Switches**

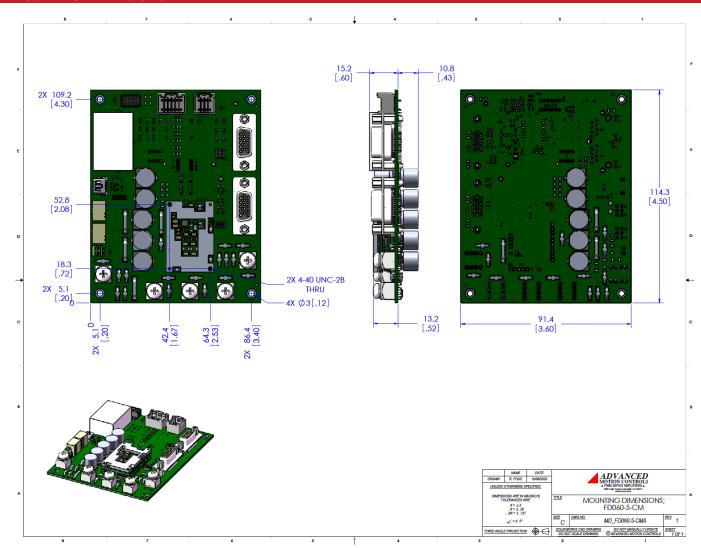
Switch	Description	ON	OFF	
SW6	Motor Thermistor Selection. Note that both switches on SW6 must be set to the same position for proper operation.	Uses the motor thermistor reading from P9 – Feedback 2 Connector	Uses the motor thermistor reading from P10 – Feedback 1 Connector	
SW9	CAN Termination. The last device in a CAN network requires termination.  Note that both switches on SW9 must be set to the same position for proper operation.	Terminated	Not terminated	
SW10	CAN Communication Selection. Note that all 4 switches of SW10 and SW11	R\$232/485	CAN	
SW11	must be set to the same position for proper operation.	N3232/403	CAN	

## Safe Torque Off (STO) Inputs

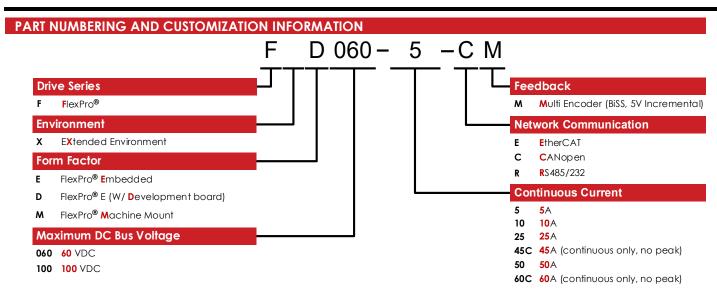
The Safe Torque Off (STO) inputs are dedicated +5VDC sinking single-ended inputs. For applications not using STO functionality, disabling of the STO feature is required for proper drive operation. STO may be disabled by installing the included mating connector for the STO connector and following the STO Disable wiring instructions as given in the hardware installation manual. Consult the hardware installation manual for more information. Alternatively, a dedicated STO Disable Key connector is available for purchase for applications where STO is not in use. Contact the factory for ordering information.



## MOUNTING DIMENSIONS







ADVANCED Motion Controls also has the capability to promptly develop and deliver specified products for OEMs with volume requests. Our Applications and Engineering Departments will work closely with your design team through all stages of development in order to provide the best servo drive solution for your system. Equipped with on-site manufacturing for quick-turn customs capabilities, ADVANCED Motion Controls utilizes our years of engineering and manufacturing expertise to decrease your costs and time-to-market while increasing system quality and reliability.

#### **Examples of Customized Products**

- Optimized Footprint
- Private Label Software
- ▲ OEM Specified Connectors
- No Outer Case
- ▲ Increased Current Resolution
- ✓ Increased Temperature Range
- Custom Control Interface
- Integrated System I/O

- ▲ Tailored Project File
- ✓ Silkscreen Brandina
- ▲ Optimized Base Plate
- ▲ Increased Current Limits
- ▲ Increased Voltage Range
- ▲ Conformal Coating
- ▲ Multi-Axis Configurations
- Reduced Profile Size and Weight

Feel free to contact us for further information and details!

#### **Available Accessories**

ADVANCED Motion Controls offers a variety of accessories designed to facilitate drive integration into a servo system. Visit www.a-m-c.com to see which accessories will assist with your application design and implementation.

All specifications in this document are subject to change without written notice. Actual product may differ from pictures provided in this document.