![ADVANCED MOTION CONTROLS]

FM100-50-CM

FlexPro® Series
Product Status: Active

SPECIFICATIONS

Current Peak	**100 A**
Current Continuous	**50 A**
DC Supply Voltage	**20 – 90 VDC**
Network Communication	**CANopen**
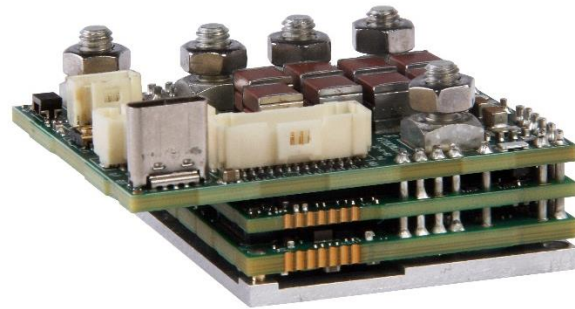
The **FM100-50-CM** is a single-axis servo drive and integration board assembly for a FE100-50-CM FlexPro® series servo drive with IMPACT™ architecture. Connections to the controller, motor, power, and feedback are simplified through the standard connectors featured on the board.

The **FM100-50-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 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 **FM100-50-CM** utilizes CANopen network communication and is configured via USB. All drive and motor parameters are stored in non-volatile memory.

IMPACT™ (**I**ntegrated **M**otion **P**latform **A**nd **C**ontrol **T**echnology) 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
- Fully Configurable Current, Voltage, Velocity and Position Limits

- 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 - Tamagawa/Nikon - Incremental Encoder - Hall Sensors - Aux Incremental Encoder - Tachometer (±10V)	**Motors Supported**	- Three Phase - Single Phase - Stepper - AC Induction	**Modes of Operation**	- Profile Modes - Cyclic Synchronous Modes - Current - Velocity - Position - Interpolated Position Mode (PVT)
Command Sources	- Over the Network ±10V Analog - Sequencing - Indexing - Jogging - Step & Direction - Encoder Following	**Inputs / Outputs**	4 Programmable Digital Inputs 3 Programmable Digital Outputs 1 Programmable Analog Input	**Agency Approvals**	- RoHS ll - UL/cUL (Pending) - CE (Pending) - TUV Rheinland (STO) (Pending)

BLOCK DIAGRAM
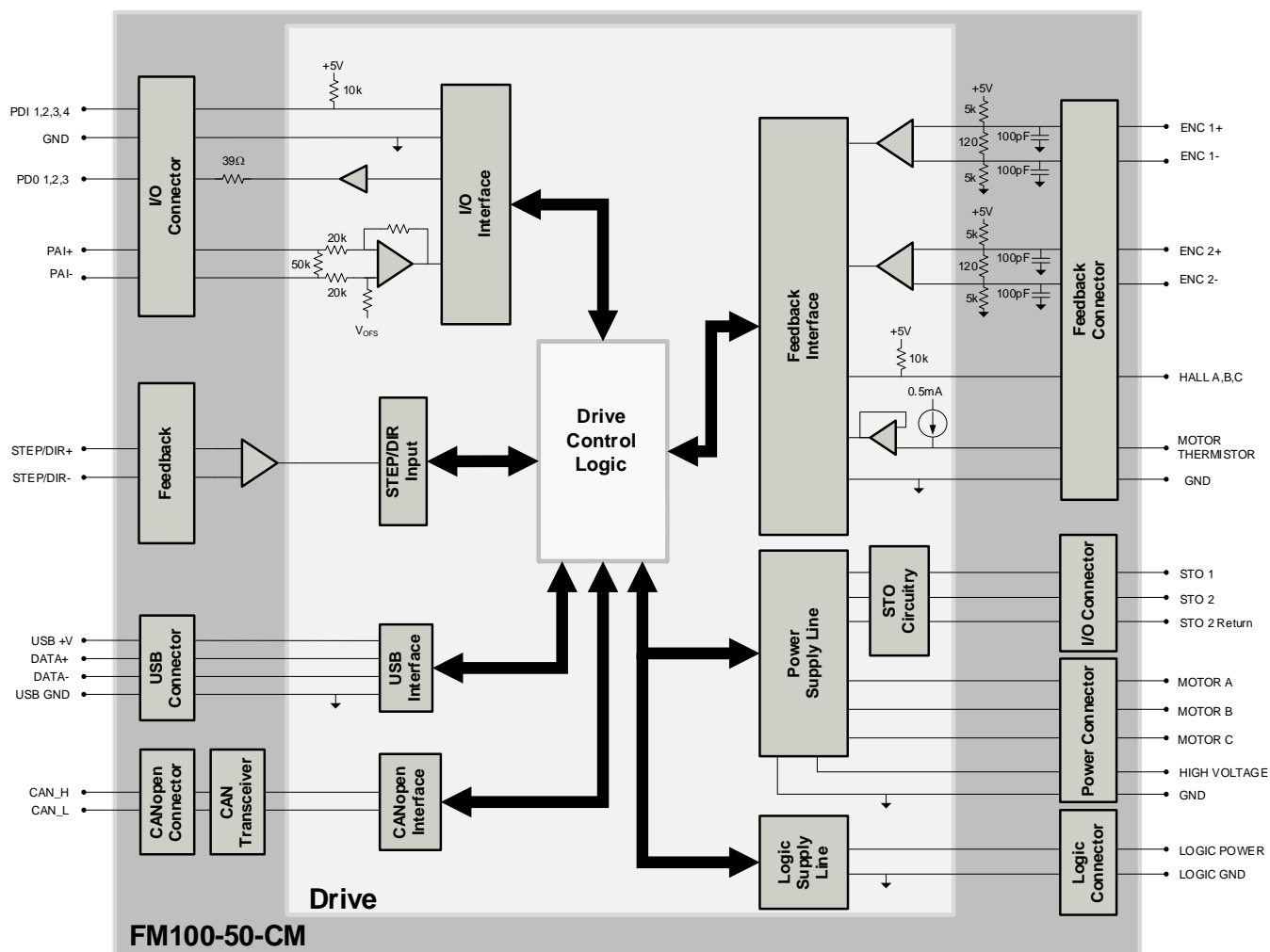
INFORMATION ON APPROVALS AND COMPLIANCES

RoHS Compliant

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.

Release Date:
2/22/2023

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SPECIFICATIONS

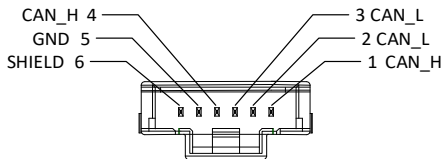| Electrical Specifications		
Description	Units	Value
DC Supply Input Range	VDC	20 – 90
DC Supply Undervoltage	VDC	15
DC Supply Overvoltage	VDC	100
Logic Supply Input Range (required)	VDC	10 – 55
Safe Torque Off Voltage (Default)	VDC	5
Bus Capacitance[1]	µF	29
Maximum Peak Current Output[2]	A (Arms)	100 (70.7)
Maximum Continuous Current Output[3]	A (Arms)	50 (50)
Efficiency at Rated Power	%	99
Maximum Continuous Output Power	W	4455
Maximum Power Dissipation at Continuous Current	W	45
Minimum Load Inductance (line-to-line)[4]	µH	250
Switching Frequency	kHz	20
Maximum Output PWM Duty Cycle	%	83
Control Specifications		
Description	Units	Value
Communication Interfaces	-	CANopen (USB for configuration)
Command Sources	-	±10 V Analog, Over the Network, Sequencing, Indexing, Jogging, Step & Direction, Encoder Following
Feedback Supported	-	Absolute Encoder (BiSS C-Mode, EnDat 2.2, Tamagawa/Nikon), 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 Supported[5]	-	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	-	40+ Configurable Functions, Over Current, Over Temperature (Drive & Motor), Over Voltage, Short Circuit (Phase-Phase & Phase-Ground), Under Voltage
Programmable Digital Inputs/Outputs	-	4/3
Programmable Analog 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		
Description	Units	Value
Size (H x W x D)	mm (in)	50.8 x 43.2 x 22.9 (2.00 x 1.70 x 0.90)
Weight	g (oz)	87.86 (3.1)
Ambient Operating Temperature Range[6]	°C (°F)	0 – 65 (32 – 149)
Storage Temperature Range	°C (°F)	-40 – 85 (-40 – 185)
Relative Humidity	-	0-95%
P1 CANopen COMMUNICATION CONNECTOR	-	6-pin, 1.0mm spaced single row vertical header
P2 USB CONNECTOR	-	USB Type C, vertical entry
P3 IO and LOGIC CONNECTOR	-	20-pin, 1.0mm spaced dual row vertical header
P4 FEEDBACK CONNECTOR	-	30-pin, 1.0mm spaced dual row vertical header
P5 and P6 POWER CONNECTOR	-	2x press-fit terminal lug
P7, P8, and P9 MOTOR POWER CONNECTORS	-	3x press-fit terminal lug

Notes
1. Minimum required external capacitance between HV and GROUND is 10µF / 2.5Arms for max rated operation assuming battery supply with <3ft lead length. Required external capacitance may be larger depending on specific system variables, capacitor types, motor current ripple, etc.
2. Capable of supplying drive rated peak current for 2 seconds with 2 second foldback to continuous value. Longer times are possible with lower current limits.
3. Continuous Arms value attainable when RMS Charge-Based Limiting is used.
4. Lower inductance is acceptable for bus voltages well below maximum. Use external inductance to meet requirements.
5. Maximum motor speed for stepper motors is 600 RPM. Consult the hardware installation manual for 2-phase stepper wiring configuration.
6. Additional cooling and/or heatsink may be required to achieve rated performance. Repeated over temperature events may cause damage to the drive due to the drive's high power density. Make sure that proper thermal management is adhered to during drive operation.

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PIN FUNCTIONS

P1 – CANopen Communication Connector

Pin	Name	Description / Notes	I/O
1	CAN_H	CAN_H bus line (dominant high)	I/O
2	CAN_L	CAN_L bus line (dominant low)	I/O
3	CAN_L	CAN_L bus line (dominant low)	I/O
4	CAN_H	CAN_H bus line (dominant high)	I/O
5	GND	Ground	GND
6	SHIELD	CAN shield	-

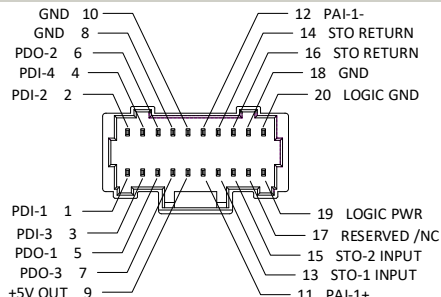|	
Connector Information	6-pin, 1.0mm spaced single row vertical header
Mating Connector Details	Molex: 5013300600
Mating Connector Included	No

```
CAN_H  4                3  CAN_L
  GND  5                2  CAN_L
SHIELD 6                1  CAN_H
```

P2 – USB Connector

Connector Information	USB Type C port
Mating Connector Details	Standard Type C USB connection cable
Mating Connector Included	No

P3 – I/O and Logic Connector

Pin	Name	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)	O
6	PDO-2	General Purpose Programmable Digital Output (TTL/8mA)	O
7	PDO-3	General Purpose Programmable Digital Output (TTL/8mA)	O
8	GND	Ground.	GND
9	+5V OUT	+5V Supply Output. Short-circuit protected. (300ma total load capacity shared between P3-9, P4-1, P4-13, and P4-21)	O
10	GND	Ground.	GND
11	PAI-1+	General Purpose Differential Programmable Analog Input or Reference Signal Input.	I
12	PAI-1-	±10VDC Range (12-bit Resolution)	I
13	STO-1 INPUT	Safe Torque Off – Input 1	I
14	STO RETURN	Safe Torque Off Return	STORET
15	STO-2 INPUT	Safe Torque Off – Input 2	I
16	STO RETURN	Safe Torque Off Return	STORET
17	RESERVED / NC	Reserved.	-
18	GND	Ground.	GND
19	LOGIC PWR	Logic Supply Input (10 – 55VDC) (required)	I
20	LOGIC GND	Ground	GND

Connector Information	20-pin, 1.0mm spaced dual row vertical header
Mating Connector Details	Molex: 501892010
Mating Connector Included	No

```
 GND  10                12  PAI-1-
 GND   8                14  STO RETURN
PDO-2  6                16  STO RETURN
PDI-4  4                18  GND
PDI-2  2                20  LOGIC GND

PDI-1  1                19  LOGIC PWR
PDI-3  3                17  RESERVED /NC
PDO-1  5                15  STO-2 INPUT
PDO-3  7                13  STO-1 INPUT
+5V OUT 9               11  PAI-1+
```

P4 – Feedback Connector

| Pin	Absolute Encoder	Incremental Encoder	Description / Notes	I/O
1	+5V OUT	+5V OUT	+5V Supply Output. Short-circuit protected. (300ma total load capacity shared between P3-9, P4-1, P4-13, and P4-21)	O
2	GND	GND	Ground.	GND
3	HALL A	HALL A		I
4	HALL B	HALL B	Single-ended Commutation Sensor Inputs.	I
5	HALL C	HALL C		I
6	THERMISTOR	THERMISTOR	Motor Thermal Protection.	I
7	ENC 2 A+	ENC 2 A+	Differential Incremental Encoder A.	I
8	ENC 2 A-	ENC 2 A-		I
9	ENC 2 B+	ENC 2 B+	Differential Incremental Encoder B.	I
10	ENC 2 B-	ENC 2 B-		I
11	ENC 2 I+	ENC 2 I+	Differential Incremental Encoder Index.	I
12	ENC 2 I-	ENC 2 I-		I
13	+5V OUT	+5V OUT	+5V Supply Output. Short-circuit protected. (300ma total load capacity shared between P3-9, P4-1, P4-13, and P4-21)	O
14	GND	GND	Ground.	GND
15	STEP +	STEP +	Differential Step Input.	I
16	STEP -	STEP -		I
17	DIR +	DIR +	Differential Direction Input.	I
18	DIR -	DIR -		I
19	RESERVED	RESERVED	Reserved.	-
20	RESERVED	RESERVED		-
21	+5V OUT	+5V OUT	+5V Supply Output. Short-circuit protected. (300ma total load capacity shared between P3-9, P4-1, P4-13, and P4-21)	O
22	GND	GND	Ground.	GND
23	ENC 1 DATA+	ENC 1 A+	Differential Data Line for Absolute Encoders (BiSS: SLO+/-) or Differential Incremental Encoder A.	I
24	ENC 1 DATA-	ENC 1 A-		I
25	ENC 1 CLOCK+	ENC 1 B+	Differential Clock Line for Absolute Encoders (BiSS: MA+/-) or Differential Incremental Encoder B.	I
26	ENC 1 CLOCK-	ENC 1 B-		I
27	ENC 1 REF MARK+	ENC 1 I+	Differential Reference Mark for Absolute Encoders (Leave open for BiSS and EnDat 2.2) or Differential Incremental Encoder Index.	I
28	ENC 1 REF MARK-	ENC 1 I-		I
29	RESERVED	RESERVED	Reserved.	-
30	RESERVED	RESERVED	Reserved.	-

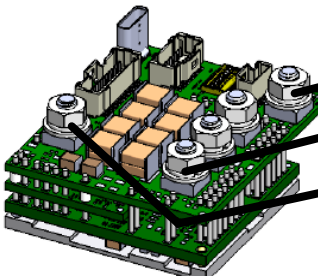|	
Connector Information	30-pin, 1.0mm spaced dual row vertical header
Mating Connector Details	Molex: 5011893010
Mating Connector Included	No
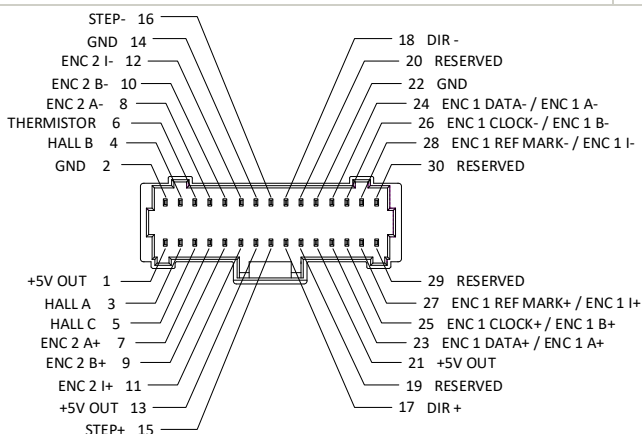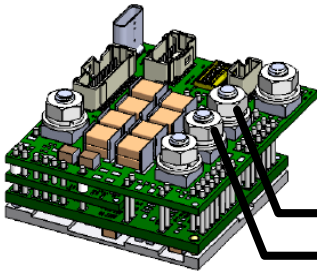
P5 and P6 - Power Connectors

Pin	Name	Description / Notes	I/O
1	HV	DC Supply Input: See Note #1 on page 3 for required external capacitance value.	I
2	POWER GND	Ground.	GND

Connector Information	2x press-fit terminal lug	P6 POWER GND P5 HV
Mating Connector Details	M4 Ring Terminal	
Mating Connector Included	No	

P7, P8, and P9 – Motor Power Connectors

Pin	Name	Description / Notes	I/O
1	MOTOR A	Motor Phase A	O
2	MOTOR B	Motor Phase B	O
3	MOTOR C	Motor Phase C	O

Connector Information	3x press-fit terminal lug	P9 MOTOR C P8 MOTOR B P7 MOTOR A
Mating Connector Details	M4 Ring Terminal	
Mating Connector Included	No	

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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 logic power is available to the drive. GREEN when logic power is available.

Switch Settings

The CANopen Node ID and baud rate are set using DIP Switch SW1. Switch settings are given in the below table.

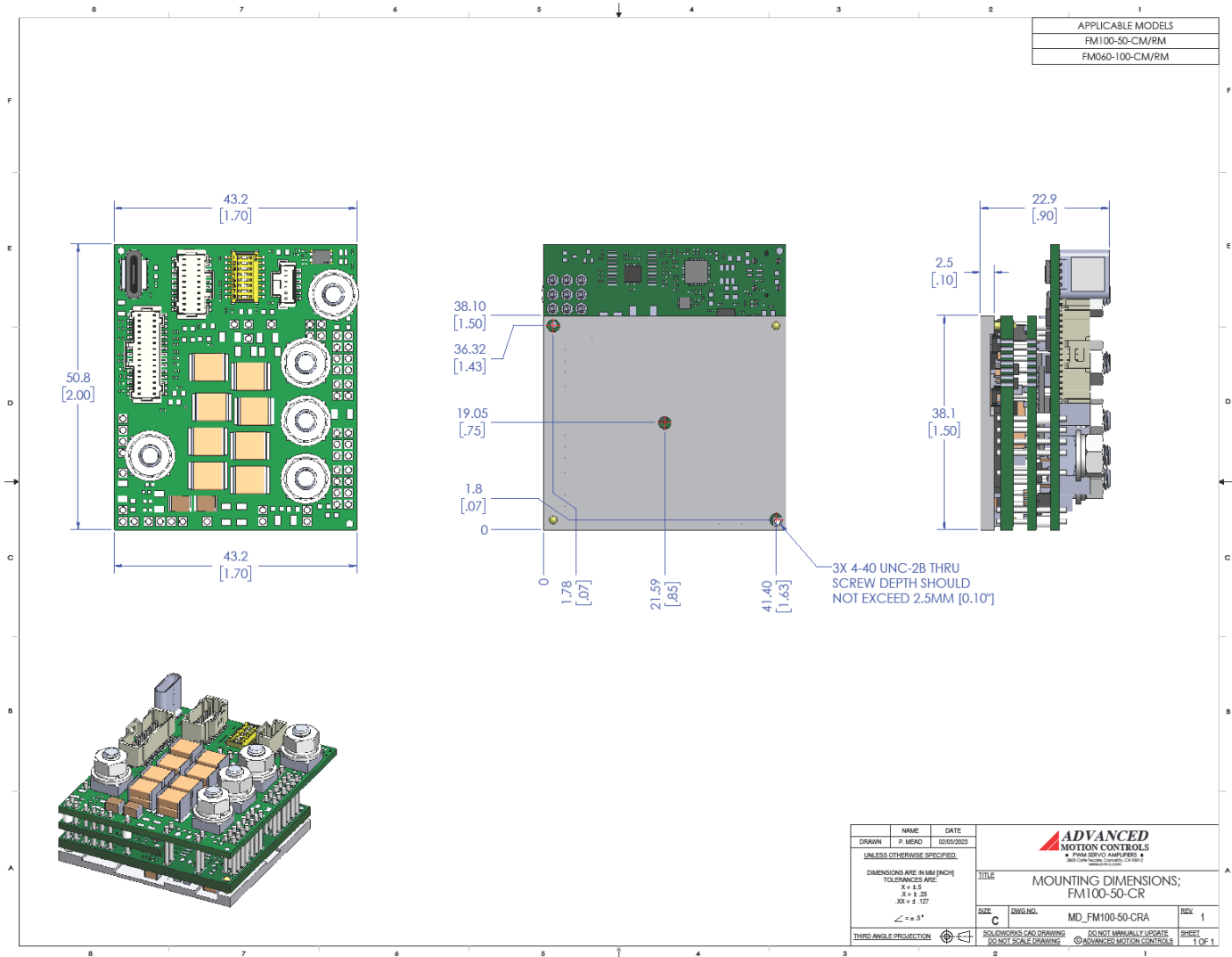| SW1	Description	On	Off
1	Bit 0 of binary CANopen ID.		
2	Bit 1 of binary CANopen ID.	On = 1, Off = 0. Note that setting all addressing switches to 0 will use the address stored in NVM. Default setting is NVM address.	
3	Bit 2 of binary CANopen ID.		
4	Bit 3 of binary CANopen ID.		
5	Baud Rate	500k	Set via software (default)
6	RESERVED	Invalid	Leave off for proper operation
7	RESERVED	Invalid	
8	Network Termination	Terminated	Not Terminated (default)

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 following the STO Disable wiring instructions as given in the hardware installation manual.

Mating Connector Kit

Mating connector housing and crimp contacts can be ordered as a kit using *ADVANCED* Motion Controls' part number KC-MC1XFMCR01. This includes mating connector housing and crimp style contacts for the Communication, I/O and Logic, and Feedback connectors. The recommended tool for crimping the contacts is Molex PN: 63819-1500 (not included with the kit). Pre-crimped leads (Molex PN: 797581018) are also available for purchase from many inline component vendors.

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MOUNTING DIMENSIONS

APPLICABLE MODELS
FM100-50-CM/RM
FM060-100-CM/RM

43.2 [1.70]

50.8 [2.00]

43.2 [1.70]

38.10 [1.50]

36.32 [1.43]

19.05 [.75]

1.8 [.07]

0

0

1.78 [.07]

21.59 [.85]

41.40 [1.63]

22.9 [.90]

2.5 [.10]

38.1 [1.50]

3X 4-40 UNC-2B THRU
SCREW DEPTH SHOULD
NOT EXCEED 2.5MM [0.10"]

	NAME	DATE	**ADVANCED** MOTION CONTROLS
DRAWN	P. MEAD	02/03/2023	PWM SERVO AMPLIFIERS

UNLESS OTHERWISE SPECIFIED:

DIMENSIONS ARE IN MM [INCH]
TOLERANCES ARE:
X = ± .5
.X = ± .25
.XX = ± .127

∠ = ± .5°

THIRD ANGLE PROJECTION

TITLE: MOUNTING DIMENSIONS;
FM100-50-CR

SIZE C | DWG NO. MD_FM100-50-CRA | REV 1

SOLIDWORKS CAD DRAWING
DO NOT SCALE DRAWING

DO NOT MANUALLY UPDATE
© ADVANCED MOTION CONTROLS

SHEET 1 OF 1

PART NUMBERING AND CUSTOMIZATION INFORMATION

F M 100 – 50 – C M

Drive Series
F **F**lexPro®

Environment
X E**X**tended Environment

Form Factor
E FlexPro® **E**mbedded
D FlexPro® E (W/ **D**evelopment board)
M FlexPro® **M**achine Mount

Maximum DC Bus Voltage
060 **60** VDC
100 **100** VDC

Feedback
M **M**ulti Encoder (BiSS, 5V Incremental)

Network Communication
E **E**therCAT
C **C**ANopen
R **R**S485/232
IP Ethernet/**IP**

Continuous Current
1 **1**A
5 **5**A
10 **10**A
25 **25**A
50 **50**A
60C **60**A (continuous only, no peak)

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 Branding
▲ 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.

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