EMERSON™
Industrial Automation

Mentor MP

High performance DC drive

25A to 7400A

400V / 575V / 690V

Two or four quadrant operation

CONTROL TECHNIQUES

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CONTROL TECHNIQUES

The Ultimate DC drive

Mentor MP is Control Techniques 5th generation DC drive and integrates the control platform from the world's leading intelligent AC drive, Unidrive SP. This makes Mentor MP the most advanced DC drive available, giving optimum performance and flexible system interfacing capability.

Upgrading your control system

There are large numbers of DC motors in service throughout the world in various applications, the majority of which are easily capable of providing continued service. Upgrading your drive allows you to maximise the motor performance, enhance system reliability and interface digitally with modern control equipment using Ethernet and Fieldbus networks. Downtime is minimised as only the drive needs to be replaced.

Driving forward with DC technology

DC drive technology remains cost effective, efficient and is relatively simple to implement. For new solutions DC provides many advantages, especially for regenerative and high power applications.

"Our main objective is to enhance the reliability and performance. Upgrading the DC drive system allows us to achieve this without replacing the motor; with minimum downtime and lost production."

N1652

RoHS Compliant

Certificate No. EMS 54446 003

Certificate No. Q 05176 003

E171230

2 YEAR Digital Drive Warranty

www.controltechniques.com

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Mentor MP DC drive features

AC supply input connections wih removable covers

Drive identification marker rail

Drive rating label

Output power connections to motor with removable covers

Armature voltage feedback for use with DC contactor and inverter common DC bus systems

Fuses for field protection (removable cartridge)

Integrated field controller connections

Optional Keypad, available as high brightness LED or multi-lanuage LCD with plain text

Smartcard for parameter, PLC and motion program storage

Modbus communications port for PC programming and device interfacing

Terminal cover

Finger guard

3 universal option module slots for communications, I/O, additional feedback devices and automation/ motion controllers

Pluggable terminals for I/O, relays, tacho feedback, encoder, and a current feedback test pin for fine tuning armature current loop

Communications port for external field controller or parallel drives

Sturdy cable management system providing an earthing point for shielded control cables

Pioneers of DC technology

Over the last 35 years Control Techniques have pioneered many of the DC drive technologies that are now taken for granted. These include the first digital DC drive and the first DC drive with an onboard programmable automation controller.

Our exemplary track record and experience in DC drive technology means that you can be sure Mentor MP will excel in the widest possible range of applications.

Leading edge control technology in a DC drive

Control Techniques have a comprehensive portfolio of AC and DC drive solutions. We can offer you impartial advice on the best solution for your application needs and future upgrade paths.

Mentor MP inherits the world beating control platform and software tools from Control Techniques AC drive range, so you retain the flexibility of changing to an AC drive system in the future if your application requirements evolve.

Control Techniques has a patent pending to protect one unique aspect of the Mentor MP design. Galvanic isolation between power and control is a standard feature in AC drives and, in the case of failure, protects the control circuits and connected equipment from high voltage on the power circuit. Mentor MP uses a novel technology to achieve Galvanic Isolation without compromising performance or reliability.

"Working with a supplier that really understands and invests in DC technologies is a big plus for us."

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Our expertise in your industry

Our extensive expertise across a wide range of industries mean that we are the ideal partner for DC solutions. Typical applications for Mentor MP include:

- Crane & hoist
- Test rigs & dynamometers
- Magnetic grabs
- Elevator
- Tyre & rubber
- Metals
- Wire drawing
- Paper
- Marine
- Winders
- Extruders
- Glass
- Materials handling
- Fair ground
- Spindle drives
- Crushers
- Active front end for DC Bus connected AC Drive systems

Global service

Being one of the market leaders in DC technology, we understand your needs. Control Techniques 89 subsidiary Drive Centres and resellers in 65 countries ensure that service, support and expertise are just around the corner, all around the world.

Environmentally sound

Re-use of existing DC motors	No new motor required	✔
High efficiency solution	DC drives and motors offer high efficiency equivalent to many AC solutions	✔
RoHS compliant	Mentor MP is manufactured using lead-free processes	✔
Simple regenerative solution	Mentor MP allows mechanical energy to be easily regenerated back to the line power supply	✔
Recyclability	Virtually all Mentor MP component parts are suitable for recycling	✔

Emerson motor and drive solutions

Control Techniques Mentor MP DC drives and Leroy Somer DC motors offer a total Emerson solution. Both companies offer quality and technology leadership to deliver the best possible combination of motors and drives. High efficiency DC motors combined with variable speed control offers a matched energy optimized solution.

Higher power DC motors

Control Techniques has access to several other ranges of DC motors, allowing us to cover the complete power range of Mentor MP DC drives.

Leroy Somer LSK square frame DC motors:

- Power rating 4.7kW to 517 kW
- Frame size 112 to 280
- IP23S drip proof
- S1 duty
- PTC thermistors
- IC06 forced vent cooling with standard polyester filter
- Class H insulation
- 3-phase full bridge supply
- Terminal box right hand side
- Forced vent top
- Tacho type REO444

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Enhanced control performance

Greater field control

Every Mentor MP has a field controller as standard. This will enable the control of the majority of DC motors encountered in the market today. However, for the following situations, the optional FXMP25 external field controller is offered:

- The required field current is greater than that offered by the standard drive, but not greater than 25A. For example, older motors with low field voltages.
- The field is required to be forced down more quickly than is possible with the standard half controlled field bridge. For example, on spindle motors or motors with high field time constants where the field is required to weaken more quickly than the natural time constant of the field winding.
- The application can be implemented with simple field current reversal, without armature reversal. For example, applications where a rapid change in torque direction is not required. With the Mentor MP it is possible to implement a four quadrant system with a two quadrant armature converter where a slow change in torque direction can be tolerated.

FXMP25

The FXMP25 may be controlled digitally by the Mentor MP using a standard RJ45 patch lead, allowing set-up by standard drive parameters.

The FXMP25 can also function in standalone mode using the integrated keypad and display.

For older motors with very low field voltages and field currents greater than 25A, the Mentor MP itself has a field mode, allowing it to be implemented as a field controller with no additional components. Field current control is effectively unlimited.

Long life

The longest possible working life is promoted by the fact that the heatsink cooling fans are all speed controlled and only run when required, making the drive effectively “wear-less”.

Add the extra features you need

Click-in option modules allow you to customise the drive to suit your needs. 18 different options are available including Fieldbus, Ethernet, I/O, extra feedback devices and automation controllers.

Intelligently driven

Mentor MP allows the drive system designer to embed automation and motion control within the drive, eliminating communication delays that reduce performance while CTNet, a high performance drive-to-drive network links the different parts of the system.

Reliability and innovation

Mentor MP is designed using a well proven development process that prioritises innovation and reliability. This process has resulted in Control Techniques having a market leading reputation for both product performance and quality.

Mentor MP set-up, configuration and monitoring

Mentor MP is quick and easy to set-up. The drives may be configured using a removable keypad, Smartcard or the supplied PC commissioning software that guides the user through the configuration process.

User interface options

Mentor MP benefits from a choice of keypads to meet your application needs.

Order Code	Details
SM–Keypad	Hot pluggable, high-brightness LED display.
MP-Keypad	Multi-lingual, hot pluggable, backlit LCD display. The display can be customised to provide application specific text.

SM-Keypad

MP-Keypad

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PC Software and Smartcard Tools for rapid commissioning

Control Techniques software suite makes it easier to access the drive's full feature set. It allows you to optimize the drive tuning, back-up the configuration and set-up a communications network. The software tools can connect using Ethernet, Serial, USB or Control Techniques drive-to-drive network, CTNet.

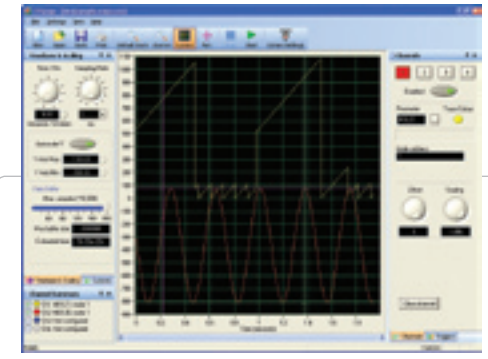
CTSoft

CTSoft is a drive configuration tool for commissioning, optimising and monitoring Control Techniques drives. It allows you to:

- Use the configuration wizards to commission your drive
- Read, save and load drive configuration settings
- Manage the drive's Smartcard data
- Visualise and modify the configuration with live animated diagrams

- The home page shortens the learning curve for new users and provides powerful shortcuts for experienced users
- A Migration Wizard guides new and experienced users systematically through the process of configuring a Mentor MP for an existing Mentor II application. Existing parameter sets can be imported from a stored file or read directly from an existing drive.
- All motor data is entered in real units and the current limit window will calculate parameter settings based on ambient temperature and required overload ratings.

CTScope



CTScope is a full featured software oscilloscope for viewing and analysing changing values within the drive. The time base can be set to give high speed capture for tuning or for longer term trends. The user interface is based on a traditional oscilloscope, making it familiar and friendly to all engineers across the globe.

Try it, download the full version of CTSoft and CTScope software from www.controltechniques.com

FREE Software

CTOPCServer

CTOPCServer is an OPC compliant server which allows PCs to communicate with Control Techniques drives. The server supports communication using Ethernet, CTNet, RS485 and USB. OPC is a standard interface on SCADA packages and is widely supported within Microsoft® products. The server is supplied free of charge and may be downloaded from www.controltechniques.com.

Try it, download the full version of CTOPCServer from www.controltechniques.com

FREE Software

Smartcard

The Smartcard is a memory device that is supplied with every Mentor MP, it can be used to back-up parameter sets and PLC programs and copy them from one drive to another.

- Parameter and program storage
- Simplify drive maintenance and commissioning
- Quick set-up for sequential build of machines
- Machine upgrades can be stored on a Smartcard and sent to the customer for installation

Easy performance tuning

Autotune features accessible through CTSoft or the keypad help you to get the best performance by measuring the motor and machine attributes and automatically optimising control parameters.

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Mentor MP - Unparalleled integration flexibility

Control Mode

Estimated speed Feedback

Tacho Feedback

Encoder Feedback

Field Control

Options

Standard

Mentor MP in field mode greater than 25A

FXMP25 Field Control up to 25A

Integrated Field Control
Size 1:8A
Size 2A and 2B: 10A
Size 2C and 2D: 20A

Drive Programming and Operator Interface

Options

Standard

Operator Interface

MP-Keypad
LCD with MP firmware

SM-Keypad
LED standard

Smartcard

Input/Output

Standard

Options

SM–I/O 32

SM–I/O Plus

SM–I/O Lite

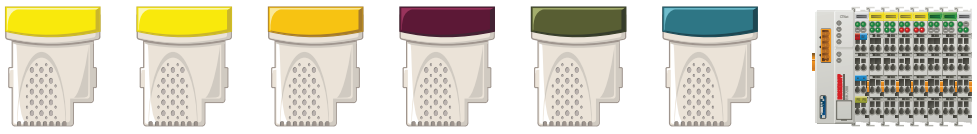
SM–I/O Timer

SM–I/O 120V

SM–PELV

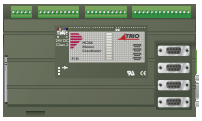
REMOTE I/O

7 Digital I/O
5 Analog I/O
2 Form C relays



Centralised PLC/Motion Control

Motion Controller



PLC

PC

Applications with PLC or Motion functionality

Standard

On Board PLC

Easy to use onboard ladder logic PLC at zero cost, ideal for simple applications requiring extra drive functionality

Configured using SyPTLite software

Options

SM–Applications Lite V2

Powerful automation controller using a dedicated microprocessor giving full drive parameter access

Configured using SyPTLite or SyPTPro software

SM–Applications Plus

Powerful automation controller with drive to drive networking and full motion capability

Configured using SyPTPro software

SM–Register

High speed motion and registration control

Configured using SyPTPro software

Communications

Standard

Modbus RTU

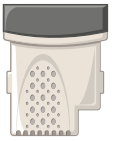
Options

SM–EtherCAT

SM–Profibus DP

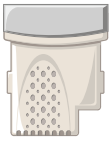
SM-Interbus

SM–DeviceNet



SM–Ethernet

SM–CANopen



Feedback

Standard

Estimated speed Tacho Encoder

Options

SM–Universal Encoder Plus

Accepts or replicates all standard feedback types, Input and output

SM–Encoder Plus

Incremental input

SM–Encoder Output Plus

Incremental Encoder input / buffered output

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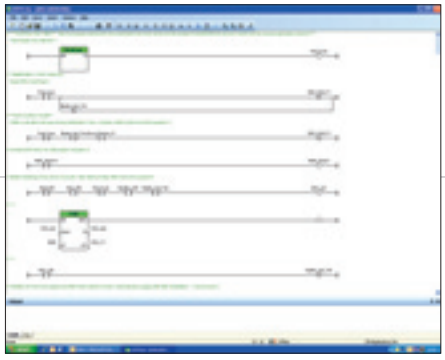
Mentor MP drive intelligence and system integration

Intelligent drives offer more compact, higher-performance and lower cost solutions in machinery automation applications. Over the past 20 years Control Techniques has pioneered the embedding of programmable automation, motion and communications features within drives.

SyPTLite and on board automation

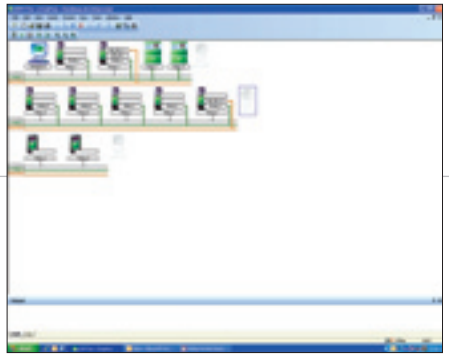


Mentor MP has an inbuilt programmable controller. It is configured using SyPTLite, an easy-to-use ladder logic program editor, suitable for replacing relay logic or a micro PLC for simple drive control applications.

The software is supplied free of charge. For evaluation, download the full version from www.syptlite.com.

FREE Software

SyPTPro automation development environment



SyPTPro is a full featured automation development environment that can be used for developing tailored solutions for single or multiple drive applications. The programming environment fully supports three industry standard languages: Function Block, Ladder and Structured Text. Motion control is configured using the new PLCopen motion language, supporting multiple axes.

CTNet, a high-speed, deterministic drive-to-drive network links the drives, SCADA and I/O together to form an intelligent networked system, with SyPTPro managing both the programming and communications.

For evaluation, download a demonstration version from www.controltechniques.com.

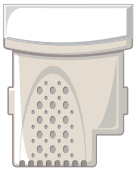
FREE Software

High performance automation

All of Control Techniques automation option modules contain a high performance microprocessor, leaving the drive's own processor to give you the best possible motor performance.

SM-Applications Lite V2

The SM-Applications Lite V2 module is designed to provide programmable control for standalone drive applications or when the drive is connected to a centralised controller via I/O or Fieldbus.



SM-Applications Lite V2 may be programmed using ladder logic with SyPTLite or can make use of the full automation and motion capabilities contained within SyPTPro.

- Easy Powerful Configuration – SM-Applications Lite V2 can be used to tackle automation problems from simple start/stop sequencing with a single drive to more complex machine and motion control applications
- Real Time Control –The SM-Applications Lite V2 module gives you real-time access to all of the drives parameters plus access to data from I/O and other drives. The module uses a high speed multi-tasking operating system with task update times as low as 250µs. Tasks are synchronised to the drive's own speed loop to give you the best possible performance for drive control and motion.

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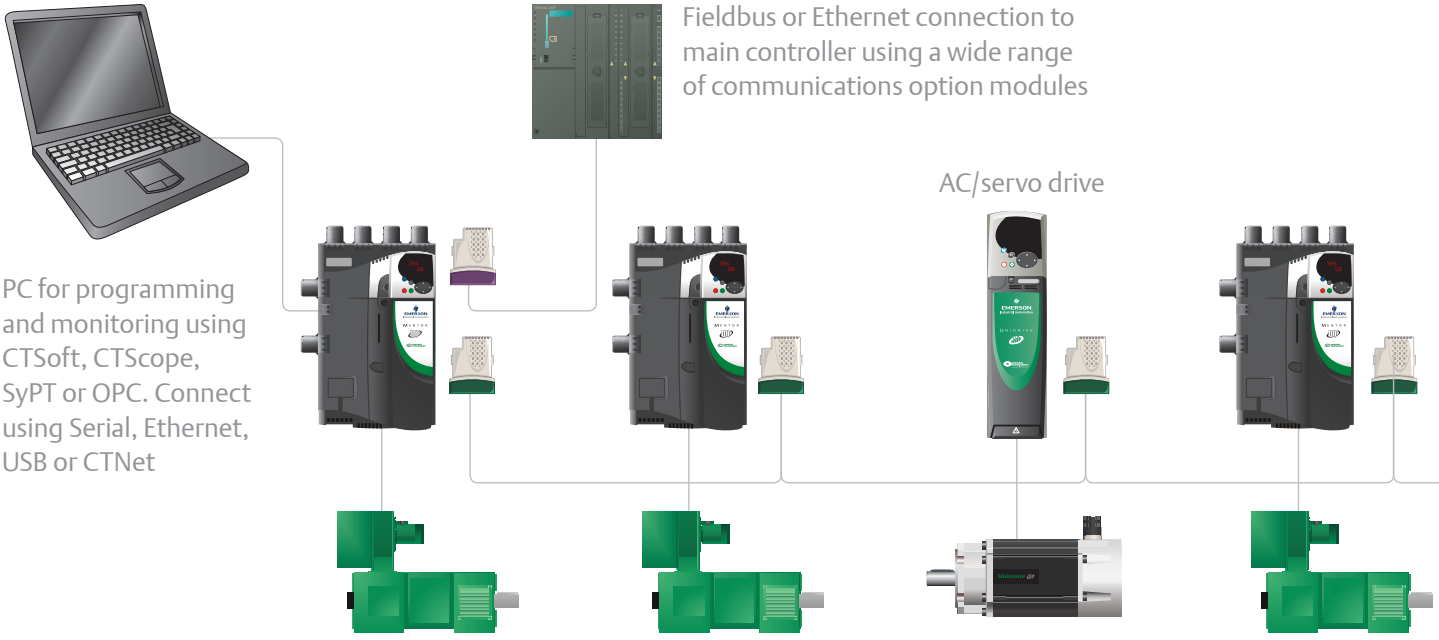
Mentor MP machine communications flexibility



SM-Applications Plus

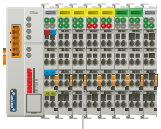
SM-Applications Plus offers all of the features of the SM-Applications Lite V2 module but with additional communications and high speed I/O.
SM-Applications Plus is programmed using SyPTPro system programming tool.

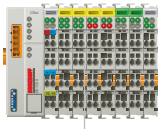
- Inputs/Outputs – The module has two digital inputs and two digital outputs for high-speed I/O operations such as position capture and actuator firing.
- High speed serial port - The module features a serial communications port supporting standard protocols such as Modbus for connection to external devices such as operator interface panels.
- Drive-to-drive communications - SM-Applications Plus option modules include a high speed drive-to-drive network called CTNet, this network is optimised for intelligent drive systems offering flexible peer to peer communications. The bus has the capability to connect to remote I/O, operator panels, Mentor MP drives and PCs using an OPC server.

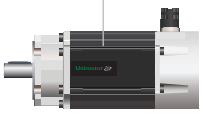
Ethernet connection for remote access, wireless connectivity and asset management

Operator interface connected using serial, Fieldbus or Ethernet

Network connected Remote I/O







CT Net is a high performance network designed for machine integration. It allows connection to PCs, operator interfaces, I/O and other Control Techniques drives

Fieldbus Communications

Option modules for all common Industrial Ethernet, Fieldbus networks such as Ethernet/IP and Profibus and Servo networks such as EtherCAT are available. We continually develop new modules as new technologies emerge.

Easy gateway

SM-Applications and CTNet allow machine designers to design an easy gateway into which customers are able to interface using their preferred Fieldbus or Ethernet interface. This solution improves the machine performance, simplifies the problem of being able to meet customer specifications for different Fieldbus communications and helps to protect your intellectual property.

	Onboard PLC	SM-Applications Lite V2	SM-Applications Plus
Intellectual property protection	✔	✔	✔
SyPTLite Programming	✔	✔	
SyPTPro Programming		✔	✔
Multi-tasking environment		✔	✔
Motion control capabilities		✔	✔
CTNet drive-to-drive network			✔
Serial port			✔
High Speed I/O			✔

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Ideal for retro-fit

Mentor MP is an ideal retro-fit choice with features to ensure it can integrate easily with your existing motor, power supply, application equipment and communication networks. Mentor MP brings new performance and new possibilities to your application.

Mentor MP drops straight into the space used by older Mentor drives, making it easy for us to retrofit. We also plan to use Mentor MP to upgrade obsolete drives from other manufactures

We've done all the hard work

Mentor MP has been designed so existing Mentor II customers can easily migrate to the new platform. All power terminal locations and mounting points have been retained and software tools have been developed to assist transfer of drive parameters and programs. If you are planning to upgrade your DC system, whether it is a Mentor or other manufacturer's drive, Mentor MP is the clear choice.

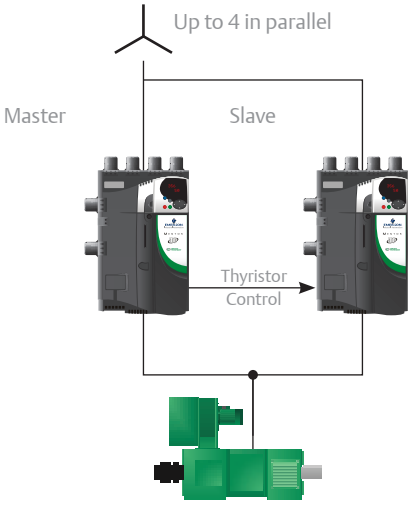
Backward compatible field control

The new FXMP25 replaces the existing FXM5 option. It may be controlled digitally by the Mentor MP or Mentor II using a standard RJ45 patch lead or ribbon cable respectively, allowing set-up by standard drive parameters. The FXMP25 has the same physical dimensions as the existing FXM5, but extends its current range to 25A. In standalone mode it is configured by its own keypad and display.

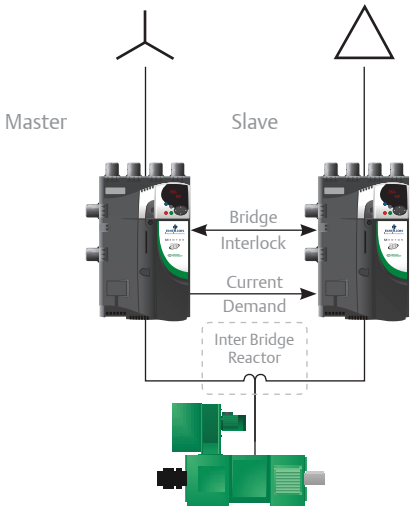
Power circuit configurations

For higher armature currents, higher armature voltages and harmonic minimisation the Mentor MP has standard features to enable the configurations below to be implemented.

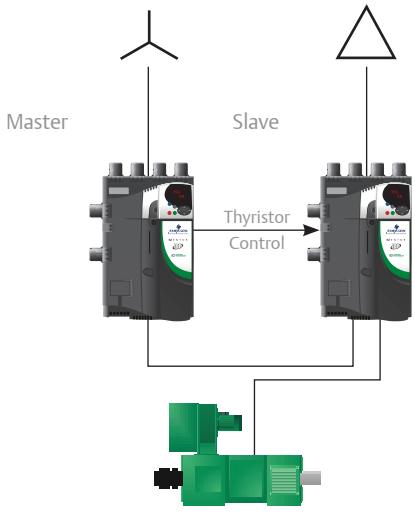
Parallel - 6 pulse



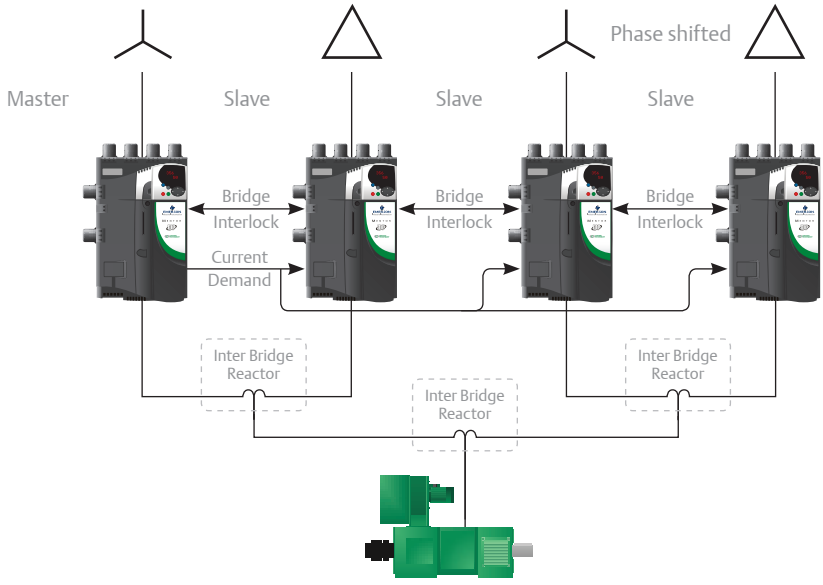
Parallel - 12 pulse



Series - 12 pulse



Parallel - 24 pulse



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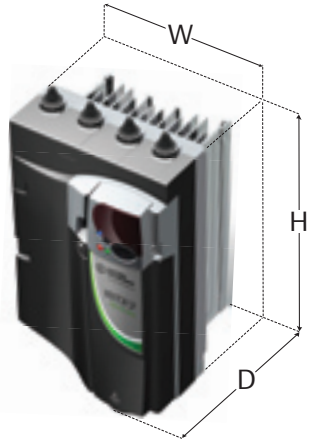
Mentor MP, the ultimate drive solution

- Models available for two or four quadrant (regenerative) operation
- 25A to 7400A, 400V / 575V / 690V
- Optional high-brightness LED or multi-language LCD keypad, simple configuration using plain text
- Modular serial and parallel connection for higher power motor operation
- 12/24 pulse operation to minimise harmonics
- IP20 protection for size 1, IP00 with finger guard protection for size 2 for easy, low cost installation
- Integrated drive and motor protection for:
  - Over current
  - Over temperature
  - Phase loss
  - Thyristor junction temperature
  - Feedback loss
  - Field loss
  - Armature open circuit
- Internal field controller with intelligent field weakening means that for 90% of applications no additional external controller is required
  - Frame Size 1 to 8A
  - Frame Size 2A and 2B to 10A
  - Frame Size 2C and 2D to 20A
  - Flux control for enhanced open loop performance
- Optional FXMP25 external field controller for current fields up to 25A
  - Digital link for field control from Mentor MP or Mentor II
  - Standalone digital control mode for simple application
  - Flux control for enhanced open loop performance
  - Intelligent field weakening
  - Field forcing – for high dynamic machine reversal
  - Field reversal – low dynamic machine reversing using two quadrant main stack.
- Mentor MP field control mode for fields requiring greater than 25A
- Serial port for Modbus RTU and PC communications
- 3 Universal option module slots, allowing Mentor MP to benefit from the solutions developed for Control Techniques market leading AC drive technology. Each option slot allows:
  - High performance PLC and motion control
  - Ethernet and Fieldbus communications
  - Connectivity to additional feedback devices
  - Additional I/O
- Galvanically isolated control
- Smartcard for drive parameter back-up and copying, allowing rapid installation and maintenance
- Integrated PLC as standard
- Standard software features for easy integration
  - PID controller
  - Motorised potentiometer
  - Digital lock (Slave operation from master encoder)
- Open loop control using estimated speed based on armature voltage and field flux feedback
- Closed loop control using
  - Tacho-generator feedback for connection to traditional DC motors
  - Incremental encoder feedback for higher accuracy and position control
  - Optional SinCos, SSI, Hiperface and EnDAT connectivity for high performance applications
- High performance control strategy
  - 32 bit microprocessor
  - 35µs current sampling time
  - Speed controller and ramps update 250µs
  - Autotune features for armature, field current loops and speed loop

Conformance

- Humidity 95% maximum (non condensing) at 40°C (104°F)
- Ambient temperature -15°C to +40°C (5°F to +104°F), 55°C (131°F) with derating
- Altitude: 0 to 3000m, derate 1% per 100m between 1000m and 3000m
- Vibration: Tested in accordance with IEC 60068-2-64
- Mechanical Shock Tested in accordance with IEC 60068-2-29
- Storage temperature -40°C to +70°C (-40°F to +158°F)
- Electromagnetic Immunity complies with EN 61800-3 and EN 61000-6-2
- Notch Immunity to IEC60146-1-1 class A
- IEC 61800-5-1 Electrical safety
- IEC 61131-2 I/O
- EN 60529 Ingress protection
- UL508C
- EN 61000-6-4 EMC
  - with optional EMC filters

Note: Specifications for optional EMC filters are available from your Control Techniques supplier.



Order codes

DC Drive						External Field	
MP1200A4R						**FXMP25**	
MP - Mentor Platform						**FX -** External Field	
Maximum armature current						**MP -** Mentor Platform	
Supply voltage rating 4 = 480V 5 = 575V 6 = 690V						**25 -** Maximum field current (A)	
R - 4 quadrant operation **Blank** - 2 quadrant operation							

Note: At the time of ordering, please select the required keypad option. Refer to page 9.

Model		Frame	Armature current (A)	Field current (A)	Width (W)	Height (H)	Depth (D)	Quadrants of Operation
MP25A4(R)	MP25A5(R)	1A	25	8	250mm (9.84in)	370mm (14.57in)	222mm (8.74in)	2 and 4
MP45A4(R)	MP45A5(R)		45					
MP75A4(R)	MP75A5(R)		75					
MP105A4(R)	MP105A5(R)	1B	105		250mm (9.84in)	350mm (14.57in)	251mm (9.88in)	2 and 4
MP155A4(R)	MP155A5(R)		155					
MP210A4(R)	MP210A5(R)		210					
MP350A4(R)	MP350A6(R)	2A	350	10	450mm (17.72in)	423mm (16.65in)	301mm (11.85in)	2 and 4
MP420A4(R)	MP420A5(R)		420					
MP550A4(R)	MP550A6(R)		550					
MP700A4(R)	MP700A6(R)	2B	700		450mm (17.72in)	423mm (16.65in)	301mm (11.85in)	2 and 4
MP825A4(R)	MP825A6(R)		825					
MP900A4(R)	MP900A6(R)		900					
MP1200A4	MP1200A6	2C	1200	20	450mm (17.72in)	1045mm (41.14in)	510mm (20.08in)	2
MP1850A4	MP1850A6		1850					
MP1200A4R	MP1200A6R	2D	1200		450mm (17.72in)	1505mm (59.25in)	510mm (20.08in)	4
MP1850A4R	MP1850A6R		1850					