



**EMERSON**<sup>™</sup>  
Industrial Automation

**M E N T O R** 

High performance DC drive  
Solution Platform

25A to 7400A

400V / 575V / 690V

Two or four quadrant operation



## Mentor MP, the ultimate DC drive

25A to 7400A, 400V | 575V | 690V

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 ongoing service. Upgrading your DC 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 applications DC provides many advantages, especially for regenerative and high power applications.

### Simple upgrade

Mentor MP has been engineered as an easy replacement for Mentor II. It has the same physical dimensions and connection layout. Software tools have been developed to easily migrate to the new platform.

*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.*



**RoHS  
Compliant**



## Mentor MP DC drive features

AC supply input connections  
with removable safety 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

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



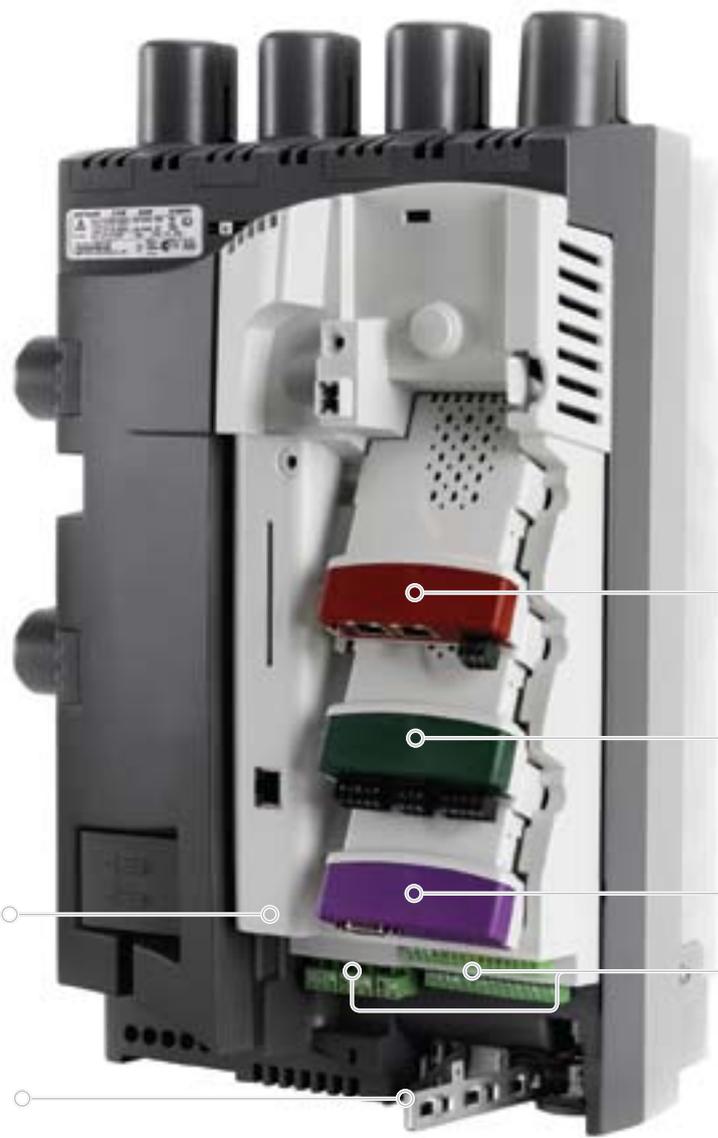
Smartcard for  
parameter and  
custom application  
program storage

Standard onboard  
Modbus  
communications  
port for PC  
programming and  
device interfacing

Safety terminal  
cover

Safety finger  
guard





Communications port for external field controller or parallel drives

Sturdy cable management system providing a grounding point for shielded control cables

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

## Pioneers of intelligent DC drive 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.*



## 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 91 subsidiary Drive Centres and resellers in 67 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 750kW
- Frame size 112 to 355
- 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 in any position
- Forced vent top
- Tacho type RE0444
- Incremental and absolute encoders



## Enhanced control performance

### Greater motor field control

Every Mentor MP has a motor field controller as standard which gives excellent field control for the majority of DC motors. However, for the following situations, the optional FXMP25 external field controller is recommended:

- The required field current is greater than that offered by the standard drive, up to 25A. For example, older motors with low field voltages.
- The field is required to be forced down more quickly than is possible with a 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.
- Applications 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 - External motor field controller

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

The FXMP25 can also function in standalone mode using its 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.

### Long life design

The longest possible working life is a design feature of Mentor MP. An example of which is the heatsink cooling fans that are all intelligently controlled and only run when required, thus reducing maintenance.



### 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 programmable automation controllers.

### Intelligently driven

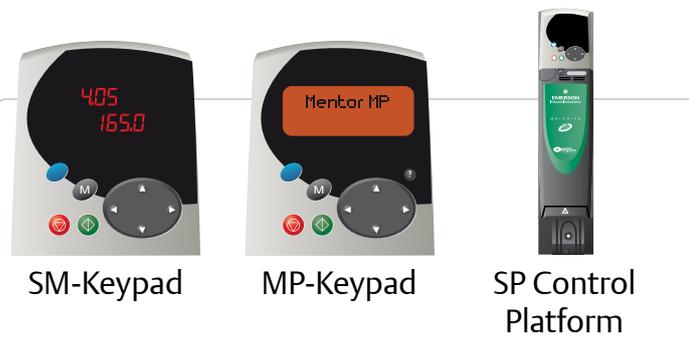
Mentor MP allows the drive system designer to embed automation and motion control within the drive, eliminating communication delays that reduce performance while CTNet, a high performance drive-to-drive network links the different parts of the system.

### 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, and reflects the results of significant amount of customer feedback.

## 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. Existing Mentor II users benefit from our free migration wizard software.



### User interface options

Mentor MP benefits from a choice of interfaces 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.
SP Control Platform	Control platform without power stage



## 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. Migration tools make the process of transferring parameter sets from Mentor II to Mentor MP a simple process.

### CTSoft

CTSoft is our free 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

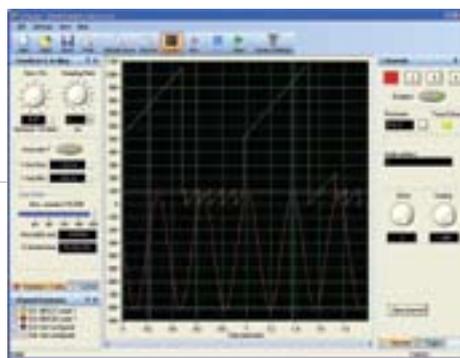


- The CTSoft home page shortens the learning curve for new users and provides powerful shortcuts for experienced users

- Migration Wizard guides experienced and new 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 free, download the full version of CTSoft and CTScope software from [www.controltechniques.com](http://www.controltechniques.com)



## CTOPCServer

CTOPCServer is an OPC compliant server which allows PCs to communicate with Control Techniques drives. The server supports communication using Ethernet, CNet, 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](http://www.controltechniques.com).

Try it free, download the full version of CTOPCServer from [www.controltechniques.com](http://www.controltechniques.com)



## Smartcard



The Smartcard is a useful memory device that is supplied free 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

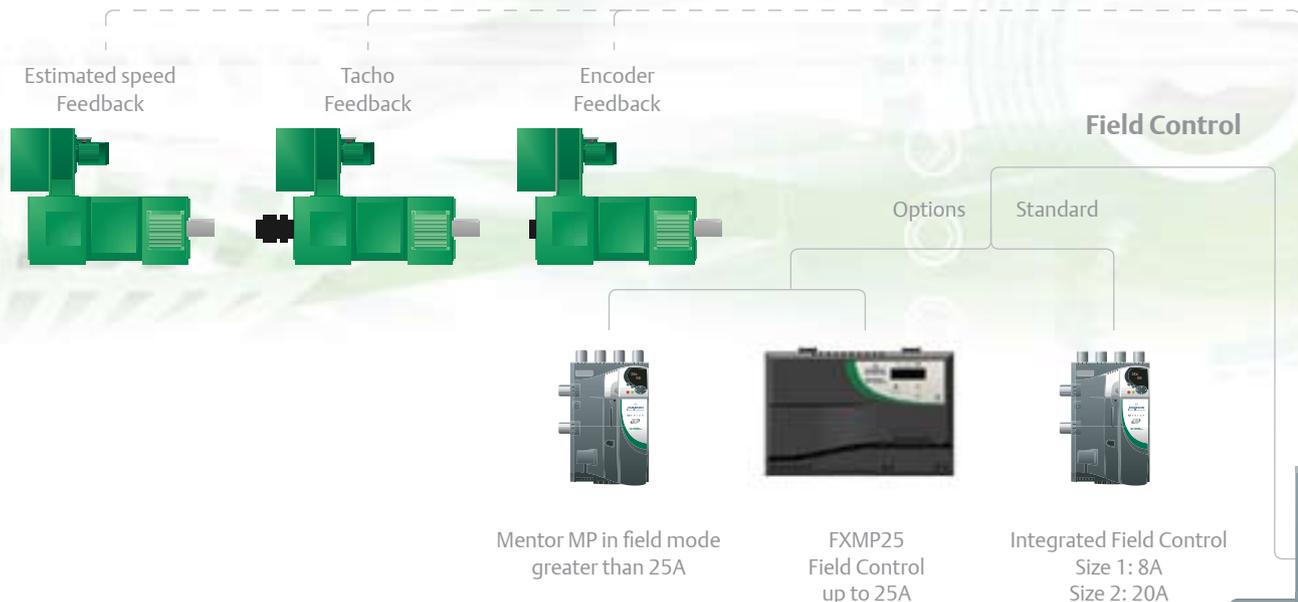
## Easy performance tuning

Mentor MP's advanced 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.

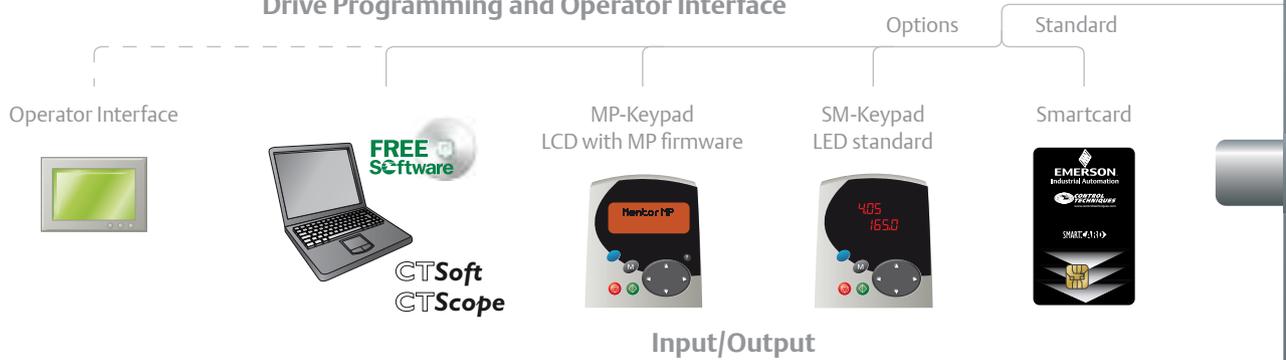


## Mentor MP - Unparalleled integration flexibility

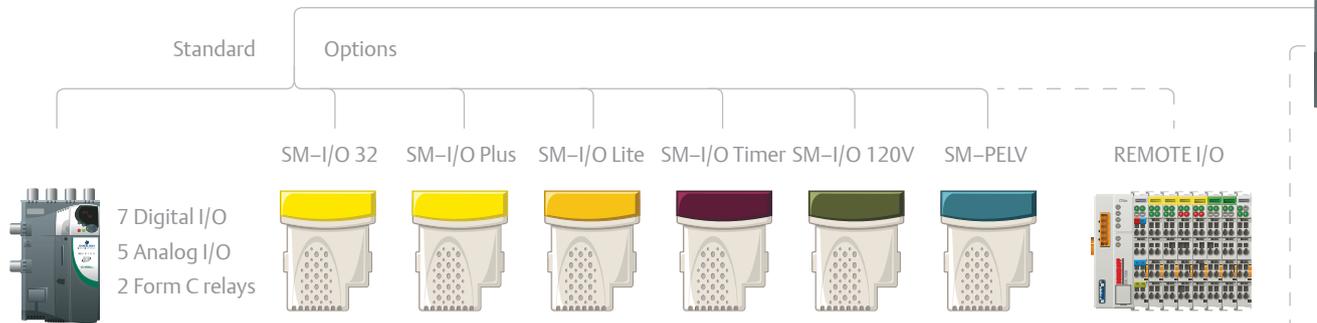
### Control Mode



### Drive Programming and Operator Interface

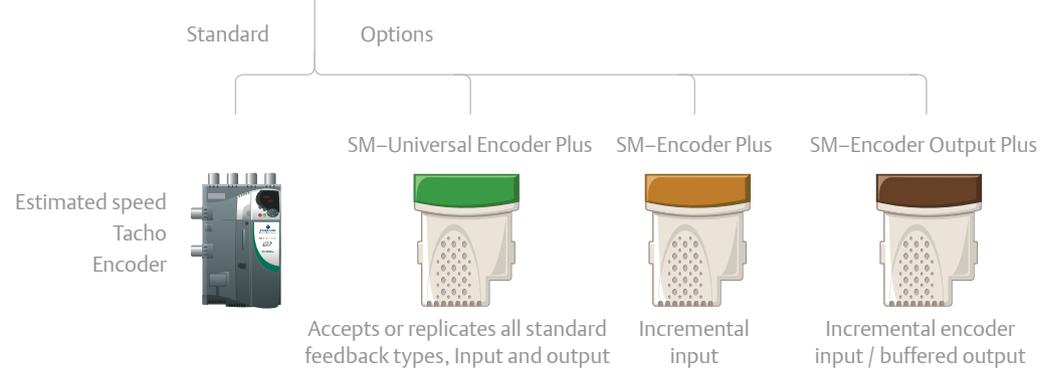
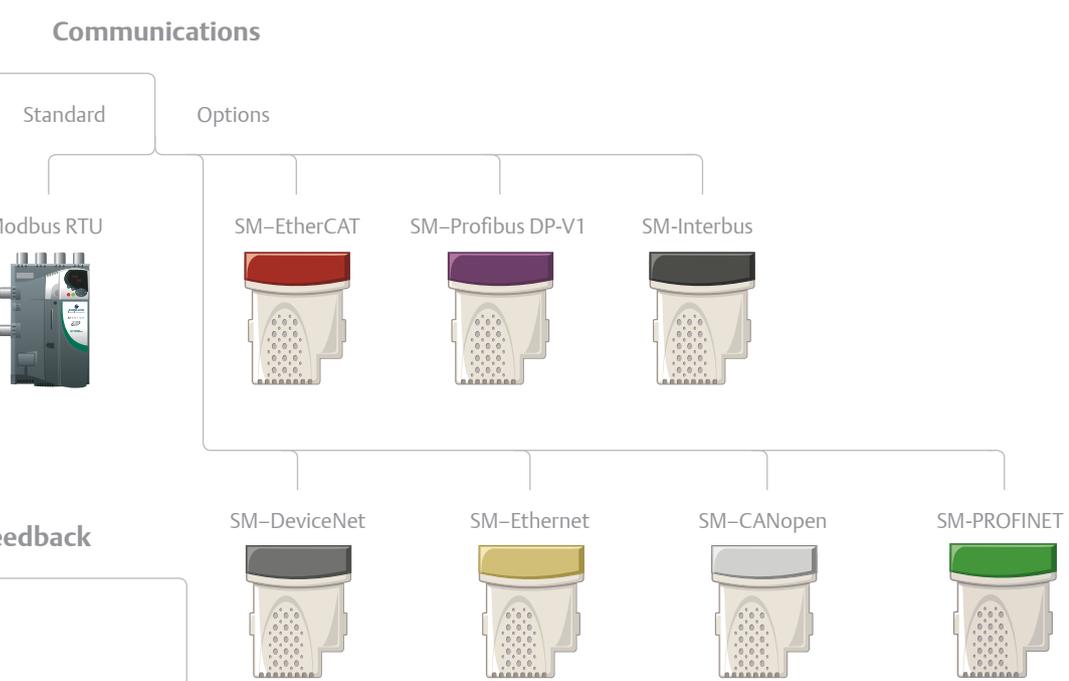
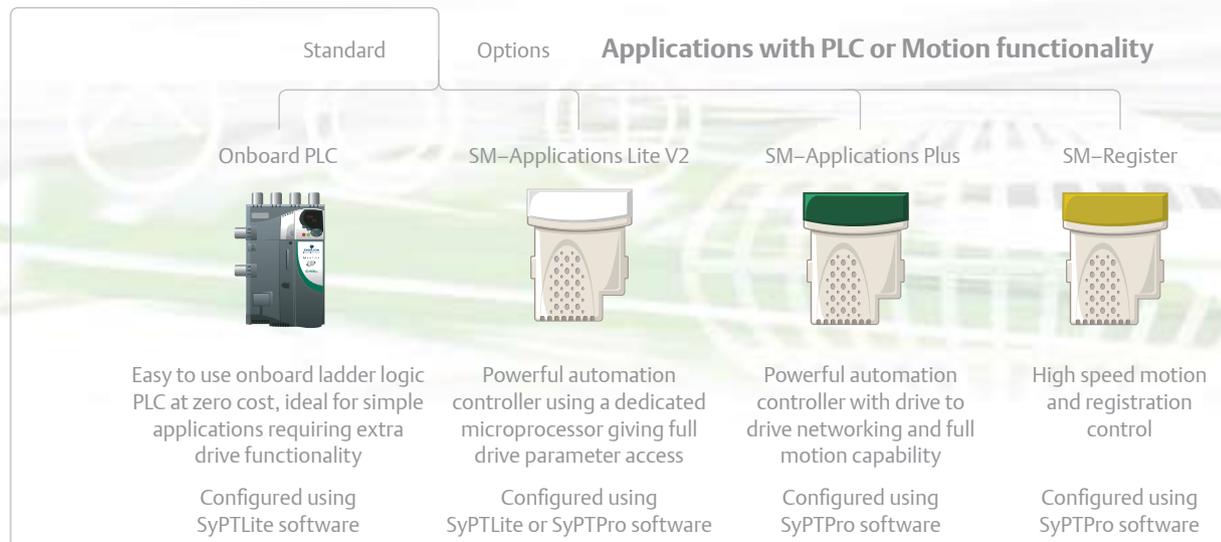


### Input/Output



### Centralised PLC/Motion Control

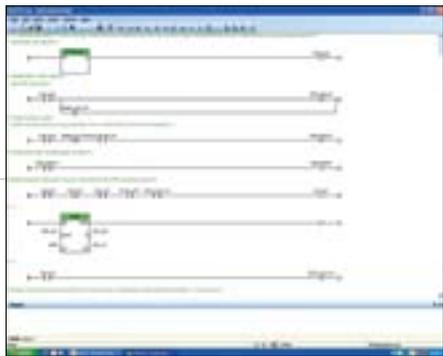




## Mentor MP drive intelligence and system integration

Control Techniques' intelligent drives offer more compact, higher-performance and lower cost solutions in machinery automation applications. Over the past 25 years Control Techniques has pioneered the embedding of programmable automation, motion and communications features within drives.

### SyPTLite and onboard automation

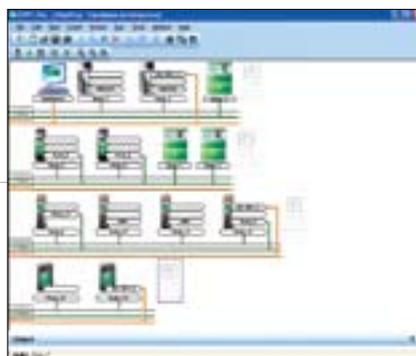


Mentor MP has an inbuilt programmable controller. It is configured using SyPTLite, an easy-to-use ladder logic program editor, suitable for replacing relay logic or a micro PLC for simple drive control applications.

The software is supplied free of charge. For evaluation, download the full version from [www.syptlite.com](http://www.syptlite.com).



### 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.

A migration wizard makes it easy to adapt existing Mentor II SYPT programmes to Mentor MP.

For evaluation, download a demonstration version from [www.controltechniques.com](http://www.controltechniques.com).



## 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.

### 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.

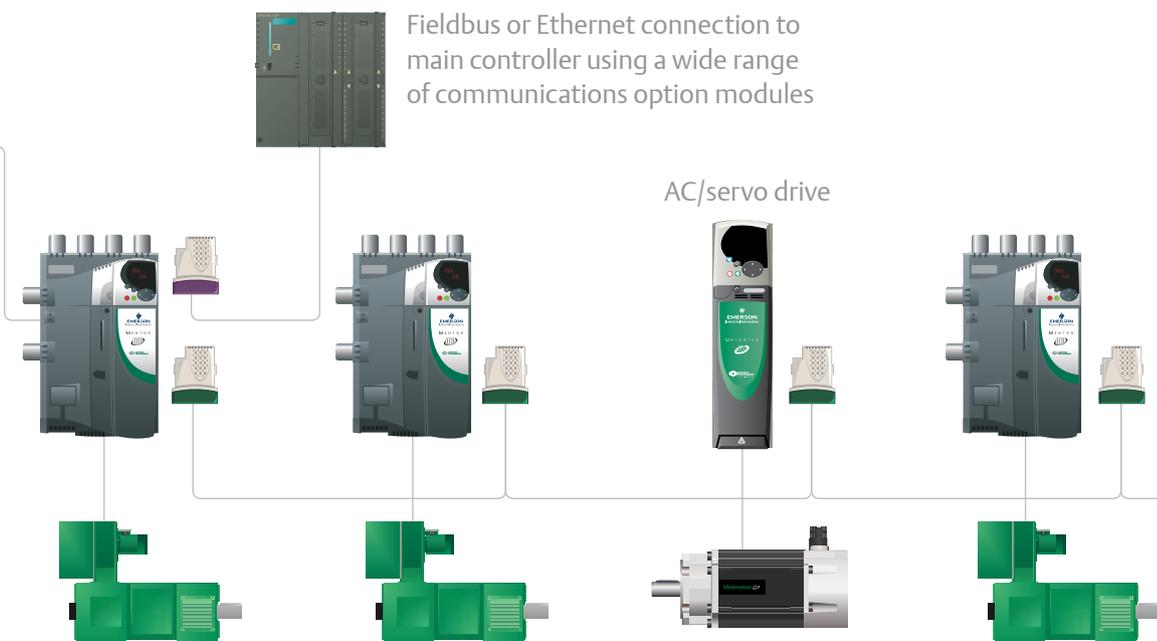
SM-Applications Plus is programmed using SyPTPro system programming tool.

- 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.

## Mentor MP machine communications flexibility



PC for programming and monitoring using CTSOft, CTScope, SyPT or OPC. Connect using Serial, Ethernet, USB or CTNet



## SP Control Platform



The unique control flexibility of the Unidrive SP/Mentor MP has led to many applications where it is being used solely for its option modules, with no motor connected. Examples include:

- Application as a protocol converter between a supervisory control system using one protocol and a drive system using another.
- Addition of an extra Unidrive SP/Mentor MP to a system when all the existing drive option slots are full simply to accommodate additional option modules. Additional position feedback devices can also be added to a system in this way.

The SP Control Platform provides all the same functions as a Unidrive SP/Mentor MP thus expanding the control flexibility without the ability to run a motor, eliminating a redundant power stage.

The SP Control Platform requires a 24Vdc power supply with a 3A, 50Vdc fuse.



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 CNet 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		✓	✓
CNet drive-to-drive network			✓
Serial port			✓
High Speed I/O			✓

## Ideal for retro-fit projects

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 with minimum projects costs.

## 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.

## Backwards compatible motor field control

The new FXMP25 replaces our existing FXM5 option. It may be controlled digitally by the Mentor MP or Mentor II using a standard RJ45 connection, 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.

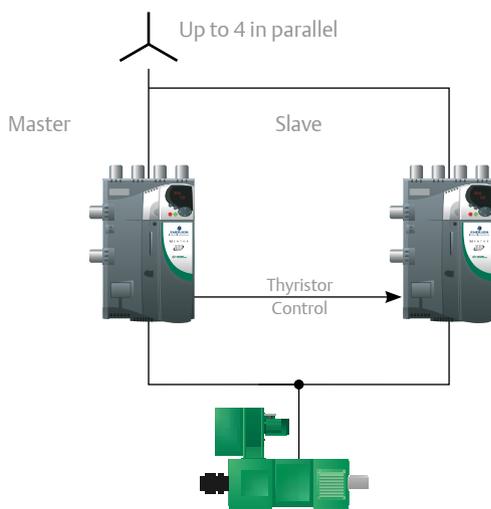
*Mentor MP drops straight into the space used by older Mentor drives, making it easy for us to retrofit. We also plan to use Mentor MP to upgrade obsolete drives from other manufacturers*



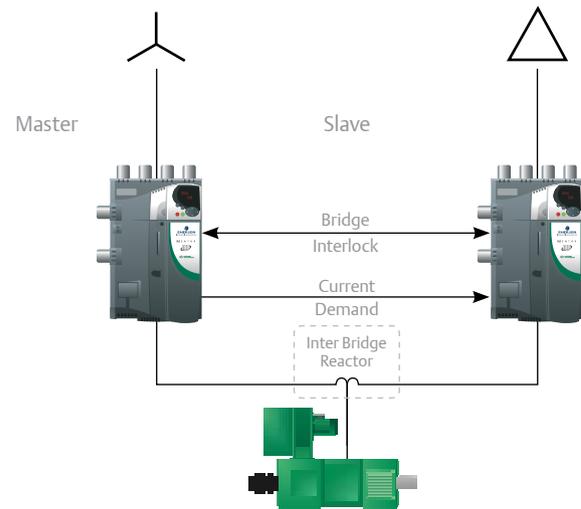
## Power circuit configurations

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

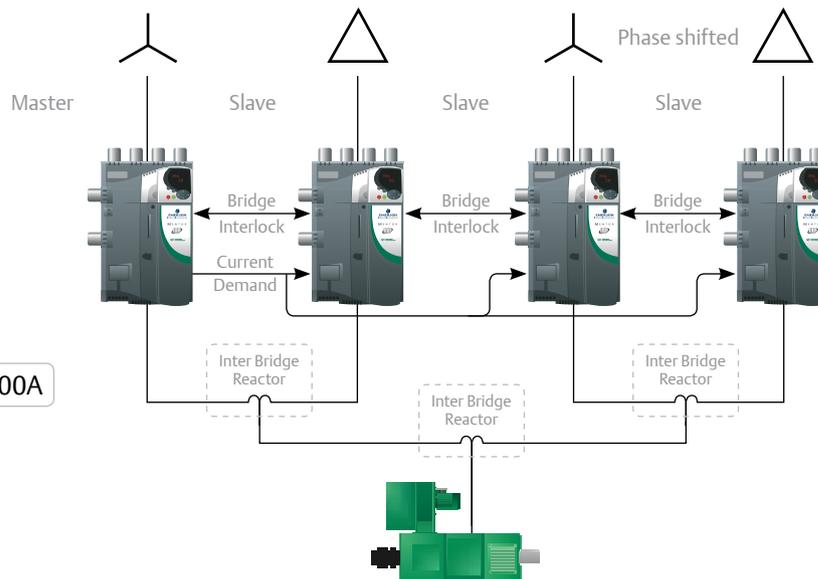
### Parallel - 6 pulse



### Parallel - 12 pulse



### Parallel - 24 pulse



Paralleling is required to get 7400A

## Mentor MP, the ultimate DC 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, IP10 for size 2A and 2B, and IP00 for size 2C and 2D 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 2 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 advanced processing 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
- RoHS compliant

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



## Order codes

DC Drive	External Field
<b>MP1200A4R</b>	<b>FXMP25</b>
<b>MP</b> - Mentor Platform	<b>FX</b> - External Field
<b>Maximum continuous armature current</b>	<b>MP</b> - Mentor Platform
<b>Supply voltage rating</b> 4 = 480V 24V to 480V -20% +10% 5 = 575V 500V to 575V -10% +10% 6 = 690V 500V to 690V -10% +10%	<b>25</b> - Maximum field current (A)
<b>R</b> - 4 quadrant operation <b>Blank</b> - 2 quadrant operation	

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

Model			Frame	Armature current (A)*	Field current (A)	Overall dimensions			Quadrants of Operation
480V EN / IEC cULus	575V EN / IEC cULus to 600V	690V EN / IEC				Width (W)	Height (H)	Depth (D)	
MP25A4(R)	MP25A5(R)		1A	25	8	293mm (11.54in)	444mm (17.48in)	222mm (8.74in)	2 and 4
MP45A4(R)	MP45A5(R)			45					
MP75A4(R)	MP75A5(R)			75					
MP105A4(R)	MP105A5(R)		1B	105	20	293mm (11.54in)	444mm (17.48in)	251mm (9.88in)	2 and 4
MP155A4(R)	MP155A5(R)			155					
MP210A4(R)	MP210A5(R)			210					
MP350A4(R)	MP350A5(R)	MP350A6(R)	2A	350	20	495mm (19.49in)	640mm (25.20in)	301mm (11.85in)	2 and 4
MP420A4(R)		MP470A6(R)		420					
	MP470A5(R)			470**					
MP550A4(R)				550					
MP700A4(R)	MP700A5(R)	MP700A6(R)	2B	700	20	495mm (19.49in)	640mm (25.20in)	301mm (11.85in)	2 and 4
MP825A4(R)	MP825A5(R)	MP825A6(R)		825**					
MP900A4(R)				900					
MP1200A4	MP1200A5	MP1200A6	2C	1200	20	555mm (21.85in)	1050mm (41.34in)***	611mm (24.06in)	2
MP1850A4	MP1850A5	MP1850A6		1850					
MP1200A4R	MP1200A5R	MP1200A6R	2D	1200	20	555mm (21.85in)	1510mm (59.45in)***	611mm (24.06in)	4
MP1850A4R	MP1850A5R	MP1850A6R		1850					

\*Current ratings are at 40°C with 150% overload for 30s. \*\*For this rating at 575V and 690V, 150% overload time is 20s at 40°C and 30s at 35°C. \*\*\*Height including optional fit exhaust duct cover is 1252mm (49.29in) for size 2C and 1712mm (67.40in) for size 2D.

7400A is achieved by parallel connection of Mentor MP drives

Control Techniques Drive & Application Centres

<b>AUSTRALIA</b> Melbourne Application Centre T: +613 973 81777 controltechniques.au@emerson.com	<b>FRANCE*</b> Angoulême Drive Centre T: +33 5 4564 5454 controltechniques.fr@emerson.com	<b>IRELAND</b> Newbridge Drive Centre T: +353 45 448200 controltechniques.ie@emerson.com	<b>SLOVAKIA</b> EMERSON A.S T: +421 32 7700 369 controltechniques.sk@emerson.com	<b>UAE*</b> Emerson FZE T: +971 4 8118100 ct.dubai@emerson.com
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