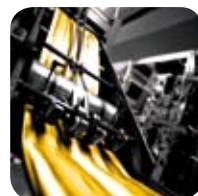


# BALDOR



## Real-Time Ethernet Motion Solutions



# e100 Solutions

## Real-Time Ethernet Control

Baldor's e100 control products provide a cutting edge solution to machine control. The e100 family includes compact single phase drives, three phase AC drives with DC bus energy sharing and Baldor's Mint® motion control technology. Combined with real-time Ethernet, they provide a platform for implementing a wide variety of machine control applications.

### e100 Key Features:



- › Multi-axis machine controllers
- › Single and three phase drives solutions
- › Programmable intelligent drive options
- › Integrated real-time Ethernet



- › TCP/IP operating modes for less time critical applications
- › CANopen networking for low cost IO and system interfacing



- › Single and three phase drive solutions
- › DC shared drive systems for optimal energy efficiency
- › Expansion options provide an adaptable architecture
- › Fieldbus communication options to interface to 3rd party systems

### Integrated Real-Time Ethernet

Ethernet is now the de facto standard for motion control in automation. With thousands of installed nodes, Ethernet Powerlink has led the way in real-time Ethernet since its beginnings in 2003.

Powerlink communication software is integrated within all of Baldor's e100 products as standard, and is the core around which its flexibility and scalability is achieved.

e100 products can also operate in a non real-time mode using TCP/IP communications for less demanding applications.

ETHERNET   
**POWERLINK**  
real-time technology

2



**P4**  
**Real-time Ethernet**  
New Possibilities



**P10**  
**Machine Control**  
The e100 Platform



**P18**  
**Mint Multitasking**  
Machine Intelligent Software



**P20**  
**Software Tools**  
Mint Workbench





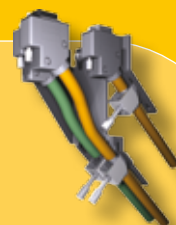
**P24**  
NextMove e100  
Powerlink Machine Controller



**P28**  
MicroFlex e100  
Compact Powerlink Servo Drive



**P32**  
MotiFlex e100  
Powerlink - DC Shared AC Drives



**P46**  
Ordering Information  
e100 and Accessories

# Real-Time Ethernet

## New Possibilities

As designers, engineers are constantly pushing technology to its limits, control solutions have been constrained by the performance of traditional fieldbus systems and device hardware, but the advent of real-time industrial Ethernet is expanding these boundaries, providing the platform for next generation machine development. Built on established standards such as IEEE802.3u, and solving the issue of determinism without compromising standard Ethernet message frames, Ethernet Powerlink is a technology which combines bandwidth, functionality, flexibility and scalability for innovative new system designs.

### Plug & Play – Connect & Control

For drive control, Powerlink provides a digital replacement for traditional control signals, analog demands and feedback signals. Additionally, it absorbs and expands on the function of typical fieldbus devices and networks. The plug & play technology provides a truly networked solution allowing access to all devices from a single connection. As a result, installation costs and system design cycles are drastically reduced. At the same time performance is enhanced considerably by replacing the analog world with digital precision. This is clearly shown in the diagrams opposite.

### Rapid Prototyping and Design.

Designers using Ethernet can quickly alter system configuration, passing real-time data instead of wired digital and analog signals. This improves performance and reliability, but also provides a rapid prototyping and development scheme for system control ideas to be tested and implemented, without hardware change.

### Centralized or Decentralized

Ethernet is ideal for distributing technology around a machine, or groups of machines, and networking them together. I/O devices can be mounted next to sensors and valves, while drives can be local to the axes being controlled. This inherently allows designs to follow both centralized and decentralized approaches as required.

e100 markets include :

### Flow Wrappers

Printing

Metal Cutting & Forming

Material Handling

Bottle filling

Paper & Tissue



Collating and Sorting

CNC

Press Transfer Systems

Flying Shears

Converting

Engraving Plotting Cutting

General Purpose Machinery

Plastics



Form Fill Seal

Over Wrappers

Textiles

Food & Beverage

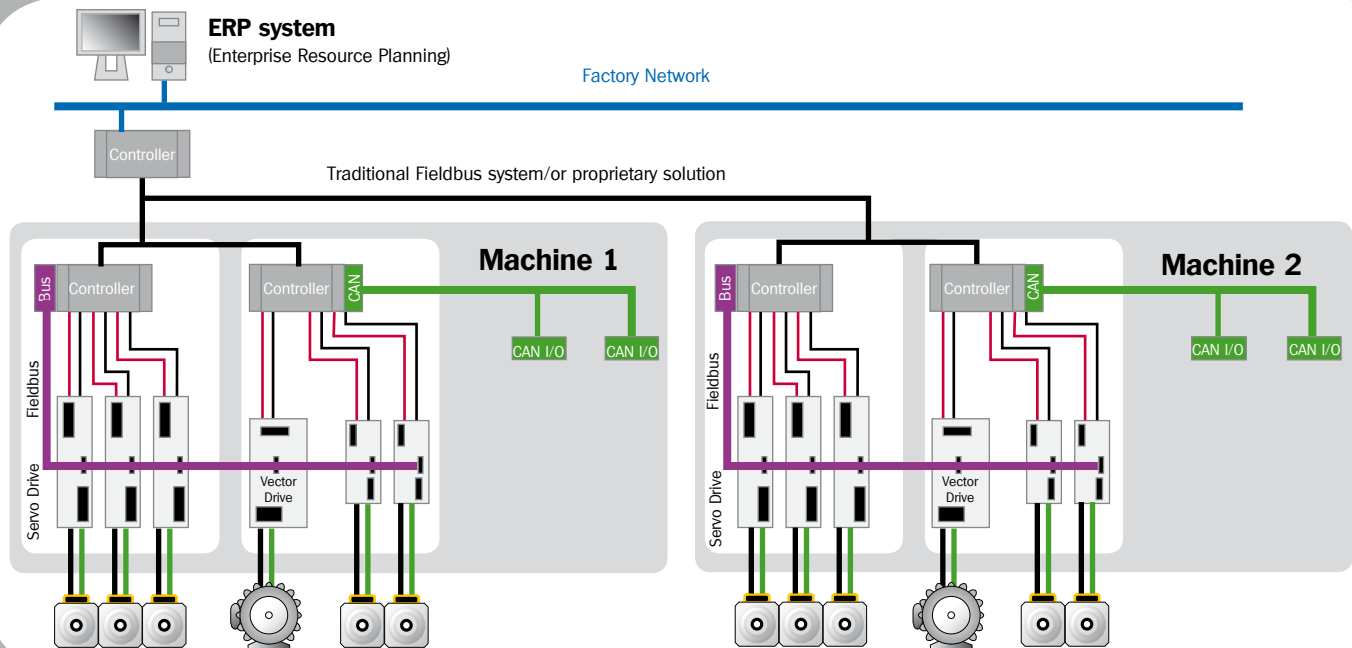
Machine Tool

Packaging



## Traditional System Architecture

The image below represents a typical control system of one or more machines connected to a corporate network.

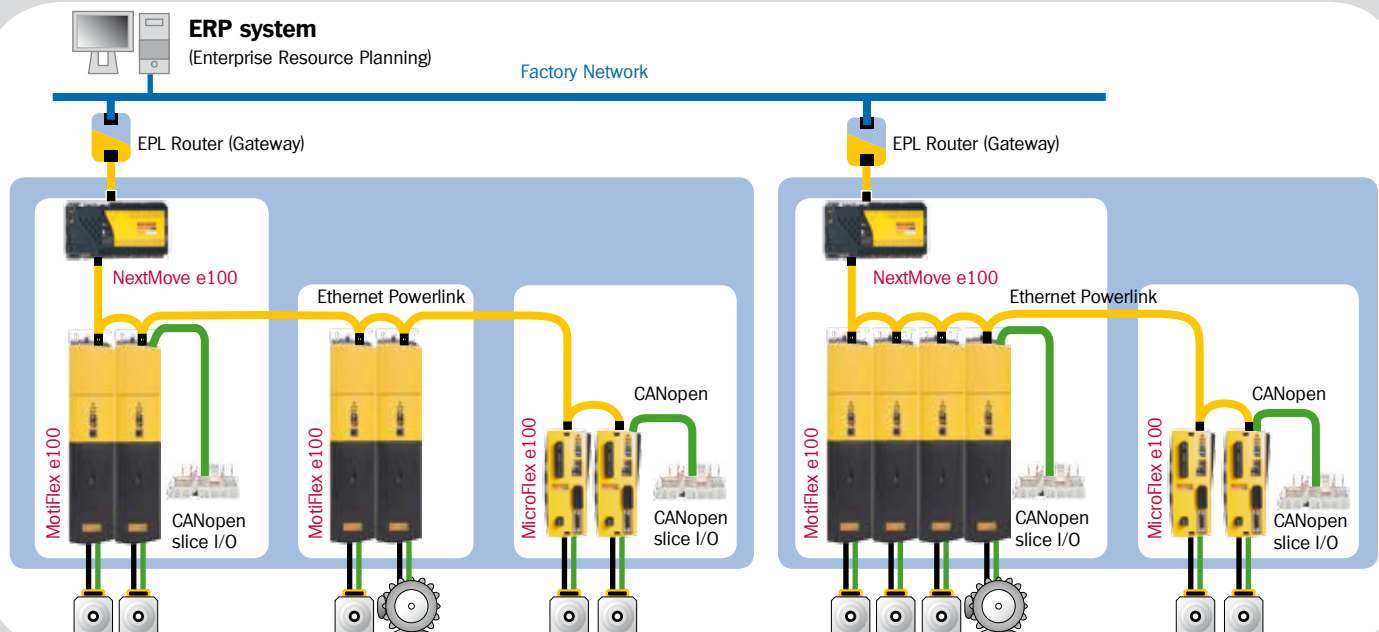


- › Multiple controller architecture – costly, complex and results in extended development time
- › Typically 4 – 8 axes per controller, sometimes expandable by hardware expansion at extra cost and panel space

- › Complex fieldbus communications – often proprietary, or limited in network capabilities (for example: device configuration)
- › Fieldbus network typically requires optional interface on the drive and controller, and burden on main controller CPU

## e100 Ethernet System Architecture

The same system designed around Baldor's NextMove e100 multi-axis motion controller and MicroFlex e100 AC servo drive shows significant system benefits.



### Advantages:

- › Fewer motion controllers
- › Enhanced performance
- › Scalable system
- › CANopen expansion
- › Reduced cabling complexity
- › Improved reliability
- › Total network visibility
- › EPL DSP 402 positioning drives
- › Shorter machine build time
- › Flexible design scheme
- › Centralized or decentralized



# Ethernet Powerlink

## Real-Time Technology

Ethernet is the single technology replacing traditional drive interfaces, discrete signals, fieldbus communications and service interface in applications today. As the first real-time Ethernet solution in industry, Ethernet Powerlink (EPL) is a proven technology, working in real applications world wide. It embraces standard Ethernet technology and infrastructure, uses standard CAT5e shielded cabling and does not compromise standard Ethernet frames in order to achieve its results.

### Flexible System Architecture

In addition to these characteristics Ethernet Powerlink is also well suited to both centralized platforms such as Baldor's NextMove® e100 motion control products and distributed intelligent drives such as MotiFlex and MicroFlex e100.

### Open Standard Driven by Industry

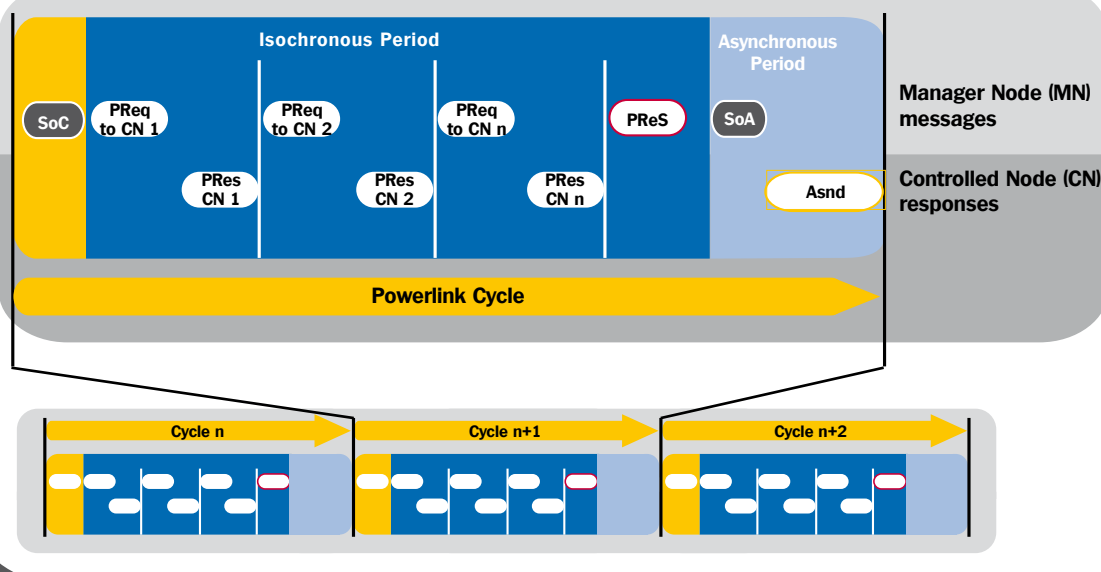
Ethernet Powerlink is a truly open technology independently managed by the Ethernet Powerlink Standardization Group.

IEC Standard – IEC 61784-2 "Digital data communications for measurement and control – Part 2: Additional profiles for ISO/IEC 8802-3 based communication networks in real-time applications.

## › Deterministic Ethernet – The Simple Solution

Ethernet Powerlink (EPL) achieves its performance by managing the device communication within allocated time slots in a defined sequence. This approach prevents collisions from ever occurring and ensures that data is exchanged precisely and on schedule.

Asynchronous communications, such as service data, takes place at the end of each cycle during a dedicated time segment.



Jitter Free Operation

Controlling devices such as servo drives requires precision in timing of information updates without significant deviation, otherwise artificial variations in demand torque, speed or position occur resulting in degraded performance. Powerlink meets this requirement by achieving less than 1µS variation (or jitter).

Network Security, by Design

Powerlink operates as a *protected segment* by design, and connects to a non-deterministic Ethernet network via a gateway/router device. This gateway acts as a defensive barrier against attacks by providing firewall security measures.

Total Network Visibility

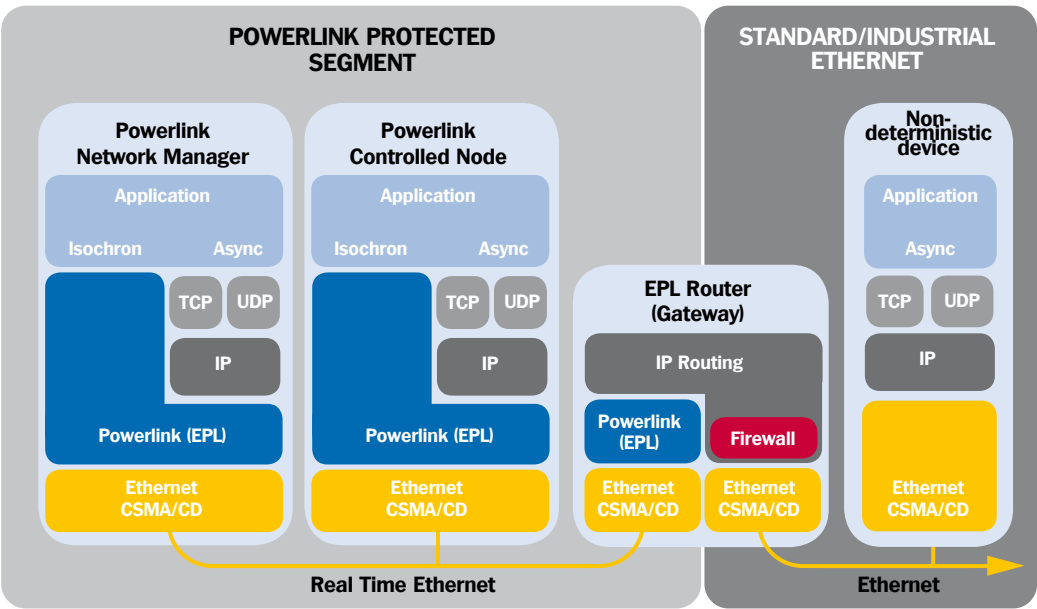
By maintaining the integrity of standard Ethernet, Powerlink provides visibility of all devices on the network. This allows any device to be monitored, configured, diagnosed, or upgraded from any accessible network point.

Commissioning Made Easier

With e100 controllers all e100 devices on the Powerlink network can be accessed via the USB port of the e100 network manager, simplifying commissioning and machinery production.

Remote Access

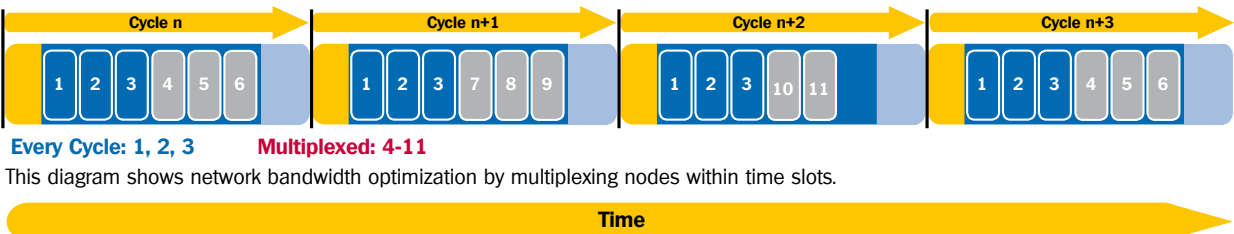
A Powerlink system can be remotely accessed by means of an EPL router, providing the potential to service and maintain a system remotely via access technologies such as VPN.



Block diagram showing a Powerlink protected network segment connected to a standard Ethernet network via an EPL router with integrated firewall.

› Bandwidth Optimization - Multiplexing

Powerlink provides the freedom to prioritize nodes on the network by multiplexing within time slots. In the diagram below, nodes 1, 2 and 3 are critical and are updated every cycle. Nodes 4 through 11 share time slots. This allows fast cycle times to be maintained with optimized network bandwidth.



# Real-time Ethernet Superior Drive Control

One major aspect of Real-Time Ethernet is its advancement in control of drive technologies such as Servo and Vector drives. State of the art in terms of control network, Ethernet Powerlink also excels in replacing traditional drive interfaces and fieldbus systems.

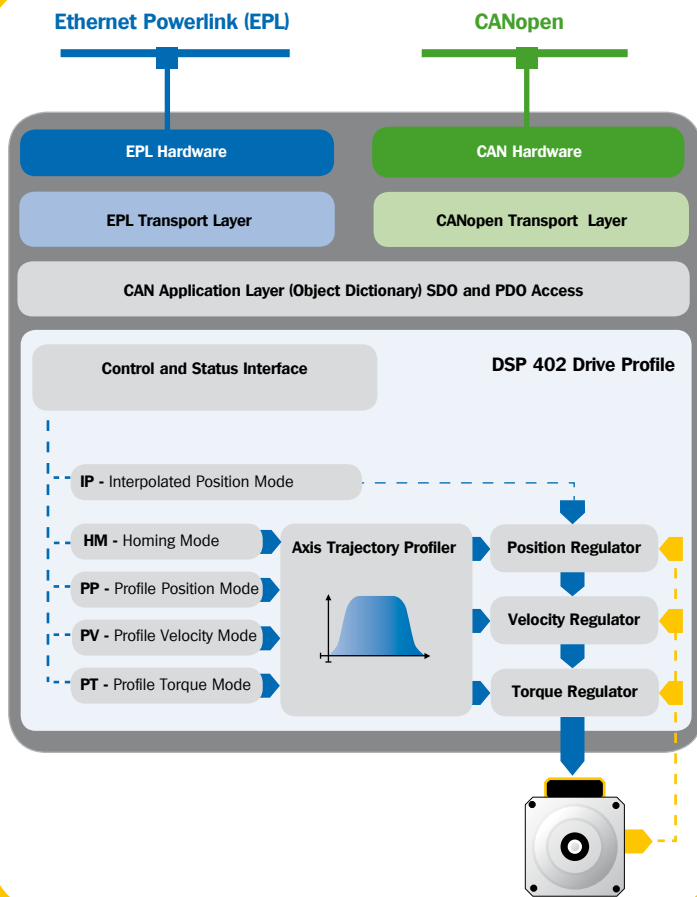
The table below highlights some of the benefits over traditional control wiring.

	Traditional Servo system	Ethernet Powerlink	Benefits
<b>Installation</b>	<ul style="list-style-type: none"> <li>› Analog demand – 2 core + shield</li> <li>› Simulated Encoder – minimum 7 wires + shield</li> <li>› Signal wires – Application dependant (typically enable and error)</li> <li>› Fieldbus – Special purpose cable, and specific connectors</li> </ul>	<ul style="list-style-type: none"> <li>› Single Ethernet cable (per axis)</li> </ul>	<ul style="list-style-type: none"> <li>› Reduced hardware requirements</li> <li>› Less cabling / interconnections</li> <li>› No soldering or complex connectors</li> <li>› Single widely available cable type</li> <li>› Elimination of traditional fieldbus systems</li> <li>› Reduced system design / Installation time</li> <li>› Improved reliability (fewer points of failure)</li> <li>› Single Fieldbus physical layer and diagnostic tools</li> </ul>
<b>Performance</b>	<ul style="list-style-type: none"> <li>› Dependant on ADC and DAC resolutions and linearity</li> <li>› Signal sampling and conversion delays</li> <li>› Prone to noise issues</li> <li>› Offsets/drift with temperature are often significant</li> </ul>	<ul style="list-style-type: none"> <li>› Pure digital demand</li> </ul>	<ul style="list-style-type: none"> <li>› No ADC/DAC dependency</li> <li>› Consistent, repeatable operation</li> <li>› No drift, noise or offsets</li> <li>› Higher resolution digital demand signals</li> <li>› Absolute precise demands</li> </ul>
<b>Communications</b>	<ul style="list-style-type: none"> <li>› Additional fieldbus connection</li> <li>› Usually additional cost for hardware per node and cable cost</li> <li>› Fieldbus type typical bandwidth 1Mbit to 12Mbit</li> <li>› Limited device configuration / parameter access.</li> </ul>	<ul style="list-style-type: none"> <li>› 100Mbit communications network</li> <li>› TCP/IP and UDP/IP messaging structure is intact</li> </ul>	<ul style="list-style-type: none"> <li>› No additional costs (integrated into Baldor products)</li> <li>› Higher bandwidth than traditional Fieldbus systems</li> <li>› Tighter integration</li> <li>› Provides single point of connection for commissioning all devices</li> <li>› Improved diagnostics</li> <li>› Total network visibility (EPL uses standard Ethernet protocols TCP/IP and UDP)</li> </ul>



# CANopen and Ethernet Powerlink Perfect Partners

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## Powerlink Utilizes CANopen Standards

Powerlink utilizes the well established and proven CANopen application layer and device profiles (in accordance with EN 50325-4) and provides the perfect choice for CANopen users looking to migrate to real-time Ethernet.

## DSP 402 Positioning Drive Profile

e100 drives are built on the CAN in Automation (CiA) DSP 402 profile for positioning drives, now part of IEC 61800-7. This results in a drive technology which is inherently more flexible and intelligent. Drives not only provide velocity or torque regulation, but can also perform positioning tasks such as point to point motion, and homing sequences. And all with minimal overhead on the motion controller.

## Using DSP 402 for Auxilliary Axes

The NextMove e100 can coordinate up to 16 axes in precisely coupled motion such as vectors, arcs and helical paths. Additional DSP 402 drives can be configured to perform their own motion tasks, when commanded to do so. This vastly expands the number of axes that can be controlled. This is ideal for axes such as positioning guides, indexers, conveyors, tension rollers and many more.

## › Integrated Powerlink - CANopen Gateway Function

All e100 products, including drives, feature an integrated CANopen port and can manage a network of CANopen devices including DSP 401 I/O and DSP 406 Encoders.

As such, CANopen I/O can be connected to any convenient e100 drive, which will manage the I/O devices, making the I/O available as process data via Ethernet, back to the machine controller. There can be multiple independent CANopen networks distributed around the machine managed by each drive, but controlled centrally from the motion controller.

### CANopen Slice I/O

System I/O can be expanded at any drive or motion controller via the on board CANopen port. The DIN-rail mount I/O system is configured from a selection of digital and analog I/O slices to suite the application requirements. Special purpose slices are also available.



# System Solutions

## Multi-Axis Machine Control

Machine control systems, requiring up to 16 axes of interpolation, can be implemented using the NextMove e100 family of motion controllers. Additional MotiFlex drives fitted with Mint option modules can be used to provide more powerful programmable local axis control, coordinated and managed as part of the total system.

## Advanced Multi-Axis Machine Controller

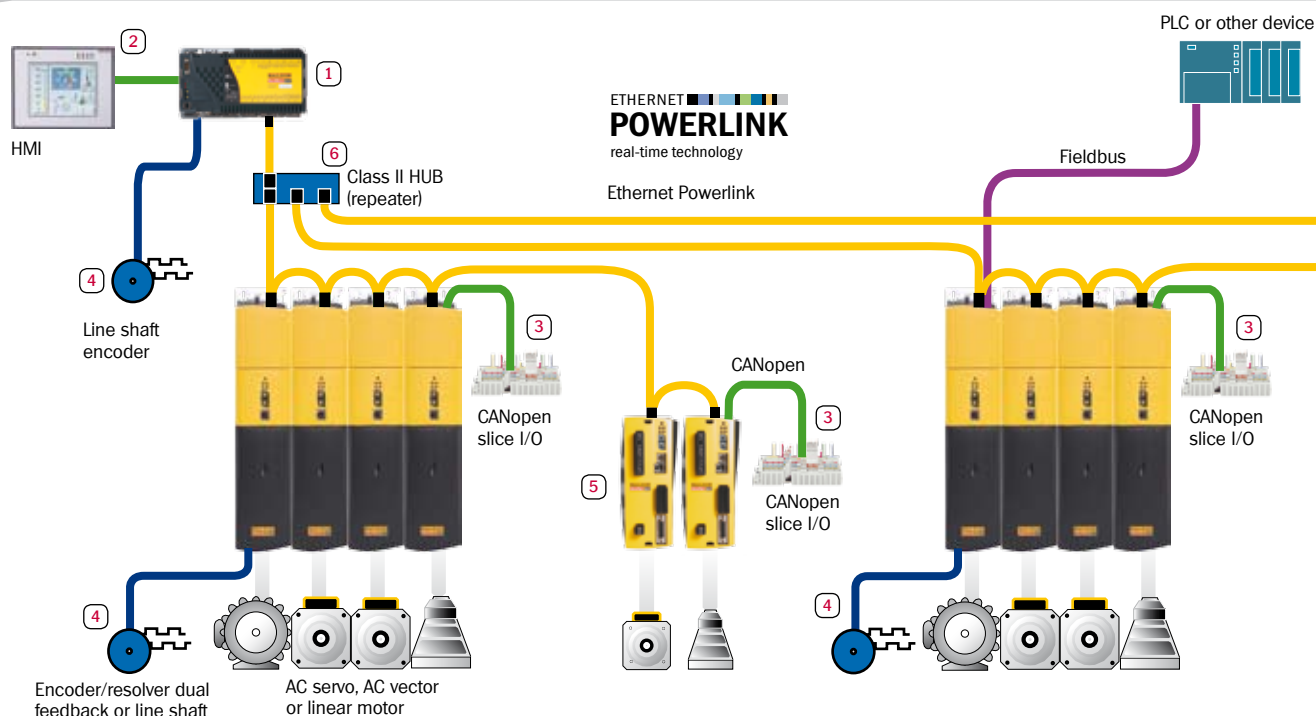
NextMove e100 can coordinate 16 axes of interpolated motion and command additional DSP 402 positioning drives via Powerlink. On board communications include, RS232/485 (selectable), USB, CANopen and Ethernet Powerlink or TCP/IP.

## Mixed Technology Motion Control

In addition to Powerlink axes, NextMove e100 supports 3 axes of analog control with incremental encoder feedback and 4 stepper axes, providing a mixed technology platform. Analog axes can be servo, vector, inverter or servo - hydraulic valves for example. Encoder inputs can be used as line-shaft inputs and all analog outputs can be used for general purpose functions.

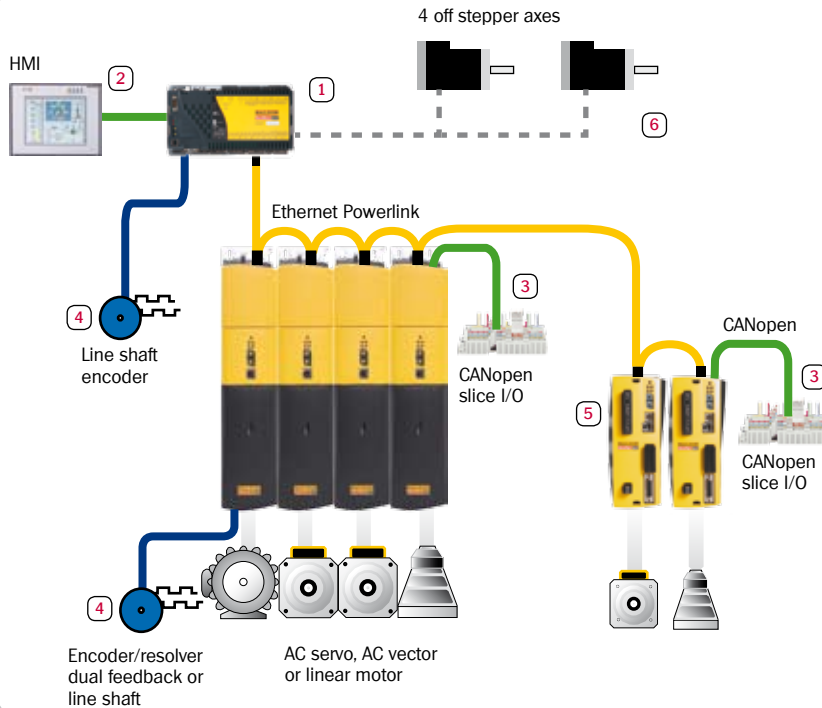
## System Wide Access to Device Resources

Digital I/O, analog I/O and encoders of any drives can be 'mapped' to the NextMove e100 and are then usable within the application program, as if it were local hardware of the NextMove itself. This includes any CANopen I/O devices connected to the drives. This approach greatly simplifies software access to resources and allows use of available I/O of any device for almost any purpose.



## Example 1 - Multi-axis DC Shared Solution with NextMove e100

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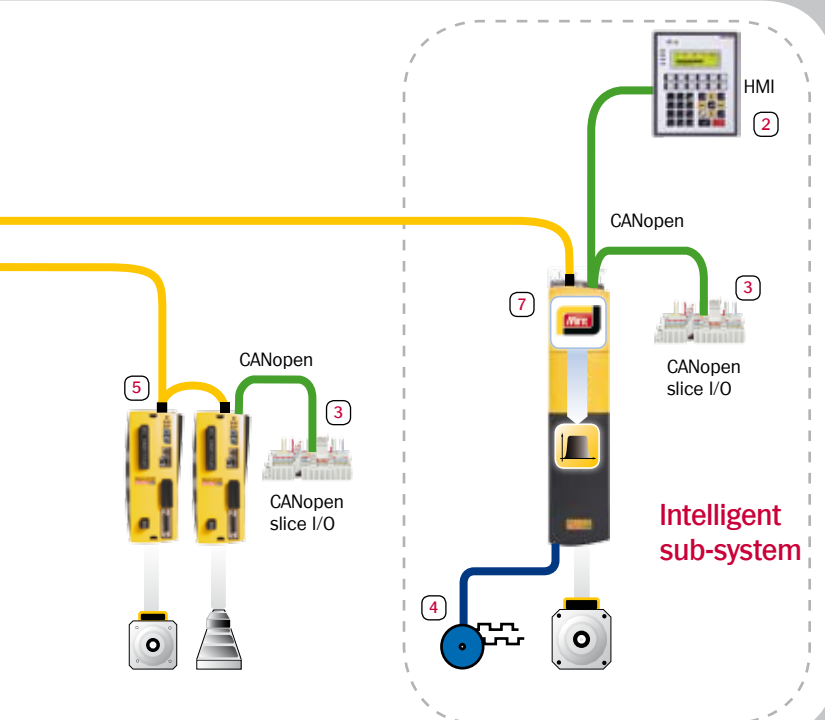
- 1 Powerful external machine controller which can profile up to 16 axes in tight coordinated motion and additional DSP 402 independent axes
- 2 HMI connected to the NextMove on CANopen
- 3 Additional distributed I/O on CANopen from any drive
- 4 Additional line shaft encoders can be connected to drive or motion controller
- 5 Additional MicroFlex e100 drive axes on Powerlink
- 6 Up to 4 additional stepper axes and 3 analog controlled axes

NextMove e100 solution providing mixed technology solution including Ethernet Powerlink, CANopen, stepper and analog axes.

## Tree, Star or Line Network Connection

Ethernet Powerlink supports flexible wiring structures, the simplest being line (daisy chain), but Tree, Star and mixed structures can be easily achieved for wiring convenience or network optimization using class 2 repeating hubs, as shown in example 4 below. Integrated 2 port hubs makes daisy chain connection extremely simple. Hubs are also recommended for systems with more than 10 devices.

## Example 2 - Multi-axis system with NextMove e100 and Intelligent MotiFlex Mint sub-system



- 1 Powerful external machine controller which can profile up to 16 axes in tight coordinated motion and additional DSP 402 independent axes
- 2 HMI connected on CANopen
- 3 Distributed I/O on CANopen from any drive
- 4 Additional line shaft encoders can be connected to MotiFlex drives or motion controller
- 5 MicroFlex e100 drive axes on Powerlink.
- 6 Class 2 repeating hub, allows tree structure network cabling.
- 7 Single axis Mint intelligent drive system as a controlled device on the Powerlink network

NextMove e100 distributed control solution, with drives and local slice I/O where required. Intelligent sub systems via Mint plug-in options on MotiFlex.

# Intelligent Drives

## Mint<sup>®</sup> Machine Modules

Mint machine modules transform MotiFlex e100 drives into powerful intelligent drive systems, assuming complete control of the drive on-board IO, communications, and networking features, eliminating the need for external controllers or PLCs.



### Features and Benefits

- › Ethernet Powerlink manager (multi-axis version) and controlled node operation
- › Powerful Mint multitasking programming
- › CANopen manager function (via drive on-board hardware)
- › Non-volatile ram for data storage and Flash program storage
- › Control of one analog axis using the encoder input and analog output, or use independently for other control functions
- › Compact solution, requiring less panel space and wiring
- › Elimination of external controller or PLC saving cost and reducing complexity

## › Dual Axis Mint Module

The dual axis Mint module provides a simple but powerful solution to applications requiring a fully programmable drive. The encoder input and analog output can be used to control a secondary axis such as an analog servo or vector drive. Alternatively the encoder input can be used as a line shaft encoder for electronic gearing motion. Combine this with options such as additional feedback or expanded I/O options to tailor the drive for your application.

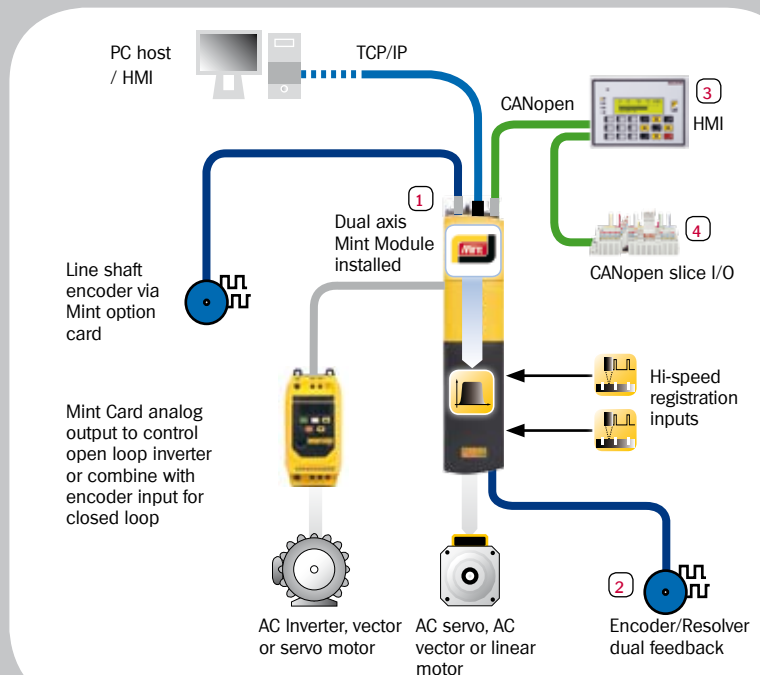
Once installed, the Mint module will assume control of the CANopen port and Ethernet interface.

The Ethernet port can be used as a TCP/IP interface from a host PC using the Mint ActiveX tools. CANopen HMI and expanded system I/O can be added and distributed around the machine. It can also be a controlled node of a much larger Powerlink control system, receiving control information from NextMove e100 for example, and controlling a local intelligent subsystem.

### Example 3 - Dual Axis Solution with TCP/IP Ethernet Communications

Options fitted :

- ① Dual Axis Mint Module
- ② Second feedback card for 'line shaft' following or dual loop feedback
- ③ HMI connected to the drive on CANopen
- ④ Additional distributed I/O managed on CANopen by the drive





## Ethernet - Powerlink and TCP/IP

- › Assumes control of Drive Ethernet port
- › Powerlink Manager or controlled node (CN)
- › Real-time Ethernet performance
- › TCP/IP mode of operation (non real-time) with ActiveX support

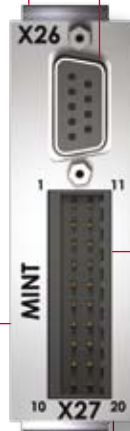


## CANopen Port - Simple Expansion

- › CANopen network manager
- › I/O expansion, HMI and other devices
- › Communicate with other Mint products

## USB - Configure or Communicate

- › The host drive USB interface can be used for programming or ActiveX interfacing to a Microsoft Windows application



## Encoder Input - 5V Incremental

- › 1off Incremental encoder input
- › Control analog servo drives, inverters or servo hydraulics, in combination with the analog output.
- › Use as a line shaft encoder input

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## Application I/O - Digital / Analog

- › 4 Digital Inputs (2 fast inputs 1μS latency ideal for registration)
- › 4 digital outputs.
- › 1 Analog input +/-10V 12bit
- › 1 Analog output +/-10v 12bit

## NextMove Core - Advanced Motion

- › Powerful Mint Multitasking software
- › Single or Multiaxis coordinated motion
- › Powerlink and Fieldbus management
- › CANopen network management

## › Advanced Multi-Axis Module

This option provides an extremely compact multi-axis motion control package. It can coordinate multiple axes via the MotiFlex Ethernet interface. MotiFlex option cards within the system become available to the Mint card as additional I/O, encoder channels, and fieldbus communication ports to other systems, such as PLCs. The drive CANopen port can be used extend system I/O or add an HMI and the USB port provides convenient configuration access using Mint Workbench.

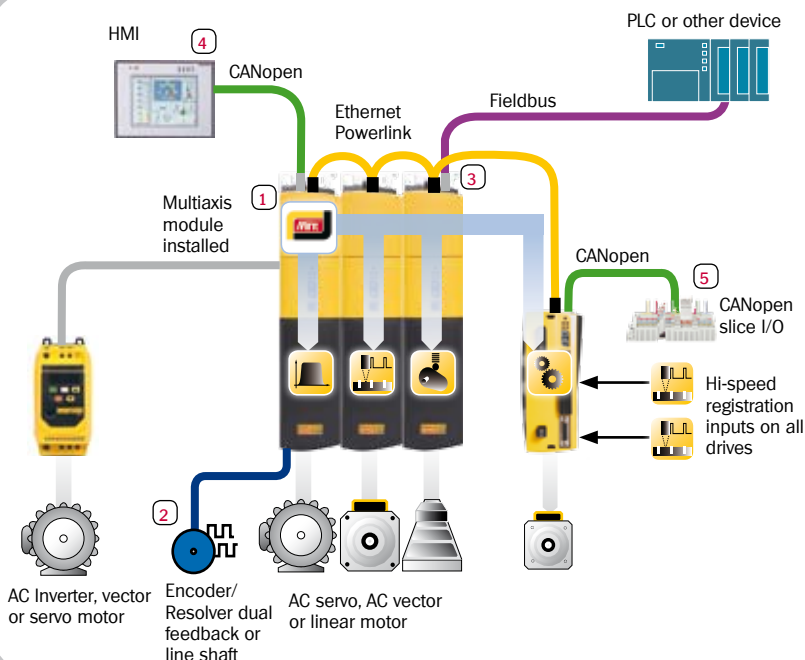
MicroFlex e100 can also be controlled via Powerlink, providing all the same motor control capabilities in a smaller package for single and three phase supply 105 to 230VAC. in 3, 6 and 9 Amp (rms) continuous ratings.

### Example 4 - Multi-axis Solution with Fieldbus Communications Module

Options fitted :

- 1 Multi-axis Mint Machine Module
- 2 Second feedback card for line-shaft following or dual loop control
- 3 Fieldbus interface
- 4 HMI connected to the first drive on CANopen
- 5 Additional distributed I/O on CANopen from any drive

Complete machine solution, with a fieldbus interface to provide data exchange with 3rd party systems such as PLC's. A range of fieldbus options are available. There are two high speed latch inputs on every drive that can be used for functions such as registration control.



# TCP/IP, Simply Ethernet Communicate and Control

Ethernet Powerlink is simply an addition to the underlying IP protocols (TCP and UDP) and behaviour of IEEE802.3 Ethernet. As such, all e100 products are able to operate as traditional Ethernet devices in applications that do not require the timing precision and deterministic operation of Ethernet Powerlink.

## TCP/IP as a Control Interface

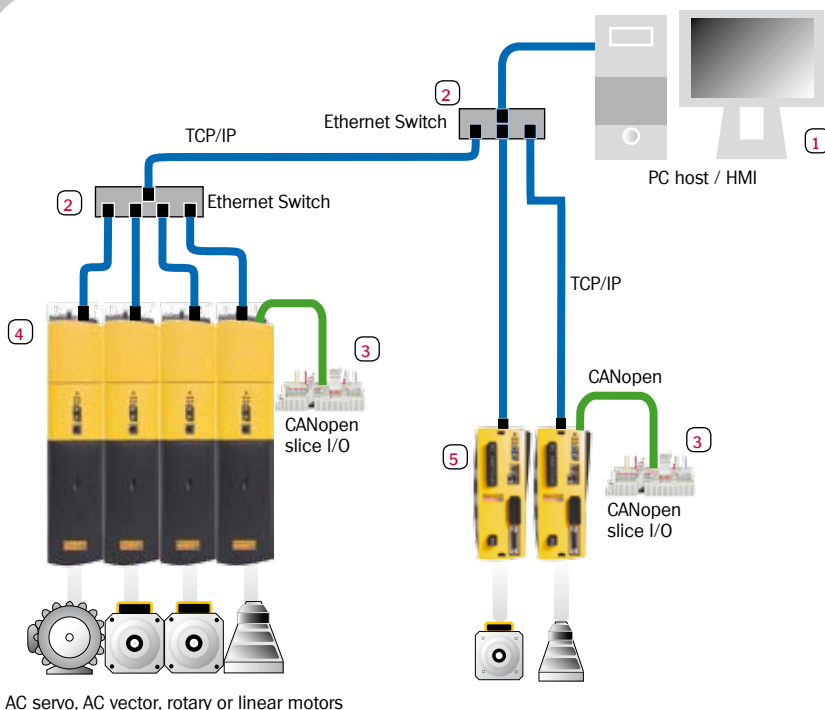
MicroFlex e100 and MotiFlex e100 drives have built in single axis positioning capability. This functionality can be controlled by TCP/IP communications to instruct axes to execute positional moves, homing sequences, jogs and much more. This can be used to implement multi-axis applications, where interpolated or tightly coordinated motion of multiple axes is not required and timing performance is not critical.

## Mint ActiveX TCP/IP Support

TCP/IP communications from a Windows based PC, can easily be implemented using the Mint ActiveX tools, which hide the complexity of Ethernet messages and provide a simple interface of all the Mint commands and functions supported by e100 products including :

- › Positional move commands
- › Drive configuration
- › Status and monitoring
- › Firmware update and parameterization

## Example 5 - TCP/IP Controlled e100 Drive System



- 1 Host Windows PC HMI / control software using Mint ActiveX TCP/IP communications interface
- 2 Ethernet 100Mbit Switches
- 3 Distributed I/O on CANopen from any drive can be controlled / monitored by Host PC
- 4 MotiFlex e100 drives can be AC powered or as a DC shared group
- 5 MicroFlex e100 drives

Multiple drives can be controlled via Ethernet in this way, each positioning an axis based on commands issued by the host. In this example a PC running Microsoft Windows operating system uses the Mint ActiveX tools to send motion commands. The entire Mint command set, drive parameters and functionality is available via the ActiveX components in this way.

## NextMove e100 TCP/IP Operation

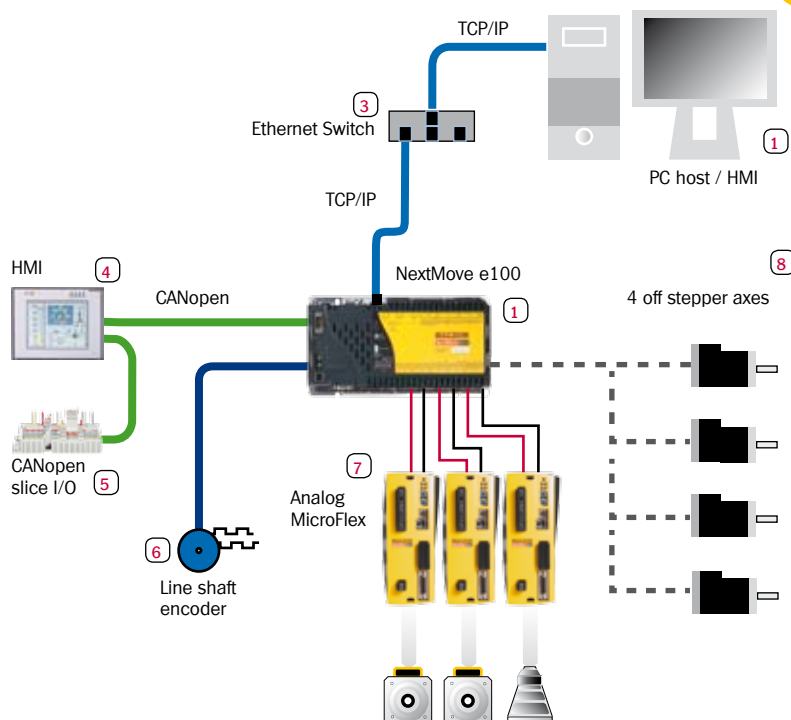
The Ethernet port can also be used for TCP/IP as a data exchange interface, providing information such as trajectory data, or simply recipe control information as data values to the Mint application.

The NextMove e100 can coordinate 3 analog and 4 stepper axes of interpolated motion. Combine this with numerous digital and analog IO, CANopen and serial communications and it provides a powerful stand-alone machine controller.

## Ethernet RAW

NextMove e100 has a reserved port (5002) which provides serial port (VT100) emulation. This allows a simple means to create custom ASCII based messages to and from the NextMove controller via Ethernet. Combined with an appropriate Mint program, it can be used to interpret and construct Ethernet frames such as ModbusTCP IO messages.

### Example 6 - Analog and Stepper System with TCP/IP communications



- ① NextMove e100 in TCP/IP operating mode
- ② Host Windows PC HMI / control software using Mint ActiveX TCP/IP communications interface. Alternatively 3rd party device using Ethernet RAW data frames.
- ③ Ethernet 100Mbit Switches
- ④ Optional HMI on CANopen or Serial port
- ⑤ DS401 IO expansion via CANopen
- ⑥ Line shaft or dual encoder
- ⑦ Analog MicroFlex drives
- ⑧ Up to 4 additional stepper axes

NextMove e100 solution providing a traditional technology approach, with stepper and analog axes and CANopen as a local network. TCP/IP used for a host interface to a PC or PLC type device for purposes such as recipe data exchange, control, monitoring or visualization.

# Ethernet Powerlink Router

## Remote Access and Control

- › Ethernet access to Powerlink networks
- › Integrated firewall security
- › Network Address Translation (NAT)
- › User configured IP addressing
- › Compact DIN-rail mounting
- › 24VDC operation
- › Diagnostics LEDs

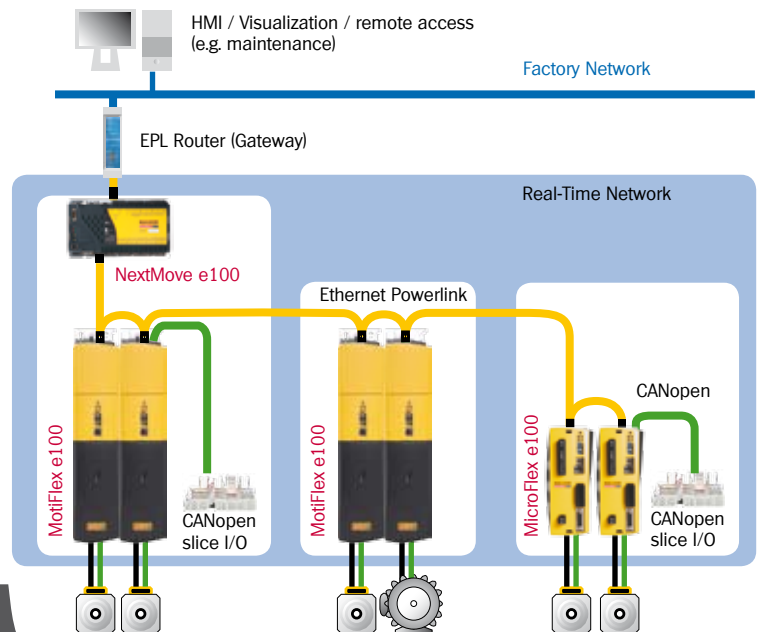


The EPL router provides convenient networking access to Baldor e100 systems utilizing the real-time Ethernet protocol, Ethernet Powerlink (EPL).

EPL routers operates in a similar manner to any normal Ethernet router on its non-real-time Ethernet port. A second port behaves in accordance to Ethernet Powerlink specification for EPL router devices.

The device manages Ethernet message exchanges between the nondeterministic factory Ethernet network and the real-time Ethernet network of the e100 system.

The EPL Router can be used to provide data access, such as process data exchange for visualization and control, or remote access for maintenance and diagnostics.



## › Technical Data

<b>Power</b>	+24VDC, 150mA
<b>Communication Ports</b>	1 x TCP/IP, 1 x Ethernet Powerlink. IEEE802.3 compliant
<b>Programming</b>	Integrated HTML web interface
<b>IP Address Configuration</b>	EPL via hex rotary switches. TCP/IP side via HTML 2 off switches for quick selection of user defined / default IP addresses
<b>Mounting</b>	Din Rail with integrated grounding
<b>Connectors</b>	RJ45 Ethernet ports. Two part screw terminals for power
<b>Indicators</b>	LED indicators for Power, Activity, Error, State (see user manual for more information)
<b>Dimensions</b>	H: 115 mm (4.53in) W: 23 mm (0.91in) D: 100 mm (3.94in)
<b>Weight</b>	0.116 Kg (4.1 oz)
<b>Operating Temperature</b>	0°C to +55°C (+32°F to +131°F)



## Network Address Translation

Network Address Translation (NAT) allows public IP addresses to be configured for EPL devices via a simple HTML interface, allowing the EPL IP addresses to be represented by IP addresses within your network.

## Network Security, by Design

Powerlink operates as a *protected segment* by design, and connects to a non-deterministic Ethernet network via a router device. This gateway acts as a defensive barrier against attacks by providing firewall security measures.

## Total Network Visibility

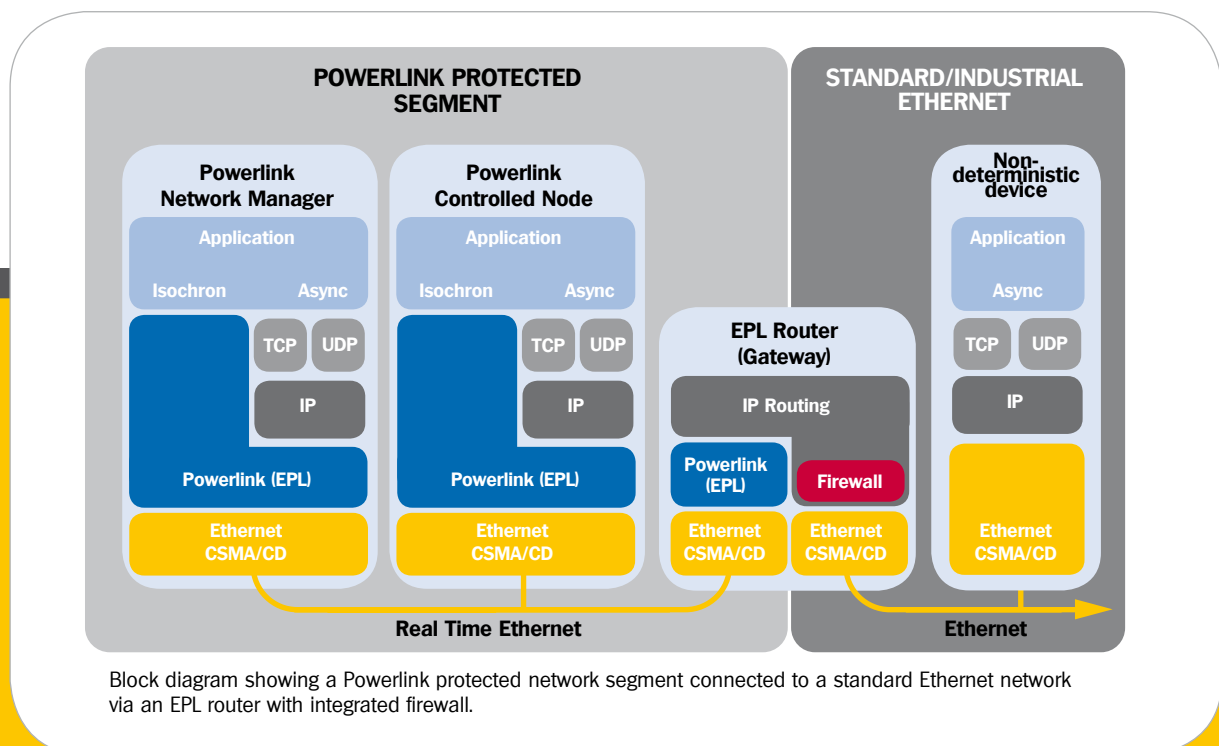
By maintaining the integrity of standard Ethernet, Powerlink can provide visibility of any or all devices on the network. This allows any devices you choose, to be monitored, configured, diagnosed, or upgraded from any accessible network point.

## Remote Access

A Powerlink system can be remotely accessed by means of a EPL router, providing the potential to service and maintain a system remotely via access technologies such as VPN.

## Order Information

Catalog Number	Description
OPT036-501	Ethernet Powerlink Router



# Mint<sup>®</sup> – Machine Intelligent Programming Language

- › Compiled BASIC programming language
- › Multitasking allows complex applications to be broken down into simpler, more manageable sub-tasks
- › Modular programming capability, including functions and subroutines, allows for code re-use and ease of debugging
- › Common programming interface for both NextMove and Baldor's intelligent drives reduces the learning curve
- › Comprehensive library of motion types including interpolated moves, CAM profiling, flying shears, gearing and more
- › Intuitive Windows<sup>®</sup> tools including advanced editing tools, software oscilloscope, online help, drive configuration wizards and auto-tuning system
- › ActiveX<sup>®</sup> components (supplied free of charge) simplify the development of Microsoft Windows<sup>®</sup> host applications

## Mint - Simply Advanced

With more than two decades in real world applications, Mint<sup>®</sup> fully embraces advanced programming functionality, such as multitasking, user defined functions and, procedures, structure data types and events. Presented in BASIC programming form, Mint makes it easy to develop modular programs that are easily understood, maintained and re-used across different applications and hardware platforms.

## Mint Code Library

Mint's Code Library makes code re-use even simpler by allowing code to be stored and used for other projects, one of the many features in the Mint WorkBench, designed to streamline your applications.

## Mint - More than just Motion Control

Mint excels in motion control applications, but is equally accomplished at tasks such as :

- HMI interaction
- Serial and fieldbus communications
- I/O logic processing
- Complex mathematical functions
- Recipe data management

## Multitasking Streamlines Program Flow

With many devices to control and machine functions to coordinate, it helps to be able to structure code into specific tasks and allocate resources dynamically at runtime. Multitasking is one of the key features of Mint. Numerous software tasks can be initiated, suspended, terminated and prioritized as required, to optimize machine performance.

## Time Critical Functions Handled with Ease

Time critical functions, such as responding to the change of state of inputs are handled with ease by Mint EVENTS (interrupt handlers). Using events within Mint is more code efficient and faster than polling the state of an input or process variable. Events can be triggered for digital inputs, 'move buffer low', errors, position latches and more. Events handlers can also be installed in host PC applications using the Mint ActiveX tools



# Comprehensive Library of Motion Types



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## Powerful Move Buffer Enables Continuous Motion and More

All axes have a flexible and powerful move buffer system that allows multiple move commands to be loaded and then executed. Each entry in the move buffer can contain a unique identifier, independent Speed, Acceleration, Deceleration and Jerk settings. A configurable *Move buffer low* system event will trigger either a Mint routine or ActiveX service which you can customize to refill the buffers. Output transitions states, pulse durations and even dwell times can be loaded into the move buffer to ensure they are synchronous to the axes motion.

## Motion Profiles – Positional Moves

Mint offers many flexible move types to suit your application requirements, some of the more commonly used functions are listed here:



**Absolute and Relative:** With its own speed, acceleration and deceleration defined (including trapezoidal and S-ramp profiles).



**Interpolated motion:** Using the Mint move buffer, multiple linear and circular moves can be blended to create continuous complex motion paths. Inter-vector angle control allows complex paths to be executed with minimum disturbance. Feed-rates and digital outputs can be loaded with each move for synchronization with motion.



**Tangential Knife:** Combined with interpolated motion, an axis can be defined as a knife axis and will follow the tangent to any 2D application.



**Helical Interpolation:** For 3 axes, defining a helical move in 3D space.



**Jog Control:** A function that allows the motor to run indefinitely at a defined speed, in position control.



**Splining:** Allows a stream of moves, defined in terms of position, velocity and time, to be blended for continuous and smooth motion.

## Motion Profiles – Master/Follower

Master follower applications can be geared off any of the encoder inputs, pulse/direction input, virtual axes or from an Ethernet Powerlink encoder.



**Electronic Gearbox & Clutch:** Enables two or more shafts to be linked with a programmable ratio. Any axis can be geared to any other axis. Clutch allows precise start and stop distances when synchronizing.



**Registration on the fly:** Offset moves can be superimposed on geared motion for position correction. This can be triggered from any of the registration inputs or within Mint.



**Electronic CAM:** Replaces traditional mechanical CAMs with servo/vector/stepper motor and software programmable profiles (relative or absolute).

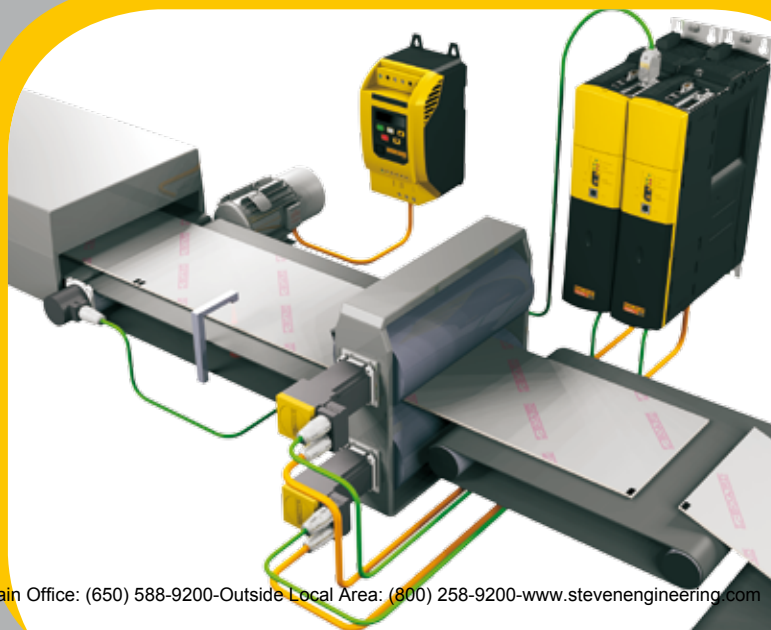


**Flying Shear:** Allows position synchronization of a slave axis to a master, with defined acceleration and deceleration profiles - all linked by software to product movement.



**Virtual Axes:** Allows motion to be executed without virtually. Can be used to test applications or as a virtual master for electronic line-shaft applications.

**Refer to Catalog BR1202-B for further information on the Mint programming language.**





# Mint® WorkBench

Program Navigator

Command Line

Mint Code Library

Quick Access Toolbox

## Monitoring Tools

The 'SPY' window provides a number of simple monitoring and test features organized into tabs. The default tab shows useful axis status information and allows the user to select the axis to monitor. Other tabs include the following features :

- › Peer to Peer Comms data exchange
- › DPR (Dual Port Ram) for PCI products
- › CANopen network status
- › Fieldbus monitoring
- › Monitor window with 6 user configured readouts
- › I/O status monitor
- › Current loop performance and testing
- › Speed loop performance testing / tuning tab
- › Position loop performance testing / tuning tab
- › S-Ramping test / design tab
- › Digital Notch/low pass filter design for drives



## Program Editor

## Monitoring Tools

## Context Sensitive Help

## Watch Window

## Program Editor

The program editor features a rich set of high-level language editing and debugging features, including :

- › Color syntax highlighting
- › Breakpoints and single step debugging
- › Watch-point monitoring
- › Tree-view software navigator
- › Variable watch-window
- › Task status window
- › Compilation errors and warnings report

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## Integrated Context Sensitive Help

A press of the F1 key takes you to the Mint integrated help, instantly presenting you with information relating to the feature you are trying to use. For example this could be a stage in the drive commissioning wizard or the highlighted Mint keyword in the program editor.

## Program Navigation

The tree-view Program Navigator provides structural overview of your program and a fast method to find code sections, tasks, functions or subroutines. Simply click on the name of the code section you are looking for. You can use it to insert new tasks, subroutines and functions from the Program Navigator pop-up menu and reorganize your program.

## Mint Code Library

The Mint code library allows you to easily store and re-use functions, subroutines or entire Mint programs for future use. These code segments can easily be recalled and inserted into new projects, streamlining code development. Simply select and insert code segments into your current program or copy segments of code into the library area.

## Quick Access Toolbox

The most commonly required functions are easily accessed from a tool bar, changing the workspace to suit the job at hand. This toolbox adapts to the type of product being configured and includes :

- › Ethernet configuration
- › Drive setup wizard
- › Fine tuning
- › Edit & debug
- › Oscilloscope mode
- › Parameter viewer
- › Homing
- › I/O configuration
- › Error log



## ActiveX Components

ActiveX® components are provided with Mint WorkBench as standard and form a powerful toolkit for developing PC based visualization, machine control and even OEM production tools. All of the functionality underlying the Mint WorkBench, is available to the user as ActiveX functions, such as 'compile and download', 'firmware update', oscilloscope data capture (graphing separate) as well as all Mint motion functions such as multi-axis motion commands, I/O operations, and much more.

ActiveX® is a registered trademark of Microsoft® Corporation



# Mint<sup>®</sup> WorkBench

## Complete System Configuration

Mint<sup>®</sup> WorkBench provides a suite of tools in a single software platform, from network configuration, drive commissioning, control programming and diagnostics, streamlining your design cycle to save you time and money. Once complex tasks are simplified through the use of experience based wizards and graphical interfaces.

### Mint Machine Center - System Design

A graphical tree-view interface represents all connected devices within a Mint network or system. Devices can be added off-line and the design implemented later, or the system simply scanned and devices detected. This view is useful for visualizing all devices and to start commissioning. The *machine view* allows you to group devices into a logical order other than by address or type sequence of the network view. By allowing group names to be defined and each device given a logical name, you can create a custom view of the system which represents your application or machine configuration.

### Configure With Ease

Making configuration changes to any device is simple. Click on the device icon within the network or application view, to launch the Mint WorkBench directly connected to that device via Mint redirection. Wizards, auto-tuning, and online help have been designed to guide you through the process of device configuration.

### Program Development and Debugging.

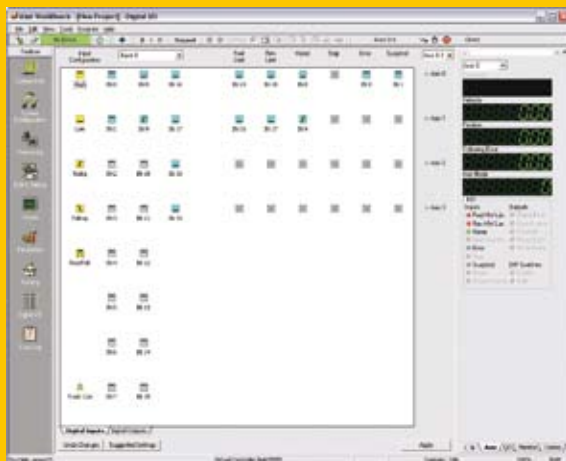
Advanced debugging tools provide task status information and control, hover over variable watch, single step, breakpoint and watch-point features to make code development and testing simple.

### Automated Web Update via SupportMe™

If you have web access, you can take advantage of the web updates feature. This will check for firmware updates for your specific motion controller or drive. The firmware files can be downloaded and installed into a maintained database on your PC, allowing you to use them as required.

### SupportMe™ Technical Support

When faced with difficulty, Baldor's SupportMe™ feature will gather a host of important information from the controller. An email will be generated automatically, offering you the option of attaching programs and additional files. This can be sent directly to your chosen local technical support contact, providing an efficient support mechanism to help you get back up and running. (Requires e-mail client).



One example of the ease of use of Mint WorkBench - I/O configuration simplified by graphical drag & drop approach to define function, active level or edge of each I/O.

## Drives Set-up Wizard

Simple step by step guide

- › Motor Selection
- › Application limits
- › Mode of operation
- › Network configuration

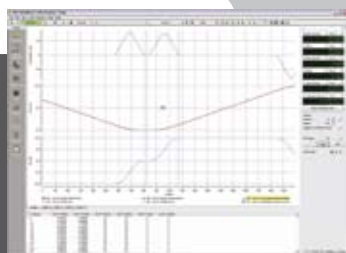
Auto-tuning wizard including :

- › User configured operation  
e.g. direction inhibit
- › Feedback verification
- › Automatic commutation test
- › Load model identification
- › Automatic adaptation of  
current speed and position  
control gain terms



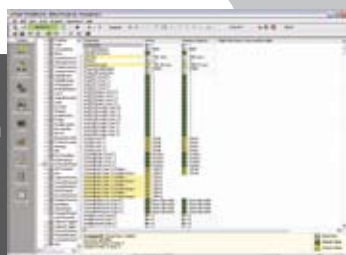
## Software Oscilloscope

- › Multiple channels of display
- › Cursor measurement
- › Save/open/print functions
- › Independent axes scaling
- › Plot X against Y position
- › Trigger and repeat capture modes
- › FFT analysis



## Parameter Viewer

- › System and axes configuration  
on motion controllers
- › View / monitor / edit / save  
and print parameter files
- › Live or offline mode
- › Multiple parameter file  
comparison
- › Changed from default  
indication
- › User configured parameter  
views



## Wizard Setup Minimizes Knowledge Requirement and Saves you Time.

Wizards have been designed to automate many tasks, reducing set up time and minimizing knowledge required by incorporating the knowledge of skilled technicians. These step-by-step guides automate processes such as network configuration, drive configuration, auto-tuning and more.

Detailed access to drive configuration is catered for by a parameter viewer which also provides useful tools for parameter file comparison, highlighting changes between files and changes from factory defaults.

## Filters Eliminate Resonance

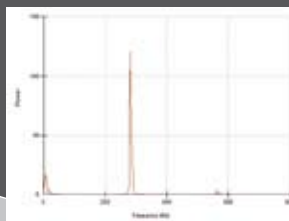
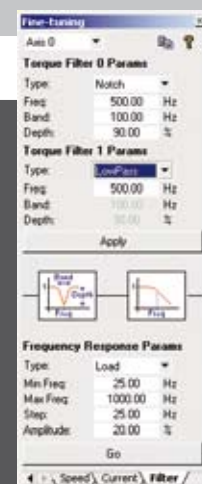
Advanced digital filtering techniques can be applied to reduce the effect of mechanical resonance on system performance.

The drive has two separate digital filters. Each can be adapted to specific frequencies as notch filters, or as low pass filters. Adapting the filters to eliminate or reduce the effects of resonance allow higher system gains and tighter control to be attained. This maximizes machine control bandwidth, without suffering from the increased resonance and performance degradation that would otherwise result.

Configuring these filters is aided by a simple filter design interface which, combined with the Mint WorkBench oscilloscope and FFT (Fast Fourier Transform) analysis, allows the user to test the axis open and closed loop frequency response. The resonant components can then be identified and filter designs tested for effectiveness.

## Digital Filter Designer

- › Tools to combat mechanical resonance effects
- › Integrated tests designed to identify problem frequencies
- › FFT analysis built in to software oscilloscope
- › Design tools to create digital filters
- › Support for low pass and notch filter designs



- › Fast Fourier Transform analysis highlights resonant frequencies.



# NextMove e100

## Real-time Ethernet Motion Controller

- › Ethernet Powerlink + integrated hub
- › 8, 12 or 16 axes of interpolated motion
- › CANopen network manager
- › RS232/485 and USB communications
- › Integrated digital and analog I/O
- › 4 stepper axes / 3 analog axes
- › Multitasking Mint®
- › ActiveX® Controls



ETHERNET   
**POWERLINK**  
real-time technology

The NextMove e100 builds on the proven NextMove controller family and now integrates management of a real-time Ethernet network. Drives, I/O devices, sensors, absolute encoders and more can be added to the Powerlink network and controlled from the Mint programming language. Ethernet greatly simplifies system design and installation and simultaneously expands the capabilities of the NextMove e100 as a machine control platform.

### Interpolation on 16 Axes

NextMove e100 can perform interpolation on 16 axes, as either a single coordinate group or as multiple coordinate systems operating independently with their own scale factors and move buffers. Alternatively all 16 can operate as independent axes.

### Add I/O, Encoders and More

A Powerlink network can contain many devices including, I/O, absolute encoders, gateways and DSP 402 positioning drives, such as the MicroFlex e100. DSP 402 axes provide simple point-to-point motion, homing sequences, jog control and torque demand functions. Example applications include guide axes, indexers, conveyors, tension rollers and more.





## CANopen Port - Simple Expansion

- › CANopen network manager
- › System I/O expansion
- › Communicate with Baldor HMI panels
- › Communicate with other Mint products



## Ethernet - Powerlink and TCP/IP

- › Network Manager or controlled node (CN)
- › Integrated 2 port hub - ease of connection
- › Real-time Ethernet performance
- › TCP/IP mode of operation (non real-time) with ActiveX support



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## Analog Axes - Encoder Inputs

- › 3 Incremental encoder inputs
- › 3 Analog outputs +/-10v 12bit
- › Control legacy analog servo drives, inverters, servo hydraulics.
- › Use the encoders and analog signals for application purposes

## Steppers - Auxiliary Axes

- › 4 Stepper drive interfaces
- › Differential or Open collector interfaces available
- › Range of stepper motors with integrated drives available
- › Linear stepper motors also available



## Communications - USB / Serial

- › USB interface for programming / ActiveX interfacing to a Microsoft Windows application
- › RS232/485 serial port to implement communications such as DF1 and Modbus

## Application I/O - Digital / Analog

- › 20 digital inputs (4 fast inputs 1μs latency ideal for registration)
- › 1 off relay output
- › 12 digital outputs.
- › 2 analog inputs +/-10V 12bit
- › 1 auxiliary analog output +/-10v 12bit

## TCP/IP Communications via ActiveX

In addition to the deterministic mode of Ethernet Powerlink, the NextMove e100 can also operate in an open mode using TCP/IP messaging. This feature is supported by Baldor's Mint ActiveX tools, which can provide control of a network of drives from a Windows® based PC. In this mode the Ethernet interface acts as a standard TCP/IP network port.

## USB Interface with ActiveX Support

An integrated USB interface provides a configuration and programming port. It allows access to the entire network from a single point, providing access to all Baldor devices connected to the Ethernet port of the controller. Mint ActiveX tools also allow use of the USB port for HMI or control purposes.

## Serial Interface for PLC, PC, HMI

A user selectable RS485/RS232 serial port is available and accessible in Mint to create a simple interface to devices such as PLC's, text displays, printers etc. Users can access the serial port directly to implement their own protocols, or make use of a predefined simple ASCII protocol (Host Comms Protocol) to simplify the task of host communications.

## On-board Digital and Analog Interfaces

Integrated digital and analog I/O provide the facility for system interlocks and logic control normally afforded by an additional PLC. This I/O can equally be expanded via Ethernet or CANopen.

## Encoder Inputs and Fast Position Latch.

The servo control interfaces include three incremental TTL encoder channels which can also be used as additional position or velocity sensors. Alternatively, these can be used as *master* axes for synchronization applications. Four digital inputs can be used to latch the position of any of these encoders within 1 $\mu$ s and generate software events. This is ideal for registration based applications such as labeling and printing.



## Analog Drive Interfaces

Integrated hardware interfaces provide a means of utilizing existing drive technologies such as simple inverters, stepper drives and servo pneumatics controlled from the industry standard  $\pm 10V$  analog outputs and encoder feedback. NextMove e100 is perfectly matched to Baldor's FlexDrive-II and MicroFlex™ range of servo drives, BSM servo and linear motor range for a complete servo control system.

## Open Loop / Stepper Control

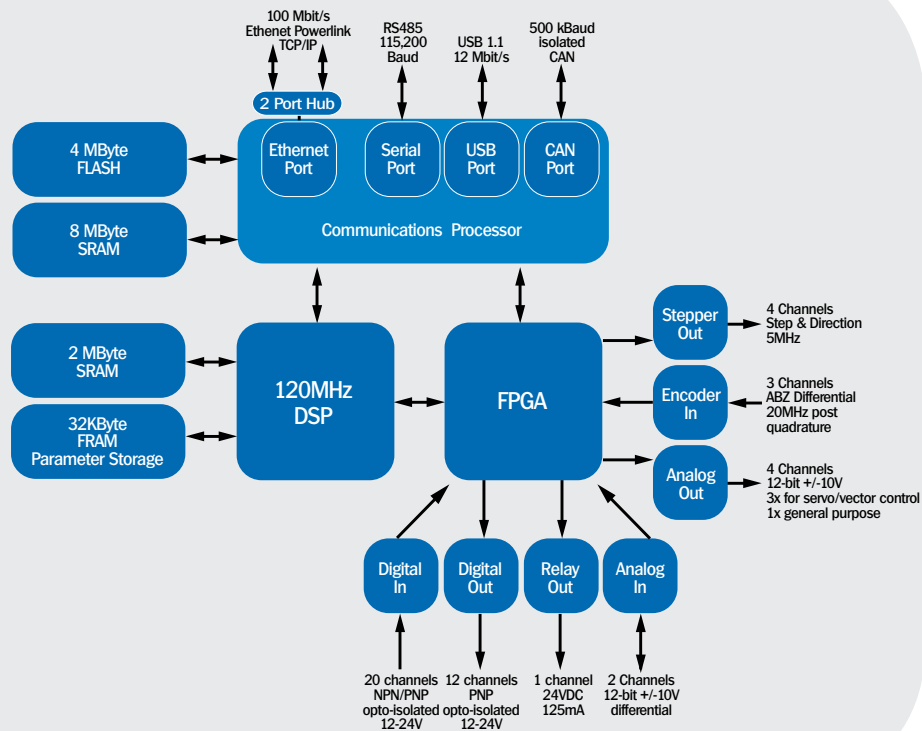
Stepper axes can be controlled from any of the four onboard step and direction outputs. The stepper outputs can also be used to interface to Baldor's FlexDrive-II or MicroFlex™ servo drives.

## Integrated Stepper Motor/Drive Technology

Baldor's range of DSM integrated stepper motors/drivers are ideally suited for use with NextMove ESB/e100. Combining both a high torque stepper motor and microstepping drive in one compact integrated package, the DSM motor/driver combination requires only power and pulse/direction signals in order to operate.

## Technical Data

<b>Number of Axes</b>	16 interpolated axes in single or multiple coordinate groups. Manage additional independent DSP 402 positioning Drives (non interpolated). Limit application dependant.
<b>Axis Type</b>	Ethernet Powerlink (EPL) v2 3 closed loop axes $\pm 10V$ interface with 5V RS422 incremental encoder inputs 4 open loop axes - Stepper interface (Step & Direction outputs) 5V differential line driver (5MHz) or 5V Darlington open collector, single ended (500KHz max) selected by order option
<b>Powerlink Device Type Support</b>	EPL DSP 401 I/O devices for I/O expansion EPL DSP 402 Positioning Drives such as MicroFlex e100 EPL Absolute Encoders Manage up to 16 interpolated axes and additional DSP 402 axes Contact Baldor for information on additional 3rd party products supported.
<b>Ethernet</b>	Specification: 100Mbit - IEEE802.3u compliant Protocol : Ethernet Powerlink V2 (EPL) and IP protocols TCP/UDP Interface : Integrated 2 port Hub for daisy chain connection Cable type : CAT5e braided shielded cable, RJ45 connectors, Max 100m(330ft) each. Address: 2 off rotary HEX switches sets node and private device IP address
<b>On-Board Memory</b>	4MByte Flash for firmware and non-volatile program storage. 2MByte SRAM 32KByte FRAM for non-volatile variable data storage
<b>Digital Inputs</b>	20 opto-isolated 24VDC. 1mS sample rate. All inputs Interrupt capable. May be connected positive or negative common (for use with NPN or PNP output transistors) Software configurable for limits (forward and reverse), home, stop and drive error
<b>Fast Inputs</b>	The first 4 of digital inputs can be configured for high speed position capture of axis position 1 $\mu$ sec capture time



## Ordering Information

Catalog Number	Description
<b>NXE100-16xxDB</b>	NextMove e100 - Differential stepper output
<b>NXE100-16xxSB</b>	NextMove e100 - Single ended open collector outputs for use with DSM integrated stepper motors
<b>Note</b>	xx = axis variant. 08, 12, 16

<b>Digital Outputs</b>	12 opto-isolated 12-24VDC PNP Software configurable for drive enable 50mA typical per channel, 350mA max load for single channel up to 500mA total for 8 channels
<b>Relay Output</b>	Single output for drive enable. Form C (SPDT) relay rated at 24V (150mA) Common, normally open, normally closed. Fail safe operation-relay de-energized on an error Function defined in Mint
<b>Analog Outputs</b>	3 outputs for drive command signals. ±10V, 12-bit resolution 1 general purpose ±10V 12-bit output
<b>Analog Inputs</b>	2 differential ±10V operation 12 bit resolution.
<b>Serial Port</b>	User selectable RS485/232 via 9 pin Sub-D. Maximum baud rate 115,200 USB1.1 (12Mbit/sec) supported on Windows 2000/XP. A 2m (6.6ft) cable is supplied
<b>CANopen</b>	Single CAN port via standard 9 pin Sub-D connector. CANopen DS301 Support for CANopen DSP 401 I/O, DS406 encoders and other devices, Master functionality for peer-to-peer communications with other Mint nodes DSP 402 Positioning drives management
<b>Power Requirements</b>	24VDC ±10% : 50W
<b>Environmental Limits</b>	Operating Temperature 0°C to 45°C (32°F to 113°C)
<b>Weight</b>	0.85Kg (1.87 lbs)
<b>Dimensions</b>	L 262mm (10.3") : W 135mm (5.32") : H 45mm (1.77")
<b>Programming</b>	Mint® - Multitasking Motion Basic. Windows 9X/NT/2000/XP/Vista 32bit via Mint ActiveX controls (Note: USB only supported on Windows 2000/XP/Vista 32bit) All Windows programming libraries supplied free of charge.

# MicroFlex e100

## Compact AC Servo Drive

- › Real-time Ethernet with integrated hub
- › CiA DSP 402 Positioning on Powerlink or CANopen
- › CANopen DSP 401 network manager for low cost I/O expansion
- › USB port for service / PC control via ActiveX®
- › Linear and rotary motor control
- › Universal encoder interface
- › 105 – 230 VAC 50/60Hz supply
- › 3, 6 and 9 Amp versions with 200% peak capability



ETHERNET   
**POWERLINK**  
real-time technology

MicroFlex e100 is built on Baldor's expertise in servo drive technology. The advanced capabilities of real-time Ethernet Powerlink provide superior performance, network integration and cost savings. MicroFlex e100 uses Space Vector Modulation (SVM) for superior motor control and efficiency. Numerous protection features are designed in for reliability and safety.

### Auto-tuning of all Axis Gain Terms Made Easy.

Auto-tuning takes place on the drive itself, adapting the current controller, velocity and position loops for the axis. In addition, it verifies feedback device signals and cabling errors. Because the position loop is tuned on the drive itself, there is no tuning to do on the motion controller. This further simplifies system tuning with all control terms in the drive.





### CANopen Port - Simple Expansion

- › Ethernet to CAN gateway
- › CANopen network manager
- › DSP 402 positioning drive
- › Expand the system I/O via the drive



### Ethernet - Powerlink and TCP/IP

- › Integrated 2 port hub - ease of connection
- › Real-time Ethernet performance
- › TCP/IP mode of operation (non real-time)
- › ActiveX support for TCP/IP communications



### Power - Universal AC Supply

- › AC single / three phase power 105 - 230VAC 50/60Hz
- › Regenerative brake resistor connections
- › Motor AC power out

### Status LEDs - Node ID and USB

- › Power / health status
- › CANopen and Ethernet communications
- › Simple Ethernet node address selection



### Drive I/O - Opto-Isolated

- › Drive enable input
- › 2 fast inputs 1μs latency ideal for registration
- › 1 additional input
- › 2 digital outputs. (eg. motor brake control)

### USB Port - Direct Configuration

- › Configure a drive direct via its USB port or via Ethernet network
- › Access diagnostics, digital oscilloscope
- › Parameter view / edit / compare
- › ActiveX tools allow custom Windows tools to be created to access the drive via its USB port or Ethernet interface

### 24V Logic Supply - Maintain Position

- › 24V back-up supply input
- › Maintain communications and position feedback when main AC power is removed to eliminate re-homing

### Motor Feedback - Universal Encoder

- › Incremental encoders with/without halls
- › Absolute single / multturn BiSS and SSI
- › EnDat 2.1 / 2.2 absolute encoders
- › 1V peak-peak SinCos encoders
- › Tamagawa absolute encoders



### TCP/IP Communications via ActiveX

In addition to the deterministic mode of Powerlink, the MicroFlex e100 can also be commanded in an open mode using TCP/IP messages. This feature is supported by Baldor's MintActiveX tools, which can provide control of a network of drives from a Windows based PC. In this mode the drive performs simple motion tasks such as point-to-point moves and homing sequences. Interpolated motion across axes is not supported in this mode.

### Universal AC Power Supply for a Global Market

MicroFlex operates from a single or three phase supply, 105 to 230 VAC. The control electronics are maintained by an external customer supplied 24 VDC supply, in the event of main AC power removal, for typical safety schemes.

Universal Encoder Interface

A unique interface design provides support for leading encoder technology. Incremental encoders (with or without Hall-effect tracks), absolute single or multi-turn encoders such as BiSS, EnDat 2.1/2.2, Synchronous Serial Interface (SSI) and 1V Sin/Cos encoders, are all supported on a single platform. This ensures the capability to utilize high performance feedback devices for optimum precision, accuracy and smooth speed regulation.

Matched Performance™ Motors

Baldor designs and manufactures both the drives and the rotary and linear motors they control. We ensure that the motor and drive are matched to operate together with optimal performance, and provide trouble free installation. The Mint Workbench configuration tool has access to all Baldor motor data, simplifying drive configuration.

Digital I/O for Axis Functions

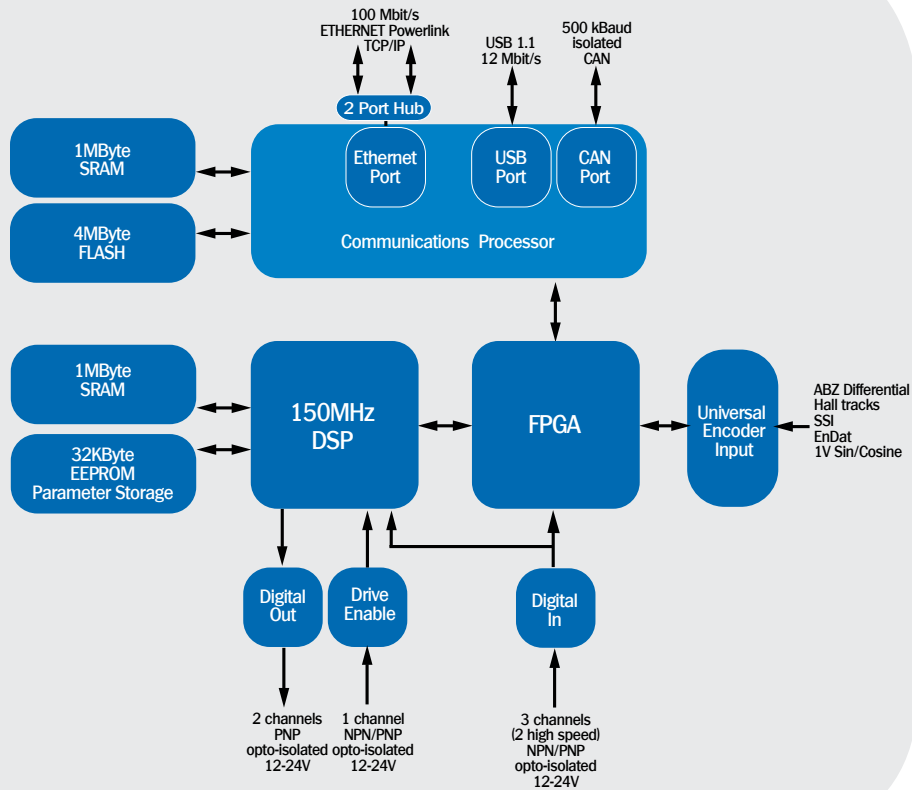
Digital inputs provide typical drive and motion signals such as home sensor limit switches, a hardware enable interlock. Two can be used for high speed registration, capturing position in typically less than 1µS. The outputs can be configured for functions such as motor brake control and drive ready.

This I/O is available to the NextMove e100 motion controller as though the I/O is local to the controller itself. Limit errors, for example, will call the Mint error handler on the NextMove e100. A position latch on the MicroFlex e100 drive will result in the position latch event being called within the Mint program on the NextMove e100. This greatly simplifies system expansion.



Technical Data

Ethernet	Specification: 100Mbit - IEEE802.3u compliant Protocol : Ethernet Powerlink V2 (EPL) and IP protocols TCP/UDP Interface : Integrated 2 port hub for daisy chain connection Cable type : CAT5e Shielded cable, RJ45 connectors, Max 100m (330ft) Address: 2 off rotary HEX switches sets node and IP address Function : EPL /CiA DSP 402 Positioning Drive
USB	Configuration and diagnostics via Mint Workbench. ActiveX support for custom user interfaces.
CANopen	Isolated CAN port via standard 9 pin Sub-D connector. CANopen DS301 Manager of CANopen DSP 401 I/O devices and DSP 406 Encoder support when used with NextMove e100 products CANopen DSP 402 Positioning drive mode via CANopen (controlled device) and Ethernet Powerlink
Digital Inputs	4 off total - opto-isolated 24V, 1mS sample rate including the following functions: 1 reserved for drive hardware enable 2 inputs with high speed position latch - for registration applications. <1µS latency May be connected positive or negative common for use with NPN or PNP signals Software configured level/edge triggered and application functions e.g. HOME, LIMIT, STOP, LATCH
Digital Outputs	2 off total - opto-isolated 12-24VDC PNP. 50mA per channel, 100mA max load for single channel, 200mA Fuse level (self resetting) Software configured functions including Motor Brake control (requires external relay)
Indicators	1 off LED for drive status/health 2 off LEDs for Ethernet activity 2 off LEDs for CANopen activity
Control Supply	24 VDC ±10% : Nominal 1.5 Amp externally supplied. (No current drawn with AC power applied)
Operating Modes	CiA DS402 Profiled Torque (current), Profiled Velocity (speed), Profiled Position - including Homing, Incremental and absolute moves.



## Ordering Information

Catalog Number	Description
<b>MFE230A003B</b>	MicroFlex e100 AC Servo Drive 3 Amp continuous, 105-230VAC 50/60Hz
<b>MFE230A006B</b>	MicroFlex e100 AC Servo Drive 6 Amp continuous, 105-230VAC 50/60Hz
<b>MFE230A009B</b>	MicroFlex e100 AC Servo Drive 9 Amp continuous, 105-230VAC 50/60Hz

## Accessories

A range of accessories for MicroFlex e100 are available to make system integration easier. These include 24V power supplies, pre-made motor and Ethernet cables in different lengths, braking resistors, EMC filters and cooling fans. Full information on these accessories can be found in the Accessories brochure - BR1202-H.

Type	MFE230A003B	MFE230A006B	MFE230A009B
<b>Power Requirements</b>	<b>1 or 3 Phase 105-230 VAC 50/60Hz</b>		
<b>Current rating</b>	3 Amp continuous 6 Amp peak 3 seconds	6 Amp continuous 12 Amp peak 3 seconds	9 Amp continuous 18 Amp peak 3 seconds
<b>Feedback Devices</b>	Universal Encoder Interface, supporting: <ul style="list-style-type: none"> <li>- SSI single and multi-turn absolute encoders</li> <li>- BiSS single and multiturn absolute encoders</li> <li>- EnDat absolute encoders (v2.1 and v2.2)</li> <li>- Incremental encoders (with Hall effect sensors). 5V differential signals.</li> <li>- Hall sensor only for DC trapezoidal control</li> <li>- 1V Peak - Peak Sin/Cos analog encoders with onboard interpolation</li> </ul> Additional devices supported by Feedback Option Cards <ul style="list-style-type: none"> <li>- Resolver with simulated encoder output</li> <li>- Incremental encoders (with Hall effect sensors). 5V differential signals. Simulated encoder output.</li> </ul> Refer to technical manual for full description of supported encoder types and manufacturer part numbers		
<b>Regenerative braking</b>	Integrated IGBT output. An external regen resistor can be fitted if required		
<b>Protection</b>	DC bus over-voltage; DC bus under-voltage; Phase-Loss; Peak over-current; Motor short circuit; Over-temperature; i <sup>2</sup> T over current, hardware dead-time protection, motor thermal trip input, network failure modes.		
<b>Dimensions and Weight</b>	H: 180 mm (7.09") W: 79.6 mm (3.13") L: 157 mm (6.18"). Weight 1.5 Kg (3.3 lbs.)		
<b>Operating Temperature Range</b>	Temperature range 0°C to 45°C (32°F to 113°C) with derating to 55°C		
<b>Shock \ Vibration</b>	10G Shock \ 1G, 10-150Hz Vibration		

# MotiFlex™ e100

## Redefining Flexibility

Introducing Baldor's range of high performance multi-axis drives, MotiFlex™ e100. Providing a single platform for drive solutions for automation needs. MotiFlex integrates state of the art DSP technology specifically designed for motor control, with a real-time Ethernet platform, modular construction and Baldor's Mint® motion control technology.

### MotiFlex Key Features:



- › Real-Time Ethernet for advanced control
- › Universal AC operation 3 phase 180 to 528VAC (max) 50/60Hz
- › 1.5 to 33.5 Amp in only two package sizes
- › Flexible overload ratings to match application
- › Servo and AC vector, software selectable
- › Rotary and linear motor control
- › Universal encoder input
- › Expansion slots for a flexible architecture



### Intelligent Drive Systems

MotiFlex e100 drives can be expanded with a range of option modules to provide Fieldbus access, additional IO or feedback inputs.

Plug-in Mint controller modules create a powerful fully integrated intelligent drive based solution for machine control.

For more information on plug-in Mint machine modules, refer to page 12-13



**P34**

Features  
Product Overview



**P38**

Flexible Solutions  
Modular Enhancements



**P40**

Fieldbus Modules  
Plug-In Networking





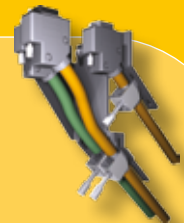
## P42

DC Shared Operation  
Energy Efficiency



## P44

Drive Ratings  
DC Power Ratings



## P46

Ordering Information  
MotiFlex and Accessories

# MotiFlex™ e100

## High Performance AC Servo Drive

- › Real-time Ethernet with integrated hub
- › CiA DSP 402 Positioning Drive Profile
- › CANopen DSP 401 manager for expansion
- › USB port for service / PC control via ActiveX®
- › Linear and rotary motor control
- › Universal encoder interface and Resolver Option
- › Options for fieldbus, IO, programmable controllers
- › Stand alone AC power and DC shared operation
- › 180 – 528 VAC 50/60Hz supply
- › 1.5 to 33.5A with flexible overload ratings
- › Servo and AC closed loop vector control



MotiFlex e100 drives offers a broad range of application capabilities in a single platform and are designed to satisfy single axis stand-alone systems and multi-axis applications alike. This system flexibility, combined with servo, AC vector and linear motor control from the same hardware, and a wealth of expansion options, provides a platform for solutions in a wide range of applications.

ETHERNET   
**POWERLINK**  
 real-time technology

## › Technical Data

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<b>Ethernet</b>	Specification: 100Mbit - IEEE802.3u compliant Protocol : Ethernet Powerlink V2 (EPL) and IP protocols TCP/UDP Interface : Integrated 2 port hub for daisy chain connection Cable type : CAT5e Shielded cable, RJ45 connectors, Max 100m (330ft) Address: 2 off rotary HEX switches sets node and IP address Function : EPL /CiA DSP 402 Positioning Drive
<b>USB</b>	Configuration and diagnostics via Mint Workbench. ActiveX support for custom user interfaces.
<b>CANopen</b>	Isolated CAN port via standard 9 pin Sub-D connector. CANopen DS301 Manager of CANopen DSP 401 I/O devices and DSP 406 Encoder support when used with NextMove e100 products CANopen DSP 402 Positioning drive mode via CANopen (controlled device) and Ethernet Powerlink
<b>Digital Inputs</b>	4 off total - opto-isolated 24V, 1mS sample rate including the following functions: 1 reserved for drive hardware enable 2 inputs with high speed position latch - for registration applications. <1µS latency May be connected positive or negative common for use with NPN or PNP signals Software configured level/edge triggered and application functions e.g. HOME, LIMIT, STOP, LATCH
<b>Digital Outputs</b>	2 off total - opto-isolated 12-24VDC PNP. 50mA per channel, 100mA max load for single channel, 200mA Fuse level (self resetting) Software configured functions including Motor Brake control (requires external relay)
<b>Indicators</b>	1 off LED for drive status/health 2 off LEDs for Ethernet activity 2 off LEDs for CANopen activity
<b>Control Supply</b>	24 VDC ±10% : Nominal 1.5 Amp externally supplied. (No current drawn with AC power applied)
<b>Operating modes</b>	CiA DS402 Profiled Torque (current), Profiled Velocity (speed), Profiled Position - including Homing, Incremental and absolute moves.

		PWM Switching Frequency			
		4 kHz	8 kHz	16 kHz	
Overload Selection	300% 3 Seconds	2.75 (8.25A)	2.75 (8.25A)	2.75 (8.25A)	Higher Dynamics Servo axes
	200% 3 Seconds	4 (8A)	3 (6A)	3 (6A)	
	150% 60 Seconds	5 (7.5A)	3.8 (5.7A)	3.8 (5.7A)	Higher Current Vector axes
	110% 60 Seconds	5.5 (6.05A)	4.5 (4.95A)	4.5 (4.95A)	
		Cont. (Peak)	Cont. (Peak)	Cont. (Peak)	
		Higher current capability		Tighter control - lower audibility	

## Optimize the Drive to the Application

### Flexible Overload and PWM Selection

Each MotiFlex power rating can be optimized by choice of overload rating and PWM operating frequency to allow the drive to be adapted to the motor and application. For example an overload of 300% for 3 seconds for linear motor control or 150% for 30 seconds for vector motor control. All are easily software selected and the drive ratings adapt automatically to match these requirements.

<sup>1</sup> Derating applies above 45°C (113°F) and above 1000m (3300ft)

Feedback Devices	Universal Encoder Interface, supporting: - SSI single and multi-turn absolute encoders - BiSS single and multiturn absolute encoders - EnDat absolute encoders (v2.1 and v2.2) - Incremental encoders (with Hall effect sensors). 5V differential signals. - Hall sensor only for DC trapezoidal control - 1V Peak - Peak Sin/Cos analog encoders with onboard interpolation Additional devices supported by Feedback Option Cards - Resolver with simulated encoder output - Incremental encoders (with Hall effect sensors). 5V differential signals. Simulated encoder output. Refer to technical manual for full description of supported encoder types and manufacturer part numbers		
Regenerative braking	Integrated IGBT output. An external regen resistor can be fitted if required		
Protection	DC bus over-voltage; DC bus under-voltage; Phase-Loss; Peak over-current; Motor short circuit; Over-temperature; $i^2T$ over current, hardware dead-time protection, motor thermal trip input, network failure modes.		
Dimensions	<b>Size A</b> H: 350 mm (13.78") <b>Size B</b> H: 350 mm (13.78")	<b>Size A</b> W: 79 mm (3.13") <b>Size B</b> W: 129 mm (5.07")	<b>Size A</b> D: 260 mm (10.31") <b>Size B</b> D: 260 mm (10.31")
Weight	<b>Size A</b> 1.9kg (4.2lb) to 5.8kg (12.8lb) <b>Size B</b> 6.5kg (14.3lb)		
Operating Temperature Range	Temperature range 0°C to 45°C (32°F to 113°C) with derating to 55°C		
Shock \ Vibration	10G Shock \ 1G, 10-150Hz Vibration		
Altitude	1000m (3300ft) nominal, Derate 1.1% /100m (per 330ft) above 1000m (3300ft)		

# Key Features

## AC Power input - Plug-in Connector

## Regen Braking Output - Plug-in Connector for External Brake Resistor

## DC Bus Connection - Convenient Robust DC Link System



- › Pre-made slot-in links
- › Simple to install
- › No proprietary backplanes required
- › Screw fixed cover for additional safety
- › Share regenerative energy
- › Improves system efficiency
- › Reduces the need for braking resistors

## User I/O - Digital - Analog - 24V Back-up



- › Drive enable input
- › 2 fast inputs 1 $\mu$ S latency ideal for registration
- › 1 additional input
- › 2 digital outputs. (eg. motor brake control)
- › +/-10V differential analog input
- › 24V backup input to maintain communications and position feedback with convenient 24V / signal routing channel for neighboring drives

## Motor Power - Labeled Plug-in Connector for Ease of Wiring

## Motor Thermal Trip Input - Prevent Overheating of the Motor

## Motor Feedback - Universal Encoder Interface

- › Incremental encoders with/without Halls
- › BiSS and SSI single/multi-turn absolute encoders
- › EnDat 2.1 / 2.2 absolute encoders
- › 1V peak-peak SinCos encoders
- › Resolver supported via plug-in option
- › Dual feedback capability
- › Master encoder (line shaft) functions such as electronic gearing and CAMS





## Ethernet Integrated - Real-Time Ethernet Powerlink

- › 2 port hub integrated - ease of connection
- › Real-time Ethernet performance
- › TCP/IP mode of operation (non real-time)
- › 3rd party Powerlink products support
- › Compatible with Baldor's e100 solutions



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## CANopen Integrated - Expand System I/O via DSP 401

- › CANopen network manager function
- › CANopen - Ethernet gateway function
- › DSP 402 positioning drive (as a controlled device)
- › DSP 401 I/O manager function to expand the system I/O from any drive
- › DSP 406 encoder support for position indication
- › Electrically isolated CAN interface



## LED Status indication - Power - CANopen - Ethernet

- › Power / health status
- › CANopen communications
- › Ethernet communications
- › Simple Ethernet node address selection
- › USB interface for service local access
- › Part number / serial number label, repeated for ease of reference



## 2 Expansion Slots - Range of Plug-in Options

- › Modular approach to drive configuration
- › Digital and analog I/O expansion
- › Additional feedback devices
- › Programmable Mint® motion controllers
- › Fieldbus option including :
  - Profibus
  - DeviceNet
  - Modbus RTU
  - Profinet IO
  - Ethernet/IP
  - ModbusTCP
- › Safety functions in preparation



# Flexible Solutions

## Modular Enhancements

Modern machine design requires different solutions for each industry, application and even classes of machines within a product range. MotiFlex provides a platform which can be tailored to each application by use of modular design. Expansion and enhancement options can be fitted in the field to MotiFlex drives

### Dual Feedback and Line Shaft Encoders

Secondary feedback channels can be added to MotiFlex to provide dual feedback solutions for eliminating mechanical transmission errors. Alternatively they can be used to provide a convenient system source for encoders or resolvers. These can also be used in electronic line shaft applications, where drives in the system will electronically synchronize to an external source.



### I/O expansion

System I/O can be optimized by adding digital or analog modules to one or more drives within a system. Where a few fast I/O are required the option modules provide a cost effective and compact route. For greater I/O count or distributed approaches, the integrated CANopen port can be used to manage CANopen DSP 401 I/O devices.

### Fieldbus Modules

A range of plug-in fieldbus interfaces provide a simple approach to interfacing to other systems. The fieldbus option allows any Baldor e100 system to communicate with devices such as PLC's, PC's and embedded controllers. Recipe data, control interlocks and system status information can easily be exchanged. This is particularly useful for interfacing to existing machine sub systems or for OEM's that must provide the end users PLC of choice, while maintaining a common motion platform.

### Programmable Option Modules

The addition of the single axis Mint motion control card will convert the standard MotiFlex into a fully programmable multitasking intelligent drive.

The multi-axis Mint module will control a number of drives connected on Ethernet Powerlink as a self contained coordinated machine control system. This provides major savings on installation and component costs in the most compact package. See page 12-13 for more information.



MotiFlex has an integrated Universal Encoder Input (UEI) as standard. This supports incremental + Halls, SSI, EnDat 2.1/2.2 and Sin/Cos encoders. Additional feedback options can be fitted and used as motor commutation, position loop feedback (dual loop) or line shaft masters for system wide electronic gearing. The simulated encoder output on some options can be generated from the drives integrated encoder interface. and scaled to provide the required output resolution.

## › Resolver + Simulated Output



- › 12/14 bit resolution, software selectable
- › Single speed 2:1 transformation ratio
- › Simulated incremental encoder output with scaled resolution to provide a custom count per revolution for external devices such as counters or PLCs

### Application notes

- › For applications where the motors are exposed to high shock and vibration, or higher operating temperatures
- › Medium performance applications
- › Dual Feedback or electronic line shaft (gearing)
- › Simulated output can represent resolver input or Drives integrated Universal Encoder Interface. Software selectable and scalable

## › Incremental Encoder + Simulated Output



- › 5V RS422 differential signals + Halls
- › 5VDC supply 200mA load for the encoder
- › Voltage sense line, max supply voltage 7V
- › Simulated incremental encoder output with scaled resolution to provide a custom count per revolution for external devices such as counters or PLCs

### Application notes

- › Medium to high performance applications. (Performance is encoder precision and resolution dependant)
- › Simulated encoder output can selected from drives integrated encoder input or from the option card input
- › This option can be used for motor commutation when a high performance encoder is required for other purposes and is connected to the integrated UEI

## › Digital I/O Module



- › 6 inputs 12-30VDC operation
- › 4 Outputs 12- 28VDC (150 mA max)
- › Sampling rate 1kHz
- › Pluggable connection

### Application notes

- › Inputs are AC opto-coupled allowing for positive or common ground connection
- › Outputs are protected via self resetting fuse rated at 200 mA
- › Can be controlled by the machine controller via Ethernet Powerlink as system I/O, or used to expand the I/O count in combination with a Mint Machine Module
- › Polled or Event based (interrupt) operation

## › Analog I/O Module



- › 4 off 12 bit analog inputs +/- 10V
- › Sampling rate 8kHz
- › 4 off 12 bit analog outputs +/- 10V
- › Update rate 8kHz
- › Pluggable connection

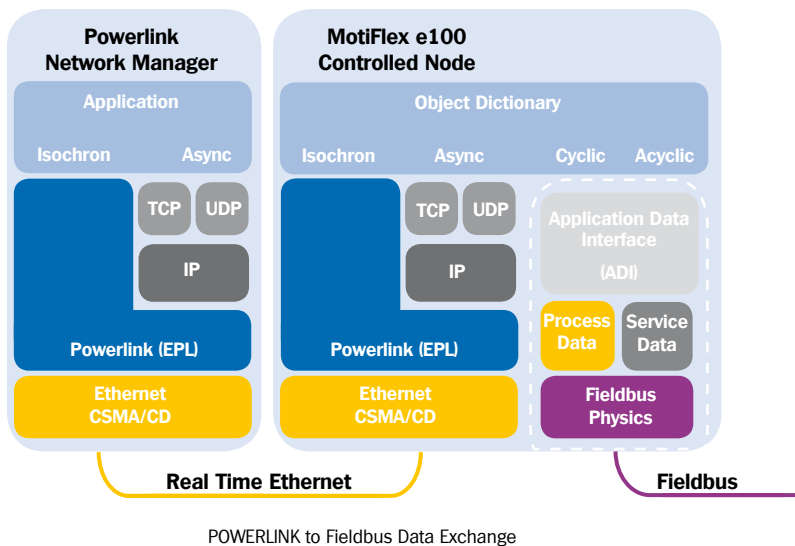
### Application notes

- › Inputs can be used in differential or single-ended configuration
- › Digital Gain, Offset, Dead-band, Hysteresis and filter time constant can be applied to all analog inputs
- › Analog I/O can be accessed via the Ethernet Powerlink network and controlled by the machine controller as distributed I/O, or used to expand the drive I/O in combination with a Mint Machine Module.

# Fieldbus Modules

## Simple Plug-in Networking

Simple plug-in modules provide a powerful and consistent approach to fieldbus communications, providing data exchange gateway solutions, or drive control interfaces as required. A range of fieldbus types are available as simple modules which can be installed in the field.

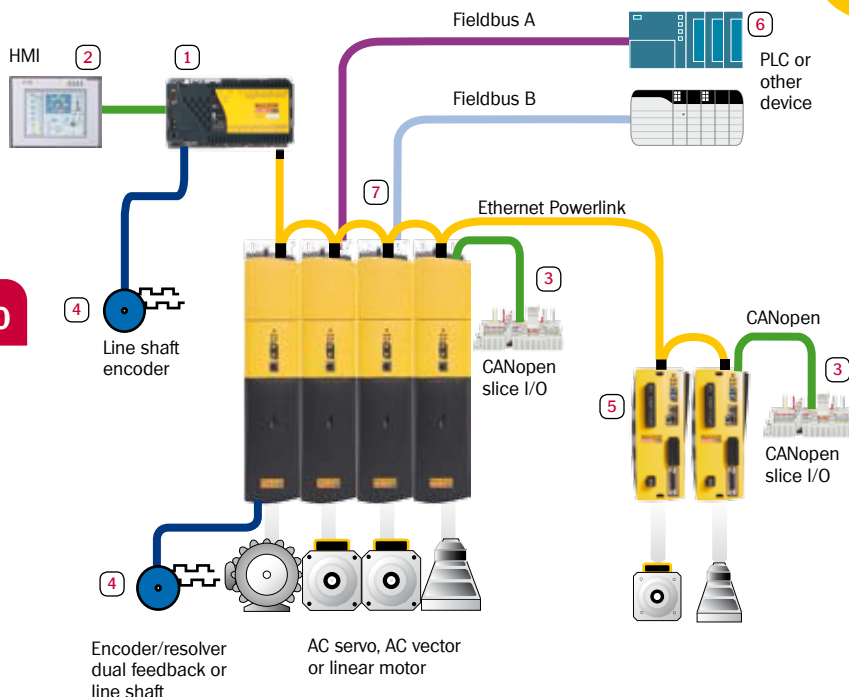


### A Consistent Motion Platform Approach

MotiFlex provides fieldbus connection to e100 control systems by routing data between the fieldbus and real-time Ethernet. Using this approach data can be easily exchanged between the application program on the Mint controller and any external device, such as a PLC.

OEMs designing for different geographic markets, are often faced with supporting multiple PLC platforms and their respective fieldbus of choice. Using MotiFlex fieldbus modules a standard motion control strategy using e100 products can be implemented, maintaining a single motion solution and simply interface to the PLC for control interlocks, visualisation and application data exchange.

### Example 2 - Multi-Axis System with Fieldbus Interface to PLC or Other Device



- 1 Powerful external machine controller which can profile up to 16 axes in tight coordinated motion and additional DSP 402 independent axes
- 2 HMI connected on CANopen
- 3 Distributed I/O on CANopen from any drive
- 4 Additional line shaft encoders can be connected to MotiFlex drives or motion controller
- 5 MicroFlex e100 drive axes on Powerlink
- 6 PLC or other controller
- 7 Fieldbus module installed in one or more MotiFlex e100 drives to provide

Fieldbus modules used to application data exchange between a real-time Ethernet motion control system and a 3rd party device such as embedded controller or PLC.



## › Fieldbus Modules



- › Field fittable, plug-in modules
- › Physics and connectors match the relevant Fieldbus standard
- › Access to drive object dictionary
- › Powerlink to Fieldbus data exchange
- › Operation in top slot of MotiFlex e100

### Application notes

- › Fieldbus modules provide a means of application data exchange between the Baldor systems and other control systems. This provides a simple and consistent interface method independent of fieldbus type. Ideal for OEM's designing machines with different end user systems to integrate with such as PLCs
- › Fieldbus functionality and performance varies with each module type and fieldbus specific features
- › Additional modules are in preparation Contact your sales office if your specific requirement is not listed

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	Fieldbus	Features
Ethernet Based	Ethernet/IP	› CIP Parameter Object Support
		› Explicit and implicit messaging
		› Transformer isolated Ethernet interface 10/100 Mbit/s full duplex
	PROFINET IO	› PROFINET IO conformance class A
		› Transformer isolated interface 100 Mbit/s full duplex Ethernet
	Modbus/TCP	› Coil/bit/register, single and multiple read/write access via process data
		› Transformer isolated interface 100 Mbit/s full duplex Ethernet
	EtherCAT	› EtherCAT node- supporting CANopen PDO and SDO communication objects
		› 100 Mbit/s full duplex with dual RJ-45 connectors
Traditional Fieldbus	DeviceNet	› CIP Parameter Object support
		› Explicit messaging support
		› Galvanically isolated interface with auto baud rate detection 125 - 500 kbit/s
		› Change-of-state / Cyclic I/O / Polled I/O, Bit-strobed I/O, Explicit messaging
	PROFIBUS DP	› Profibus-DP/DPV1 slave
		› Additional acyclic parameter data
		› Supports master class 1 & class 2 access
		› Galvanically isolated Profibus interface with auto baud rate detection 9.6 kbit/s - 12 Mbit/s
	Modbus RTU	› Modbus-RTU slave
		› Galvanically isolated Modbus RTU interface (RS-232/485) with baud rates 1.2 - 115.2 kbit/s
	Notes	<p>The fieldbus interface supports exchange of up to 64 process data values in each direction (read and write), dependant on system configuration and limitations of some specific networks. Refer to technical documentation for more details.</p> <p>For a fieldbus not listed please enquire with your local sales office or visit <a href="http://www.baldormotion.com">www.baldormotion.com</a></p>

# DC Shared Operation

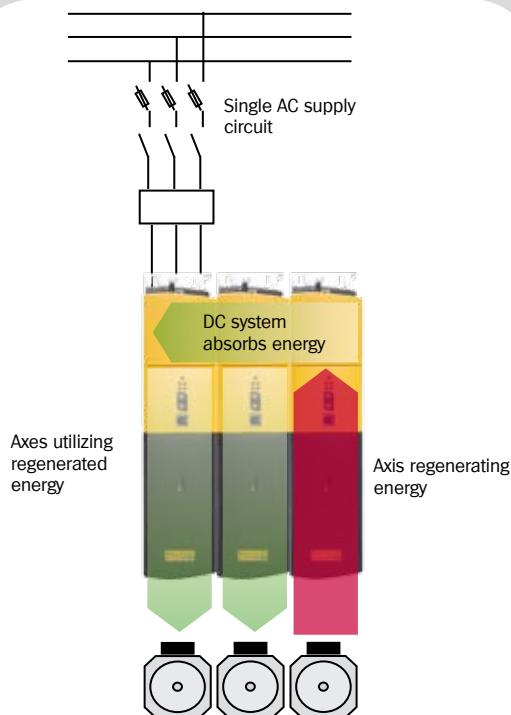
## Energy Efficient Design

As energy costs rise, efficiency of machine operation becomes an increasingly critical measure of modern machine design. Energy generated by axes during braking, or load driven operations is often wasted as heat in regeneration resistors. The simplest and most cost effective solution is allowing other drives to consume the energy. All MotiFlex drives include the ability to share DC energy as standard and more uniquely are able to provide power to other drives. Each MotiFlex drive can convert power from the AC supply to share with other drives, eliminating the need for separate power supplies.

### Installation Cost Savings

MotiFlex DC shared systems reduce the number of line side components such as contactors, circuit breakers, fuses and cabling, reducing cost, simplifying design and inherently improving reliability through reduction of components and complexity.

The ability to power other drives eliminates the need for a separate DC power supply in many applications, further reducing system costs. And where required, a single regenerative resistor can be added to provide any occasional or safety margin power dissipation requirements



### Shared DC Bus Benefits

- › Installation cost savings
- › Fewer AC side components such as contactors, fuses or circuit breakers
- › Less cabling, connectors, terminals, and other components
- › Reduced design time
- › Simplified build and reduced wiring time
- › Lower component count and inventory
- › Lower energy costs
- › Reduced panel heating
- › Reduced panel space
- › Higher reliability through reduced complexity
- › Improved 'ride-through' capability
- › Shared energy reserve and braking capacity

- › Energy generated by any axis is absorbed and used by the system, reducing energy wasted as heat. The potential need for braking resistors is therefore greatly reduced.



- › A simple and robust DC bus connection system is integrated into each drive. The links can be easily installed by opening the DC bus bar cover on the top of the drive, which is screw locked for additional security and safety. This approach is inherently less costly and more reliable than proprietary backplane approaches.

## Energy Savings for the Life of the Machine

Energy costs are rising and machine efficiency is now a key challenge for modern machine designers. A simple but effective DC shared bus scheme, means that the benefits of single AC supply system and the machine lifetime energy savings, can be employed in a greater number of applications. DC bus systems usually become cost effective for typically 5 axes or more. MotiFlex however, has been designed to offer cost effective DC sharing from 2 axes and above.

## Intelligent DC Bus Pre-Charge Control

Inrush current can be problematic, causing troublesome fuse trips. This often leads to over sized fusing, contactors and cabling to compensate. Each MotiFlex drive features an intelligent pre-charge system. Powered from AC, in stand-alone operation, or as a shared DC system, the pre-charge is active in all drives. This reduces the peak charging currents preventing fuse failure and inherently reducing stress on capacitors, increasing the operational life of the drives.

## Determining Power Requirements

The optimum method to analyzing the system power requirements is by developing a power flow analysis. This can be done by calculating power against time for each axis for a complete machine cycle. This will provide peak (overload) power usages, average power usage and any regenerative energy cycles for each axis. By summing these individual axis graphs it is then possible to determine the power supply requirement of continuous and overload requirements and sizing of regenerative braking resistors.

# Motor Solutions

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Baldor has been manufacturing and supplying high performance servo motor solutions to worldwide applications for over 2 decades, and AC motors for almost a century.

BSM Servo Motors



## Rotary Brushless Servo Motors

- › 0.4 Nm (4 lbin) through to 134 Nm (1,185 lbin).
- › High dynamic N series for high acceleration / high duty
- › High inertia C Series where inertia matching is critical
- › Stainless range available for wash-down applications

Linear Motors & Stages



## Linear Motors and Stages

- › Brushless servo (cog free)
- › Brushless Iron core
- › AC Induction linear
- › Linear Steppers
- › 2 axis linear stepper platens
- › Choice of feedback devices and bearing solutions
- › Single bearing stages
- › Extruded stages

AC Vector Motors & Inverter Drives



## AC Vector Motors

- › 0.75 kW to 375 kW (1 Hp to 500 Hp)
- › Washdown versions available
- › Encoder options available

## VS1 Drives

- › Single and three phase inverter / vector drives
- › Keypad configuration

Expansion via 2 Option Slots

## › Drive Current Ratings

Size A Drives		MFE460A001B		MFE460A003B		MFE460A006B		MFE460A010B		MFE460A016B	
Overload Mode	PWM	Continuous A <sub>rms</sub>	Overload A <sub>rms</sub>	Continuous A <sub>rms</sub>	Overload A <sub>rms</sub>	Continuous A <sub>rms</sub>	Overload A <sub>rms</sub>	Continuous A <sub>rms</sub>	Overload A <sub>rms</sub>	Continuous A <sub>rms</sub>	Overload A <sub>rms</sub>
300% for 3 Seconds	4kHz	1.15	3.45	2.75	8.25	5	15	8	24	12	36
	8kHz	1.15	3.45	2.75	8.25	4.5	13.5	7.33	22	12	36
	16kHz	1.15	3.45	2.7	8.1	3	9	5	15	8.5	25.5
200% for 3 Seconds	4kHz	1.75	3.4	4	8	7.5	15	12	24	18	36
	8kHz	1.5	3	3	6	6	12	10.5	21	16	32
	16kHz	1.5	3	3	6	4	8	7.5	15	10	20
150% for 60 Seconds	4kHz	2.2	3.3	5	7.5	9	13.5	16	24	20	30
	8kHz	2	3	3.8	5.7	7	10.5	13	19.5	16	24
	16kHz	2	3	3.8	5.7	5	7.5	8.5	12.75	9	13.5
110% for 60 Seconds	4kHz	3	3.3	5.5	6.05	10	11	18.5	20.35	22	24.2
	8kHz	2.7	2.97	4.5	4.95	8	8.8	15	16.5	17	18.7
	16kHz	2.7	2.97	4.5	4.95	5.5	6.06	9.5	10.45	10	11
Notes	Nominal drive ratings shown in red, are based on 200% overload at 45°C (113°F)										

## › DC Power Data

415VAC 50/60Hz Operation		MFE460A001		MFE460A003		MFE460A006		MFE460A010		MFE460A016	
Temperature	Power Supply Overload	3sec	60sec	3sec	60sec	3sec	60sec	3sec	60sec	3sec	60sec
45°C (113°F)	Continuous AC Supply Current (rms)	10A		10A		14A		18A		20A	
	Power Supply to DC Bus (continuous) <sup>(4)</sup>	5.8kW		5.8kW		8.05kW		10.35kW		11.5kW	
	Power supply to DC Bus (Overload) <sup>(4)</sup>	9.6kW	7.8kW	9.6kW	7.8kW	12kW	9.8kW	22kW	16.6kW	25.7kW	20.2kW
	Motor Power Output (415v 0.7PF)	0.75kW		1.5kW		3kW		5.28kW		8kW	
55°C (131°F)	AC Supply Current (rms)	7.5A		7.5A		8.4A		15A		17.5A	
	Power Supply to DC Bus (continuous) <sup>(4)</sup>	4.35kW		4.35kW		4.83kW		8.63kW		10kW	
	Power supply to DC Bus (Overload) <sup>(4)</sup>	9.6kW	7.8kW	9.6kW	7.8kW	12kW	9.8kW	22kW	16.6kW	25.7kW	20.2kW
	Motor Power Output (415v 0.7PF)	560W		600W		1.65kW		3.2kW		5.2kW	
Supply Conditions	Voltage / Line Reactor / Power Factor (PF)	415VAC 1.2mH line reactor 0.81PF		415VAC 1.2mH line reactor 0.81PF		415VAC 1.2mH line reactor 0.85PF		415VAC 0.8mH line reactor 0.85PF		415VAC 0.8mH line reactor 0.8PF	
Notes	Ratings shown are nominal based on 8kHz PWM with 200% overload unless otherwise stated refer to technical manual for complete rating information										

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# MotiFlex Rating Data

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Size B Drives		MFE460A021B		MFE460A026B		MFE460A033B	
Overload Mode	PWM	Continuous A <sub>rms</sub>	Overload A <sub>rms</sub>	Continuous A <sub>rms</sub>	Overload A <sub>rms</sub>	Continuous A <sub>rms</sub>	Overload A <sub>rms</sub>
300% for 3 Seconds	4kHz	17	51	20	60	24.5	73.5
	8kHz	15	45	19	57	19	57
	16kHz	10	30	12.5	27.5	-	-
200% for 3 Seconds	4kHz	24	48	29	58	33.5	67
	8kHz	21	42	26	52	26	52
	16kHz	14	28	12.5	25	-	-
150% for 60 Seconds	4kHz	25	37.5	29	43.5	33.5	50.25
	8kHz	23	34.5	26	39	26	33
	16kHz	14	21	12.5	18.75	-	-
110% for 60 Seconds	4kHz	25	27.5	29	31.9	33.5	36.85
	8kHz	23	25.3	26	28.6	26	28.6
	16kHz	15	16.5	12.5	13.75	-	-
Notes	Nominal drive ratings shown in red, are based on 200% overload at 45°C (113°F)						

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Regeneration Resistor Ratings								
Drive Type	Size A					Size B		
	MFE460A001B	MFE460A003B	MFE460A006B	MFE460A010B	MFE460A016B	MFE460A021B	MFE460A026B	MFE460A033B
Switching Thresholds	800VDC(on)					775VDC (off)		
Switching Current (Max)	13.3A <sub>PK</sub>			24.2A <sub>PK</sub>		53.3A <sub>PK</sub>		
Resistance <sup>(1)</sup> (10% Duty)	60Ω			33Ω		15Ω		
Resistance <sup>(2)</sup> 100% Duty	150Ω			68Ω		60Ω		
Peak Power <sup>(1)</sup> (10% Duty)	10.7kW			19.4kW		42.7kW		
Rated Power <sup>(2)</sup> (100% duty)	4.2kW			9.4kW		10.7kW		
(1) 10% duty ratings are based on absolute minimum resistance value.								
(2) For drives connected in DC bused shared operation, use the 100% duty rating and resistors.								

415VAC 50/60Hz Operation		MFE460A021		MFE460A026		MFE460A033	
Temperature	Power Supply Overload	3sec	60sec	3sec	60sec	3sec	60sec
45°C (113°F)	Continuous AC Supply Current (rms) <sup>(3)</sup>	30A	26A	35A	28A	40A	34A
	Power Supply to DC Bus (continuous) <sup>(4)</sup>	18.3kW	15.9kW	21.3kW	17.1kW	24.4kW	20.7kW
	Power supply to DC Bus (Overload) <sup>(4)</sup>	36.6kW	23.8kW	42.7kW	25.6kW	48.8kW	31.1kW
	Motor Power Output (415v 0.7PF)	10.5kW		13kW		16.9kW	
55°C (131°F)	AC Supply Current (rms)	21A	18.2A	24.5A	19.6A	28A	23.8A
	Power Supply to DC Bus (continuous) <sup>(4)</sup>	12.8kW	11.1kW	14.9kW	11.9kW	17kW	14.5kW
	Power supply to DC Bus (Overload) <sup>(4)</sup>	36.6kW	23.8kW	42.7kW	25.6kW	48.8kW	31.1kW
	Motor Power Output (415v 0.7PF)	6.8kW		6.5kW		8.45kW	
Supply Conditions	Voltage / Line Reactor / Power Factor (PF)	415VAC 0.5mH line reactor 0.85PF		415VAC 0.5mH line reactor 0.85PF		415VAC 0.5mH line reactor 0.85PF	
Notes	Ratings shown are nominal based on 8kHz PWM with 200% overload unless otherwise stated refer to technical manual for complete rating information					(Ratings of 33A unit shown for 4kHz pwm).	

The rating information shown is provided as a guide for the nominal operating conditions of 45°C (113°F) on 415VAC supply. A detailed set of rating data can be found in the technical manuals. 55°C (131°F) derated information is also shown.

(3) The continuous AC current rating of size B drives is dependent on the drives overload operating mode (3 seconds or 60seconds).

(4) Power supplied to the DC bus is dependent on AC supply voltage and current. Figures shown assume V<sub>supply</sub> 415VAC

# Ordering Information

## MotiFlex® e100

Package Size	Catalog Number	Nominal Current	Description
Size A	MFE460A001B	1.5A	MotiFlex e100 AC servo/ vector drives with DC sharing capability, integrated Ethernet technology and modular expansion.
	MFE460A003B	3A	
	MFE460A006B	6A	
	MFE460A010B	10.5A	
	MFE460A016B	16A	
Size B	MFE460A021B	21A	
	MFE460A026B	26A	
	MFE460A033B	33.5A	

Refer to technical manual for more detailed rating information

## Option Cards

Catalog Number	Description
OPT-MF-001	Analog I/O +10V 16bit 4 inputs / 4 outputs differential operation 1mS sampling rate
OPT-MF-005	Digital I/O 12-24V 6 digital inputs / 4 digital outputs
OPT-MF-011	Encoder 5V Line receiver with Halls. Simulated encoder output with selectable encoder output ppr scaling
OPT-MF-013	Resolver input 12/14bit resolution. Simulated encoder output with selectable encoder output ppr scaling

Note resolver option card must be fitted in the lower option slot

## Programmable Options

OPT-MF-100	Dual axis (drive) control + 1 analog axis interface. Digital and analog IO, 5V incremental Encoder input.
OPT-MF-101	Multiaxis control 4 EPL axes + 1 analog axis interface. Digital and analog IO, 5V incremental line receiver Encoder input.

## Fieldbus Options

Fieldbus gateway modules provide a means to communicate between an e100 system and a 3rd party controller such as a PLC.

OPT-MF-030	Fieldbus Carrier Card (required for all fieldbus options)
OPT-FB-001	DeviceNet
OPT-FB-002	Profibus DP
OPT-FB-003	Modbus RTU
OPT-FB-004	EthernetIP
OPT-FB-005	ModbusTCP
OPT-FB-006	ProfiNet IO
OPT-FB-007	CCLink

## Cable Management Brackets

Catalog Number	To Fit Drive Size	Description
OPT-CM-001	A / B	AC power / motor power brackets + clamps
OPT-CM-002	A	Signal and feedback bracket + cable clamps
OPT-CM-003	B	Signal and feedback bracket + cable clamps

## DC Bus Bars

Catalog Number	To Fit	Description
OPT-MF-DC-A	Size A	Pack of 2 links for drives 1.5A to 16A
OPT-MF-DC-B	Size B	Pack of 2 links for drives 20A to 34A

## EMC Filters

Catalog Number	Current rating rms	Voltage
FI0035A00	8A	3 x 520VAC
FI0035A01	16A	3 x 520VAC
FI0035A02	25A	3 x 520VAC
FI0035A03	36A	3 x 520VAC
FI0035A04	50A	3 x 520VAC
FI0035A05	66A	3 x 520VAC

All filters meet EN61800-3 Drives Standard.

FI0014A00	16A	Optional EMC Filter for 24V Supply
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## Line Reactors

Catalog Number	Inductance	Description
LRAC00802	3mH	1.5A or 3A units operating stand alone on poor quality AC supply
LRAC02502	1.2mH	6A to 16A units operating stand alone on poor quality AC supply 1.5A to 6A units in DC shared systems
LRAC03502	0.8mH	10.5A and 16A units DC shared systems
LRAC05502	0.5mH	21A, 26A and 33.5 A units DC shared systems

Line reactors for DC shared systems or operation on poor quality AC supplies. Refer to the technical manual for more information

## MotiFlex Braking Resistors

Catalog Number	Rating	Single Drive	DC Shared or Duty >0.2	MotiFlex Cat Nr.
RGJ160	100W 60 Ohm	60 Ohm	150 Ohm	MFE460A001
RGJ260	200W 60 Ohm			MFE460A003
RGJ360	300W 60 Ohm			
RGJ1150	100W 150 Ohm			MFE460A006
RGJ2150	200W 150 Ohm			
RGJ3150	300W 150 Ohm	33 Ohm	68 Ohm	MFE460A010
RGJ533	500W 33 Ohm			MFE460A016
RGJ368	300W 68 Ohm			MFE460A021
RGJ515	500W 15 Ohm	15 Ohm	60 Ohm	MFE460A026
RGJ360	300W 60 Ohm			MFE460A033

Refer to the technical manual for more detailed sizing information

## NextMove® e100



Catalog Number	Description
<b>NXE100-16xxDB</b>	NextMove e100 - 8,12 or 16 Axis motion controller: Differential stepper outputs
<b>NXE100-16xxSB</b>	NextMove e100 - 8,12 or 16 Axis motion controller: Single ended open collector stepper outputs for use with DSM integrated stepper/driver motors

xx = 08, 12, or 16 for number of supported axes which can perform interpolated motion (e.g. circular or vectored moves). Additional DS402 in dependant axes can be added

## MicroFlex™ e100



Catalog Number	Nominal Current	Description
<b>MFE230A003B</b>	3A	MicroFlex e100 AC Servo Drive 105-230VAC 50/60Hz
<b>MFE230A006B</b>	6A	
<b>MFE230A009B</b>	9A	

## MicroFlex EMC Filters



Catalog Number	Current rating	Description
<b>FI0029A00</b>	22A	1 phase 250VAC Foot-mount filter
<b>FI0015A00</b>	6A	1 phase 250VAC
<b>FI0015A02</b>	12A	1 phase 250VAC
<b>FI0018A00</b>	7.7A	3 phase 230/480VAC
<b>FI0018A03</b>	17.5A	3 phase 230/480VAC
<b>FI0014A00</b>	16A	Optional EMC Filter for 24V Supply

## MicroFlex Braking Resistors



Catalog Number	Power rating	Description
<b>RG56</b>	44W	For use with 3A MicroFlex
<b>RG39</b>	100W	For use with 6A and 9A MicroFlex

## MicroFlex Fan Tray

Catalog Number	Description
<b>FAN001-24</b>	Additional cooling fan for nominal rms currents exceeding 4A or high ambient temperatures. See MicroFlex technical manual for more information.

## EPL Router



Catalog Number	Description
<b>OPT036-501</b>	Ethernet Powerlink Router enables controlled access from an external Ethernet network for purposes such as remote monitoring or maintenance, data exchange with MRP systems or PC equipment for visualization.

## Ethernet Powerlink Cat5e cables



Catalog Number	Description
<b>CBL002CM-EXS</b>	200mm (8") CAT5e Shielded RJ45 Ethernet Cable
<b>CBL005CM-EXS</b>	500mm (1.6ft) CAT5e Shielded RJ45 Ethernet Cable
<b>CBL010CM-EXS</b>	1m (3.2ft) CAT5e Shielded RJ45 Ethernet Cable
<b>CBL020CM-EXS</b>	2m (6.5ft) CAT5e Shielded RJ45 Ethernet Cable
<b>CBL050CM-EXS</b>	5m (16.3ft) CAT5e Shielded RJ45 Ethernet Cable
<b>CBL100CM-EXS</b>	10m (32.6ft) CAT5e Shielded RJ45 Ethernet Cable

## 24VDC Power Supply Units



Catalog Number	Description
<b>DR-75-24</b>	75W (3.2A) Din rail mount 24VDC power supply
<b>DR-120-24</b>	120W (5A) Din rail mount 24VDC power supply
<b>DRP-240-24</b>	240W (10A) Din rail mount 24VDC power supply

## System Cables



A range of cables, both pre-made and raw, are available. These include motor power cables, feedback cables and communication cables. Available in different lengths.

Further details can be found in the brochure BR1202-H

## Programmable HMI Panels



Baldor's programmable HMI range from simple text displays through to large color touch screen panels.

- › Text displays from 4x20 character displays to 8x40 with keyboard entry
- › Touch screen displays from mono 3.8" to color TFT 12.1"

All displays are programmable with an easy to use Windows tools **Refer to catalog BR1202-H for full information.**

## Baldor's Motion Solutions Catalogs

- BR1202-A** Motion Control Solutions
- BR1202-B** Mint<sup>®</sup> Software and Applications
- BR1202-C** NextMove Multi-Axis Motion Controllers
- BR1202-D** AC Servo Drives
- BR1202-E** AC Servo Motors
- BR1202-F** DC Servo Motors and Drives
- BR1202-G** Linear Motors and Stages
- BR1202-H** Motion Product Accessories
- BR1202-I** Real-Time Ethernet Motion Solutions

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