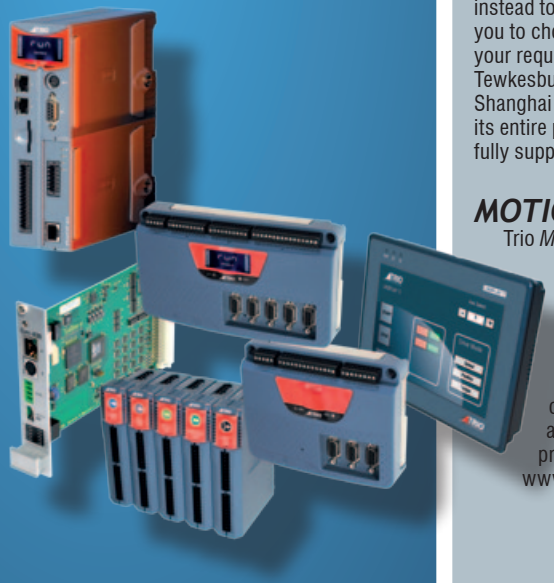
TRIO MOTION TECHNOLOGY

PRODUCT BROCHURE

BREATHING LIFE INTO MACHINES

MOTION COORDINATOR | I/O DEVICES | HMI | SOFTWARE

ABOUT TRIO



Trio Motion Technology provides a specialised source of high performance motion control technology. We manufacture flexible and economical solutions for motion control applications, enabling control of complex high speed automation and machine control in most industries throughout the world.

Trio Motion Technology has been manufacturing high-quality motion controllers branded "*Motion Coordinators*" since 1987 and has a comprehensive range that allows seamless control of 1 to 64 axes of servo motors, stepper motors, piezo motors or hydraulic systems. With over 100,000 *Motion Coordinators* in the field, Trio products can be found in virtually every servo and stepper application.

OUR APPROACH

Trio does not sell servo drives or motors; preferring instead to provide the interfaces required to enable you to choose motors and drives to best suit your requirements. With Trio support offices in Tewkesbury (UK), Pittsburgh (USA), Pune (India) and Shanghai (China), Trio Motion Technology supplies its entire product range worldwide via a network of fully supported distributors.

MOTION COORDINATORS

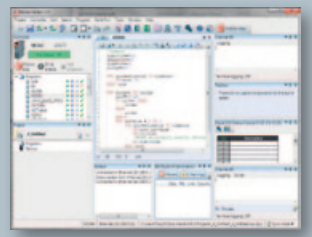
Trio *Motion* Technology's range of *Motion Coordinators*, Expansion Modules, I/O modules and HMI's are designed to enable the control of industrial machines with the minimum of external components. In many applications, Trio's range can be combined to build a control system capable of driving a multi axis machine and all its auxiliary equipment. Information of all our products may be found on our website at www.triomotion.com.

MANUFACTURE

Our manufacturing is done by carefully selected subcontractors, allowing us to quickly ramp up production to fulfil large orders. Trio purchases key component parts and provides kits to our subcontractors allowing us to control the quality of the components used. We aim to deliver most orders from stock. All our products are tested to international standards and the company holds ISO9001:2000 quality approval certification.

TRIO'S SOFTWARE

Trio has developed powerful software tools for use with every *Motion Coordinator*. These tools provide all the features necessary for setup, programming, cam profile generation, and CAD 2D path conversion.



TrioBASIC is a multi-tasking programming language used by the Trio's *Motion Coordinator* range. The IEC 61131-3 language and G-Code can also be utilised. This gives the option to use the most suitable language for your needs.

AN EXPERT IN MOTION

Trio has a dedicated in-house research and development team that designs controls as solutions for customer applications. Over the years we have introduced many innovations into the market.

Because of Trio's rich history of producing innovative motion products, it has become a source for other companies wishing to incorporate motion control technology into their products. Major automation companies either use Trio standard products as their control line, or have worked with Trio to design custom products exclusively for them.

TRAINING

We offer a 2-day introductory course based at any of our four main offices, designed to provide an overview of the *Motion Coordinator* product range and to give an introduction to programming using TrioBASIC.

The course is based upon practical worked examples of each topic covered to enable the attendees to gain some valuable hands-on experience of using *Motion* Perfect to develop applications.

For experienced programmers and customers requiring specialised or more advanced training we can tailor a course to suit your specific needs.

Whether you are curently using our products or considering them for the first time we want you to gain the most from selecting Trio as your motion control provider.

SOFTWARE

Powerful Software Tools

Trio has developed powerful software tools for use with every *Motion Coordinator*. These tools provide all the features necessary for setup, programming, cam profile generation, and CAD 2D path conversion to ensure minimum development time.

Multi-Tasking BASIC

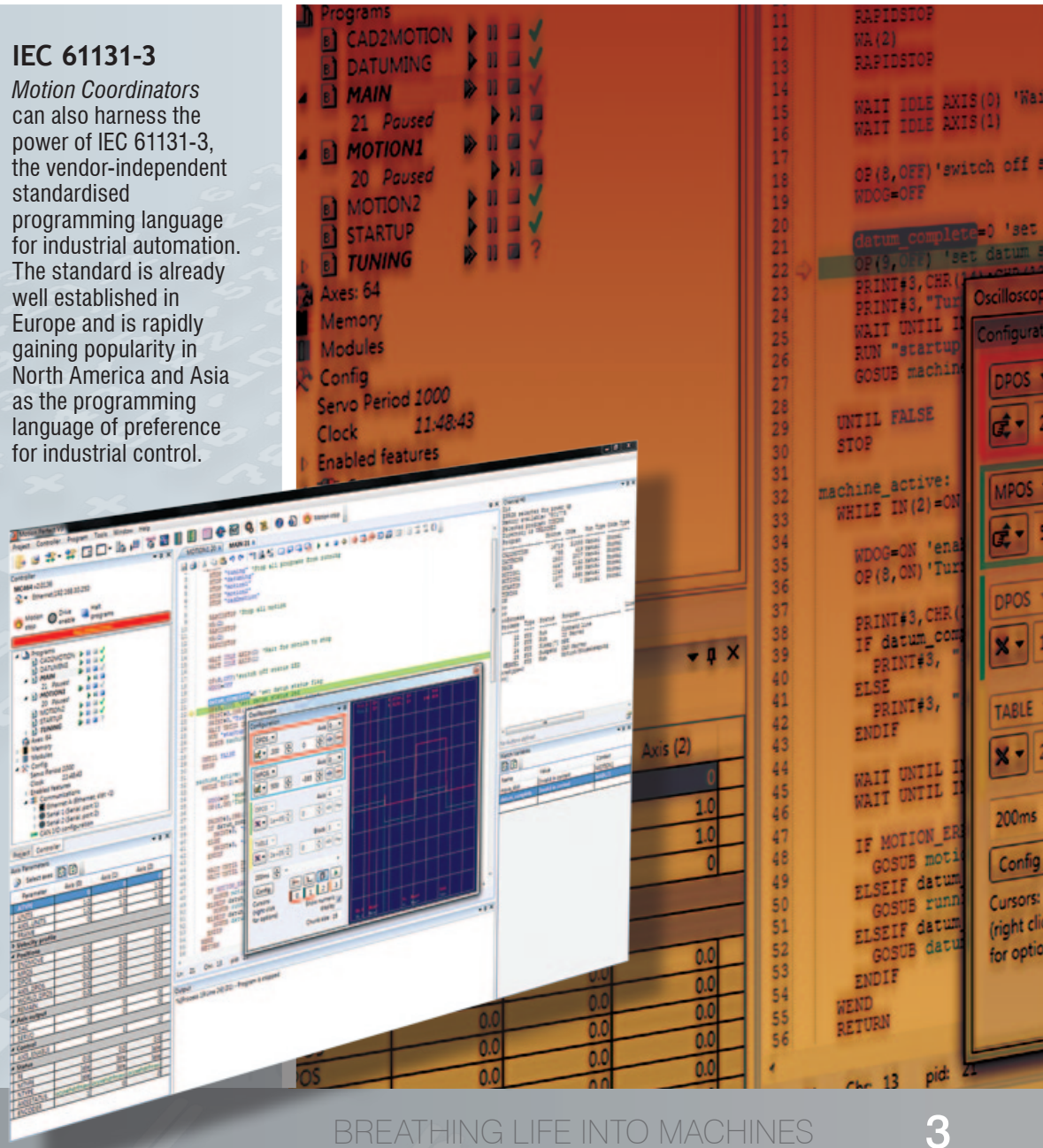
TrioBASIC is a multi-tasking programming language used by all the Trio *Motion Coordinator* range. The syntax is similar to that of other BASIC family languages. Multiple programs can be constructed and run simultaneously to make programming of complex applications much easier.

Motion Perfect v3

A PC running the Microsoft Windows™ operating system is used to develop and test the application programs which co-ordinate all the required motion and machine functions using Trio's *Motion* Perfect v3 software. *Motion* Perfect v3 provides all the editing and debugging functionality needed to write and debug applications written in TrioBASIC, all supported IEC languages, and G-Codes. The completed application does not require the PC in order to run.

IEC 61131-3

Motion Coordinators can also harness the power of IEC 61131-3, the vendor-independent standardised programming language for industrial automation. The standard is already well established in Europe and is rapidly gaining popularity in North America and Asia as the programming language of preference for industrial control.



TrioBASIC

TrioBASIC FEATURES

- Fast BASIC language for easy standalone machine programming
- Fully integrated with Trio's *Motion* Perfect application development software
- Comprehensive motion control functions for multiple axes
- Multi-tasking of multiple programs for improved software structure and maintenance
- Support for traditional servo or stepper axes as well as digital (EtherCAT, RTEX, Sercos, SLM.) axes
- A comprehensive set of move types supporting multiple axis coordination as well as simple single axis moves. This includes linear, circular and spherical interpolation as well as cam profiles and software gearboxes
- Real maths (up to 64 bit) including bit operators and variables
- Support for hardware position capture
- Support for high speed outputs

TrioBASIC is a multi-tasking programming language used by the Trio *Motion Coordinator* range. The syntax is similar to that of other BASIC family languages.

A PC with Microsoft Windows™ operating system running Trio's *Motion* Perfect v3 software is used to develop and test the application programs which coordinate all the required motion and machine functions. *Motion* Perfect v3 provides all editing and debugging functionality needed to write and debug applications written in TrioBASIC. The completed application does not require the PC in order to run.

One of the many strengths of TrioBASIC is that a program written for an entry level *Motion Coordinator* can be run, with only minimal modification on the highest performance *Motion Coordinator*. This portability extends even to users requiring upgrades for older *Motion Coordinators* where the core functions of a program written in TrioBASIC over a decade ago will still run on the latest hardware platforms.

Motion Profile Generation

Every *Motion Coordinator* includes a feature-rich *Motion* Profile Generator. This is the heart of the *Motion Coordinator* and allows axis speeds and accelerations to be set as well as accurately controlling the gearing during linked motion. All motion commands issued by either TrioBASIC or IEC 61131-3 programs run in the same known and repeatable way.

The target axis type, whether analogue servo, stepper or a digital axis, has no effect on the motion profile. This makes programming *Motion Coordinators* very predictable and gives consistent results no matter which programming system or axis type is used.

TrioBASIC Commands...

Multi-Tasking

At the heart of the *Motion Coordinator* is an efficient and highly reliable pre-emptive multi-tasking operating system. Application programs and system processes share the processor resources in a deterministic way.

BASIC Language

This familiar, easy-to-use but powerful language, has been the mainstay of motion programming for over three decades. The MC4 range extends the functionality while keeping compatibility with previous versions of TrioBASIC.

Motion

Every *Motion Coordinator* comes with an extensive library of Motion Functions. Intuitive commands like **`MOVE, MOVEABS, SPEED`** etc. allow first time users to quickly generate fully functioning motion programs.

Linked Motion

One of the strengths of the TrioBASIC motion language is the provision of accurate and repeatable functions for linking an axis to a master. The powerful set of commands gives life to a huge number of applications, such as flying shear, flow wrapper and conveyor synchronisation. **`MOVELINK, CAMBOX`** and **`FLEXLINK`** commands cover 99% of linked motion types.

Look-Ahead

Multi-axis interpolation often uses CAD/CAM data as the motion source. The Look-Ahead functions allow data from polylines to be buffered and handled in an intelligent way. Both constant speed for glue-laying, or corner speed control for cutting, allow an XY motion system to be tailored precisely to need.

3D Motion

In addition to linear, circular and helical interpolated moves, the *Motion Coordinator* MC4 range supports spherical moves and plane rotation in 3 dimensions. The 64 bit mathematics produces a dramatic improvement in accuracy and resolution when generating curves.

Robotics

The MC4 range opens up a new world of robotics and frame transformations. 2 and 3 axis Delta systems are programmed in familiar Cartesian coordinates while the complex axis position calculations are taken care of by the *Motion Coordinator*. Scara robots with up to 4 axes and articulated robots with up to 6 axes are also supported.

- Delta
- Parallel Link
- Scara
- Cartesian
- Anthropomorphic
- Single Belt 2 Axis
- Custom Kinematic Transformations

Communications

The speed and power of the BASIC language can be used to create protocol engines for RS232, RS485 and CANbus communications. Alternatively the growing number of built-in protocols can be configured by simply running the appropriate BASIC function.

Applications

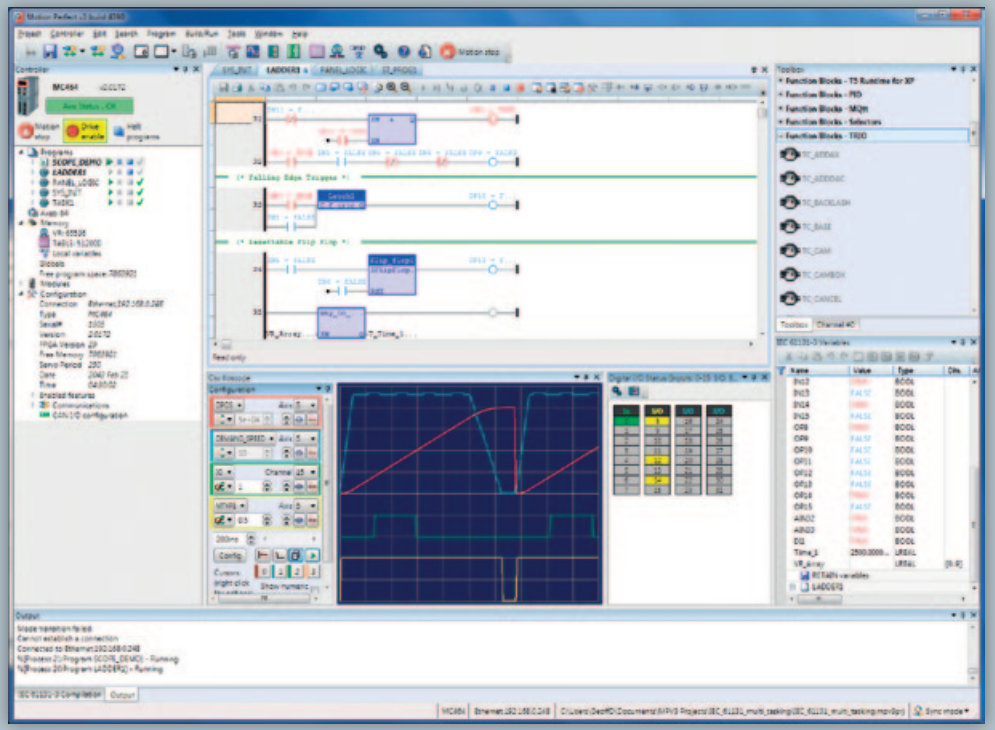
- Assembly
- Bending
- Carton Folding
- Coil wrapping
- Converting
- Cut to Length
- Entertainment
- Flow Wrapping
- Glue Laying
- Grinding
- Handling
- Inspection
- Labelling
- Packaging
- Retrofits
- Robotics
- Spark Erosion
- Stamping
- Testing
- Tufting
- Welding

Motion Perfect v3

Motion Perfect v3 is a Microsoft Windows™ based application for the PC, designed to be used in conjunction with Trio Motion Technology's *Motion Coordinator* MC4 range of multi-tasking motion controllers.

Motion Perfect v3 includes the MC400 Simulator program which allows offline programming.

Motion Perfect v3 is available as a **FREE** download from the Trio website:
www.triomotion.com

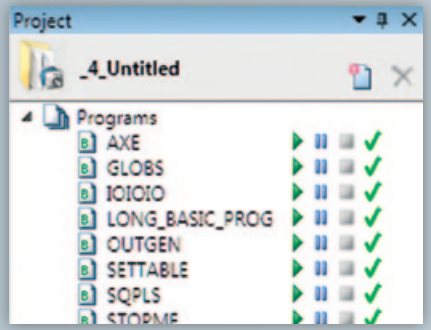


FEATURES

- **New clear connection modes**... MPv3 can connect to the *Motion Coordinator* MC4 range in Direct, Tool or Synchronous mode, allowing connection at a level that is appropriate to the operations needed.
- **Tree view of *Motion Coordinator* and Project**... See all the controller and project information in one place, via a familiar intuitive display.
- **Window docking**... Allows the user even more flexibility in how the *Motion* Perfect v3 desktop is laid out.
- **Improved program editor**... The TrioBASIC editor appears in a tabbed layout and includes enhanced breakpoint handling, NEW bookmarks, auto commenting and scope checking.
- **Support for IEC 61131-3 included**... The program editor can be used to create and edit IEC 61131-3 programs in Structured Text, Function Block, Sequential Function Chart and Ladder.
- **Enhanced Axis Parameter display**... Choose which parameter groups to display and which parameters to see live in a continuously updated window.
- **Improved data viewers**... The VR and TABLE viewers can be set to display non-contiguous data ranges and with auto-updating enabled will provide a live display of the values.
- **Real-time-clock synchronisation**... View the contents of the *Motion Coordinator*'s real-time clock (where fitted) and synchronise it with the PC clock at the touch of a button.
- **All-new project resolution dialogues**... When connecting to the *Motion Coordinator* a completely new set of windows will guide you through the process of synchronising the controller's project with the copy on the PC.
- **Support for multiple controllers**... View any number of controllers running from one instance of *Motion* Perfect v3
- **Fully integrated HMI support**...Design a complete graphical HMI interface within *Motion* Perfect v3 where buttons and fields can link to any system parameter or command.
- **Oscilloscope...** Increased ranges and parameters lists enables more data to be captured for analysis. X/Y display mode now available to check interpolated motion in 2d. Ability to plot Table points to the oscilloscope to check CAM profiles.

Motion Perfect v3

Motion Perfect Projects



One of the keys to using *Motion* Perfect v3 is its concept of a "Project". The project aids the application design and development process, by providing a disk based copy of the multiple controller programs, parameters and data required for a single motion application.

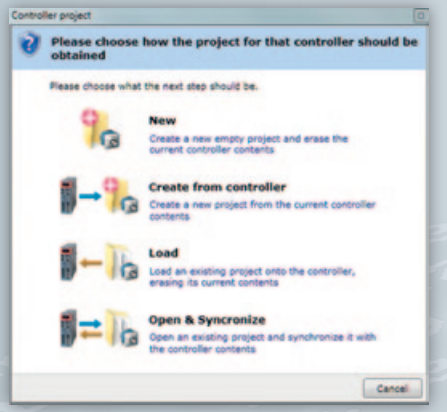
Once the user has defined a project, *Motion* Perfect v3 works behind the scenes automatically maintaining consistency between the programs on the controller and the files on the PC.

When creating or editing programs on the controller they are automatically duplicated on the PC which means you do not have to worry about loading or saving programs and you can be confident that next time you connect to a controller you will have the correct information on your PC. *Motion* Perfect v3 keeps multiple backup copies of the project in a sub folder, thus allowing the programmer to revert to a previous version.

HELP

Motion Perfect v3 comes with complete help files for Trio BASIC and the IEC programming libraries. Using the search function, or jumping to a help topic via the context sensitive help in the editor, the programmer has access to all the information from Trio's technical programming manuals. The help files are also rich in programming examples for many motion applications.

Project Manager



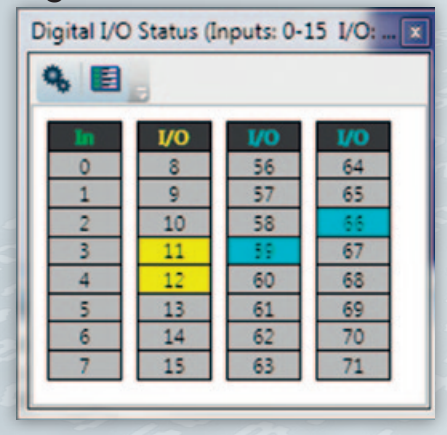
The multi-tasking capability of *Motion Coordinators* means there will often be a number of different program files associated with an application. In order to keep track of these multiple files and their associated data a major component of the *Motion* Perfect v3 environment is the project manager.

- Load and Save multiple programs as a single named project
- Simultaneous saving of program files to both the PC and the *Motion Coordinator*
- Verify that the contents of a controller match the project file on disk
- Load and Save controller variables and table memory to disk
- Automatically generate controller "Startup" configuration files
- Include BASIC, HMI and IEC 61131-3 programs in the same project

Axis Parameter Screen

- Spreadsheet style interface to monitor and set axis parameters
- Automatically updates real time parameters
- Support for all axis types (including virtual axes)
- Enhanced user configured axis display

Digital I/O Status

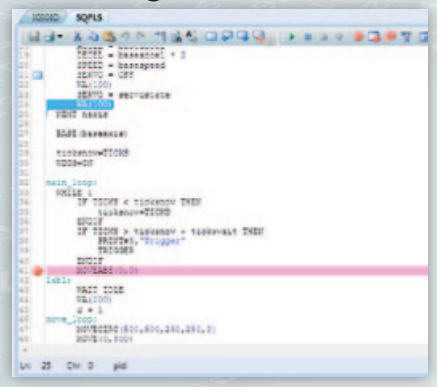


- Display status of all I/O Channels simultaneously
- Automatically configures to support all available I/O
- Set outputs with a mouse click
- I/O's can be named and saved in a Project

MC400 Simulator

The MC400 Simulator is a Microsoft Windows™ based application for the PC, designed to be used in conjunction with Trio Motion Technology's *Motion* Perfect v3 development software. It provides a software simulation of Trio Motion Technology's MC4 range of multi-tasking *Motion Coordinators*.

Basic Program Editor



- Simultaneously edits the controller program and a copy on disk - programs do not need to be downloaded after editing
- Windows style editor with Cut, Copy & Paste - information may be pasted between programs
- Edit multiple programs simultaneously
- Find & Replace
- Jump directly to any line number or program label
- View and edit programs while they are running
- Bookmark lines for easy access
- Offline editing with advanced MC400 simulator
- Immediate line tokenisation
- Context sensitive help
- Autocomplete suggestions and command line help menus
- Keyword assisted and parameter help
- Auto-formatting, colour-coded syntax to make editing and debugging easier

IEC 61131-3

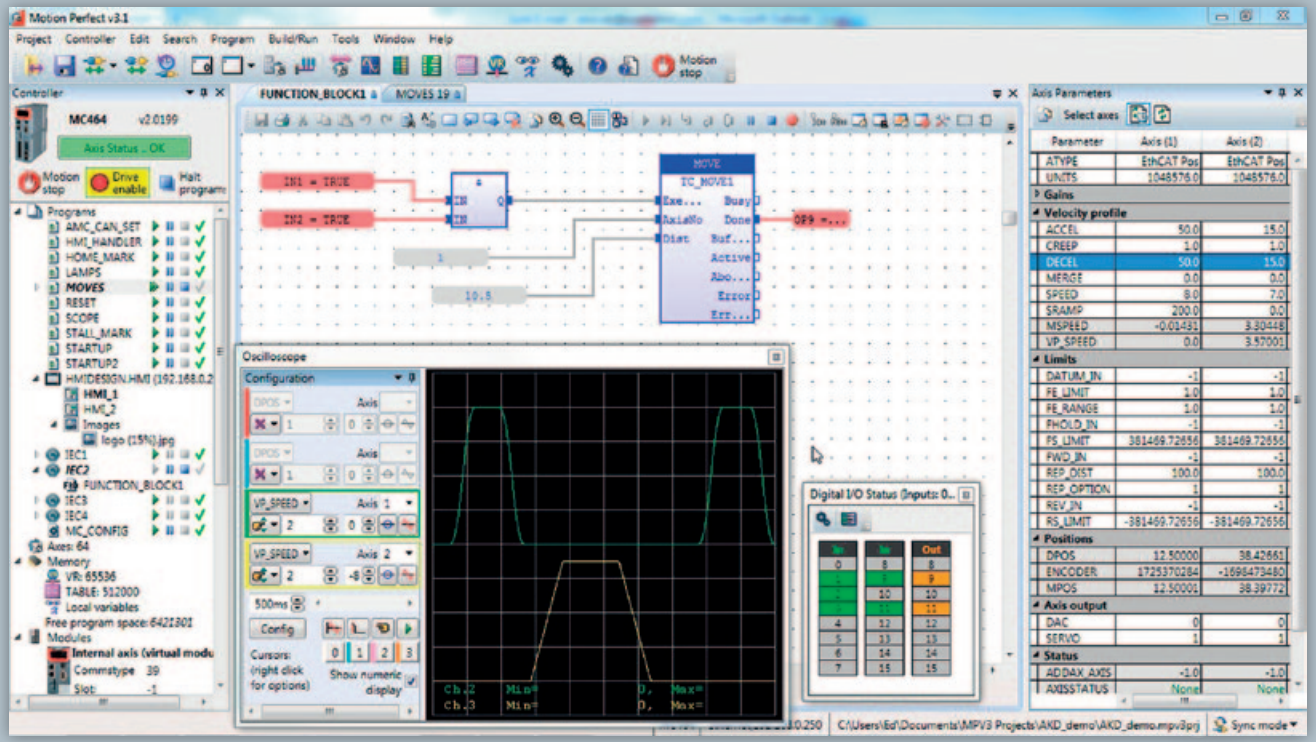
With IEC 61131-3, programming of PLCs, distributed control systems, and motion controllers from different manufacturers is more manageable. IEC 61131-3 is the third part of the open international standard IEC 61131 for programmable logic controllers, first published in 1993 by the IEC then later revised in 2003.

Trio's latest MC4 range of controllers support Ladder Diagram (LD), Function Block Diagram (FBD), Sequential Function Chart (SFC), and Structured Text (ST) programming methods in additional to TrioBASIC. Trio controllers utilize a runtime IEC kernel with added motion and parameter functions like cams, gearing, and interpolated motion. Machine control projects can now be programmed to best meet the needs of the application in a simple but powerful environment.

With the addition of IEC 1131-6 programming, Trio controllers are now equipped to be a more powerful motion and machine control system.

The Trio MC4 range allows multiple programs to run concurrently, eg. ST, LD and TrioBASIC, thus handling I/O and motion most efficiently.

IEC61131-3 is FREE on all MC4 *Motion Coordinators*.



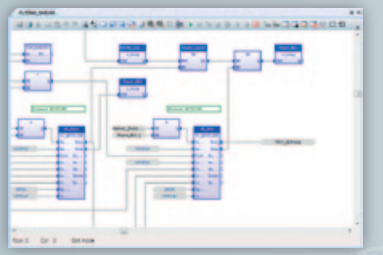
FEATURES

- Standard language can be used by any programmer who is already familiar with IEC 61131-3
- Choice of graphical or textual programming while attaining consistent results
- Visual interactive debugging information
- Real-time program execution
- Powerful and familiar Trio Motion function block library
- Program editor is built-in to *Motion* Perfect v3
- Multi-tasking operation with user selectable priorities

IEC 61131-3

Function Block Diagram (FBD)

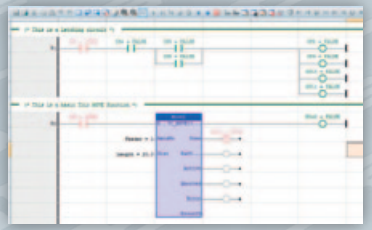
The FBD editor is a powerful graphic tool to edit and manage FBD diagrams according to the IEC 61131-3 standard. The function block concept is one of the most important features of the standard for supporting hierarchical software design. User functions blocks can be developed and then re-used in higher level programs.



The FBD editor supports advanced graphic features such as drag and drop, object resizing and connection line routing features, so that you can rapidly and freely arrange the elements of your diagram. It also enables you to directly insert in a FBD diagram graphic elements such as inputs, outputs, VR and TABLE data.

Ladder Diagram (LD)

The LD editor is a powerful graphical tool that enables you to enter and manage Ladder Diagrams according to the IEC 61131-3 standard. The editor enables quick input using the keyboard, and it supports advanced graphic features such as drag and drop.

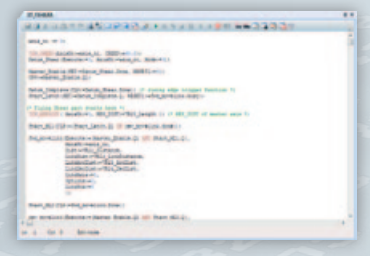


LD is probably the most widely recognised of the four supported methods because of its use in PLCs and its analogy to real world circuits. Programming in LD is best suited to applications where mostly binary variables are required and the interlocking and sequencing of digital IO points is the primary control requirement.

Direct access to all local and remote IO is provided as standard. Function blocks from the FB library can be included in the ladder program.

Structured Text (ST)

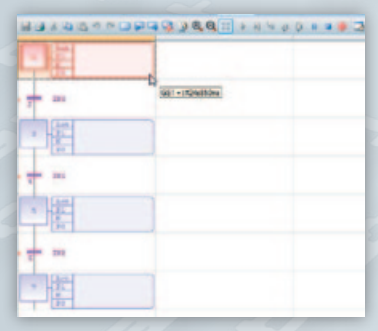
The ST editor is a dedicated editor supporting the Structured Text language of the IEC 61131-3 standard and has the following advanced features:



- Full syntax colouring
- “Intellisense” pop-up with Auto-completion
- Drag and drop of objects from toolbox
- Variable type and size assist
- View variable value in source code
- Tool tip with variable or function information

Sequential Function Chart (SFC)

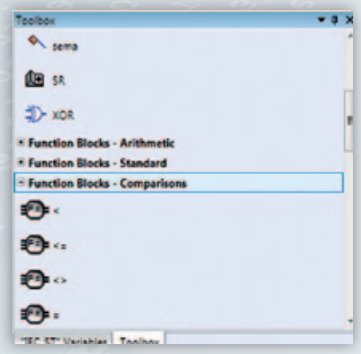
The SFC editor is a powerful graphical tool that enables you to enter and manage Sequential Function Chart programs according to the IEC 61131-3 standard.



The editor supports advanced graphic features such as drag and drop, so that you can rapidly and freely arrange the elements of your diagram. It also supports automatic chart formatting when inserting or deleting items and thus enables quick input using the keyboard.

Toolbox & variable definition

Motion Perfect v3 includes a toolbox with a set of IEC 61131-3 standard functions which can be included in all of the supported methods. Functions are simply dragged into the graphical or text editor window to become part of the program.



An interactive program variable definition window helps to keep track of all local and global variables in use. Variables can be bound to the *Motion Coordinator*’s inputs, outputs, VR and TABLE data. Use of these “super-global” variables allows the IEC programs to interact with programs written in BASIC and with the Uniplay HMI.

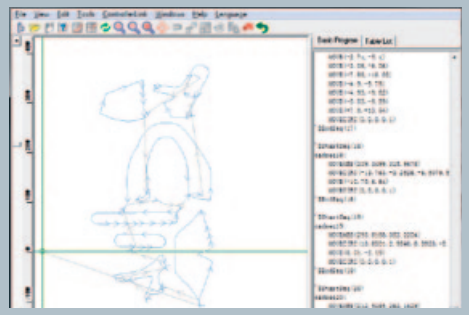
Motion Library

A library of all the motion functions in the *Motion Coordinator* is included with *Motion* Perfect v3. The motion library is in the toolbox so that functions like **`MOVE`**, **`MOVEABS`**, **`CAMBOX`** etc. are dragged into the program in the same way as the standard IEC functions. Motion functions in the IEC language run in axes in exactly the same way as they do from TrioBASIC.

The motion functions are powerful, well-structured and easy to learn. The consistent approach to motion within the *Motion Coordinator* means that programmers familiar with TrioBASIC have the added advantage that they can immediately recognise and start to use the functions.

Free Support Software

CAD2Motion

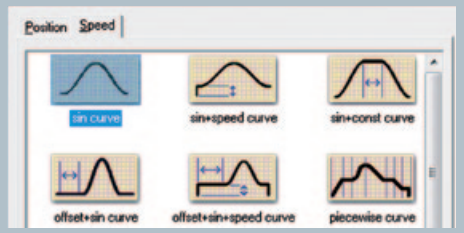


CAD2Motion is a program designed to allow users to translate CAD generated two dimensional motion paths into TrioBASIC programs.

The program allows the user to create motion paths in a CAD package such as AutoCAD and convert them into code executable by a Trio *Motion Coordinator*. Typically the path information will be drawn on a single layer in the CAD package and exported as a DXF file. The DXF file (layer with motion path only) is read into CAD2Motion to create a program to follow the motion path.

The motion path can be manipulated and edited before being saved as a TrioBASIC program file that can be loaded onto a Trio *Motion Coordinator*.

CamGen



CamGen is easy to use as the most commonly used cam shapes are pre-built, ready for you to enter the dimensions. Alternatively you can build shapes from tables of points and flexibly specify the shape in-between using curves and straight sections.

CamGen is so simple to use, you can import a set of points from Excel and build a smooth motion profile in a few minutes.

CamGen exports TABLE statements ready to paste into a *Motion Coordinator* TrioBASIC program. Or you can have more flexibility by using CamGen to write a TrioBASIC routine, which will build the cam shapes while your machine is running. CamGen even constructs example CAM and CAMBOX statements to put into your program.

Trio PCMotion

PCMotion is an ActiveX component allowing direct connection to the Trio *Motion Coordinator* from a custom user application. It can be used to control any of the *Motion Coordinator* functionality as well as send text files down to the controller.

PCMotion ActiveX runs a high speed dedicated communications protocol between the user application and the *Motion Coordinator*. It allows simple programming of user 'front end' software that can be "tailored" to the application.

PCMotion ActiveX can be used in any programming language that supports ActiveX (OCX) components such as any of the Microsoft Visual languages (BASIC, C#, C++, etc.), LabView, Delphi, etc.

Autoloader

A compact, self-contained package designed to allow simple distribution of projects written using *Motion* Perfect v3. Simply add the project to the Autoloader folder, edit a script file to provide control of the loading sequence and send to the customer. The Autoloader, complete with project files is small enough to distribute efficiently via email and the end user needs only minimal PC knowledge to complete the loading process.

MCLoader

Trio MCLoader is a Windows ActiveX control which can load projects (produced with *Motion* Perfect v3) and programs onto a Trio *Motion Coordinator*. Communication can be via Serial link, USB, Ethernet or PCI depending on the *Motion Coordinator*.

Similar to G-Code an HGPL parser can also be provided which reads the HGPL sequence line by line. A conversion program takes the HPGL commands like PR (plot relative), AA (arc absolute) and LT (line type) and performs the appropriate motion operation. Machine designers have access to the program and can change the actions performed to suit their application.

This flexible approach ensures that OEMs can maintain control over the machine specification and add differentiators to make them stand out in their market.

TextFileLoader

The TextFileLoader can load files into the controller memory or the SD card. This allows programs written in text based languages such as G-Code and HPGL to be loaded to the controller where they can be parsed and executed by a TrioBASIC program.

The transfer process is optimized to compress the file and reduce transfer times, or it can be set to stream the file into a FIFO buffer on the controller. This can help reduce overall machine cycle times when file sizes can be large.

G-Code & HGPL Programming

The Trio MC4 range of *Motion Coordinators* has the ability to save and read text files, operate FIFO buffer files and receive text data such as G-Code and HPGL. This text file handling allows TrioBASIC to process either pre-recorded files or stream information coming in real-time to a serial port or the Ethernet port. String handling functions in the TrioBASIC allow for simple parsing of any text based file.

Example G-Code parsing and dispatching programs can be made available, which can then be used as the basis for a machine development. The examples cover the use of many common codes controlling up to 3 axes. As the examples are all written in TrioBASIC they are fully adaptable by the machine builder or system programmer to suit custom mechanics or special functions.

Project Encryptor

Encrypt your project software inside the controller, allowing you to maintain any in house intellectual property and stay ahead of your competition.

The Project Encryptor is a utility that enables a programmer's intellectual property to be licenced to individual *Motion Coordinators*. A project is developed normally using *Motion* Perfect v3 and then encrypted.

Once encrypted the program is safe to distribute and can only be loaded to a controller with a correct key, which is unique to both the controller serial number or distributor code and source project.

The *Motion Coordinator* system is extremely modular, allowing the user to tailor the controller to their specific applications, this also allows the flexibility to incorporate new modules if the need should change, making the system “future proof”. Systems may be used with a stand alone program or alternatively commands can be sent from an external computer.

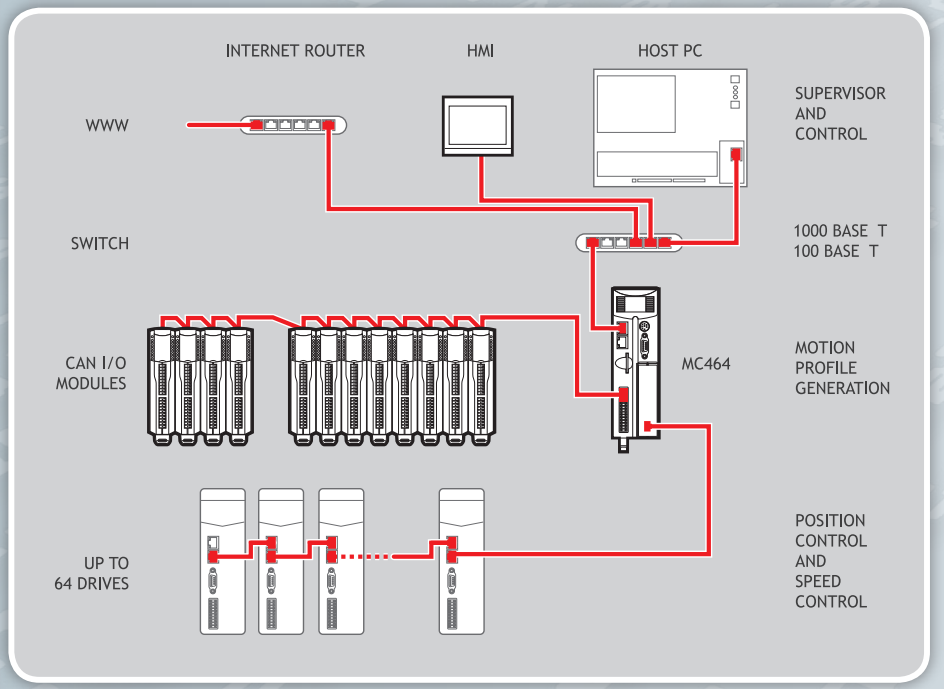
All *Motion Coordinators*, whether panel mount, rack mount, DIN-rail mount or a custom design format, incorporate a CANbus interface allowing digital or analogue I/O expansion with Trio’s I/O modules. Special I/O requirements can also be accommodated using the CANopen protocol to control third party I/O modules.

Trio’s UNIPLAY range of operator interfaces provide a robust and functional HMI using the Ethernet network. Third party HMI products, touchscreens, etc. can communicate to the *Motion Coordinator* via the Modbus-RTU serial protocol.

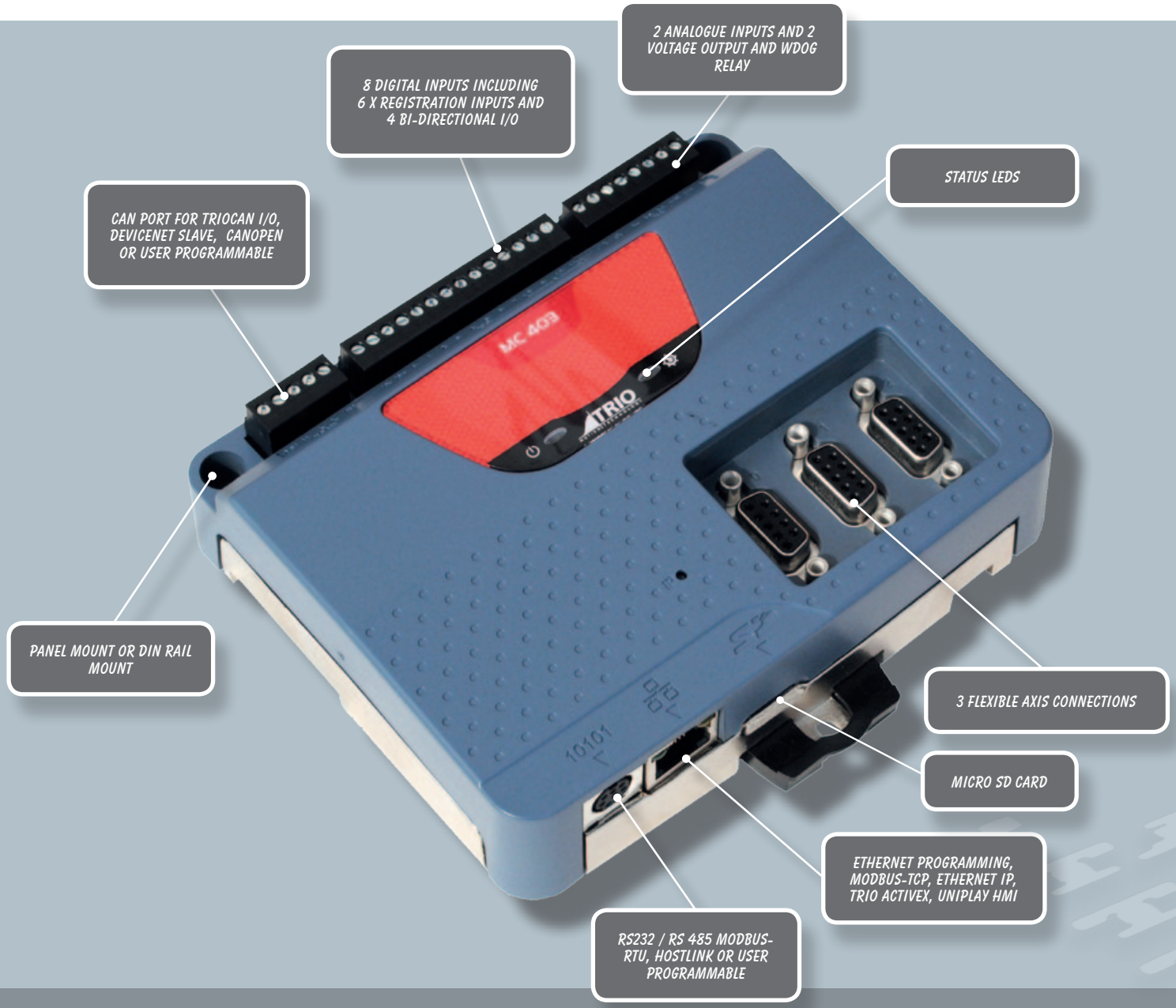
System Set-Up

The MC4 range includes advanced networking technology for connection to Digital Servos, CANbus and Factory Networks. Access to all parts of the system by network connections allows reduced down-time with automated fault reporting and analysis.

With an MC464 *Motion Coordinator*, it is possible to control a machine with up to 64 axes, 256 digital inputs, 256 digital outputs, 32 analogue inputs and 16 analogue outputs.



MC403 / MC403-Z



FEATURES

- Advanced 2 Axis Closed Loop Servo / 3 Axis Pulse Direction
- Linear, Circular, Helical and Spherical Interpolation
- Flexible CAM shapes, Linked Motion
- EnDAT and SSI Absolute Encoder Supported
- Hardware Linked Outputs for Camera / Laser Control
- Ethernet-IP / Modbus TCP / Ethernet Interface Built-In
- 125 – 2000μsec Selectable Servo Update
- Precise 64 bit Motion Calculations on ARM11 Processor with VFP
- EC 61131-3 Programming
- Multi-tasking BASIC Programming
- Text File Handling
- Robotic Transformations
- Micro SD Memory Card Slot
- CANopen I/O Expansion
- RoHS, UL and CE Approved

The MC403 is a high specification *Motion Coordinator* using a high performance ARM11 processor, with three flexible axis ports and two Voltage outputs.

The flexible axis ports can be configured in software as feedback devices or pulse direction outputs. As outputs they can be used as pulse and direction with stepper or servo drives or they can operate as a simulated encoder output. When configured as feedback they can be either incremental encoder input or one of three popular absolute encoder types; SSI, Tamagawa or Endat. Any feedback axis with a Voltage output can be used to form a closed loop servo.

The built-in Ethernet port allows programming and connection of common HMI and PLC protocols directly to the MC403. User programs can be written in Trio's established multi-tasking TrioBASIC language using the powerful *Motion* Perfect v3 application development software making complex motion easy. Also available as an option are the industry standard IEC 61131-3 languages allowing a fully functional PLC programming system.

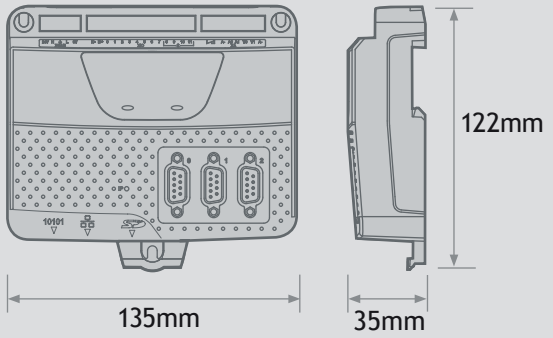
The MC403 is available in 2 model formats offering 5 different axis configurations. The entry level MC403-Z does not have a built-in DAC. All models feature a total of 8 axes in software. Any axes not assigned to built-in hardware can be used as a virtual axis. Every axis can be programmed to move using linear, circular, helical or spherical interpolation, electronic cams, linked axes and gearboxes.

Two LED's enable the controller status to be easily determined, whilst the single piece metal cast backplate provides an integrated earth chassis to improve noise rejection in the industrial environment.

ACCESSORIES:

P317 - P327	CAN Modules
P750	Kinematic Runtime FEC
P843 - P844	UNIPLAY 7" & 10" HMI's

OVERALL DIMENSIONS:

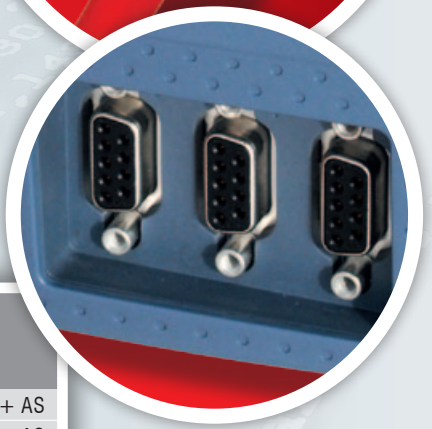


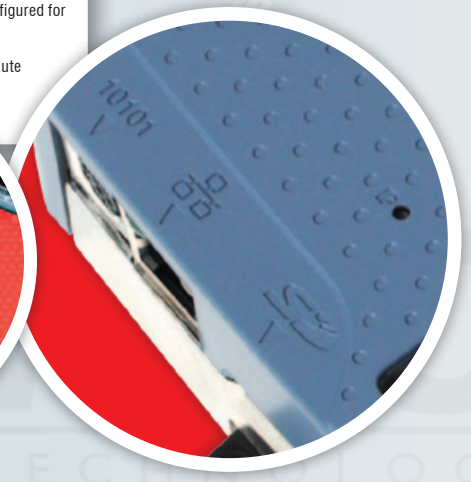
MC403-Z PRODUCT OPTIONS			MC403 PRODUCT OPTIONS		
	P821	P822	P825	P823	P824
Axis 0	Core	Core	Extended + AS	Core	Extended + AS
Axis 1	Core	Core		Core	Extended + AS
Axis 2		Extended	Core	Core	Extended

CORE AXES – can be configured in software as pulse and direction outputs to stepper or servo drives. They can also be configured for incremental encoder feedback or simulated encoder output.

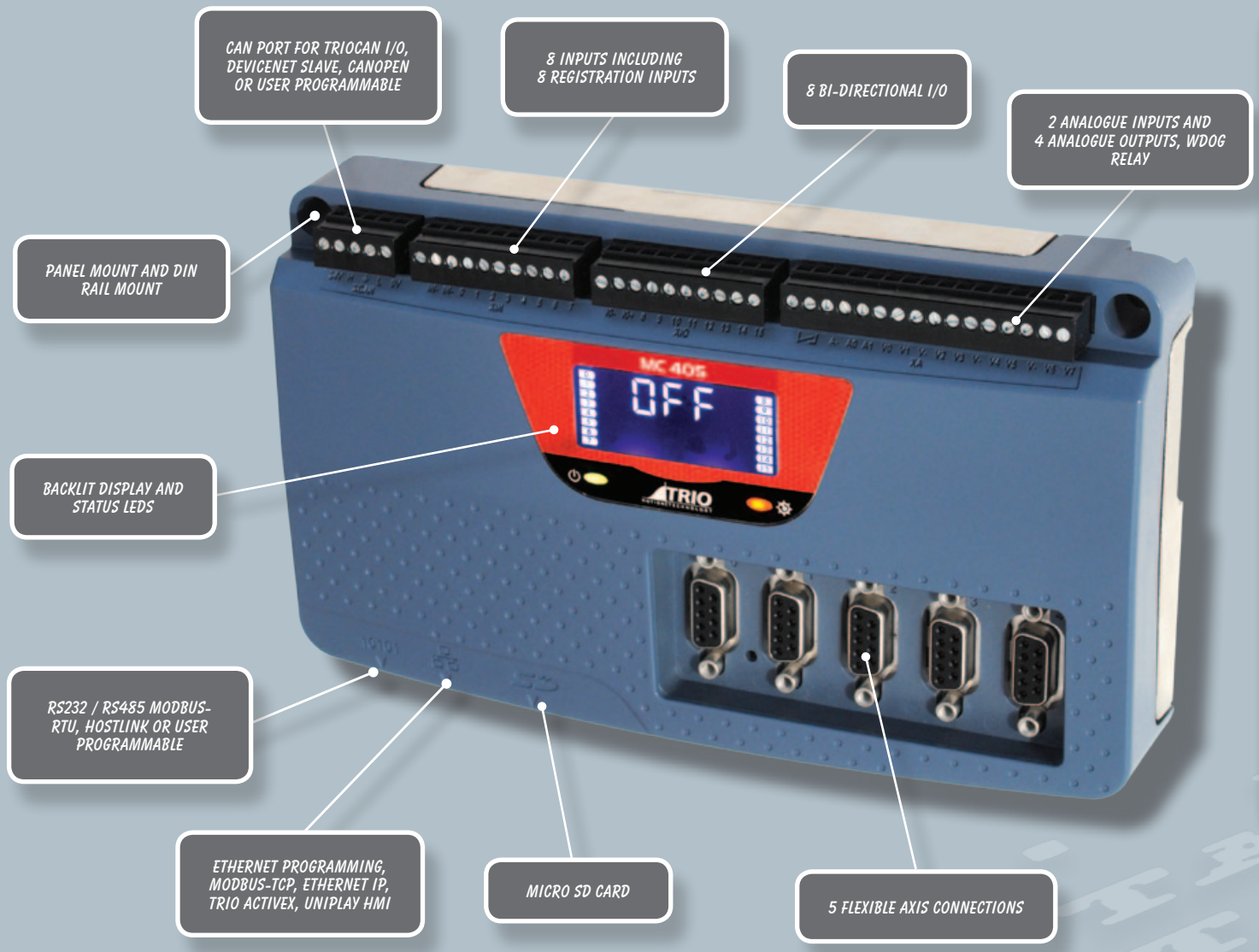
EXTENDED AXES – in addition to the Core functionality these axes can also be configured for SSI, Tamagawa or EnDat absolute encoders.

AS - Analogue 'closed loop' Servo using built-in ±10V analogue output.





MC405



FEATURES

- Advanced 4 Axis Closed Loop Servo / 5 Axis Pulse Direction
- Linear, Circular, Helical and Spherical Interpolation
- Flexible CAM shapes, Linked Motion
- EnDAT and SSI Absolute Encoder Supported
- Hardware Linked Outputs for Camera / Laser Control
- Ethernet-IP / Modbus TCP / Ethernet Interface Built-In
- 125 – 2000μsec Selectable Servo Update
- Precise 64 bit Motion Calculations on ARM11 Processor with VFP
- IEC 61131-3 Programming
- Multi-tasking BASIC Programming
- Text File Handling
- Robotic Transformations
- Micro SD Memory Card Slot
- CANopen I/O Expansion
- Backlit LCD Display
- RoHS, UL and CE Approved

The MC405 is a high specification *Motion Coordinator* using a high performance ARM11 processor, with five flexible axis ports and four Voltage outputs.

The flexible axis ports can be configured in software as feedback devices or pulse direction outputs. As outputs they can be used as pulse and direction with stepper or servo drives or they can operate as a simulated encoder output. When configured as feedback they can be either incremental encoder input or one of three popular absolute encoder types; SSI, Tamagawa or Endat. Any feedback axis with a voltage output can be used to form a closed loop servo.

The built-in Ethernet port allows programming and connection of common HMI and PLC protocols directly to the MC405. User programs can be written in Trio's established multi-tasking TrioBASIC language using the powerful *Motion* Perfect v3 application development software making complex motion easy. Also available are the industry standard IEC 61131-3 languages allowing a fully functional PLC programming system.

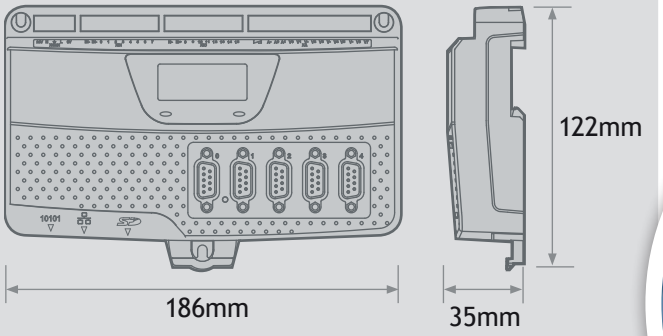
The MC405 is available in 2 different axis configurations. Both models feature a total of 16 axes in software. Any axes not assigned to built-in hardware can be used as a virtual axis. Every axis can be programmed to move using linear, circular, helical or spherical interpolation, electronic cams, linked axes and gearboxes.

A bright easy to read backlit display enables the controller status to be easily determined, whilst the single piece metal cast backplate provides an integrated earth chassis to improve noise rejection in the industrial environment.

ACCESSORIES:

P317 - P327	CAN Modules
P750	Kinematic Runtime FEC
P843 - P844	UNIPLAY 7" & 10" HMI's

OVERALL DIMENSIONS:



MC405 PRODUCT OPTIONS

	P826	P827
Axis 0	Core	Extended + AS
Axis 1	Core	Extended + AS
Axis 2	Core	Extended + AS
Axis 3	Core	Extended + AS
Axis 4	Core	Extended

CORE AXES – can be configured in software as pulse and direction outputs to stepper or servo drives. They can also be configured for incremental encoder feedback or simulated encoder output.

EXTENDED AXES – in addition to the Core functionality these axes can also be configured for SSI, Tamagawa or EnDat absolute encoders.

AS - Analogue 'closed loop' Servo using built-in ±10V analogue output.

MC464

FEATURES

- Up to 64 Digital Drive Axes
- Up to 25 Axes Conventional Servo/ Stepper
- EtherCAT, Sercos, SLM and RTEX Digital Drive Interfaces
- Linear, Circular, Helical and Spherical Interpolation
- Flexible CAM shapes, Linked Motion
- EnDAT and SSI Absolute Encoder Supported
- Hardware Linked Outputs for Camera / Laser Control
- Ethernet-IP / Modbus TCP / Ethernet Interface Built-In
- Precise 64Bit Motion Calculations with 400MHz MIPS Processor
- Anybus-CC Module for Flexible Factory Comms Including ProfiNet/ Profibus
- IEC 61131-3 Programming
- Multi-tasking BASIC Programming
- Text File Handling
- Robotic Transformations
- SD Memory Card Slot
- CANopen I/O Expansion
- Backlit LCD Display
- RoHS, UL and CE Approved

The MC464 is Trio's highest performance and most flexible *Motion Coordinator* and is based on the 64bit 400MHz MIPS processor making it ideal for high axis count machines or robotic applications.

The MC464 supports up to 64 axes of motion with 64 bit integer position registers for ultra precise axis resolution. Using expansion modules the MC464 supports up to 64 networked digital drives, 24 analogue servo drives, 24 pulse and direction drives and 64 absolute and incremental encoders in any combination.

The built-in Ethernet port allows programming and connection of common HMI and PLC protocols directly to the MC464. User programs can be written in Trio's established multi-tasking TrioBASIC language using the powerful *Motion* Perfect v3 application development software making complex motion easy. Also available as an option are the industry standard IEC 61131-3 languages allowing a fully functional PLC programming system.

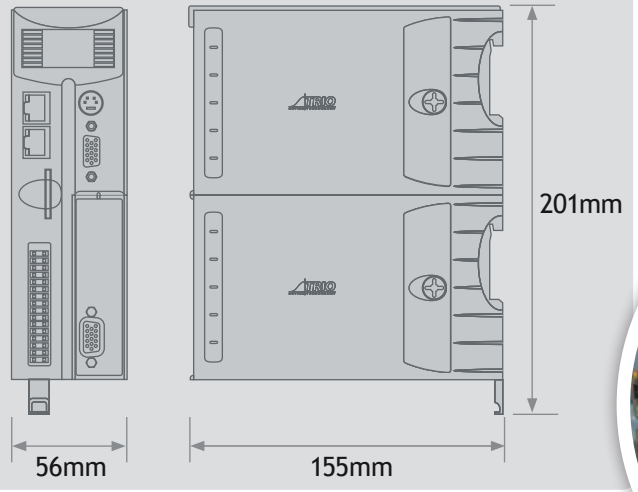
The MC464 features a total of 64 axes in software. Any axes not assigned to built-in hardware can be used as a virtual axis. Every axis can be programmed to move using linear, circular or helical or spherical interpolation, electronic cams, linked axes and gearboxes. The power of the controller allows for multiple robotic transformations to run simultaneously.

A bright easy to read backlit display enables the controller status to be easily determined, whilst the single piece metal cast backplate provides an integrated earth chassis to improve noise rejection in the industrial environment.

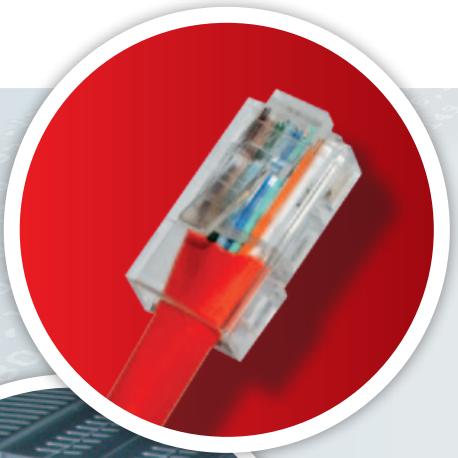
ACCESSORIES

P871	MC464 RTEX Interface
P872	MC464 Sercos Interface
P873	MC464 SLM Interface
P876	MC464 EtherCAT Interface
P879	MC464 FlexAxis 4 Interface
P874	MC464 FlexAxis 8 Interface
P381	MC464 FlexAxis Splitter Cable
P875	MC464 Anybus-CC Module
P878	MC464 Blanking Module
P701 - P732	Remote Axes FEC
P750	Kinematic Runtime FEC
P317 - P327	CAN Modules
P843 - P844	UNIPLAY 7" & 10" HMI's

OVERALL DIMENSIONS (INC EXPANSION MODULE)



MC464 PRODUCT CODE: P860



MC464 Expansion

Configure your application by connecting up to 7 half-height expansion modules or 3 full-height expansion modules.

Each module easily attaches to the controller with a high density bus connection and a uniquely designed screw integrates the earth planes of all modules and *Motion Coordinator* together. Trio's feature enable code system for axis activation allows the whole system to be scaled exactly to your requirements.

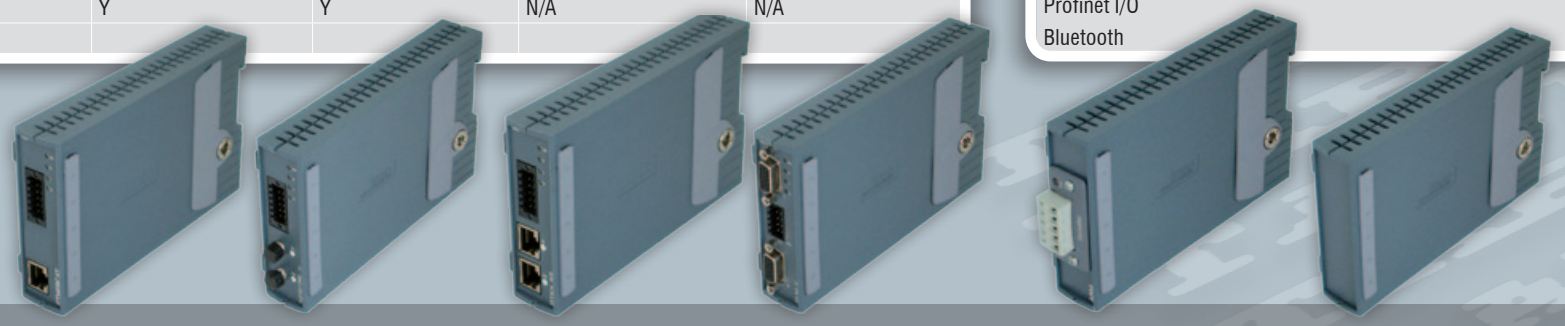
The P876, P872 and P871 all come equipped with two axes per module as standard. To add further axes, Feature Enable Codes can be purchased: P701, P702, P704, P708, P716 and P732 provide 1, 2, 4, 8, 16 and 32 axes.

MC464 EXPANSION OPTIONS

	P876	P872	P871	P873
Network	EtherCAT	Sercos	Panasonic (RTEX)	SLM
Network Speed	100Mbps	4, 8 or 16Mbps	100Mbps	SLM Standard
Topology	Chain	Ring	Ring	Star
Max Axes per Interface	64	16	32	6
Max Interfaces per MC464	7	7	7	7
Max Axes on MC464	64	64	64	42
Cable	STP Cat 5-e or better	Fibre Optic	STP Cat 5-e or better	RS485
Bus to MC464	32 Bit	32 Bit	32 Bit	32 Bit
Interpolated time based registration	8 x 24V Inputs	8 x 24V Inputs	8 x 24V Inputs	6 x 24V Inputs
Optically isolated registration inputs	Y	Y	Y	Y
Map any I/O to any Axis	Y	Y	Y	Y
Remote Registration	Y	Y	N/A	N/A

MC464 EXPANSION OPTIONS

P876	P878
CompactCom Modules...	Blanking module to ensure the system is "tied" together mechanically if there are any gaps in the build. There is no communication bus connection, but the P878 is required for the earth connection.
Profibus	
DeviceNet	
CANopen	
CC-Link	
EtherNet IP	
USB	
Modbus-TCP	
Modbus-RTU	
RS232	
RS485	
Profinet I/O	
Bluetooth	



MC464 Expansion

For use with Stepper, Analogue Servo and Piezo Motors with support available for SSI/Endat/Tamagawa Absolute encoders. Standard FlexAxis interface modules are available in 4 axis (P879) and 8 axis (P874) versions. An 8 axis SSI absolute encoder version (P881) is available as a special order.

P381 - Breakout cable to split the high density D-Type connectors to standard 9 way D type connectors.

MC464 EXPANSION OPTIONS

	P874	P879	P881
Axis 0	Core + AS	Core + AS	Core + SSI + AS
Axis 1	Core + AS	Core + AS	Core + SSI + AS
Axis 2	Core + AS	Extended + AS	Core + SSI + AS
Axis 3	Core + AS	Extended + AS	Core + SSI + AS
Axis 4	Extended + AS		Core + SSI + AS
Axis 5	Extended + AS		Core + SSI + AS
Axis 6	Extended + AS		Core + SSI + AS
Axis 7	Extended + AS		Core + SSI + AS
Max Interfaces per MC464	3	3	3
Max Axes on MC464	24	12	24
Connectors: Encoder	15pin HD D-type	15pin HD D-type	15pin HD D-type
Discrete Wiring	Removable terminal block	Removable terminal block	Removable terminal block
Bus to MC464	32 Bit	32 Bit	32 Bit
Registration Inputs*	Flexible registration on all axes	Flexible registration on all axes	Flexible registration on all axes
Position based registration	4 x 24V inputs	4 x 24V inputs	N/A
Bi-direction registration input/position switch output	4 x 24V	4 x 24V	4 x 24V
Optically isolated registration inputs	Yes	Yes	Yes
Map any registration input to any Axis	Yes	Yes	Yes
Independant axis Configuration	Yes	Yes	Yes
No of 16 bit DAC Outputs	8	4	8

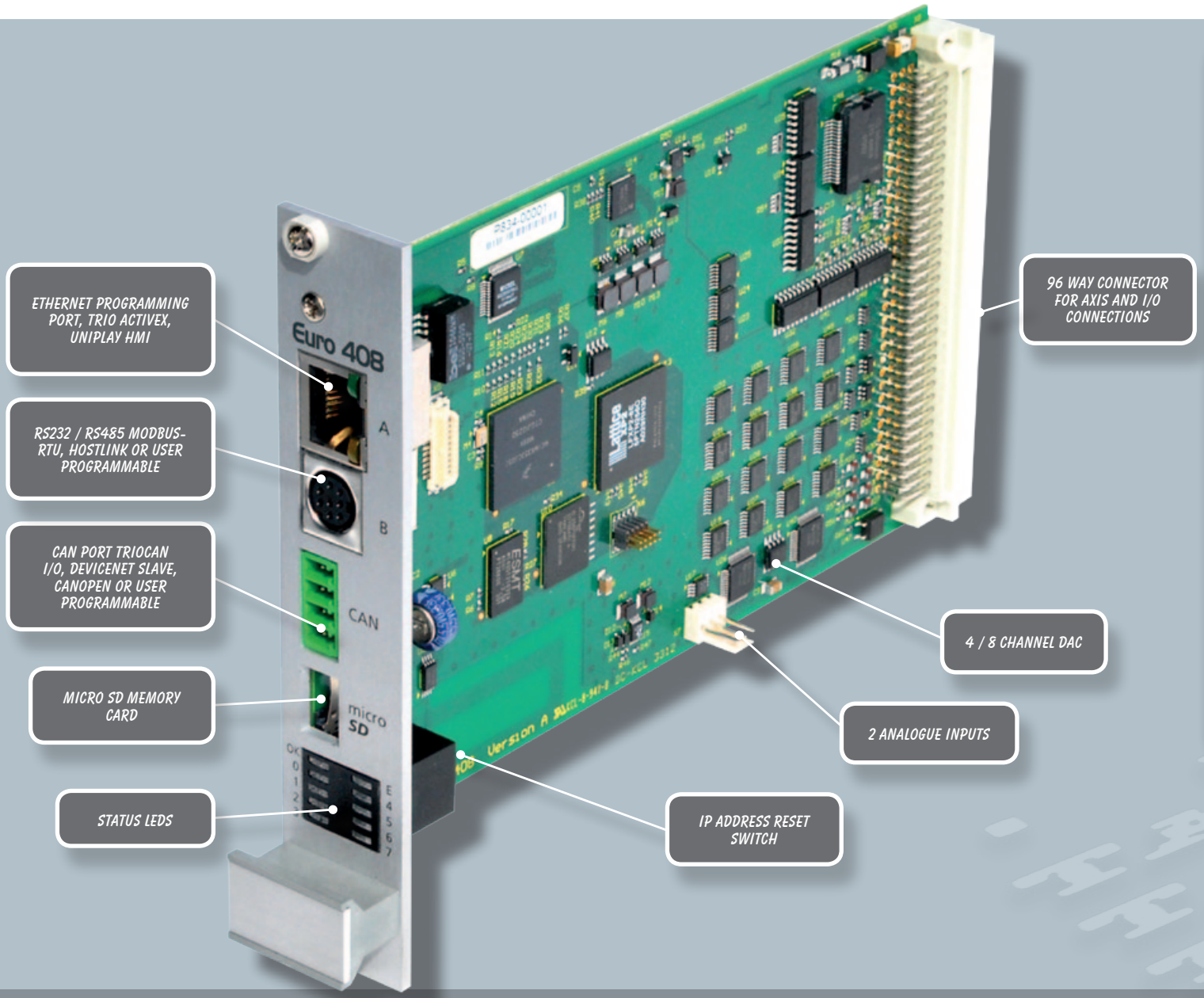
***** N/A to absolute axes.

CORE AXES – can be configured in software as pulse and direction outputs to stepper or servo drives. They can also be configured for incremental encoder feedback or simulated encoder output.

EXTENDED AXES – in addition to the Core functionality these axes can also be configured for SSI, Tamagawa or EnDat absolute encoders.

AS - Analogue 'closed loop' Servo using built-in ±10V analogue output.

Euro404 / Euro408



FEATURES

- Linear, Circular, Helical and Spherical Interpolation
- Flexible CAM shapes, Linked Motion
- EnDAT and SSI Absolute Encoder Supported
- Hardware Linked Outputs for Camera / Laser Control
- Ethernet-IP / Modbus TCP / Ethernet Interface Built-In
- 125 – 2000μsec Selectable Servo Update
- Precise 64 bit Motion Calculations on ARM11 Processor with VFP
- IEC 61131 Programming
- Multi-tasking BASIC Programming
- Text File Handling
- Robotic Transformations
- Micro SD Memory Card Slot
- CANopen I/O Expansion
- 3U Rack Mount Format
- RoHS and CE Approved

The Euro404 and Euro408 *Motion Coordinators* are designed to provide a powerful yet cost effective control solution for OEM machine builders that are prepared mount the unit and provide the power supplies required.

Both the Euro404 and Euro408 are high specification *Motion Coordinators* using a high performance ARM11 processor, with up to 4 / 8 flexible axis ports and 4 / 8 voltage outputs respectively. The flexible axis ports can be configured in software as feedback devices or pulse direction outputs. As outputs they can be used as pulse and direction with stepper or servo drives or they can operate as a simulated encoder output. When configured as feedback they can be either incremental encoder input or one of three popular absolute encoder types; SSI, Tamagawa or Endat. Any feedback axis with a Voltage output can be used to form a closed loop servo.

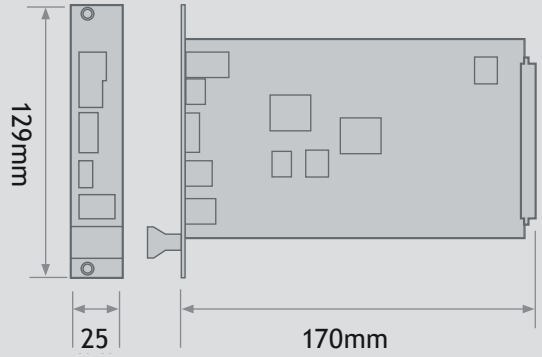
The built-in Ethernet port allows programming and connection of common HMI and PLC protocols directly to the *Motion Coordinator*. User programs can be written in Trio's established multi-tasking TrioBASIC language using the powerful *Motion* Perfect v3 application development software making complex motion easy. Also available as an option are the industry standard IEC 61131-3 languages allowing a fully functional PLC programming system.

The Euro404 / 408 are each available in 2 different axis configurations. All models feature a total of 16 axes in software. Any axes not assigned to built-in hardware can be used as a virtual axis. Every axis can be programmed to move using linear, circular or helical or spherical interpolation, electronic cams, linked axes and gearboxes.

ACCESSORIES:

P317 - P327	CAN Modules
P446	Euro Breakout Board
P750	Kinematic Runtime FEC
P843 - P844	UNIPLAY 7" & 10" HMI's

OVERALL DIMENSIONS

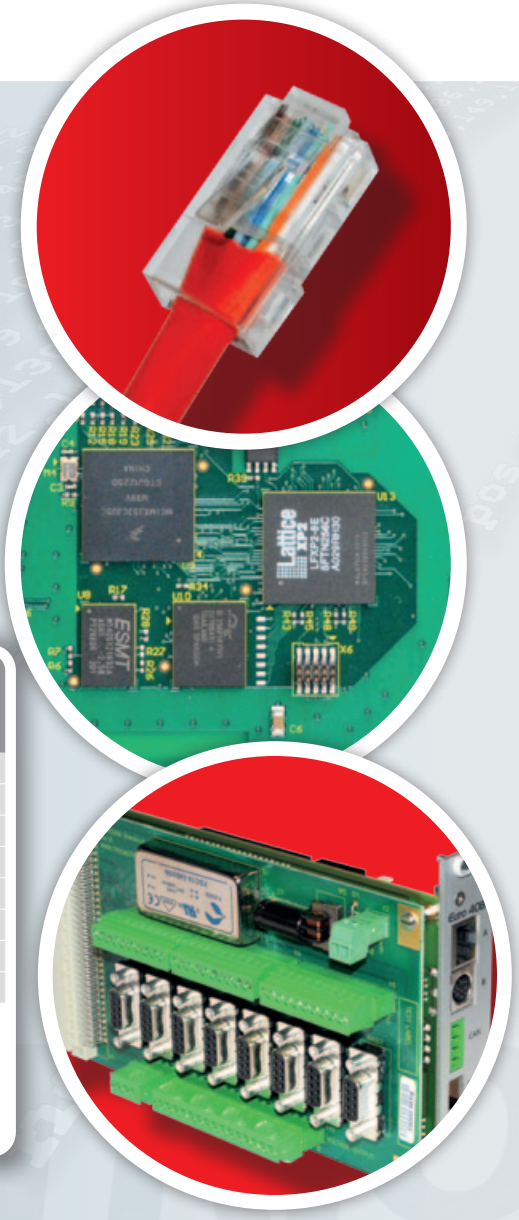


EURO404 PRODUCT OPTIONS			EURO408 PRODUCT OPTIONS	
	P831	P832	P833	P834
Axis 0	Core	Extended + AS	Core	Extended + AS
Axis 1	Core	Extended + AS	Core	Extended + AS
Axis 2	Core	Extended + AS	Core	Extended + AS
Axis 3	Core	Extended + AS	Core	Extended + AS
Axis 4			Core	Extended + AS
Axis 5			Core	Extended + AS
Axis 6			Core	Extended + AS
Axis 7			Core	Extended + AS

CORE AXES – can be configured in software as pulse and direction outputs to stepper or servo drives. They can also be configured for incremental encoder feedback or simulated encoder output.

EXTENDED AXES – in addition to the Core functionality these axes can also be configured for SSI, Tamagawa or EnDat absolute encoders.

AS -Analogue 'closed loop' Servo using built-in ±10V analogue output.



UNIPLAY HMI

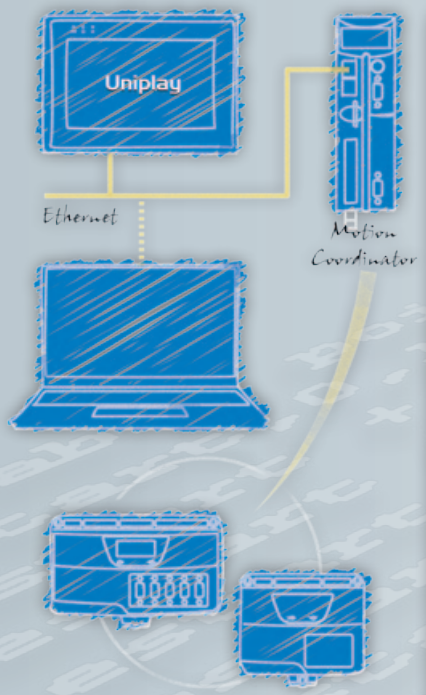
FEATURES

- ✶ Single Point HMI Programming Inside *Motion* Perfect v3
- ✶ Centralised Program / HMI screen Storage in a MPv3 Project
- ✶ Easily Display any Controller Data Type and Graphics
- ✶ No Need to Separately Program HMI Panel
- ✶ 7” and 10” UNIPLAY Sealed Touch Panels Available
- ✶ Ethernet Connection Reduces Wiring

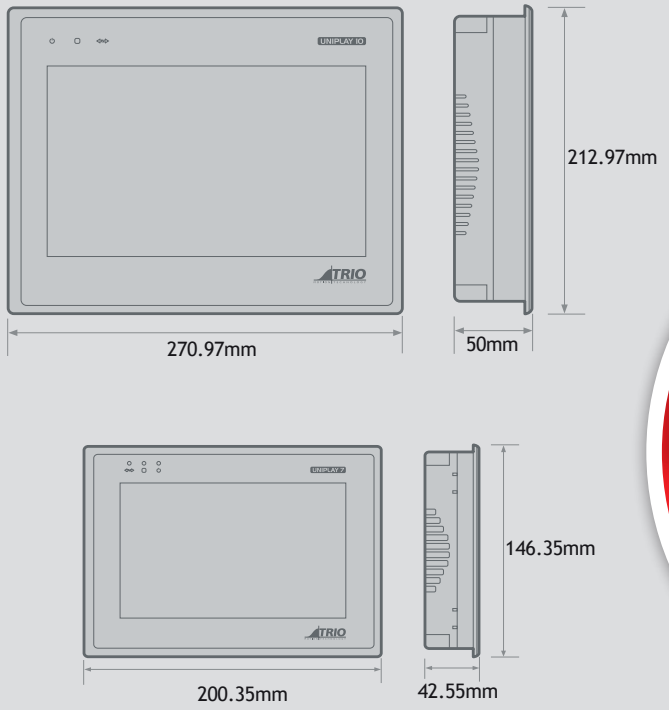
Trio's unique UNIPLAY HMI system is a revolutionary way to make operator interfaces better, easier and more secure! The UNIPLAY series boasts a 7" and 10" colour display.

The UNIPLAY range has built-in power isolation technology making it more reliable in noisy environments.

No additional software is required; UNIPLAY HMI's work with the Trio MC4 *Motion Coordinator* range. *Motion* Perfect v3 is used to create operator HMI screens which are transferred to the UNIPLAY HMI by the *Motion Coordinator* at runtime.



OVERALL DIMENSIONS P843 AND P844



UNIPLAY PRODUCT OPTIONS

P843	P844
UNIPLAY 7"	UNIPLAY 10"

I/O Modules

Trio Motion Technology's range of digital and analogue input/output expansion modules are designed to enable simple and scalable and low-cost I/O extension for Trio's *Motion Coordinators*. In addition to 24V input, output and bi-directional modules, there are relay and analogue I/O modules.

CANbus is used for communication and control between the *Motion Coordinator* and the CAN I/O modules. CANbus is a tried and tested, well known data link in industry which is reliable, noise immune and flexible. All CAN I/O modules are compatible with any *Motion Coordinator* that has a CANbus port.

As well as being able to connect to any *Motion Coordinator* using Trio's own high speed CANbus protocol, each CAN module can run the DS401 CANopen protocol allowing them to be used with other CANopen masters. Protocol selection is by DIP switches on the front of the module.

When using the TrioCANbus protocol, a *Motion Coordinator* can handle up to 16 Digital Input modules and 16 Digital Output modules, a total of 32 Digital modules and 4 Analogue modules. The CAN 16 I/O module counts as one Input and one Output module.

P317: CAN 16-OUT DIGITAL

The Trio CAN 16 Output modules can provide up to 256 distributed output channels at 24Vdc level.

Outputs	16 x 24V sourcing (PNP) output channels
Configuration	2 x 8 output channels
Output Capacity	1A per bank of 8 250mA/channel.
Network Speed	500KBit/s
Protocols	TrioCAN I/O / CANopen DS401
Compliance	RoHS, CE, UL and EMC

P318: CAN 16-IN DIGITAL

The Trio CAN 16 Input modules can provide up to 256 distributed input channels at 24Vdc level.

Inputs	16 x 24V sourcing (PNP) input channels
Configuration	2 x 8 input channels
Network Speed	500KBit/s
Protocols	TrioCAN I/O / CANopen DS401
Compliance	RoHS, CE, UL and EMC

P319: CAN 16-IN / OUT DIGITAL

The Trio CAN 16 Input / Output modules can provide up to 256 distributed bi-directional I/O channels at 24Vdc level.

Inputs	16 x 24V Input channels with 2500V isolation
Outputs	16 x 24V sourcing (PNP) output channels
Configuration	2 x 8 bi-directional input/output channels
Output Capacity	1A per bank of 8 250mA/channel.
Network Speed	500KBit/s
Protocols	TrioCAN I/O / CANopen DS401
Compliance	RoHS, CE, UL and EMC

I/O Modules

P326: CAN 8-IN / 4-OUT ANALOGUE I/O

The Trio CAN Analogue I/O modules can provide up to 32 analogue input and 16 output channels.

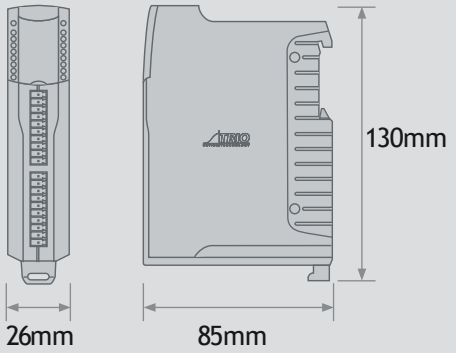
Inputs	8 x ± 10V inputs with isolation from CANbus
Outputs	4 x 0 - 10V outputs with isolation from CANbus
Network Speed	500KBit/s
Protocols	TrioCAN I/O / CANopen DS401
Compliance	RoHS, CE, UL and EMC

P327: CAN 8-RELAY OUT

The Trio CAN 8 Relay modules can provide 128 distributed low power relay channels per *Motion Coordinator*.

Outputs	8 x relays 30Vdc / 49Vac
Configuration	4 x NO+NC contacts and 4 x NO only contacts
Network Speed	500KBit/s
Protocols	TrioCAN I/O / CANopen DS401
Compliance	RoHS, CE, UL and EMC

OVERALL DIMENSIONS



Custom Products

Trio is an independent motion control technology company that concentrates 100% on developing 'motion control products'. Our dedicated and focused approach allows us to design products that fit our customers' needs whether the customer is a machine builder requiring a bespoke *Motion Coordinator* or a Drives company requiring a licenced product or a commonly used interface to a Digital Drive Bus System.

Some examples are shown here… But more Trio designed motion control solutions are operating in the market as 'badged' products by major drives/motion control companies and OEM machine builders.

Digital Drive Interfaces

Because Trio does not manufacture drives and equally is not aligned or connected to any particular drives company, it is important that our products can be used with as many popular drives as possible. To achieve this we have developed the following 'growing' list of digital drive interfaces…

EtherCAT

Sercos

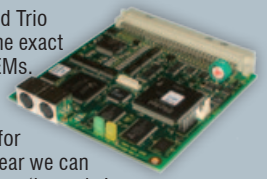
Panasonic RTEX

Control Techniques SLM

'Drive-In'

Many servo drives have an expansion slot or port allowing the connection of a specially designed Trio *Motion Coordinator*. Trio has developed various "Drive-In" products for leading servo drive brands all of which are programmed in TrioBASIC using *Motion* Perfect. Some are sold as badged products and one, the P190 MC302-K, is available from Trio as a stock item. The MC302-K was developed in response to requests by many of our distributors selling Kollmorgen drive it offers 1½ axes and simply slots inside the S300 / S600 expansion slot.

Bespoke



Sometimes the standard Trio products do not have the exact features required by OEMs. In such cases where a machine builder has a specific requirement for 200+ controllers per year we can design and manufacture a 'bespoke' *Motion Coordinator*.

Licensed

For larger companies wishing to fully integrate a motion control product line but not wanting to develop the technology themselves, we can provide a very cost effective solution by designing the hardware of a motion control range to be manufactured under license from Trio. This option has already been adopted by one major motion control company.

THE TRIO NETWORK

TRIO WORLDWIDE

With offices in Tewkesbury (UK), Pittsburgh (USA), Pune (India) and Shanghai (China), Trio Motion Technology supplies its entire product range worldwide via a network of fully supported distributors.

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Greece
Hungary
INDIA
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New Zealand
Norway
Poland
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Trio Motion Technology's range of *Motion Coordinators*, expansion interfaces, I/O modules and HMI's are designed to enable the control of industrial machines with the minimum of external components. In many applications, Trio's product range can be combined to build a control system capable of driving a multi axis machine and all its auxiliary equipment.

The Trio concept is complemented by a range of software programs designed to work seamlessly with the hardware for unparalleled system performance.

In support of the Trio concept, we aim to offer the best technical support by telephone, email, our comprehensive website and training courses held throughout the year. Please look at our web site for details.

www.triomotion.com

WHY BUY TRIO?

- Learn Only One Programming Environment
- Easy Programming of Complex Motion
- Protect Your Investment With Program Encryption
- Modular Architecture Saves Cost
- Your Choice of Drive Interface
- Your Choice of Factory Communications
- Make Your Machine Perform Faster
- Your Choice of Programming Methods
- Reduce Machine Delivery Times
- We Can Customise and Embed