TRIO
MOTION TECHNOLOGY

A MEMBER OF THE ESTUN GROUP

TRIO MOTION TECHNOLOGY
Motion-PLC
MCS 40|50 - MC 44|45 - MC 54|55

EtherCAT®

- THE MOTION SPECIALIST -

Introducing *Motion*-PLC

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New class of controller…
Motion…Logic…

Motion-PLC Range

MCS 40
Flexible Machine Controller

MC 44 / MC 45
All-In-One Controller

MCS 50
Flexible Machine Controller

MC 54 / MC55
All-In-One Controller

MS EC
EtherCAT Coupler

MS I/O
Digital and Analogue I/O

Introducing *Motion*-PLC

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Trio's *Motion*-PLC incorporates advanced motion functions alongside the simplicity of a PLC; a true paradigm shift in the world of motion and factory automation.

Motion-First Automation

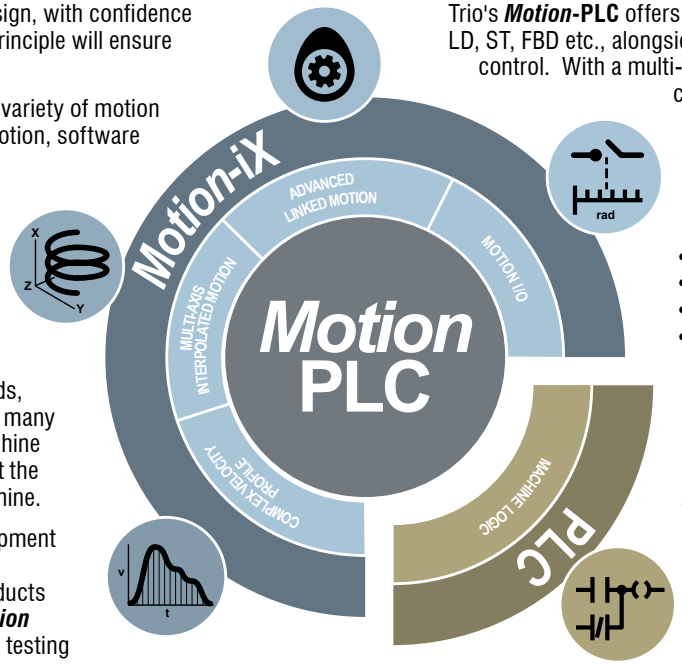
The *Motion*-PLC range comprises a family of controllers designed to integrate Trio's advanced motion control features of TrioBASIC with the simplicity of a PLC in a compact an economical package.

Combining the ***Motion*-iX** core with PLC programming languages and a PLCopen motion library gives machine designers complete flexibility in the machine design, with confidence that Trio's **Motion-First Automation** principle will ensure maximum machine performance.

Trio's ***Motion*-iX** core includes a wide variety of motion features from simple point-to-point motion, software gearbox, flying shear through to gantry / pick-and-place applications. This feature-rich core has been developed over 35 years of field experience with real machines.

The focus for all Trio ***Motion Coordinators*** is on optimizing the machine motion. Through enhanced velocity profiles, compound commands, intelligent multi-axis interpolation and many other features. This focus on the machine motion enables the Trio solution to get the maximum performance from the machine.

The ***Motion* Perfect** integrated development environment provides programming, diagnostics and debug for all Trio products including the ***Motion*-PLC** range. ***Motion* Perfect** enables design, development, testing and deployment in a single tool.



In typical machine design the PLC offers the familiar programming languages of IEC 61131-3 and allows easy integration to machine I/O and machine sensors for general machine control. The motion controller is generally viewed as a more complex part of the machine, controlling multiple axes and typically programmed in a high level language.

Trio's ***Motion*-PLC** offers the familiar IEC 61131-3 PLC languages including LD, ST, FBD etc., alongside **TrioBASIC**, our high-level language for motion control. With a multi-tasking operating system these two applications can run alongside each other allowing execution of motion control and Logic Control in a single device.

Execution of the complete machine program in a single device allows:

- Improved data sharing between applications
- Removing latency of any fieldbus connections
- Removing cabling and improving reliability
- Saving cost and time in machine development

Which results in faster more reliable machines.

Trio's latest range of controllers builds on a successful motion heritage, integrating PLC functionality to offer Trio's ***Motion*-iX** core alongside PLC programming languages in a single ***Motion*-PLC**.

Trio's *Motion*-PLC range includes:

- *Motion*-iX core for advanced motion and machine control
- PLC programming languages (IEC 61131-3)
- PLCopen motion library
- TrioBASIC
- Trio's Unified API (application programming interface)
- Synchronized I/O expansion though Trio's MS-Bus I/O System
- EtherCAT for real-time remote devices (e.g. Drives and I/O)
- Fieldbus support (PROFINET and Ethernet/IP for upstream connections)

Motion-PLC
Overview

MCS 40 - MCS 50
Flexible Machine Controller

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AT A GLANCE

- New class of controller for machine solutions combining mathematical processing power and logic control in a compact design
- '40' range: EtherCAT Axes (2 to 4)
  '50' range: EtherCAT Axes (2 to 8)
- More powerful MC 50 range has higher specification features and more expansion options.
- All controllers compatible with MS I/O System

Local I/O expansion is provided though a MS-Bus interface and the MS I/O system, supporting up to 16 slices. Slices can be any combination of digital inputs, digital outputs, analogue inputs or analogue outputs.

Both the MS-Bus and EtherCAT are synchronized to the *Motion*-iX core, allowing deterministic behaviour of all devices for use with motion and machine applications.

The Ethernet port(s) support application programming along with HMI and PLC protocols including Modbus TCP, PROFINET IO and Ethernet/IP.

User programs can be written in Trio's established TrioBASIC multi-tasking programming language or industry standard IEC61131-3 (including PLCopen).

MCS controllers are ideally suited to control simpler stand-alone machines.

The MCS 40 and the more powerful MCS 50 range are 'Flexible Machine Controllers' ideal for simple (MCS 40) or more advanced machines (MCS 50).

With local I/O expansion through the MS-Bus and Trio's MS I/O system, remote expansion through EtherCAT and Ethernet communications for both programming and factory communications MCS controllers provide a flexible solution for simple machines.

- Entry level controllers
- Base specification with 2 EtherCAT axes
- Add I/O with MS I/O System
- Competitive controller and I/O solution
- TrioBASIC, IEC61131-3 and Unified API

MCS 40

SUB-MACHINES
Ideal for: Gantry Machines

MCS 40 (P620)
1 Ethernet Port
1 EtherCAT Port
MS I/O Interface

Upgrade FEC Codes	
P982	Add One Axis (max:4)
P981	Increase I/O up to 1024 Digital - 128 Analogue
P751	Security
P984	TrioBASIC

MCS 50

SMALL STAND-ALONE MACHINES
Ideal for: Glue Laying, Flying Shear

MCS 50 (P625)
2 Ethernet Ports
1 EtherCAT Port
MS I/O Interface

Upgrade FEC Codes	
P982	Add One Axis (max:8)
P981	Increase I/O up to 1024 Digital - 128 Analogue
P751	Security
P984	TrioBASIC

MC 44 - MC 45 : MC 54 - MC 55

All-In-One Machine Controller

Motion Coordinator + high performance I/O

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MC controllers are ideal for more advanced machines requring higher performance features. E.g. Registration inputs and a 'Flexible Axis Port' for reference encoder input / pulse output.

The MC 44 (NPN) and MC 45 (PNP) are 'All-In-One' Controllers ideal for general machines whilst the MC 54 (NPN) and MC 55 (PNP) are suited to more complex machines.

With local hardware including a Flexible Axis port* for high speed motion functions, local I/O expansion through a slice interface and Trio's MS I/O system, remote expansion through EtherCAT and multiple Ethernet ports supported by an Ethernet switch for communications, MC controllers provide an 'all-in-one' solution for advanced machines.

* MC 54 and MC 55

- **On-board I/O**
- **Serial Port (RS232 / RS485)**
- **Registration Inputs**
- **TrioBASIC, IEC61131-3 and Unified API**

MC 44 - MC 45

SMALL STAND-ALONE MACHINES

Ideal for: Glue Laying, Flying Shear

MC 44 (P630) (NPN)
MC 45 (P635) (PNP)
1 Ethernet Port
1 EtherCAT Port
1 Serial Port
NPN or PNP On-board I/O
MS I/O Interface

Upgrade Codes	
P982	Add One Axis (Max 4 Axes)
P981	Increase I/O up to 1024 Digital - 128 Analogue
P984	TrioBASIC
P751	Security

MC 54 - MC 55

LARGER STAND-ALONE MACHINES

Ideal for: VFFS, Labelling, Packaging

MC 54 (P640) (NPN)
MC 55 (P645) (PNP)
2 Ethernet Ports
1 EtherCAT Port
1 Serial Ports
1 Flexible Axis Port
NPN or PNP On-board I/O
MS I/O Interface

Upgrade Codes	
P982	Add One Axis (Max 8 Axes)
P981	Increase I/O up to 1024 Digital - 128 Analogue
P984	TrioBASIC
P751	Security
P983	Axis Port Upgrade

All Controllers
Specification

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		 MCS 40 **P620**	 MC 44 **P630**	 MC 45 **P635**	 MCS 50 **P625**	 MC 54 **P640**	 MC 55 **P645**
Axes	EtherCAT axes	2 - 4 with FEC			2 - 8 with FEC		
Upgrades	Feature Enable Code (FEC)	P981 (Increase I/O up to 1024 Digital - 128 Analogue) P982 (add 1 axis - up to 4) P751 (Security) P984 TrioBASIC			P981 (Increase I/O up to 1024 Digital - 128 Analogue) P982 (add 1 axis - up to 8) P751 (Security) P984 TrioBASIC P983 Axis Port Upgrade (MC 54 & MC 55)		
Peripherals	Digital Input	0	8 NPN	8 PNP	0	8 NPN	8 PNP
	Digital Input or Output	0	8 NPN	8 PNP	0	8 NPN	8 PNP
	Flexible Axis Port	0	0	0	0	1 (core axis)	1 (core axis)
	Registration Input	0	4	4	0	8	8
	Display	LED Status	LED Status + I/O Indicators	LED Status + I/O Indicators	LED Status	LED Status + I/O Indicators	LED Status + I/O Indicators
	MS I/O Interface	Yes					
	SD Card	Yes					
MS I/O	Max # of I/O slices directly coupled	16					
Programming	Languages	IEC61131-3 (LD, ST, FBD, SFC), TrioBASIC (with FEC)					
	Motion Features	PLCopen, *Motion*-IX (with FEC)					
	Motion Cycle Time	1ms, 2ms, 4ms					
	Maximum Programs / Tasks	48/4					
	User Memory	8 Mb					
	Max VR variables	4096					
	Execution Benchmark (lines/ms)	70 (single core)			70 (dual core*)		
	Flash Memory	32 x 1600 values					
	Table Memory	512000 values					

*User application runs in a dedicated core to ensure execution time is unaffected by motion and communication load

Preliminary specifications may change without notice

All Controllers
Specification

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		 MCS 40 **P620**	 MC 44 **P630**	 MC 45 **P635**	 MCS 50 **P625**	 MC 54 **P640**	 MC 55 **P645**
EtherCAT	EtherCAT nodes	32					
	EtherCAT PDO data	EtherCAT update rate ≥2ms 1514 bytes EtherCAT update rate 1ms 8964 bytes					
	EtherCAT profiles	CoE, FoE					
Communications	Ethernet Port 100Mbit/s	1			2		
	EtheCAT Port 100Mbit/s	1			1		
	Serial Port RS232/RS485	0	1		0	1	
Protocols	Serial Port	n/a	Modbus RTU		n/a	Modbus RTU	
	Ethernet	Modbus TCP, PROFINET IO, Ethernet IP					
Dimensions	H x D x W (mm)	100 x 75 x 23	100 x 75 x 59		100 x 75 x 23	100 x 75 x 59	
Power Supply		24V					
Environmental	Operating Temperature	- 20 to + 55 deg C					
	IP rating	IP20					
Certifications		RoHS, CE					

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MS I/O System
Compact Expansion

MS I/O System offers a compact, robust, high performance I/O expansion system. The 'MS-Bus' slice interface enables direct connection to the ***Motion*-PLC** range of *Motion Coordinators*. The MS EC EtherCAT coupler along with our MS I/O slices offer a distributed remote I/O solution keeping the I/O close to the sensor reducing cabling.

AT A GLANCE

- High performance, flexible topology and simple configuration
- Compact size, 12mm slice width
- Easy wiring through spring clamp connectors
- DIN rail mounted with forword slice insertion
- Up to 16 slices connected to a coupler for remote I/O
- EtherCAT coupler supporting update rates from 125us to 4ms
- I/O functions synchronized to EtherCAT cycle
- Competitive I/O solution
- RoHS, CE

MS I/O system can be tailored to the I/O requirements of the machine with any combination of digital inputs, digital outputs, analogue inputs or analogue outputs.

With front face insertion and removal, slices can be easily fitted or swapped.

Spring clamp connectors allow easy wire insertion and push button wire removal making wiring quick and easy.

Both the slice interface and EtherCAT are synchronized to the *Motion*-iX core, allowing deterministic behaviour of all devices for use with motion and machine applications.

Motion-PLC Connection

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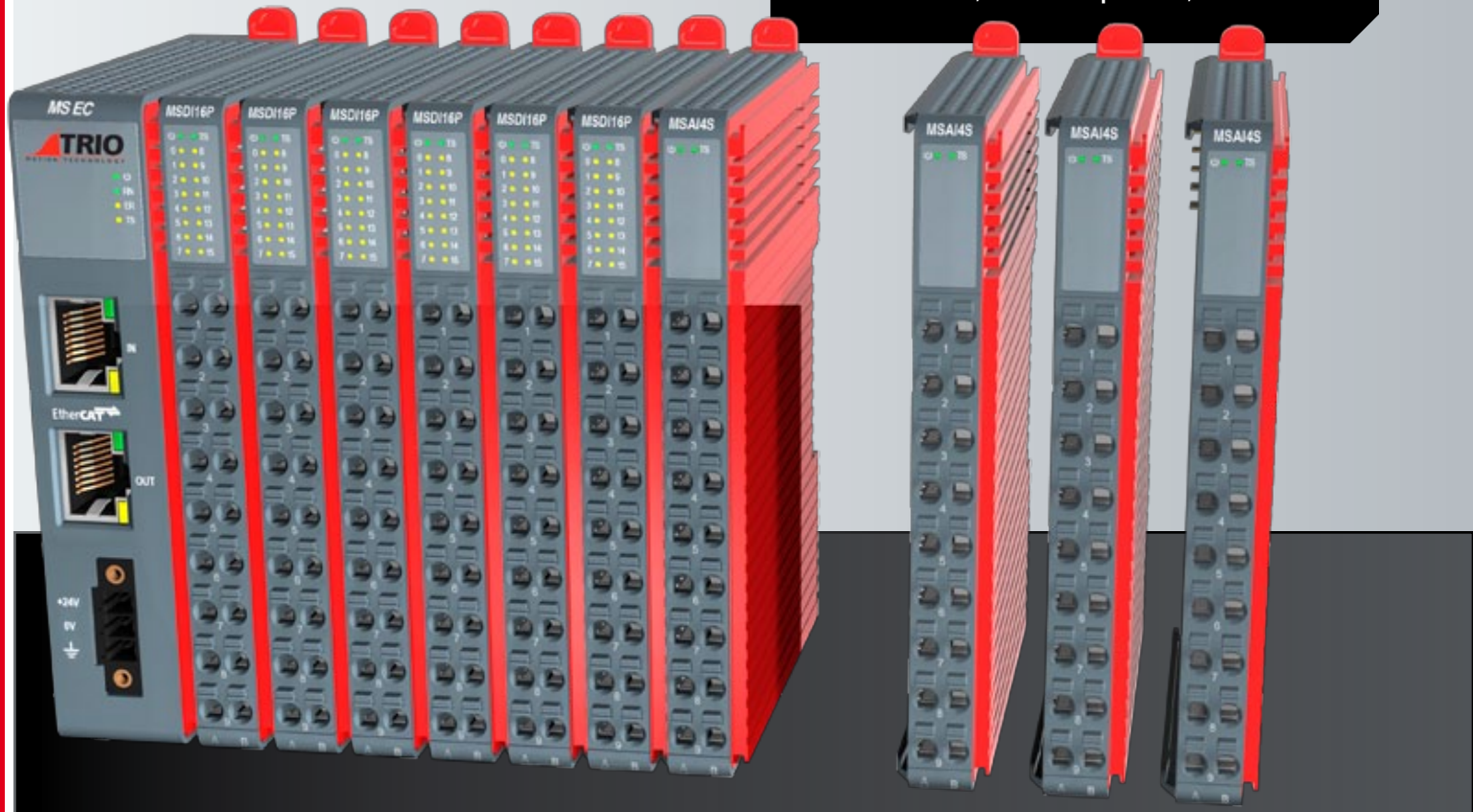
For the most compact machine control solution, connect MS I/O directly to our *Motion*-PLC range of controllers.

- Connection via our MS-Bus Interface
- Local expansion up to 16 slices
- Any combination of slices
- Select MCS 40 – MCS 50 controllers for competitive 'Controller + I/O solution' up to 256 I/O



EtherCAT Coupler Connection

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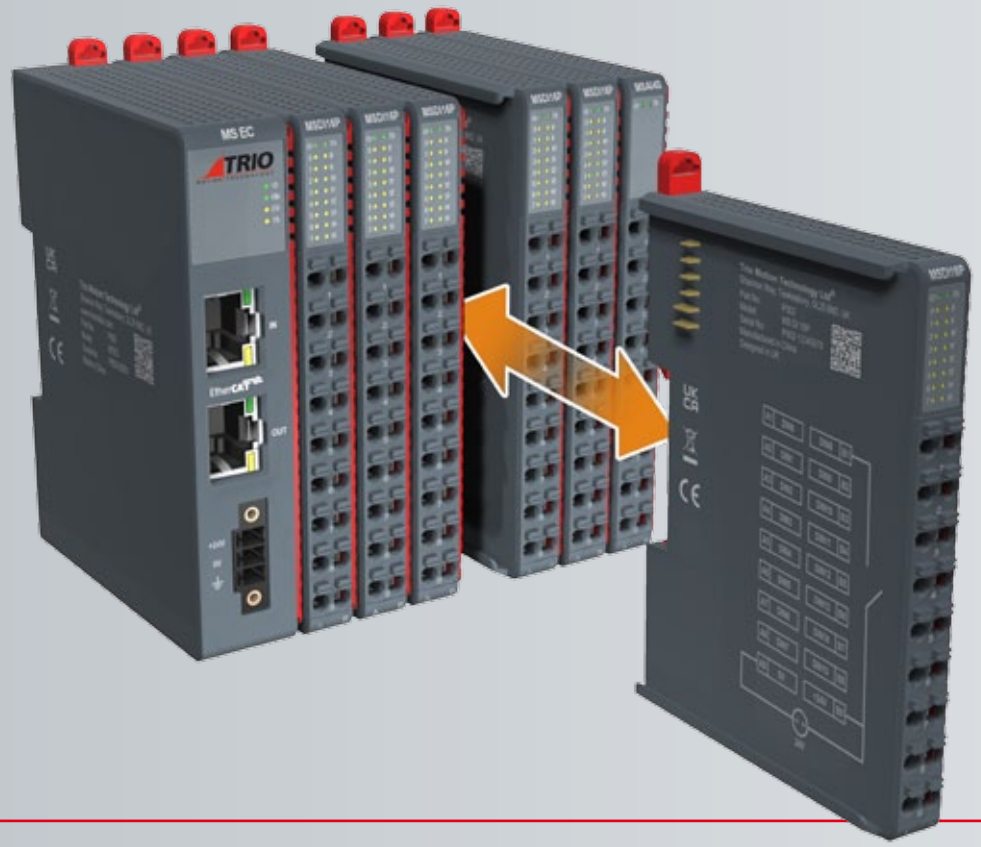
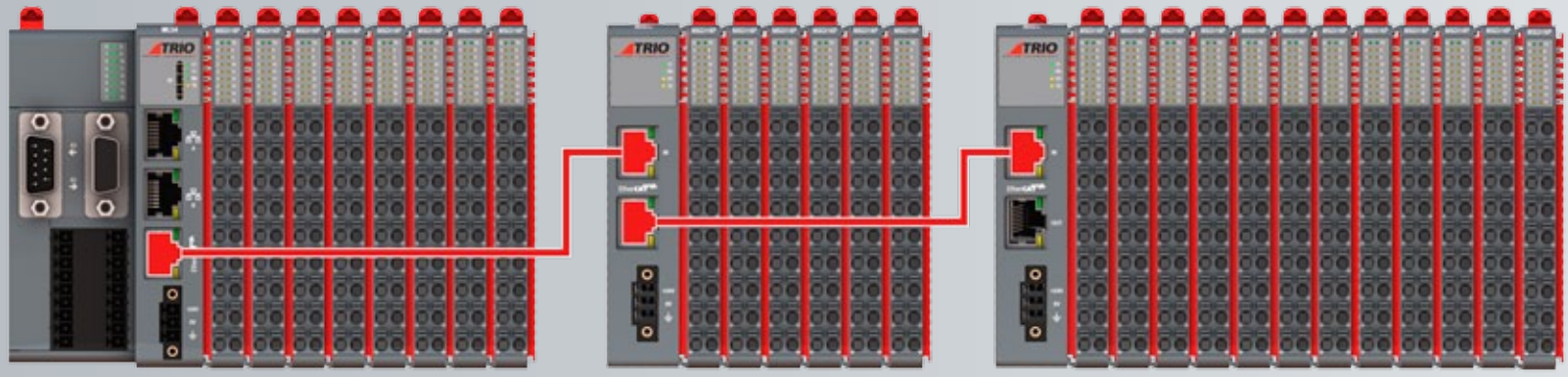
Providing the most flexibility to add MS I/O on a machine the P659 MS EC EtherCAT Coupler allows:

- Scalability via EtherCAT
- Motion optimised slices
- Distributed I/O stations to reduce cabling complexity
- Combine with ANY Trio EtherCAT controller for a highly compact, modular system
- Use with 3rd Party EtherCAT controllers



The MS EC EtherCAT Coupler supports update rates from 125us to 4ms, providing performance for both motion control and general automation applications.

With EtherCAT IN and OUT ports the MS EC Coupler can be placed at any point in the EtherCAT network.



Up to **16 MS I/O slices** can be connected via **MS-Bus** to a single **MS EC Coupler** in any combination. Multiple couplers can be connected to a single EtherCAT controller for complete machine control.

MS I/O System
Compact Expansion

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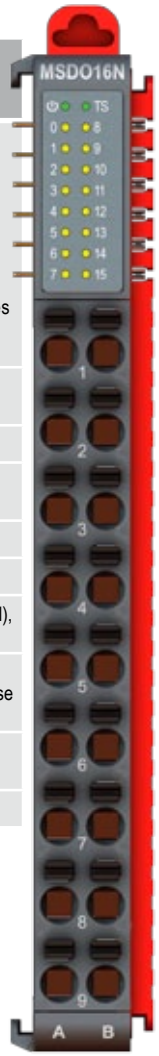
P659: MS EC	
The P659 MS EC EtherCAT coupler provides a gateway to the MS I/O System for any EtherCAT master. One coupler can connect up to 16 slices.	
Power Supply	24V ± 10%
EtherCAT Connection	RJ45 x 2
Protocol	EtherCAT
Update Rates	125us, 250us, 500us, 1ms, 2ms, 4ms
Data Rate	100Mbit/s
Network Cable	CAT5e min
Dimensions WxHxD (mm)	23 x 100 x 75
Compliance	RoHS, CE

P001: MS DI 16N P002: MS DI 16P	
The digital input slice connects 24V DC signals on the machine to binary control registers. The 16 inputs are either NPN current sourcing (P001) or PNP current sinking (P002) type and have electrical isolation. All connections are via 18 way push-in connectors. The slice indicates the input signal states via LEDs.	
Digital Input Channels	16
Power Supply	24V ± 10%
ON voltage	>15V
OFF voltage	<5V
Input Current	3.5mA
Input Filter Cut-Off	18kHz
Protection	Overvoltage Overcurrent Reverse Voltage
Dimensions WxHxD (mm)	12 x 100 x 75
Compliance	RoHS, CE

P003: MS DO 16N P004: MS DO 16P	
The digital output slice connects 24V DC signals on the machine to binary control registers. The 16 outputs are either NPN current sourcing (P003) or PNP current sinking (P004) type and have electrical isolation. All connections are via 18 way push-in connectors. The slice indicates the output signal states via LEDs.	
Digital Output Channels	16
Power Supply	24V ± 10%
Load Type	Resistive, Indictive, Capacitive
ON time	100us
OFF time	100us
Max. Output Current	500mA (per channel), 4A (per slice)
Protection	Short Circuit, Overvoltage, Reverse Voltage
Dimensions WxHxD (mm)	12 x 100 x 75
Compliance	RoHS, CE



Preliminary specifications may change without notice

MS I/O System
Compact Expansion

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P005: MS AI 4S

The P005 analogue input slice has 4 Voltage or current channels, each with a programmable range and digitized to a resolution of 16-bits. Each channel has a separate 0V and shield connection for optimized signal to noise ratio.
All connections are via 18 way push-in connectors

Analogue Input Channels	4
Power Supply	24V ±10%
Signal Voltage	±10V 0-10V ±-5V 0-5V
Signal Current	4-20mA 0-20mA ±20mA
Resolution	16-bit
Protection	Overvoltage
Dimensions WxHxD (mm)	12 x 100 x 75
Compliance	RoHS, CE

P006: MS AO 4SV

The P006 analogue output slice has 4 Voltage channels, each with a programmable voltage range and digitized to a resolution of 16-bits. Each channel has a separate 0V and shield connection for optimized signal to noise ratio.
All connections are via 18 way push-in connectors

Analogue Input Channels	4
Power Supply	24V ± 10%
Signal Voltage	+/-10V
Signal Current	±6mA
Resolution	16-bit
Protection	Short Circuit
Dimensions WxHxD (mm)	12 x 100 x 75
Compliance	RoHS, CE

P007: MS AO 4SC

The P007 analogue output slice has 4 current channels supporting a 4 to 20mA output range and digitized to a resolution of 16-bits. Each channel has a separate 0V and shield connection for optimized signal to noise ratio.
All connections are via 18 way push-in connectors.

Analogue Input Channels	4
Power Supply	24V ± 10%
Signal Current	0-20mA
Resolution	16-bit
Protection	Short Circuit
Dimensions WxHxD (mm)	12 x 100 x 75
Compliance	RoHS, CE

Preliminary specifications may change without notice

Motion-PLC
Building Your Solution

TRIO MOTION TECHNOLOGY
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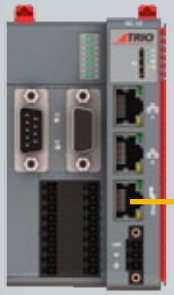
UNIPLAY HMI
System is a revolutionary way to make operator interfaces better, easier and more secure.

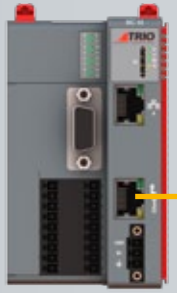
MOTION PERFECT
A fully featured IDE for program development and debugging in all *Motion*-iX languages including TrioBASIC, IEC61131-3, multi-page HMI screen development and diagnostic tools for machine commissioning.

UNIFIED API
Trio's Unified API is a set of libraries for Windows or Linux supporting languages including Python, C, C++ and C# allowing desktop application development with a direct connection to our *Motion Coordinator*.

MCS 50
Flexible Machine Controller

MC 54 / MC55
All-In-One Controller

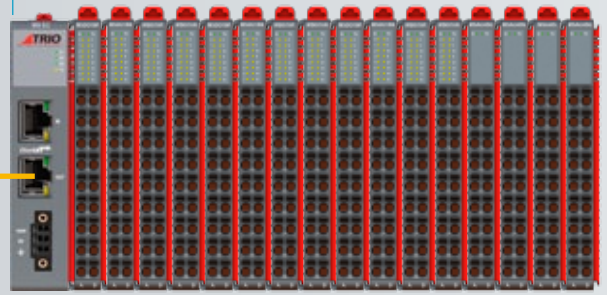




MCS 40
Flexible Machine Controller

MC 44 / MC 45
All-In-One Controller

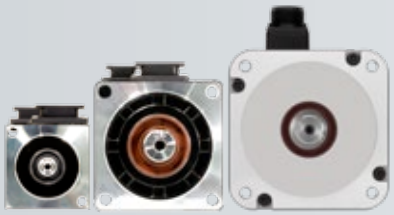
MS EC
Provides a gateway to the MS I/O System for any EtherCAT master



MS-Bus

MS I/O
Offers a compact, robust, high performance I/O expansion system.

EtherCAT



COMPACT I/O
Up to 16 slices can be connected to a single coupler and multiple couplers can be connected to a single controller for complete machine control. Up to 16 slices can also be directly coupled to the *Motion*-PLC controllers via MS-Bus.

DX DRIVES MX MOTORS
Solutions with new DX servo drive and MX motor range provide performance and dependability, delivering everything you need and nothing more.

Motion-PLC
Building Your Solution

TRIO MOTION TECHNOLOGY
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Build Your Solution for Your Machine with Trio's fully integrated range of operator interfaces, *Motion Coordinators*, I/O options, matched servo drives & motors.

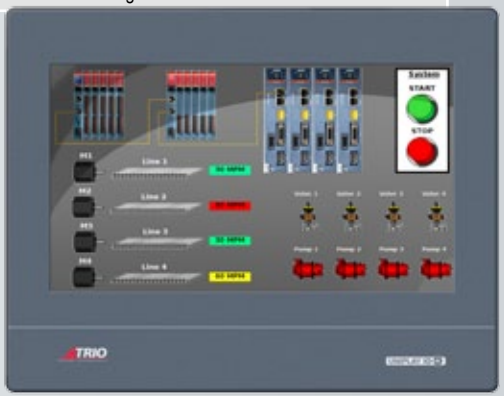
Trio's unique **UNIPLAY** HMI is a revolutionary way to make operator interfaces better easier and more secure!

Compact modular **Motion-PLC** controllers and the **MS I/O System** allow for the selection of only the hardware and optional features required; saving cost and reducing the panel space.

DX servo drives and MX servo motors; provide performance and dependability delivering; **'Everything you need…nothing more'.**

UNIPLAY HMI

UNIPLAY touch panels 7", 10" and 15".
Integrated HMI programming as part of machine solution.
Centralised program / HMI screen storage in a single project.
Tightly integrated to *Motion*-PLC application.
Link HMI buttons to functions in *Motion*-PLC program.
Simulator built into *Motion* Perfect to test designs before deployment.
Connect up to 2 HMI's to your *Motion*-PLC.
Ethernet connection reduces wiring.



DX - Servo Drives

Fully integrated into *Motion* Perfect.
Matched with MX motor range.
Zero stacking.

DX5	Systems Level Drive	200V ac (3-phase) supply module
		Dual 750W axis module, supports 750W & 400W motors
		Dual 400W axis module, supports 400W, 200W & 100W motors
DX4	Performance Level Drive	200V ac from 50W up to 3kW including additional encoder port
DX3	Entry Level Drive	200V ac from 50W to 2kW
		480V ac from 1kW to 7.5kW

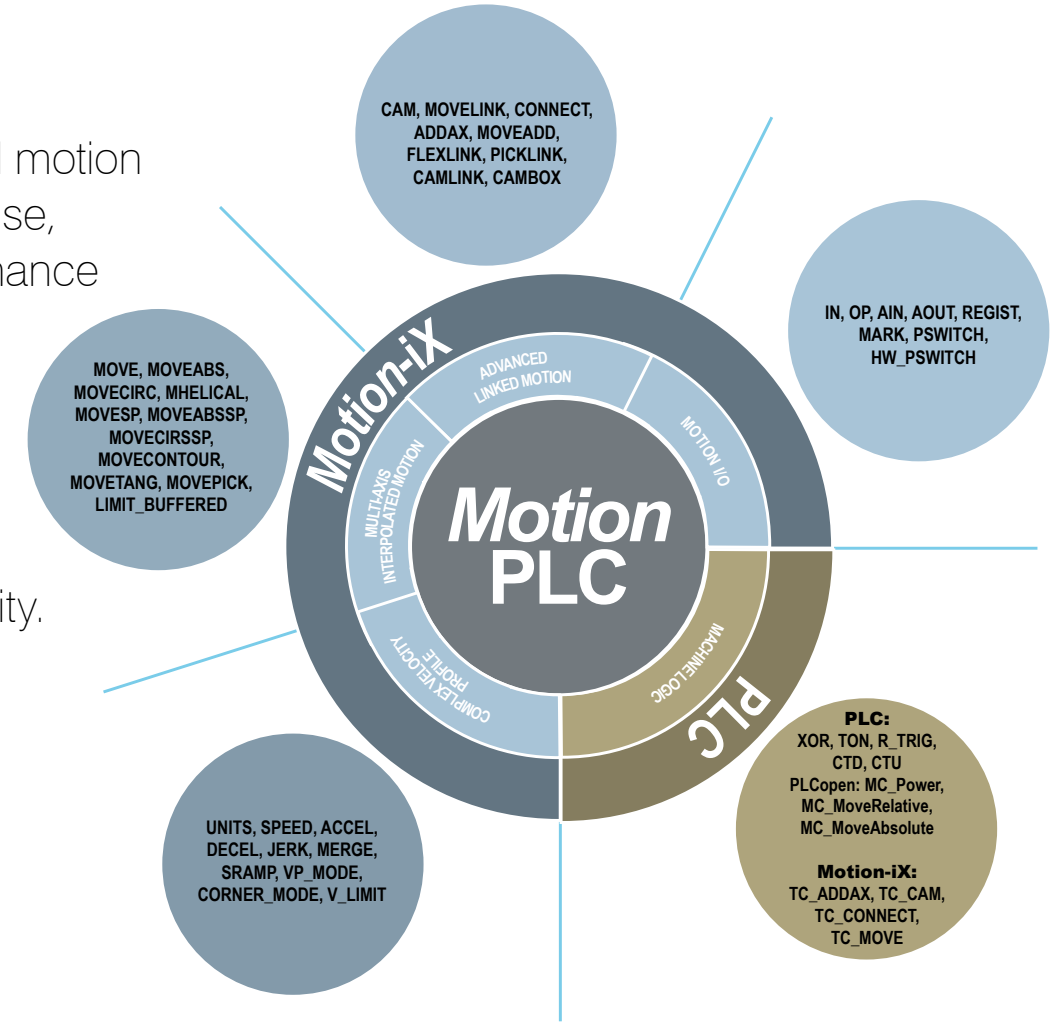
DX4 and DX3 EtherCAT drives have safe torque off (STO) inputs; inputs are safety rated SIL3 level according to IEC 61508, IEC 62061 standards. STO inputs are used in conjunction with your external E-stop circuits to disable the drive's output power stage to the motor.

MX - Servo Motors

MXL	50W - 5kW Low Inertia - High Speed - up to 6000rpm
MXJ	200W - 1kW Intermediate Inertia - High Speed - up to 6000rpm
MXM	850W - 7.5kW Medium Inertia - Medium Speed - up to 3000rpm

Motion Optimal Engineering Technologies

Combining an advanced motion core with Trio's ease-of-use, ***Motion*-iX** offers performance and dependability of packaged solutions, from "The Motion Specialist", where motion is the core and not just a bolt-on capability.



Motion-iX – a unified software engineering framework for machine development, that places the focus on optimising motion to deliver truly optimal machine control performance.

Motion-iX includes development in IEC61131 and PLCopen to truly coordinate all machine axes to maintain tight synchronisation.

Virtualization allows simulation of the mechanics and motion to significantly reduce development and testing time, delivering optimal control by minimising machine cycle times.

Motion Perfect

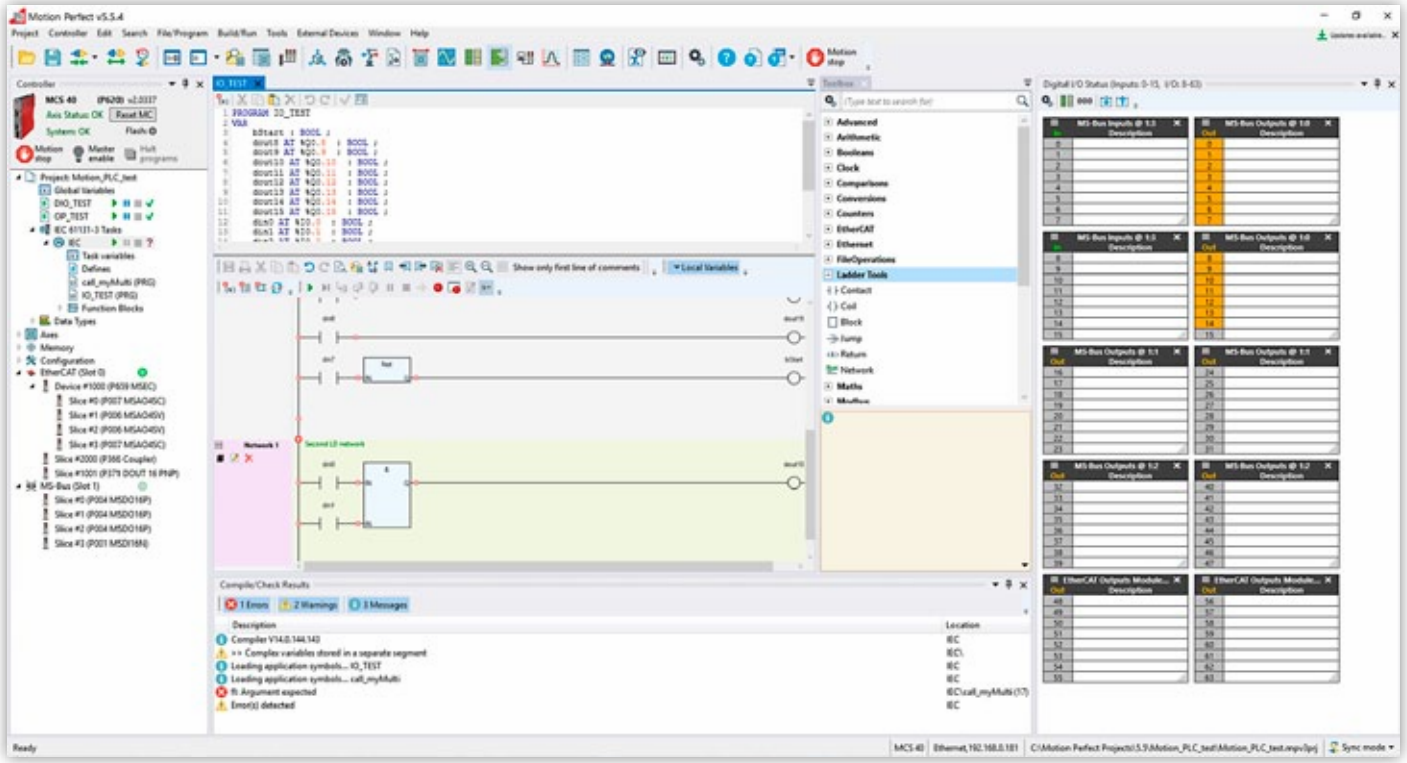
Design, Develop, Test, Deploy and Secure

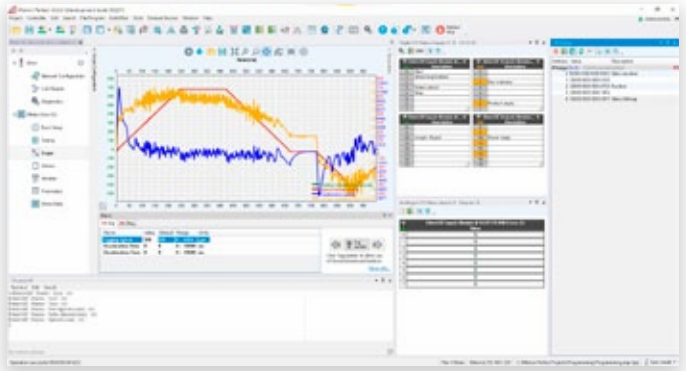
Built on Trio's *Motion*-iX core technology, ***Motion* Perfect** provides the user with an easy to understand interface for rapid application development, controller and drive configuration and monitoring of functions.

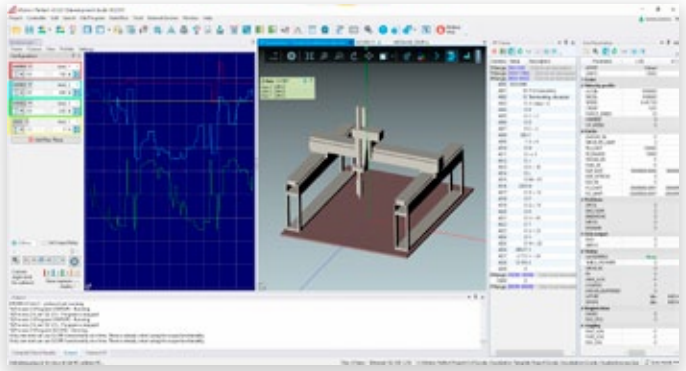
The commissioning of DX Servo Drives and machines is made simple with a series of Device Configuration Screens allowing access to status information and diagnostics at a glance. All motor axes can be detected, setup, monitored and controlled in real-time from the easy to use dialogue windows.

Motion Perfect includes access to IEC 61131 and PLCopen. Advanced visualisation including a 3D oscilloscope and IP protection of your projects are also included within *Motion* Prefect.

Motion Perfect is **FREE** to download and use.







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TRIO
MOTION TECHNOLOGY

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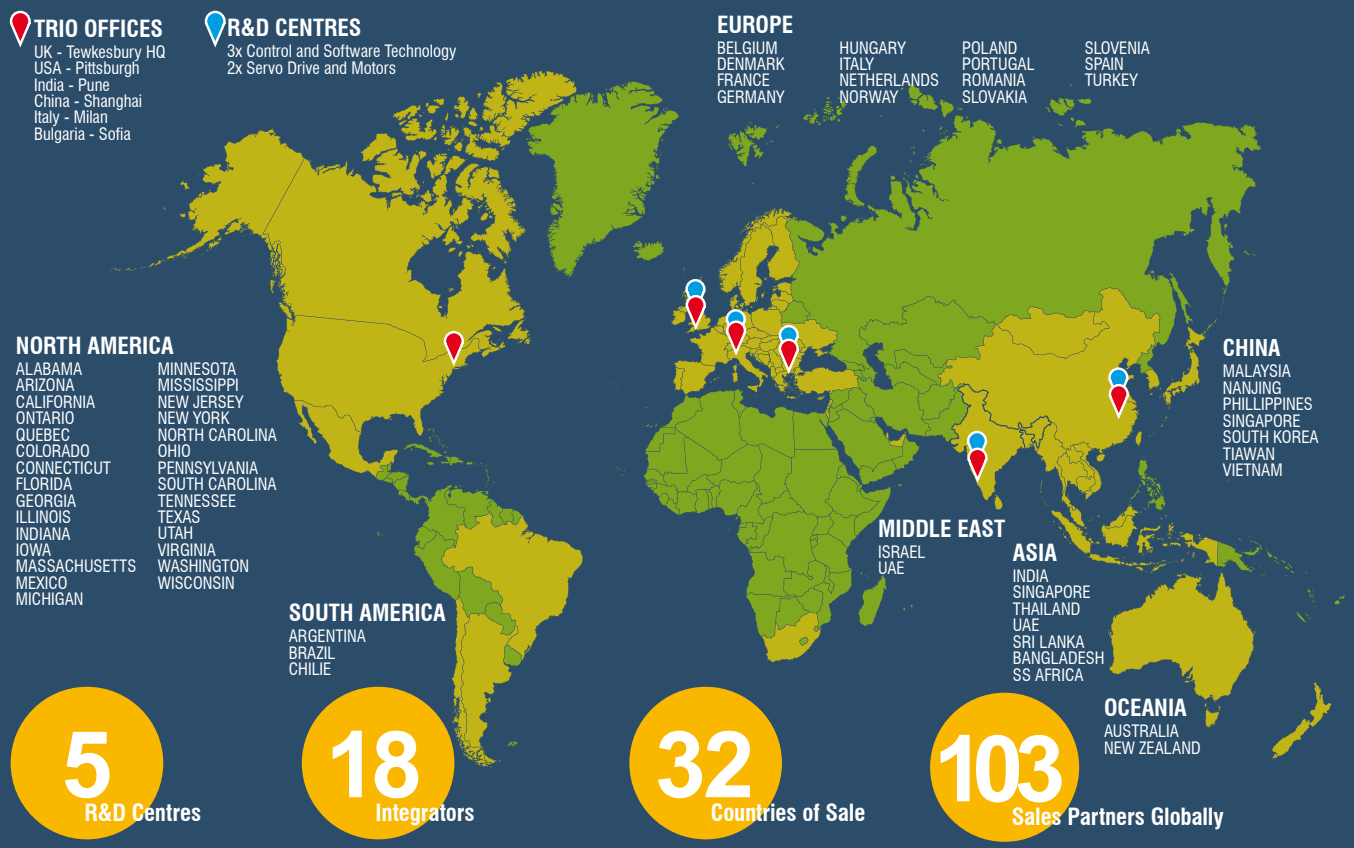
TRIO MOTION TECHNOLOGY
Motion-PLC

Trio Motion Technology specialises in advanced motion control as a core, providing a range of *Motion Coordinators*, drives and motors, expansion interfaces, I/O modules and HMI's built on *Motion*-iX technologies and designed to enable the control of industrial machines with the minimum of external components.

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



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