TRIO
MOTION TECHNOLOGY

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TRIO MOTION TECHNOLOGY
FLEX-X NANO

EtherCAT®

- THE MOTION SPECIALIST -

Flex-X Nano

Integrated EtherCAT Controller

Pocket sized 64 axis controller

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AT A GLANCE

- Up to 64 EtherCAT Digital Drive Axes
- EtherCAT Cycle Times Down to 125 μsec
- 1.2 GHz, 64 Bit Dual Core ARM Cortex A55 Processor
- 128 Mbyte DDR3 Memory
- 128 Mbyte Fast Serial NOR Flash
- Real Time Clock
- Built in Ethercat Coupler for Direct Access to Trio's Flexslice Slaves
- Field programmable with *Motion* Perfect
- High Performance, Flexible Topology and Simple Configuration
- Bus Cycle Time Synchronised with *Motion Coordinator* Servo Period
- Ethercat Protocol to Individual Modules Using the EBUS System
- I/O Functions Tightly Synchronised to Motion Using Ethercat Distributed Clocks
- Practical Push-In Connector Options – No Break Outs Required
- Clip-Together Design With 'Quick Release' Locks For Mechanical Integrity
- RoHS, CE and UL Approved

The Flex-X Nano is a compact, integrated EtherCAT solution offering up to 64 Axes of motion. The on-board memory can be boosted to 32 GByte with the addition a micro SD card.

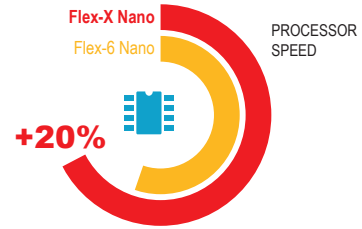
The Flex-X Nano can "plug" straight into our Flexslice System removing the need for the EtherCAT coupler (P366).

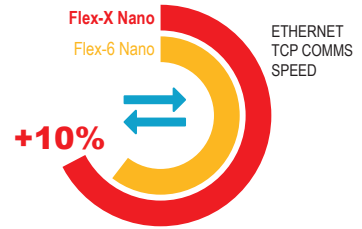
Trio's Flexslice input/output system modules provide a robust, high speed and flexible solution for both motion control and general automation. Fast EtherCAT cycle times are supported by the bus coupler using EBUS technology to bring all the sub-modules on to the EtherCAT network with no degradation in performance.

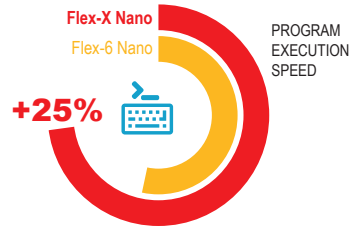
The Flexslice system makes available a selection of digital and analogue I/O terminals as well as motion modules with pulse + direction outputs designed for precise positioning of stepper and servo motors via suitable drive technology.

The digital I/O modules have high-speed functionality. In addition, analogue modules and axis modules may be fitted to make a superbly tailored system that can be placed remotely from the master if needed.

All Flexslice modules support automatic addressing with the master to automatically detect and configure the modules on startup. The bus coupler can support up to 16 input/ output modules which have a positive mechanical lock and bus connector, making a reliable EBUS connection through the backplane. The complete assembly can be DIN rail mounted.







Flex-X Nano

Integrated EtherCAT Controller

Pocket sized 64 axis controller

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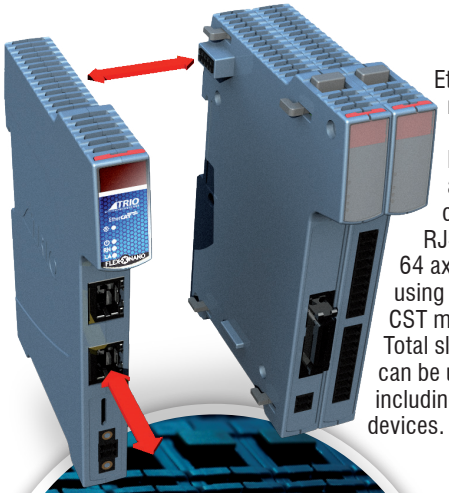
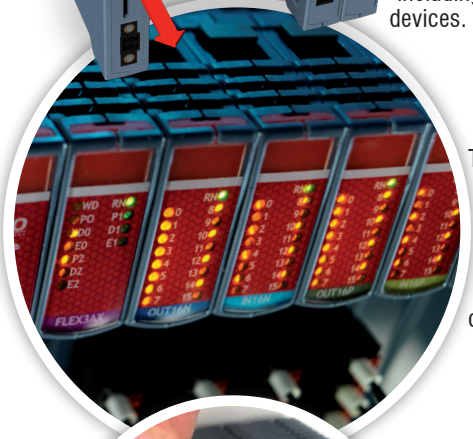
Expansion	
P362	Flexslice Power Connect
P366	Flexslice EtherCAT Coupler
P367	Flexslice Thermocouple
P368	Flexslice RTD Module
P371	Flexslice 16-Out PNP
P372	Flexslice 16-In PNP
P374	Flexslice Analogue 2 Servo Axes
P375	Flexslice Flex 3-Axis
P376	Flexslice 16-Out NPN

Expansion	
P377	Flexslice 16-In NPN
P378	Flexslice 8 Analogue Outputs
P379	Flexslice 8 Analogue Inputs
P386	32-Out NPN
P387	32-Out NPN
P561	UNIPLAY 7A
P562	UNIPLAY 10A
P752	Trio RPS FEC



EtherCAT slave nodes are connected via the Flexslice EBUS and the EtherCAT connector (lower RJ45 socket). Up to 64 axes are supported using CSP, CSV and CST modes of operation. Total slave connections can be up to 128 nodes including I/O and complex devices.

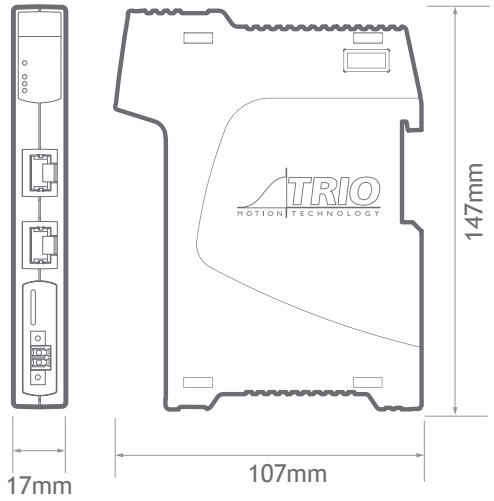


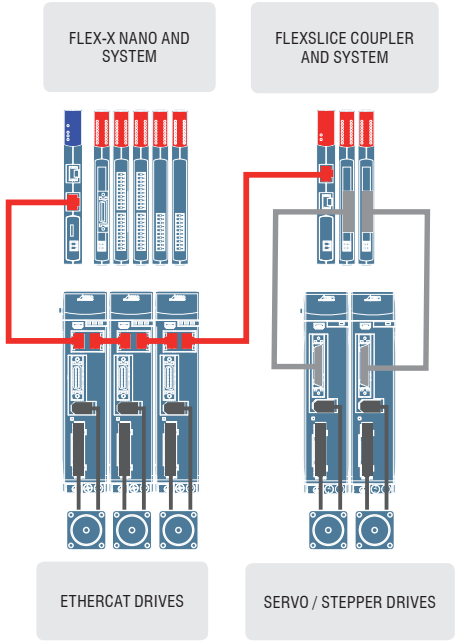
The Flex-X Nano plugs straight into the Flexslice System via the EBUS connector allowing expansion of the system.

To help with identification, each Flexslice module incorporates a handy removable tab that can be written on. It simply slides in and out of a slot at the top of each module.

The Micro SD Card port allows the memory to be expanded to up to 64 GByte.

Product Codes		
P660	Flex-X Nano	2 Axes
P661	Flex-X Nano	4 Axes
P662	Flex-X Nano	8 Axes
P663	Flex-X Nano	16 Axes
P664	Flex-X Nano	32 Axes
P665	Flex-X Nano	64 Axes





Preliminary specifications may change without notice

Flexslice Expansion

Flexible EtherCAT Devices

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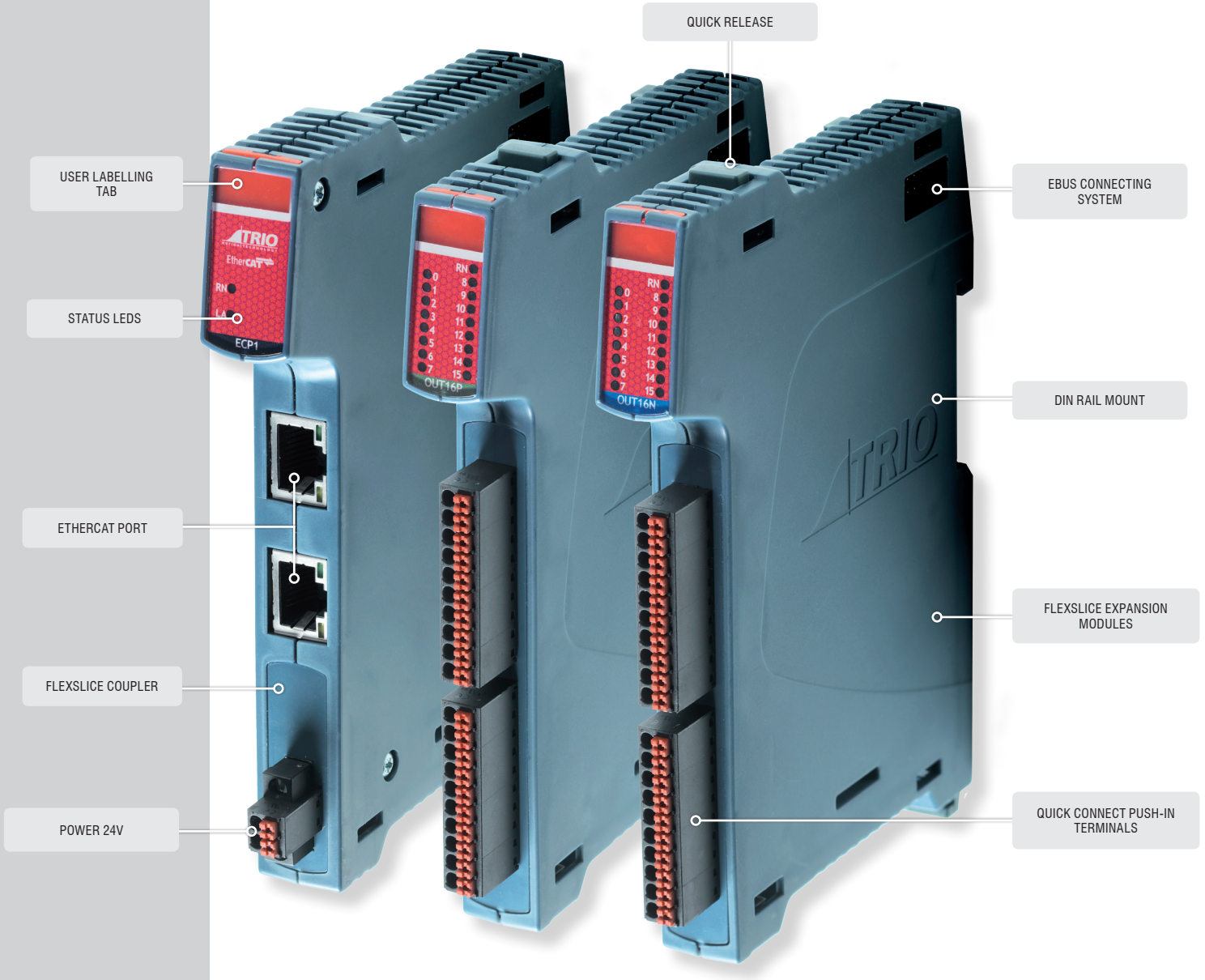
AT A GLANCE

- Use with Trio or 3rd Party EtherCAT Masters
- High Performance, Flexible Topology and Simple Configuration
- Bus Cycle Time Synchronised with *Motion Coordinator* Servo Period
- Bus Coupler Module with 2x RJ45 Ethernet Ports For Ethercat Connection
- Ethercat Protocol Remains Fully Intact Down to Individual Modules Using the E-Bus System
- I/O Functions Tightly Synchronised to Motion Using Ethercat Distributed Clocks
- Automatic Mapping to the *Motion Coordinator* I/O System
- DIN Rail Mounted
- Multiple Practical Push-In Connector Options – No Break Outs Required
- Clip-Together Design With 'Quick Release' Locks For Mechanical Integrity
- User Labelling Facility
- Machine Builder Custom Functionality Options



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The EtherCAT Flexslice System is designed to let you do more! It offers fast flexible expansion for motion applications and can be used with Trio or 3rd Party Masters.

Trio's Flexslice input/output modules provide a robust, high speed and flexible solution for both motion control and general automation. EtherCAT cycle times down to 125 - 4000 μsecs are supported and the bus coupler uses EBUS technology to bring all the sub-modules on to the EtherCAT network with no degradation in performance.

The Flexslice system makes available a selection of digital and analogue I/O terminals as well as motion modules with pulse + direction outputs designed for precise positioning of stepper and servo motors via suitable drive technology.

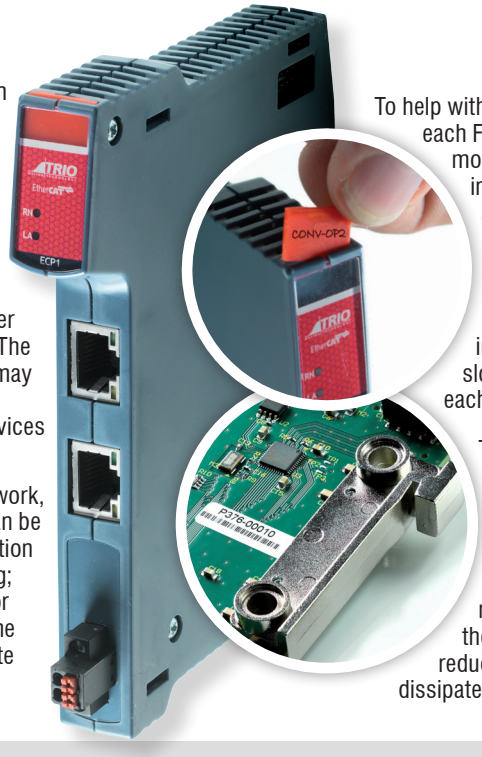
The digital I/O modules have high-speed functionality. In addition, analogue modules and axis modules may be fitted to make a superbly tailored system that can be placed remotely from the master if needed.

All Flexslice modules support automatic addressing with the master to automatically detect and configure the modules on startup. The bus coupler can support up to 16 input/output modules which have a positive mechanical lock and bus connector, making a reliable EBUS connection through the backplane. The complete assembly can be DIN rail mounted.

The Flexslice system begins with the coupler when used with Trio EtherCAT controllers other than the Nano.

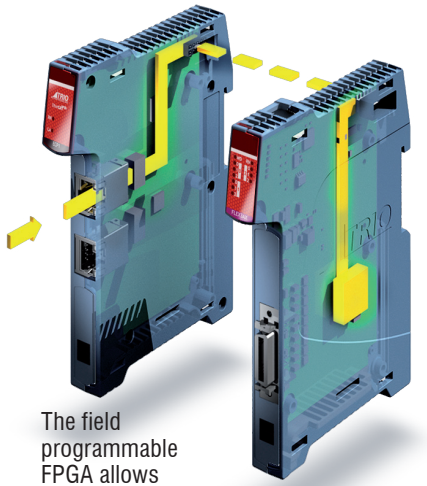
The coupler is connected to the network via the upper Ethernet interface. The lower RJ45 socket may be used to connect further EtherCAT devices in the same strand.

In the EtherCAT network, the P366 coupler can be installed in any position in the Ethernet string; making it suitable for operation close to the master or at a remote position.



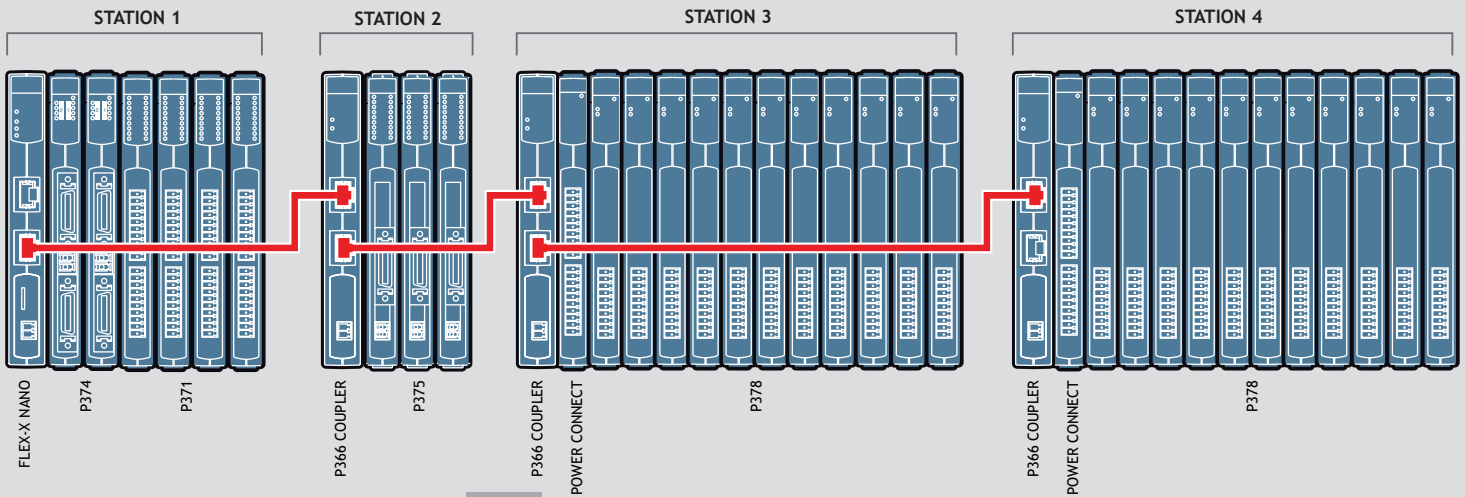
To help with identification, each Flexslice module incorporates a handy removable tab that can be written on. It simply slides in and out of a slot at the top of each module.

The robust metal chassis provides a good earth from the pcb of each module to the DIN rail to reduce noise and dissipate heat.



The field programmable FPGA allows customisation of the functionality of some Flexslice Modules using *Motion* Perfect. The program can be "locked-down" creating a unique function for a machine builder which protects the functionality from being copied.

Up to 16 digital I-O or 8 analogue I-O (for the P367, P368, P374, P375, P378 and P379) Flexslice Modules are supported per P366 EtherCAT Coupler when required. Extra stations can be added to the network using the second EtherCAT port.



Flexslice Expansion

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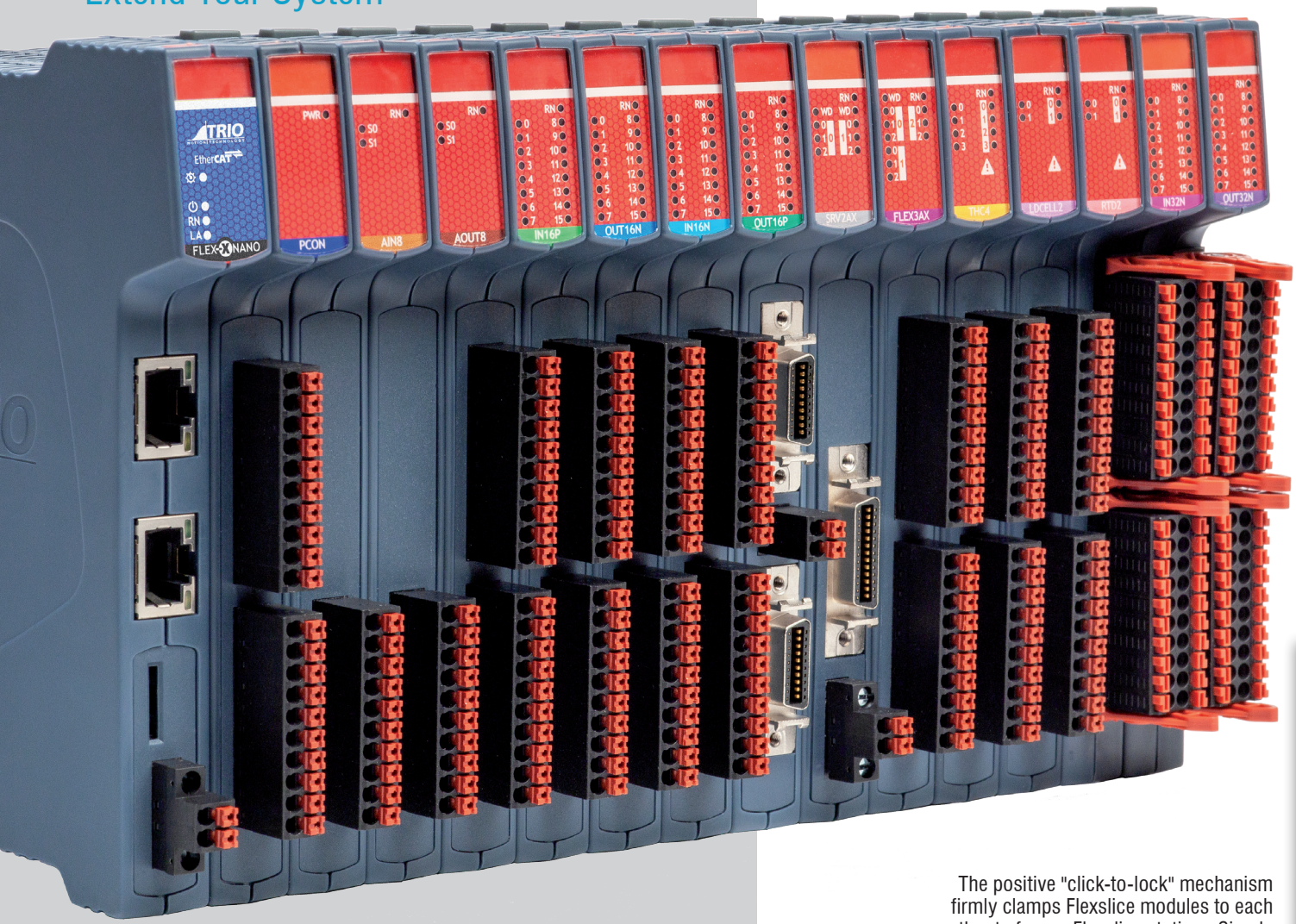
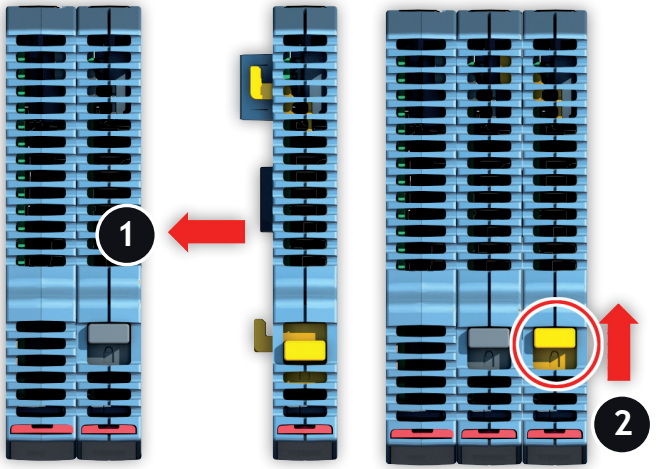


Product Codes	
P362	Flexslice Power Connect
P366	Flexslice EtherCAT Coupler
P367	Flexslice Thermocouple
P368	Flexslice RTD Module
P371	Flexslice 16-Out PNP
P372	Flexslice 16-In PNP
P374	Flexslice Analogue 2 Servo Axes
P375	Flexslice Flex 3-Axis
P376	Flexslice 16-Out NPN
P377	Flexslice 16-In NPN
P378	Flexslice 8 Analogue Outputs
P379	Flexslice 8 Analogue Inputs
P386	Flexslice 32-Out NPN
P387	Flexslice 32-In NPN



The positive "click-to-lock" mechanism firmly clamps Flexslice modules to each other to form a Flexslice station. Simply push each module together and slide the quick release locks into position.

Flexslice Expansion

Flexible EtherCAT Devices

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All Flexslice Modules	
Connectors	Push-in
Cable length (max)	30m
Dimensions (mm)	15w x 147h x 107d
Dimensions (P366)	17.2w x 147h x 107d
Weight	145 g
EtherCAT refresh cycle	≥ 125us
Isolation	1KV
Compliance	RoHS and CE

P366: EtherCAT Coupler

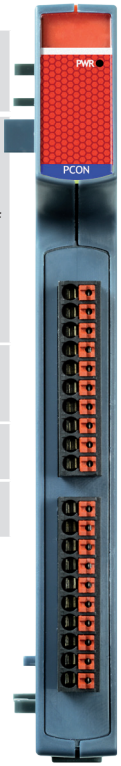
The P366 Flexslice EtherCAT Coupler connects EtherCAT with the EtherCAT slices if required. One station consists of a P366 Coupler and up to 16 Flexslice EtherCAT modules. The Coupler converts the passing telegrams from Ethernet 100BASE-T to EBUS signal format.

Power supply requirement	24V DC, 0.8A min for full system
EtherCAT Connection	RJ45
Protocol	EtherCAT
Data rate	100 Mbit/s
Dimensions (mm)	17.2w x 147h x 107d
Weight	160g
Network Cable	CAT5e min

P362: Flexslice Power Connect

The P362 Flexslice Power Connect provides a solution for simple and convenient wiring of 3 wire sensor power and return wires. The pins of the 2 x single-row push-in connectors are joined together to form 2 isolated banks of commoned connections. With 0V connected to the lower connector and 24V to the upper connector, the LED gives an indication that power is on.

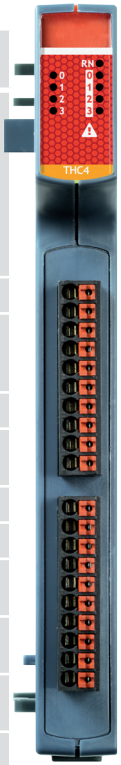
Module current consumption (EBUS 5V)	0mA
Power supply requirement	24V (+/-20%) DC
Max connector current	4A

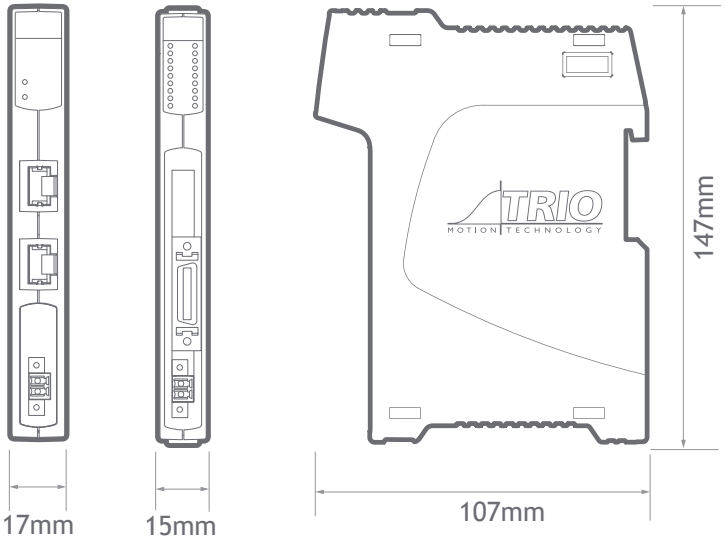


P367: Flexslice Thermocouple

The P367 Flexslice Thermocouple module has 4 thermocouple inputs, each digitised to a resolution of 16 bit. The 4 thermocouple inputs are brought out to a single row push-in connector. A second single row push-in connector has 4 relay outputs for control of a heater or other switched load.

Power supply	via the EBUS
Module current consumption (EBUS 5V)	160mA max
Number of Inputs	4
Thermocouple types	J, K, T, E
Resolution	16 bit
Number of Outputs	4
Output type	Normally open (NO) solid state relay
Load type	Resistive, inductive and capacitive
Max. Output Voltage	24V
Max Output Current	100mA





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P368: Flexslice RTD Module

The P368 Flexslice RTD module has 4 resistance temperature detector (RTD) inputs, each digitised to a resolution of 16 bit. The 4 RTD inputs are brought out to a single row push-in connector. A second single row push-in connector has 4 relay outputs for control of a heater or other switched load.

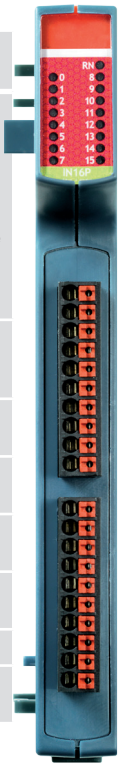
Power supply	via the EBUS
Module current consumption (EBUS 5V)	160mA max
Number of Inputs	4 (or 2 with 4 wire RTD)
RTD types	PT100 2, 3 or 4 wire
Resolution	16 bit
Number of Outputs	4
Output type	Normally open (NO) solid state relay
Load type	Resistive, inductive and capacitive
Max. Output Voltage	24V
Max Output Current	100mA

P371: 16-Out PNP

The P371 digital output Flexslice connects the binary control signals from the Motion Coordinator to the machine's output devices at 24V DC. All 16 outputs are current sourcing (PNP) type and have electrical isolation. Outputs and power connection are via 2 x single-row push-in connectors. The Flexslice module indicates the output signal states via LEDs.

Module current consumption (EBUS 5V)	110mA max
Number of Digital Outputs	16 (2 banks of 8)
Power supply requirement	24V (+/-20%) DC
Load type	Resistive, inductive and capacitive
"ON" time	110us (10% to 90%)
"OFF" time	210us (90% to 10%)
Max. Output current	0.5A per channel
Max. Output current	4A per bank of 8 Outputs
Short−Circuit Protection	1.4A typ per output
Over voltage Protection	Yes
Reverse Voltage Protection	Yes

P372: 16-In PNP



The P372 digital input Flexslice connects 24V DC signals from devices on the machine to the binary control registers in the Motion Coordinator. All 16 inputs are current sinking (PNP) type and have electrical isolation. Inputs and power connection are via 2 x single-row push-in connectors. The Flexslice module indicates the input signal states via LEDs.

Module current consumption (EBUS 5V)	100mA max
Number of Digital Inputs	16 (2 banks of 8)
Power supply requirement	24V (+/-20%) DC
"ON" Voltage threshold	11.2V typ
"OFF" Voltage threshold	10.2V typ
Input current	3.5mA typ
Input filter Cut-off (RC network)	18KHz

P374: Flexslice Analogue 2 Servo Axes

The P374 Flexslice Analogue 2 Servo Axis Module allows up to 2 servo motors, stepper motors or encoders to be connected to a control system. It supports incremental encoder inputs. If configured for stepper / pulse output an axis can be pulse+direction or quadrature simulated encoder output. Two 20 way MDR connectors provide a reliable shielded connection for high speed signals. Each MDR connector supports all the signals for full closed loop control of a servo axis.

Module current consumption (EBUS 5V)	180mA max
Max Axes	2 (software configurable)
Max Enc Rate	8M Edges/s encoder count
Max Step Rate	8MHz pulse count
Step / Pulse Width	Pulse Control or Square Wave
Enc / Step Input / Output	RS422
DAC Voltage Output	2 x 12bit +/-10V @ 5mA
Registration Inputs	4 x 24V Isolated PNP inputs
WDOG Output	2 x Normally open (NO) solid state relay
WDOG Max. Output Voltage	24V
WDOG Max Output Current	100mA
Field Programmable	Yes
Power Supply	24V (+/-20%) DC @ 100mA

Preliminary specifications may change without notice

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P375: Flex 3-Axis

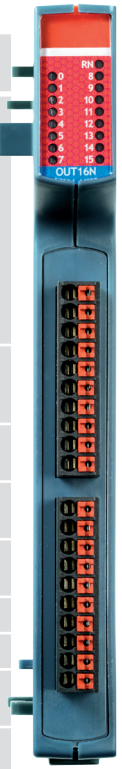
The P375 Flex 3 Axis Module allows up to 3 stepper motors or encoders to be connected to a control system. It supports incremental encoders. If configured for stepper / pulse output an axis can be pulse+direction or quadrature simulated encoder output. A single MDR connector provides a reliable shielded 26 way connector for high speed signals. The P375 is compatible with most high-resolution microstep drives.

Max Step Rate	8MHz pulse count
Step / Pulse Width	Pulse Control or Square Wave
Max Enc Rate	8MHz encoder count
Module current consumption (EBUS 5V)	150mA max
Field Programmable	Yes
Step/Enc Port	MDR Connector 0...5V
Max Axes	3 (software configurable)
WDOG Output	Yes
Resistration	1 per axis

P376: 16-Out NPN

The P376 digital output Flexslice connects the binary control signals from the Motion Coordinator to the machine's output devices, such as relays, contactors, valves, lamps etc. at 24V dc. All 16 outputs are current sinking (NPN) type and have electrical isolation. Outputs and power connection are via 2 x single-row push-in connectors. The Flexslice module indicates the output signal states via LEDs.

Module current consumption (EBUS 5V)	110mA max
Number of Digital Outputs	16 (2 banks of 8)
Power supply requirement	24V (+/-20%) DC
Load type	Resistive, inductive and capacitive
"ON" time	75us (90% to 10%)
"OFF" time (typ)	105us (10% to 90%)
Max. Output current	0.5A per channel
Max. Output current	4A per bank of 8 Outputs
Short−Circuit Protection	3A typ per output
Over voltage Protection	Yes
Reverse Voltage Protection	Yes



P377: 16-In NPN

The P377 digital input Flexslice connects 24V dc signals from devices on the machine to the binary control registers in the Motion Coordinator. All 16 inputs are current sourcing (NPN) type and have electrical isolation. Inputs and power connection are via 2 x single-row push-in connectorss. The Flexslice module indicates the input signal states via LEDs.

Module current consumption (EBUS 5V)	100mA max
Number of Digital Inputs	16 (2 banks of 8)
Power supply requirement	24V (+/-20%) DC
"ON" Voltage threshold	13.7V typ
"OFF" Voltage threshold	14.6V typ
Input current	3.5mA
Input filter Cut-off (RC network)	18KHz

P378: 8 Analogue Outputs

The P378 Flexslice 8 Analogue Output module has eight programmable voltage range output terminals, each digitised to a resolution of 12 bit. The 8 single ended outputs have a common 0V potential and are brought out to a single push-in connector.

Power Supply	via the EBUS
Module current consumption (EBUS 5V)	200mA max
Signal voltage	-10...+10V; 0...+10V
Signal current	+/-6mA max
Resolution	12 bit
Output impedance	0.5ohm
Number of Analogue Ouputs	8

Flexslice Expansion

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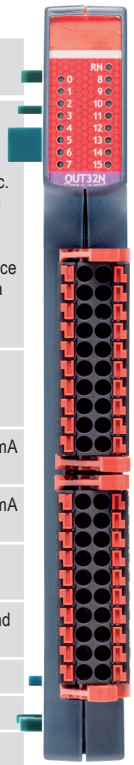
P379: 8 Analogue Inputs

The P379 Flexslice 8 Analogue Input module has eight programmable voltage range input terminals, each digitised to a resolution of 12 bit. The 8 single ended inputs have a common 0V potential and are brought out to a single row push-in connector.

Power Supply	via the EBUS
Module current consumption (EBUS 5V)	160mA max
Signal voltage	-10...+10V; 0...+10V
Resolution	12 bit
Overvoltage protection	±25V
Number of Inputs	8

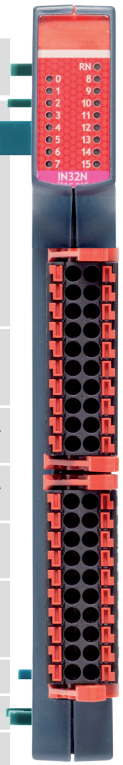
P386: 32-Out NPN



The P386 digital output slice connects the binary control signals from the Motion Coordinator to the machine's input devices, such as relays, contactors, valves, lamps etc. at 24V dc. All 32 outputs are current sinking (NPN) type and have electrical isolation. Outputs and power connection are via 2 x double-row push-in connectors. The Flexslice module indicates the output signal states via LEDs.

Module current consumption (EBUS 5V)	160mA max
Output-Bank 1	16 x NPN Output, 3.5mA typ, 24V dc common
Output-Bank 2	16 x NPN Output, 3.5mA typ, 24V dc common
Power supply requirement	24V (+/-20%) DC
Load type	Resistive, inductive and capacitive
"ON" Voltage	13.7V typ
"OFF" Voltage	14.6V typ
Input current	3.5mA typ
Input filter Cut-off (RC network)	18KHz

P387: 32-In NPN



The P387 digital input slice connects 24V dc signals from devices on the machine to the binary control registers in the Motion Coordinator. All 32 inputs are current sourcing (NPN) type and have electrical isolation. Inputs and power connection are via 2 x double-row push-in connectors. The Flexslice module indicates the input signal states via LEDs.

Module current consumption (EBUS 5V)	160mA max
Input-Bank 1	16 x NPN Inputs, 3.5mA typ, 24V dc common
Input-Bank 2	16 x NPN Inputs, 3.5mA typ, 24V dc common
Power supply requirement	13.7V typ 24V (+/-20%) DC
Load type	3.5mA Resistive, inductive and capacitive
"ON" Voltage	13.7V typ
"OFF" Voltage	14.6V typ
Input current	3.5mA typ
Input filter Cut-off (RC network)	18KHz

Motion Perfect

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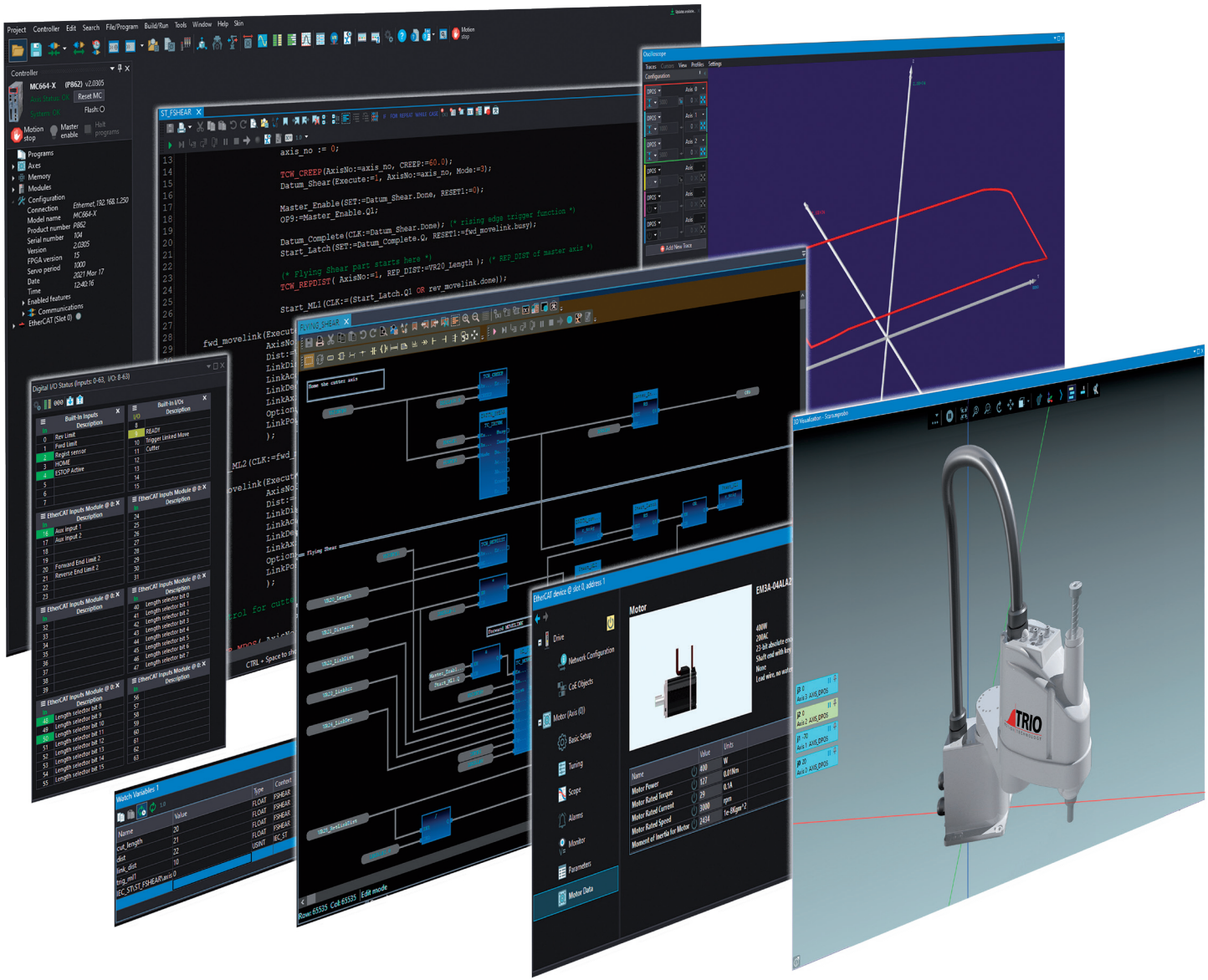
Design, Develop, Test, Deploy and Secure

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

The commissioning of DX Servo Drives, SCARA 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 and the robotics solution; TrioRPS. Advanced visualisation including a 3D oscilloscope and IP protection of your projects are also included within *Motion* Prefect.



Motion iX

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Motion Optimal Engineering Technologies

Trio Machine Automation Technology

Trio has developed powerful rich set of software tools for use with Trio systems. These tools provide all the features necessary for setup and programming to ensure minimum development time.

Development Tools

- Project Management
- 3D Visualisation
- Security Project Encryption
- 6D Motion Scope
- Simulation
- CAMGen
- Drive Configuration
- CAD2Motion
- HMI Design
- Program Libraries

Motion-iX - Advanced Motion Core

- Motion-iX Programming
- 64bit Precision
- Up to 128 axis Coordination Control
- IEC61131
- Scalable Motion Technologies
- Complex Motion
- PLCopen
- Kinematic SCARA Delta Cartesian
- G-Code and HPGL
- API - PC Application Development
- Path Planning Look Ahead
- Advanced Interpolation
- MOTION-rX ROBOTICS Programming
- GEARING/CAM MOVELINK FLEXLINK
- Registration Control

Network / Technologies

- EtherCAT
- RTEX
- ETHERNET-IP
- PROFINET
- MODBUS
- DEVICENET
- CANOPEN
- FUNCTIONAL SAFETY (STO)

Not all technologies are used with all Trio product.

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 and complex kinematics, including robotics such as SCARA, to deliver truly optimal machine control performance.

Motion-iX includes development in IEC61131 and PLCopen, and boasts inverse kinematics capabilities to truly coordinate all machine axes as one, including robots to maintain tight synchronisation or robots and machine as one. Virtualization allows simulation of the mechanics and motion to significantly reduce development and testing, delivering optimal control every time, by minimising machine cycle times.

Trio Global
Worldwide Network
Design, Develop and Support Worldwide

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UK - Tewkesbury HQ
USA - Pittsburgh
India - Pune
China - Shanghai
Italy - Milan

R&D Centres
2 x Control & Software Technology
2 x Servo Drives & motors

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DENMARK
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ITALY
NETHERLANDS
NORWAY
POLAND
PORTUGAL
ROMANIA
SLOVAKIA
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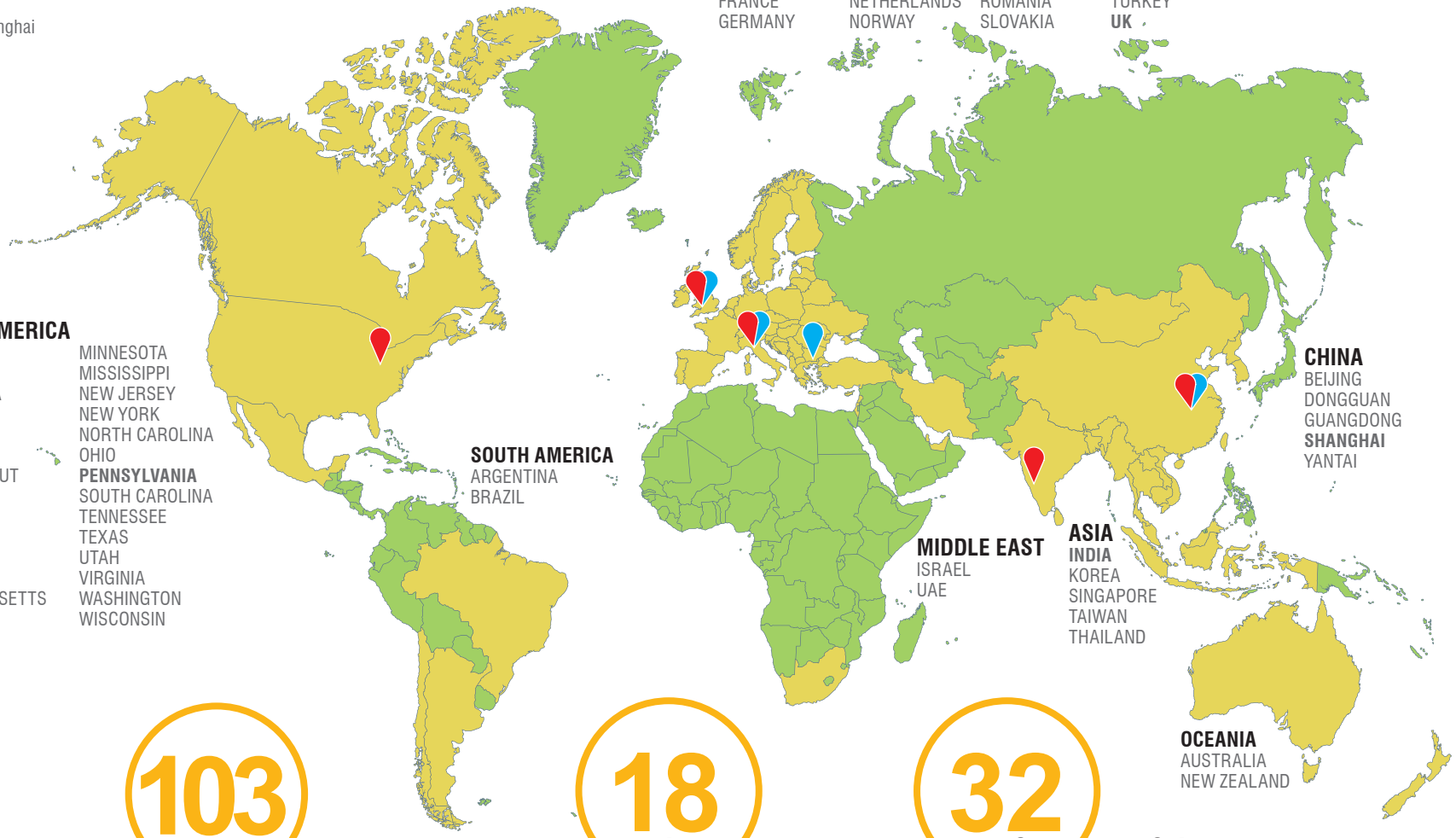

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UAE

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INDIA
KOREA
SINGAPORE
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THAILAND

CHINA
BEIJING
DONGGUAN
GUANGDONG
SHANGHAI
YANTAI

OCEANIA
AUSTRALIA
NEW ZEALAND

103 Sales Partners Globally

18 Integrators

32 Countries of Sale

TRIO MOTION TECHNOLOGY

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TRIO MOTION TECHNOLOGY
FLEX-X NANO

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

TRIO MOTION TECHNOLOGY
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Version 1.3-Flex-X Nano Solutions brochure-2022