

Motion Controllers,
Motion Modules,
Servo Amplifiers
and Motors



**Motion
Controllers**

**MELSEC
System Q**

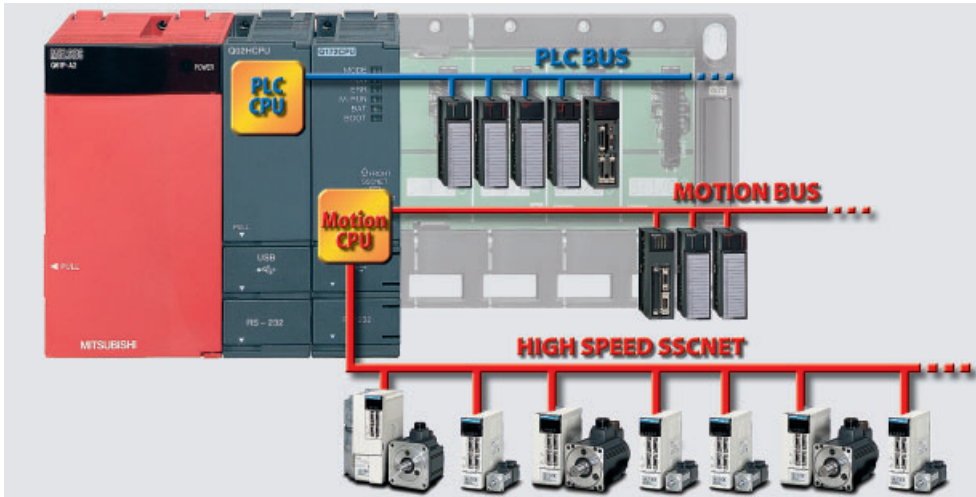
MELSEC A



**Intelligent Technology
for Moving Performance**



Motion Control and PLCs – Perfect Integration of Intelligence and Precision



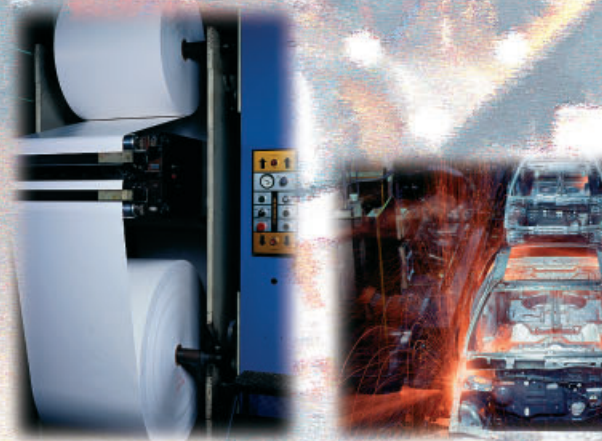
Motion Control and PLC in perfect harmony

Motion control systems have huge potential for optimising production processes and improving product quality. Today, motion controller systems are already predominant in specialised mechanical engineering applications, machine tools, printing and paper processing machines, modern packaging

Today's machine manufacturers and end users demand forward-looking automation concepts that suit to the needs of today's and tomorrow's markets.

Mitsubishi has combined dynamic servo technology with PLC intelligence to create a completely new generation of motion control products: Motion Controllers and Motion Modules

The MELSEC System Q and MELSEC A controller lines are now more versatile than ever. Their flexible modular design enables configuration of system solutions with motion controllers or motion modules to cater to individual customer needs and requirements. Whichever option you choose, System Q allows flexible integration of the motion controller and the motion modules.



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and food bottling and canning machines, grinding, polishing and engraving machines, X-Y-Z tables and many automation and handling systems in semiconductor fabs.

Perfectly synchronous axis control

Mitsubishi motion control systems synchronise all connected servo axes simultaneously. Synchronisation of the individual axes is performed almost in real time via a high-speed SSCNET Motion Bus –

with hitherto unimaginable precision. Ready-made cable connector sets for the high-speed motion network reduce cabling overheads to a minimum, delivering plug-and-play performance in the most literal sense of the term.

Smart motion functions

The Mitsubishi motion controllers include many powerful functions and capabilities as standard features, including the ability to program virtual and real master axes, simultaneous interpolation of 4 axes, freely-definable cams, electronic gears etc.



Simple operation

Mitsubishi motion control systems come with many powerful functions and capabilities as standard features. Additional support is provided by a powerful graphical programming package for the motion controllers.

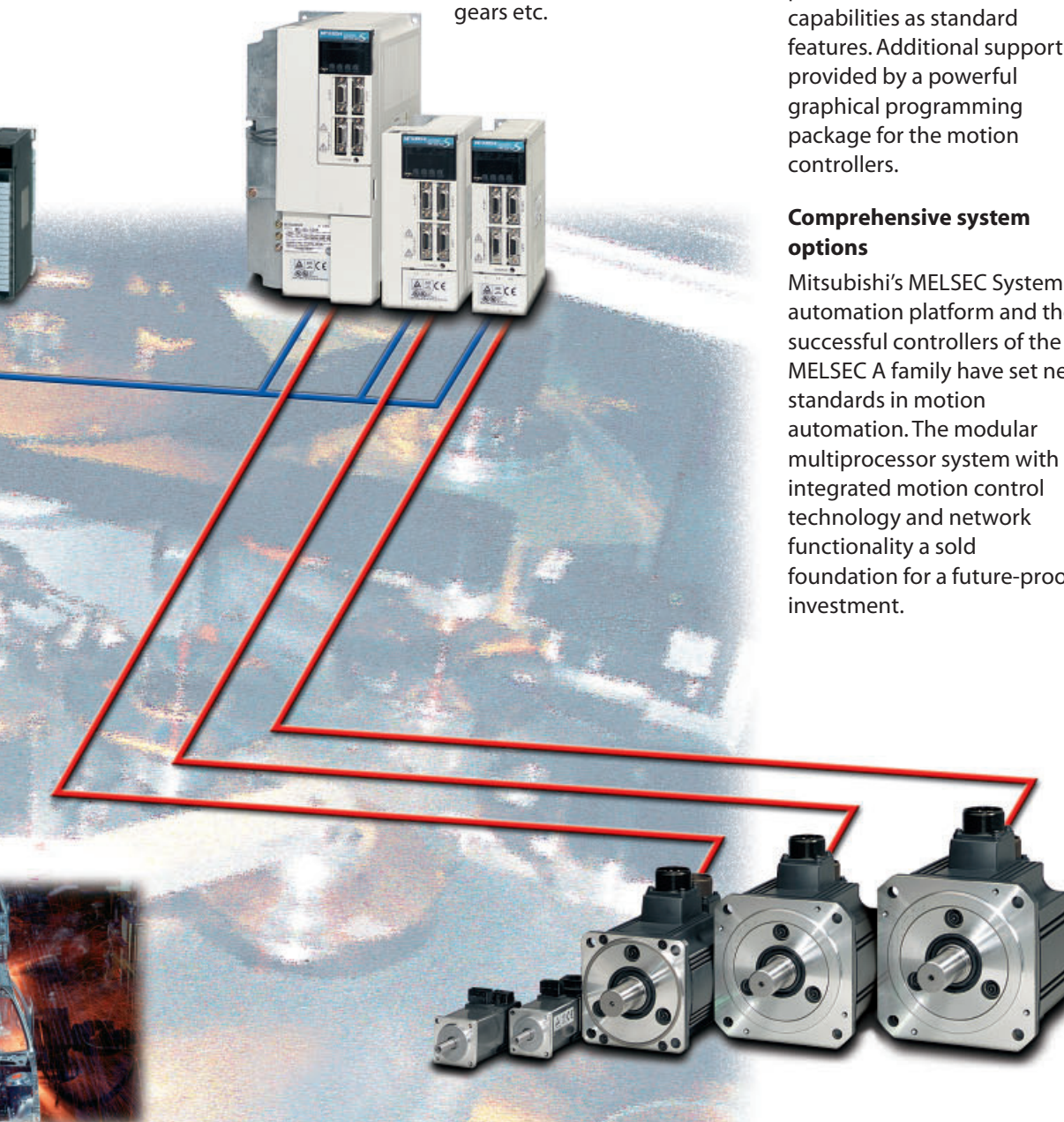
Motion Control technology is perfectly integrated in the MELSEC System Q.

Comprehensive system options

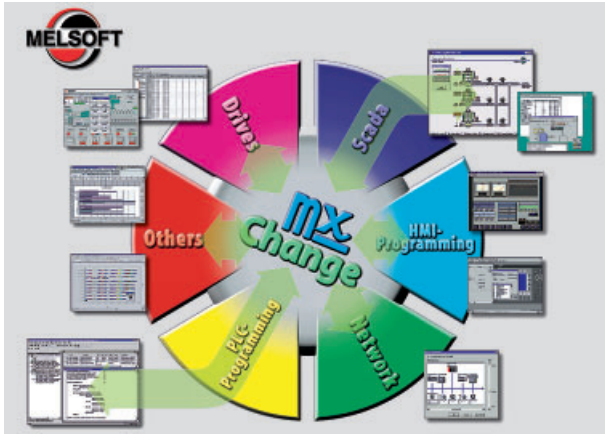
Mitsubishi's MELSEC System Q automation platform and the successful controllers of the MELSEC A family have set new standards in motion automation. The modular multiprocessor system with integrated motion control technology and network functionality a solid foundation for a future-proof investment.

In addition to the ability to configure their control systems to meet machine manufacturer's individual needs, the modular design of Mitsubishi motion controller systems also bring many additional user benefits:

- *Reduced machine down times*
- *Faster installation and setup*
- *Improved machine performance*
- *Enhanced machine flexibility and versatility*
- *Faster format changes*
- *Faster machine delivery times*



Powerful Software Packages for Your Individual Needs



Software is becoming more and more important: Just a few years ago mechanical components still accounted for 80% of the total development costs of a machine. Today this has fallen to just 40%.

A powerful, Windows-based programming environment makes it easier for users to get their complex systems up and running quickly and easily.

High programming standards

A wide range of powerful standard software tools are available, significantly reducing expensive programming time. All specific settings and parameters are set up and administered with a standard software utility. No separate servo setup software is required.

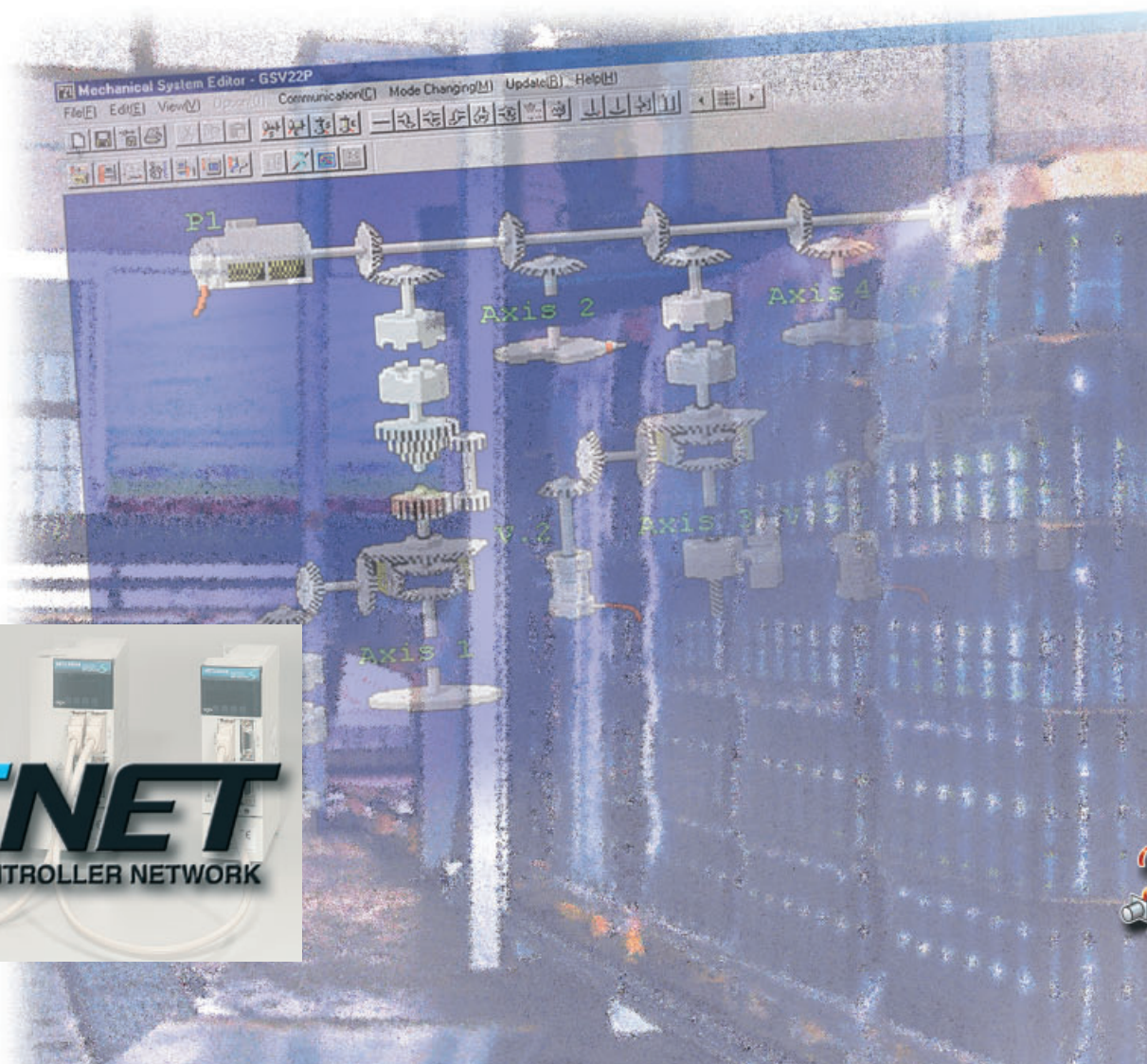
The motion controller and servo drives are all configured directly on screen. The individual combinations of servo amps and motion control CPUs are checked

automatically and any errors are signalled immediately, making system crashes impossible.

Multitasking power for reliable process execution

The speed of production processes and machine movements depends to no small degree on the programming and execution of the motion control program. Mitsubishi has developed a special motion SFC language with multitasking performance that keeps it isolated from external influences.

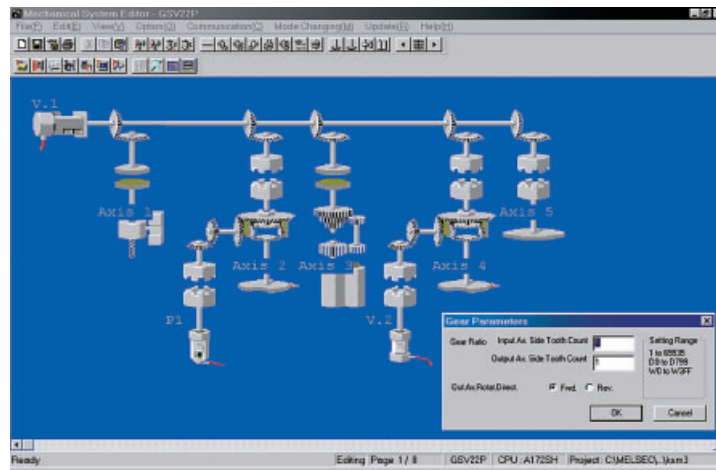
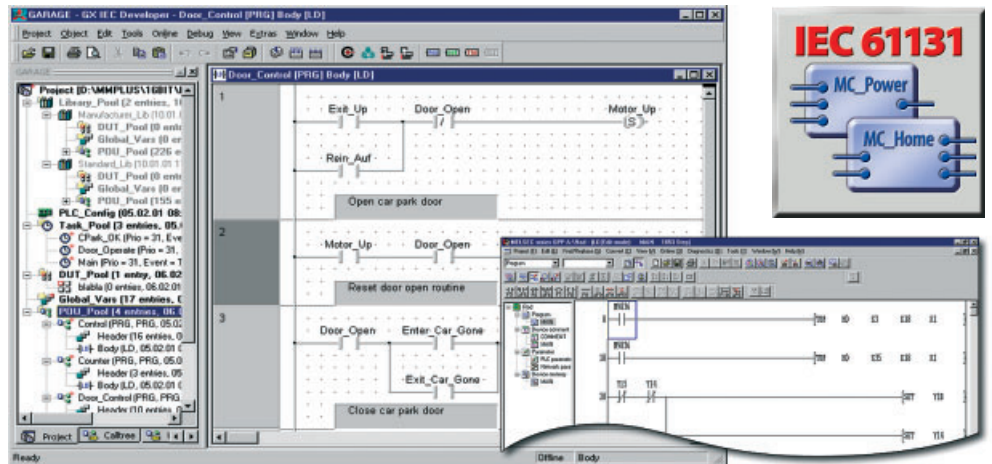
The individual axes are synchronised almost in real time via the high-speed SSCNET network.



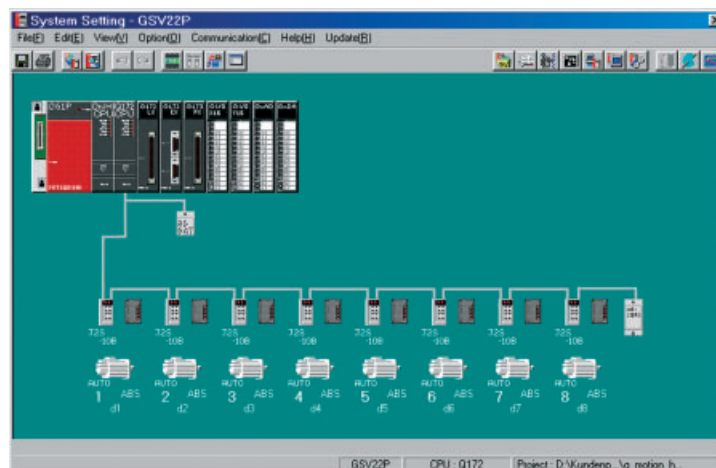
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IEC 1131.3 and/or virtual programming

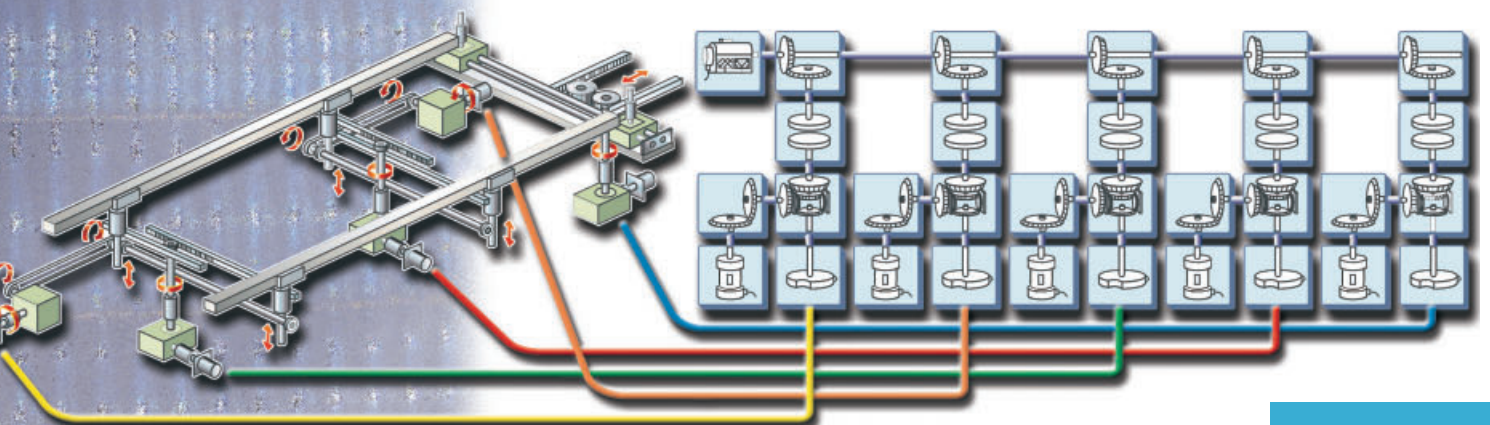
Mitsubishi motion control systems synchronise all the connected axes simultaneously. Programming is performed quickly and easily online with a "virtual mechanical editor", eliminating the need for time-consuming text editing and step programming. The ability to use the graphical editor to define electronic cam disks greatly simplifies the implementation of complex mechanical processes. The logic of the motion controller and motion modules is programmed with a software platform conforming to the IEC standard. The motion modules also support function block programming in accordance with the PLCopen standard.



The graphical interface makes configuration a virtual line shaft very simple. System component configuration settings and parameters are edited directly in the motion control configuration software.



Simple graphical drive system development with a virtual or real master axis and a virtual mechanical editor that makes it extremely easy to program even the most complex motion sequences.



Digital Servo Drives in Integrated Motion Control Systems



All Mitsubishi servo motors come with an absolute positioning encoder as standard equipment. Special materials and winding technologies guarantee the shortest possible motor cycle times.

Mitsubishi Electric's servo amps feature intelligent technology with a high level of miniaturisation and extremely short program cycle times.

International standards

The servo amps of the motion control system conform to all major international standards, regulations and directives.

The separate connection for the control logic power supply makes it possible to maintain error message capabilities even when the servo amp itself is switched off. All motors are available

with electromagnetic braking as an option. All these features make it possible to choose exactly the right product for your application.

Absolute value encoders as standard equipment

An absolute value positioning encoder is included as standard equipment (17 bits resolution, 131,072 p/rpm). The non-volatile absolute encoding system with battery backup eliminates the need for time-wasting zeroing routines. You can configure an absolute position localisation

Mitsubishi Electric's worldwide presence ensures maximum product and service availability and quality, no matter where you are located.



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system using conventional I/Os and a controller with pulse trains. All servo amps are also fitted with a serial RS-232/RS-422 port for connection of a PC or notebook computer, enabling simple and comfortable parameter configuration and diagnostics.

Adaptive control with vibration suppression

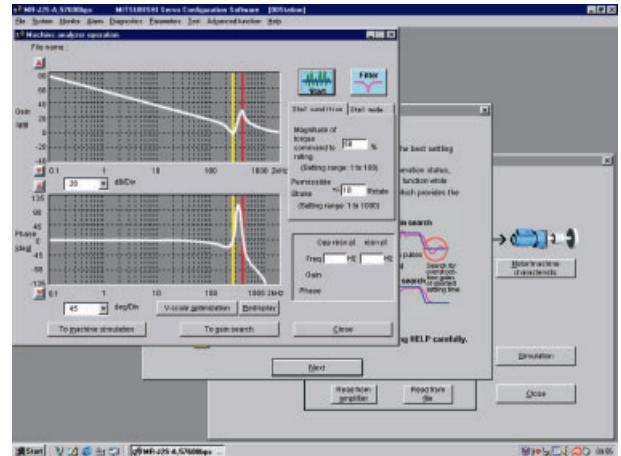
Irrespective of your application the high-speed response performance of the servo amps guarantees stable systems with minimal rise times. Micro-vibrations (oscillation around a pulse point at standstill) are effectively suppressed.

Automatic motor identification

As soon as the positioning encoder connection is established the servo amp automatically registers the model parameters of the connected servo motor. No additional settings are needed.

Real-time auto-tuning

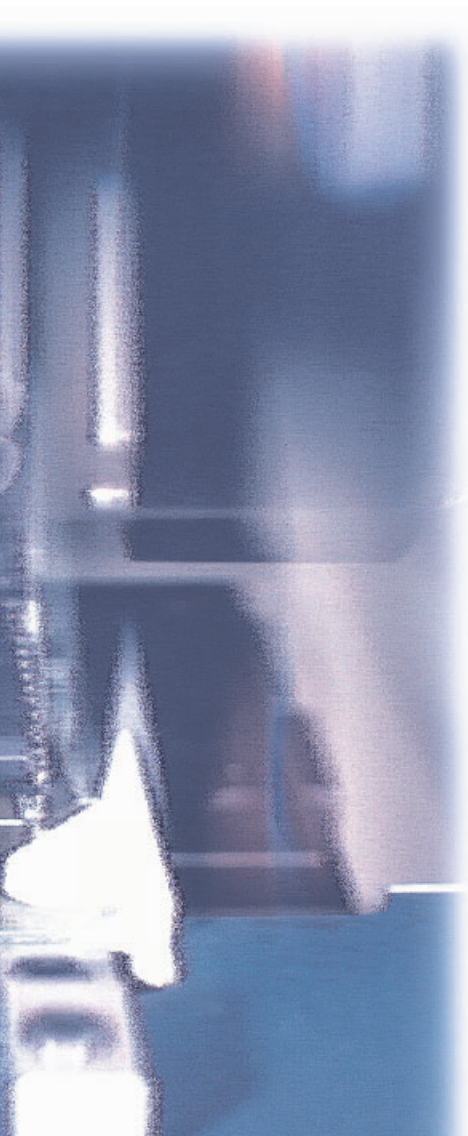
The servo amp gain is regulated automatically, even in applications with fluctuating torque loads. This system reliably identifies even the most difficult load situations, including hanging loads and high friction, and automatically optimises the parameters.



Machine analysis

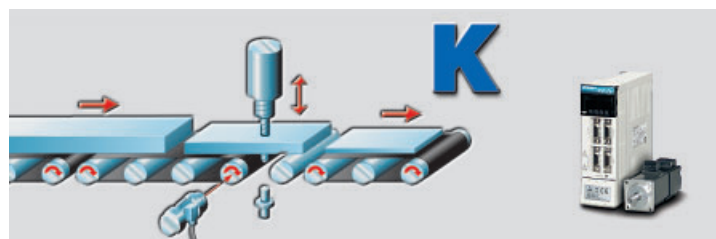
After connection of the motor the integrated machine analysis takes just 30 seconds to calculate the resonance frequency of the mechanical system.

The machine analysis results are used to eliminate speed and torque fluctuations and to optimise response performance.

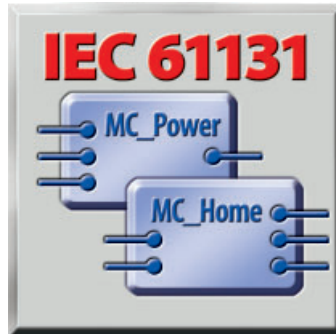


Mitsubishi servo motors are available in a wide power range for all imaginable applications.

- **Motor Type M** (0.16 ~ 2.4Nm): Minimum inertia for positioning tasks requiring exceptionally short cycle periods
- **Motor Type K** (0.16 ~ 2.4Nm): Low inertia for applications involving drive trains with low rigidity
- **Motor Type S** (2.4 ~ 33.4Nm): Medium inertia for applications calling for a broad speed range
- **Motor Type R** (3.18 ~ 15.8Nm): Low inertia for applications with a direct connection to a rotating spindle



Mitsubishi Motion Control Systems Offer Many Functions and Benefits



MELSEC A
A171SHCPU
A172SHCPU
A173UHCPU-S1



MELSEC System Q
Q172CPUN
Q173CPUN



- **IEC 61131 programming for the motion modules**
- **Graphical programming for the motion controllers**
- **Free choice of hardware and software brings enhanced productivity**
- **Simple software servicing and maintenance**
- **Low initial, servicing and maintenance costs**
- **Minimum training overheads**
- **Shorter time-to-market for new machines**
- **Powerful instruction sets for all normal positioning functions**
- **Simultaneous interpolation of 4 axes**

Motion Control MELSEC System Q

CPU	Q172CPUN	Q173CPUN
Cycle period/log. instr.	0.034 µs	0.034 µs
I/Os	8,192	8,192
Servo axes	8 x 3	32 x 3
Axis synchronisation	0.88 ms	3.5 ms
Servo program memory	64 K	64 K
No. of servo programs	4,096	4,096
Ports (CPU)	USB (12 Mbit/s), RS-232 (5.6 Mbit/s), SSCNET (115.2 Mbit/s)	
Servo amp port	SSCNET (115.2 Mbit/s)	SSCNET (115.2 Mbit/s)

Motion Control MELSEC A

CPU	A171SHCPU	A172SHCPU	A173UHCPU-S1
Cycle period/log. instr.	0.25 µs	0.25 µs	0.15 µs
I/Os	512	1,024	2,048
Servo axes	4	8	32
Axis synchronisation	3.5 ms	7.11 ms	14.1 ms
Servo program memory	13 K	13 K	14 K
No. of servo programs	4,096	4,096	4,096
Ports (CPU)	RS-232 (5.6 Mbit/s), SSCNET (115.2 Mbit/s)		
Servo amp port	SSCNET (115.2 Mbit/s)	SSCNET (115.2 Mbit/s)	SSCNET (115.2 Mbit/s)

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