2010/2011

MITSUBISHI ELECTRIC
FACTORY AUTOMATION

The Automation Book
A world of solutions

Global service & support /// Innovative solutions ///
Standards driven /// Improving financial performance ///

Global impact of Mitsubishi Electric

We bring together the best minds to create the best technologies. At Mitsubishi Electric, we understand that technology is the driving force of change in our lives. By bringing greater comfort to daily life, maximising the efficiency of businesses and keeping things running across society, we integrate technology and innovation to bring changes for the better.

Through Mitsubishi Electric's vision, "Changes for the better" are possible for a brighter future.

Mitsubishi Electric Quality

Mitsubishi Electric is involved in many areas including the following

- **Energy and Electric Systems**

A wide range of power and electrical products from generators to large-scale displays.

- **Electronic Devices**

A wide portfolio of cutting-edge semiconductor devices for systems and products.

- **Home Appliances**

Dependable consumer products like air conditioners and home entertainment systems.

- **Information and Communication Systems**

Commercial and consumer-centric equipment, products and systems.

- **Industrial Automation Systems**

Maximising productivity and efficiency with cutting-edge automation technology.

Changes for the Better

Contents

Present right through Europe

An open working relationship between supplier and customer gets results faster and more efficiently.

From the development of products to the management of entire plants, our experience in the industrial market spans more than 75 years. The knowledge we have built up over the decades and our complete product portfolio allow us to work together with customers to create complete turnkey solutions that meet all specific needs. With a globe-spanning service network, we not only provide after-sales service, but also training and technical consultation.

Global partner, local friend

Mitsubishi Electric Factory Automation is synonymous with innovative, high-quality products. Our programmable logic controllers, drive solutions and industrial robots are among the most powerful on the market, and have been contributing to the success of European manufacturing for over 30 years.

Sales and support, never far away

The Factory Automation division has its own sales organisations in Germany, Great Britain, France, Ireland, Italy, Spain, Russia, Poland and Czech Republic. In addition, we have developed an extensive network of partner companies across the whole of Europe and neighbouring countries.

Our European Support Group (ESG) has been set up to provide coordination, control and quality management of our local support activities. This is complimented by our European Development Center as well as our EMC competency centre.

Trust and loyalty is as important as products

Collaboration with capable partners in the automation industry is one of the key elements in Mitsubishi's success. Today more than ever, customers expect automation solutions tailored to the specific requirements of their applications. Our partners' expertise in specific industries, coupled with Mitsubishi Electric's innovative automation technology, are the two main ingredients of a successful recipe for made-to-order solutions and perfect customer service.

A focus on service

The customer is always the focus of all our service activities. Our customers get the best possible support from experienced staff, who provide competent advice and help with planning, projects, installation and configuration, training and all automation questions and tasks. Optimized stocks and a central logistics centre ensure fast, efficient deliveries of replacement and spare parts. For fast technical information and support, we handle questions from customers all over Europe via our telephone hotline.

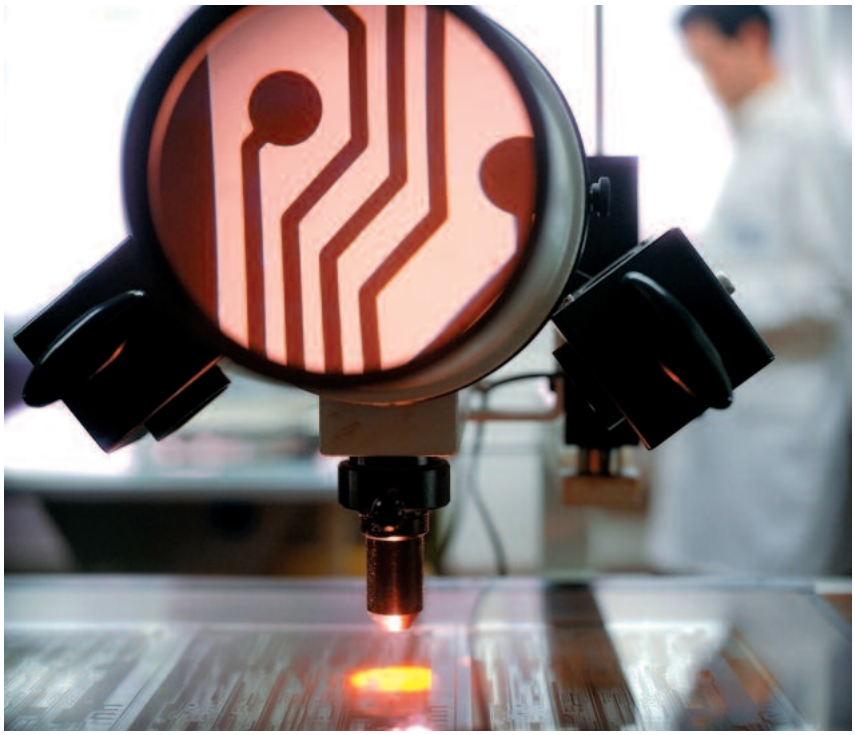
Setting the standards

Mitsubishi has a reputation for producing high quality products. This comes, in part, from our commitment to understanding and meeting the requirements of international standards and directives. In addition to European CE compliance, many products also have additional approvals such as:

- e-mark, for use in vehicles
- Shipping approvals like ABS, DNV, GL, RINA, BV, Lloyd's register
- International approvals like UL (USA), cUL (Canada) and GOST (Russia)

Market leaders

In the world of manufacturing, change is omnipresent. To ensure our products reflect the current needs of customers, we base every aspect of product development and production on the voice of the market. To keep our high levels of product reliability, we incorporate a quality control program that leaves nothing to chance, resulting in the high level of quality synonymous with the Mitsubishi name.



Attention to detail leaves little to chance.

Mitsubishi Electric products are widely regarded as being among the most innovative in the industry. In terms of volume, one in three PLCs in the world today is a Mitsubishi. Indeed, some of our competitors use Mitsubishi's innovative power management technology in their own frequency inverters. When all these factors are taken together, it is no wonder our customers think of Mitsubishi's automation products as leading the market.

Water

Application in action
Company: Klinting Vandvaerk
Location: Denmark
Automation specialist: PRO/AUTOMATIC
Application: Water pumping station
Products: Mitsubishi modular PLCs, frequency inverter drives, Wago remote I/Os
Network: CC-Link
Note:
Bore holes were up to 1.2 km away from the main water station.
Comment :
"It was easy to create the network systems and it has some very powerful unique features."
Jean Petersen PRO/AUTOMATIC

Water is a critical element of life. Without a constant, clean supply for drinking and washing and effective handling of grey waste, society quickly breaks down. Automation solutions need to be reliable and flexible to meet the changing demands of the public but also the pressures to deliver shareholder value. That is why so many utility companies use Mitsubishi Electric.

Food

The range of food available to the consumer today is vast, from ready prepared salads to pre-cooked pies and frozen meats. Much of it comes from far off places but must be processed and delivered on time, every time. Because food is so important to our daily lives there are strict rules and guidelines regarding traceability, labelling, packaging and quality control. Mitsubishi has expertise in all of these areas.

Application in action
Company: Virgin Trading (Virgin Cola)
Location: Ireland
Automation Specialist: Charles Wait
Application: Manufacture of cola concentrate
Products: Mitsubishi software and modular PLCs
Note:
Production facility built to be one of the most efficient in the world with an on-site staff of 6 producing up to 2 billion litres of Cola per year
Comment: :
"We chose Mitsubishi … because of their reputation for reliability and worldwide support particularly in the food and beverage industry."
Rod Golightly, Charles Wait

Manufacturing

Application in action
Company: Kaba Group
Location: Austria
Application: Manufacture of keys
Products: Mitsubishi robots
Note:
Two robots are used, one to place the brass workpiece in to the milling machine while a second Robot picks up machined keys and applies the final finsh from a rotating brush.
Comment :
"Thanks to the use of the robot we were able to reduce costs and significantly improve the transit time."
Robert Weninghofer Production Manager at Kaba

Manufacturing, like all engineering fields, is constantly under pressure to deliver innovative products in the most cost effective way. Generally, manufacturers are looking for suppliers who offer automation solutions that support the wide variety of standards they need, as well as offering flexibility, availability and reliability. This is one reason why the world's manufacturers have bought more than nine million Mitsubishi FX family PLCs since their introduction over 25 years ago.

Automotive

Shorter production cycles, adaptive manufacturing and integration of all areas in the manufacturing process are what make the automotive industry one of the most high power, high pressure, manufacturing sectors in the world.

This is also why these global brands turn to Mitsubishi for the highest level of automation expertise.

Application in action
Company: Global Engine Manufacturing Alliance (GEMA)
Location: USA
Application: Manufacture of automotive engines
Products: Mitsubishi modular PLCs, HMI control units, servo amplifiers, CNC controllers and software
Note:
GEMA is an alliance of the Chrysler Group, Mitsubishi Motors and Hyundai Motor Co. There are two facilities which will, together, produce up to 840,000 engines per year.
Comment:
The Chrysler Group estimates that they will save annual costs of around 100 million dollars per year with the new automation concept.

Chemical

Application in action
Company: Follmann & Co.
Location: Germany
Application: Adhesive manufacture
Products: Mitsubishi compact PLCs, HMI control units, frequency inverter drives
Networks: Ethernet + Profibus
Note:
The system has control over the manufacturing process for processes for 17 different adhesives
Comment :
"This economical alternative to centralised process control technology makes all functions and process and production data transparent, from the source up to the management Level."
Axel Schuschies Works Manager

The chemical and pharmaceutical industries are among the world's most competitive, facing tough "speed to market" issues. New products developed in the laboratory have to be rushed into production. To do this safely, quickly and reliably, manufacturers need flexible automation solutions that support a wide range of standards. Mitsubishi Electric automation products answer these needs.

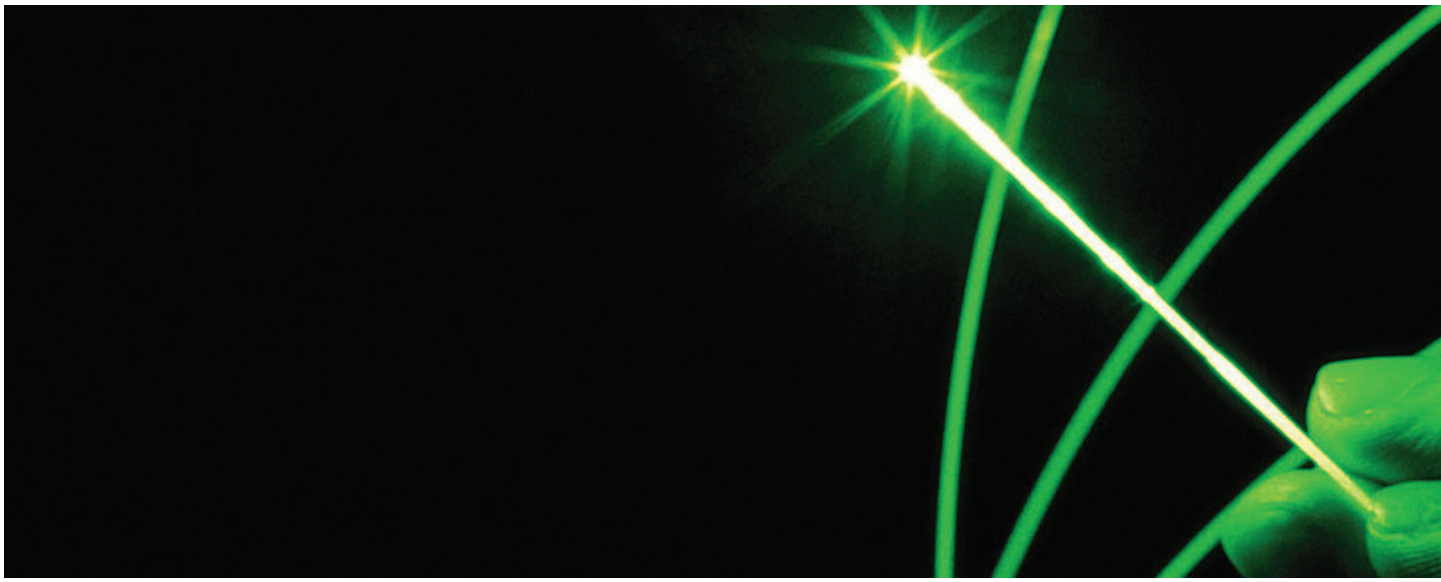
Process

Many automated applications are a continuous process. They vary widely, ranging from power stations to waste incineration. However, all share a need for highly reliable systems. Moreover, control and management of operational waste is an issue undergoing greater regulation through directives such as IPPC. Mitsubishi developed its System Q specifically to meet these requirements.

Application in action
Company: European Vinyls Corporation (EVC)
Location: United Kingdom
Automation specialist: Tritec
Application: Combined Heat and Power (CHP) plant
Products: Mitsubishi modular PLCs and software
Note:
Dual redundant PLC solution cost 25 % of traditional DCS solution. Installed system now saves £500,000 (approx. €530k) per year. Payback for the control system was 6 months.
Comment :
"The PLC control system we developed had a system cost of around £0.25m, compared to £1m or more for a conventional system."
Tim Hartley, Tritec

Tomorrow's quality...

No matter what the application, the industry or a company’s size, Mitsubishi offers its customers the best service possible. This involves getting to know and understand the customer’s needs, and being responsive to changing legal and social attitudes in order to develop products required tomorrow, in one year, or in five years.



Tomorrow’s technology requires investment today

R&D – lifeblood of the future

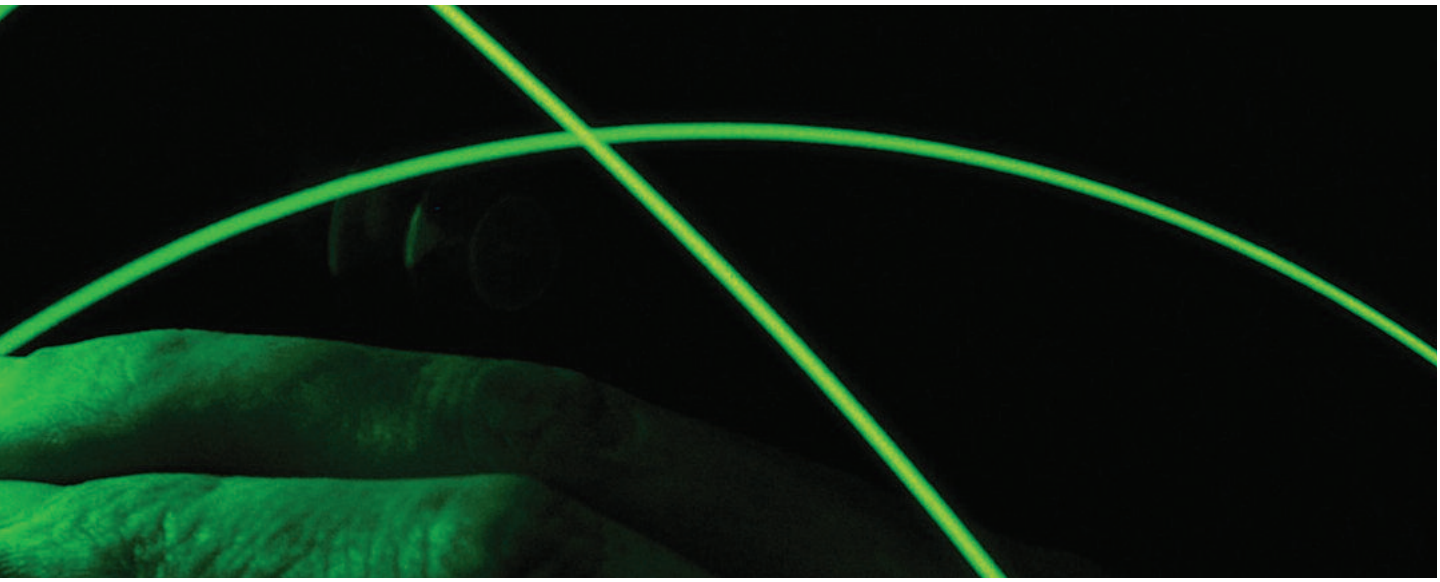
Research and development is the lifeblood of Mitsubishi Electric. Our research and development centres in Japan, the United States and in Europe are working on innovative technologies today for the breakthrough products of tomorrow. Mitsubishi Electric invests approximately 4 % of sales in developing tomorrow’s technologies.

...today's goals

In a variety of ways, putting programmes and systems into place that help us get closer to our goal of actualizing a sustainable planet. From procurement to product design and manufacturing to logistics these activities demonstrate how environmentally conscious thinking and action are steadily becoming ingrained in our corporate culture.

Helping the environment

It's all about balance: the balance between effective use of resources, efficient use of energy, and safeguards against potentially harmful substances.



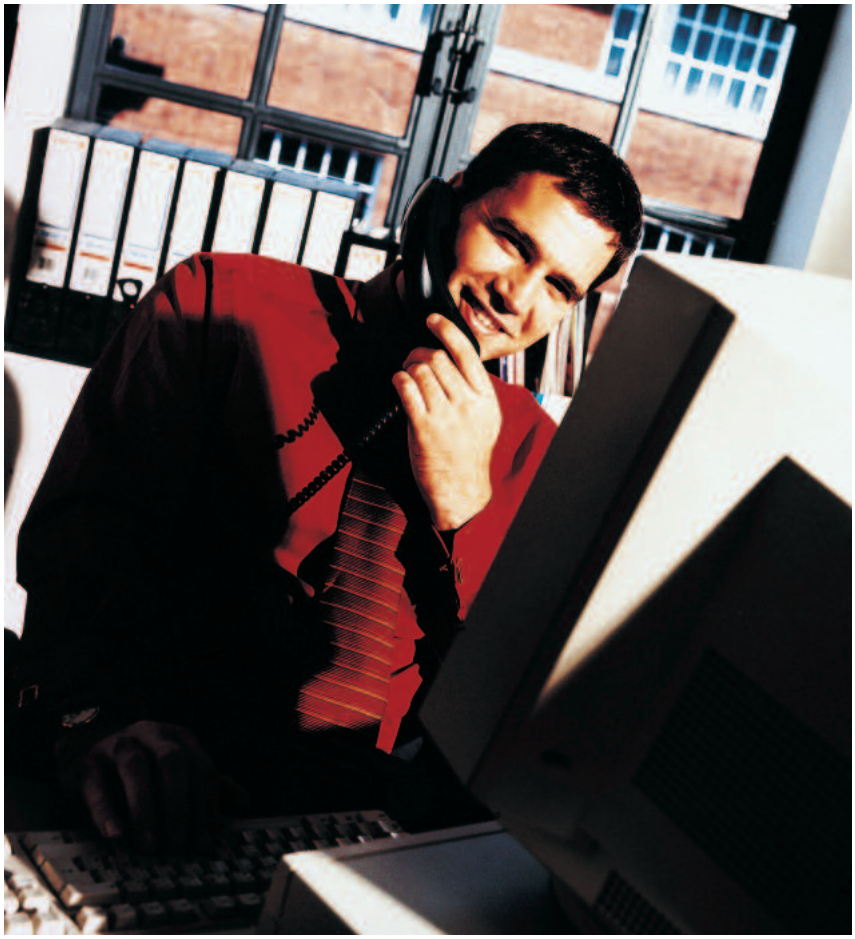
This insight into the balance between efficient automated manufacture and care for our environment helps us to better understand the needs of our customers. For example, the need to monitor and control waste in accordance with the European Integrated Pollution Prevention Control (IPPC) directive.

Working for a sustainable future.

This is an immense challenge, but one that Mitsubishi Electric is actively pursuing on a daily basis, while keeping focused on one goal. That goal is a global society where life can continually improve in harmonious coexistence with the natural environment.

And so Mitsubishi factories work to ensure full ISO 14000 compliance, and to produce products with fewer harmful substances.

Product and service



Technical support is about getting the right answers first time.

When choosing an automation partner our customers look at many different factors, from company stability to market-leading products. Yet one thing they are all interested in is service and support.

The European Service Group is here to help you

The European Service Group

Mitsubishi Electric's European Service Group is the umbrella organization covering all industrial automation service and support in Europe. A network of Mitsubishi Customer Technology Centres and partners across Europe provides local assistance, backed up and supported by the central ESG team.

ESG offers a wide range of services including maintenance and repairs, training, engineering advice and 24-hour assistance.

The human element

Our customer telephone hotline services, supporting both current and past product lines are controlled and organised by the ESG. Local engineers then provide telephone support in native languages.

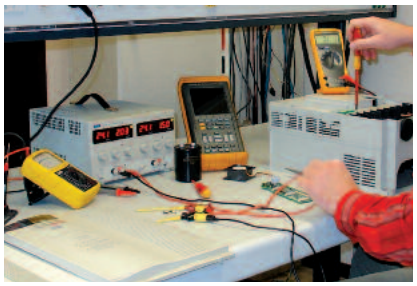
Reliable technical support is only a call away

This local service is backed up by our central European Service Group providing deep technical support where needed. Thanks to this mix of local and centralized support customers can always be sure they can get the support they need, when they need it.

Complementing our local support, the website www.mitsubishi-automation.com offers MyMitsubishi users access to manuals, CAD drawings, HMI drivers, GSD files etc. for free.

Minimizing downtime

Downtime caused by an operational failure is never good news. In today's tough business environment returning to full production as soon as possible is critical. Through the ESG, Mitsubishi offers a wide range of repair options for minimizing customer downtimes.



All repairs are carried out by qualified and experienced engineers.

Training for performance

Dealing with complex automation equipment in a fast-paced manufacturing environment requires well-trained personnel. Mitsubishi's ESG offers the latest automation training in the use and maintenance of automation systems. This ensures optimum operating performance.

Comprehensive training programs

Automation solutions...

Micro PLCs
The world's favorite micro PLC brings together power and simplicity in equal measure.

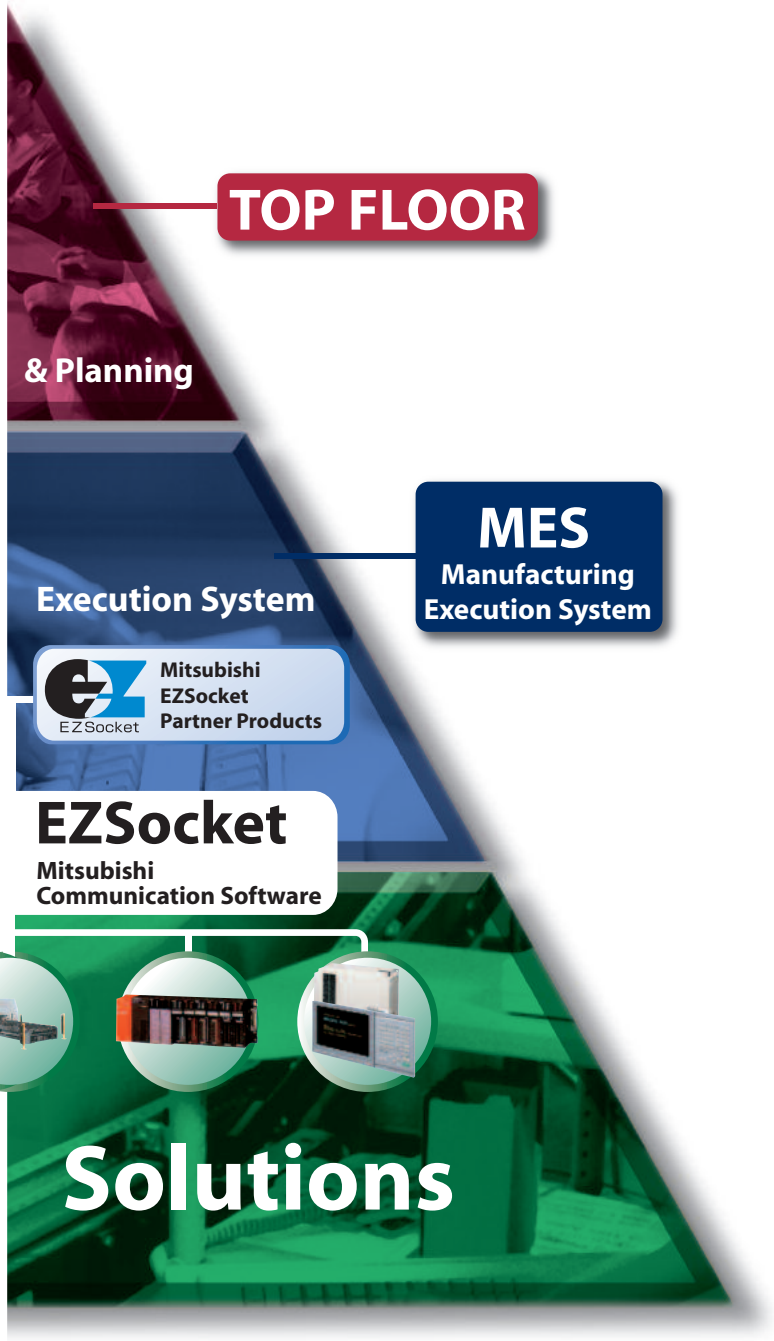
Modular PLCs
From standalone solutions to networked and redundant systems, System Q is the automation platform to build on.

MELSOFT
Productivity tools and software solutions to help you get the best out of your automation investment.

HMIs, GOTs and IPC
Mitsubishi offers what is probably the biggest range of control terminals and industrial PCs (IPCs) available from any single manufacturer.

Inverters
Mitsubishi has a reputation for reliable inverters, which makes it easy for customers to "Fit and Forget".

...whatever the application



Motion Control
Mitsubishi Servo and Motion systems offer scalable solutions from 1 to 96 axes.

Robots
MELFA robots offer class leading technology for both SCARA and articulated arm systems.

LV Switchgear
Advanced low voltage technology covering switchgear and circuit breakers.

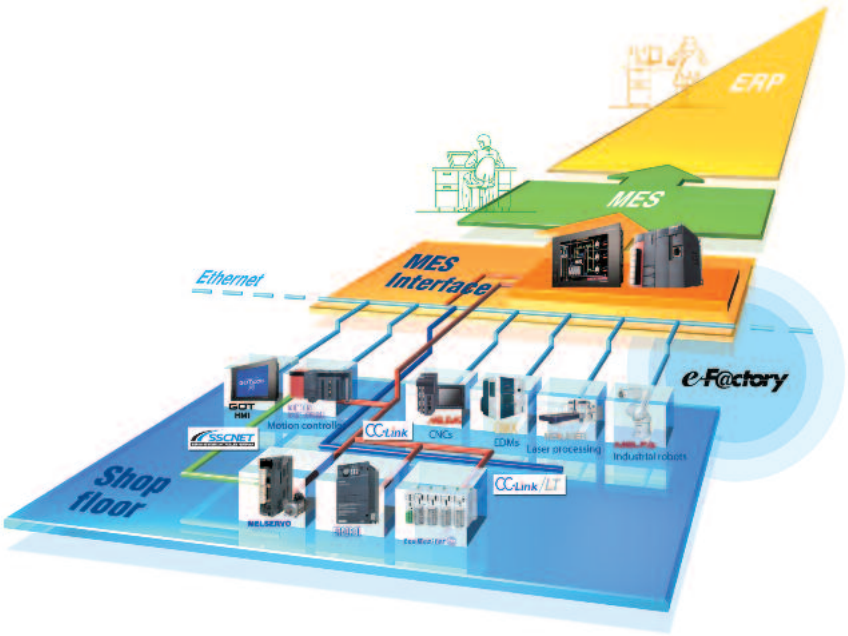
CNC Control
Maximise your production and control with the utmost reliability.

EDM Machines
Mitsubishi EDM - voted as the "Global Market Leader 2005" by Frost and Sullivan.

e-F@ctory

e-F@ctory is the Mitsubishi Electric solution for improving the performance of any manufacturing enterprise, providing three key benefits: Reduced total cost of ownership (TCO), Maximized productivity, and Seamless integration.

The e-F@ctory solution



Get maximum system efficiency and performance with e-F@ctory

Our solutions for your benefit

e-F@ctory was born out of the expertise Mitsubishi Electric has developed as a global manufacturing enterprise, facing essentially the same challenges our customers face. Our solution has been implemented in our factories with dramatic results. We are now sharing this expertise with those who are looking for the same benefits from their own manufacturing operations.

An e-F@ctory plant solves various issues through the direct collection of a wide variety of production site data, such as production and operation performance results and quality information, in real-time from equipment and devices, and then utilizes this data in an enterprise IT system.

This real time integration of production data and enterprise IT solidly aids in improving quality, reducing lead time and increasing productivity. The e-F@ctory solution has several key parts as follows.

CC-Link Network Architecture

CC-Link provides a complete open network architecture that links all factory devices. The top layer is CC-Link IE, which provides the first gigabit Ethernet backbone to meet the ever increasing data communication needs of modern factories.

This extends down the hierarchy with CC-Link IE Field, bringing gigabit bandwidth to all devices.

iQ Platform

The iQ Platform is the enabling controller hardware for the e-F@ctory solution. An iQ system unites PLC, motion, CNC, robot and process control in a single unified controller architecture, linked seamlessly by a high speed backplane.

MES Interface

The MES Interface IT products provide the vital link between the shop floor controllers such as the iQ Platform, and the enterprise IT systems. The connection is direct, with no intermediate PC hardware introducing maintenance or security issues.

For more informations about Mitsubishi MES interface products please refer to the technical part, chapter 12 in this catalogue.

The e-F@ctory Alliance

A key part of the e-F@ctory solution is the "e-F@ctory Alliance". We have teamed with other best-in-class suppliers to create partnerships that allow our customers to truly benefit from the most comprehensive solutions available. Currently the e-F@ctory Alliance covers over 10 different partners, with more to follow in the future. Current partners include: such as: 3S-Smart Software Solutions, Cognex, Control Microsystems, ILS Technology, INEA, LEM, ProLeiT, Raima/Birdstep, Rittal, Schad, ubigrate, Invensys/Wonderware, etc.

Safety solutions

Comprehensive safety solutions

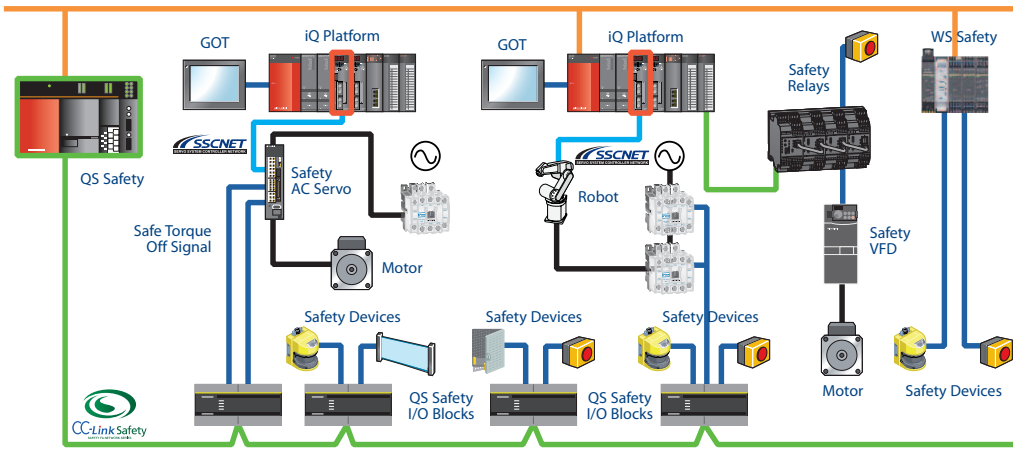
The European Machinery Directive or international standards such as ISO12100 impose strict regulations for the safety of plant and machinery. Just like the machines themselves, the automation systems that control them must also comply with the directives and standards to ensure the safety of personnel in all phases of the machines' service life.

At the same time, the safety concept has shifted from human intervention based "zero accidents" to risk assessment based "zero risk". As a solution for this, Mitsubishi Electric provides a total safety solution by incorporating safety control devices, safety drive devices, and safety components required for safety systems. This allows optimal safety control to be realized, boosting productivity.

Many companies can offer you a choice of safety devices, or perhaps a safety system of some kind. However, few can provide a complete safety solution that fully integrates with the conventional automation of your systems. The result is not only worker, machine and process safety, but industry leading productivity and performance.

Safety in every phase of your production

Please refer to the technical information section of this catalogue for more informations and ask for our seperatly available safety brochure.



Safety control is fully integrated into the Mitsubishi Electric automation solution

Simple, easy, reliable

Proven reliability from standalone to complete installations

Simple

Mitsubishi PLCs are simple to use. We have reduced many complex actions to a single instruction, making our PLCs much easier to program.

Easy

Moreover, we have designed programming and system configuration to be as flexible as possible. For example, programming tools like GX Developer allow users to quickly create PLC programs and configure new modules.

Complementing these are our GX IEC programming packages, specially designed for users who wish to use a structured programming standard such as IEC61131-3.

Both programs help to reduce programming costs by allowing users to reuse PLC code they have already created.

In addition, we offer innovative support tools such as GX Simulator. This package permits users to run PLC programs in a simulation mode without any additional hardware, helping to reduce expensive on-site commissioning time.

PLC Programming					
Package	GX IEC Developer		GX Developer		AL-PCS/WIN
	All MELSEC PLC's	FX PLC's	All MELSEC PLC's	FX PLC's	Alpha Series
Ladder	•	•	•	•	
Instruction	•	•	•	•	
Function Blocks	•	•			•
Structured Text	•	•			
SFC	•	•	•	•	
IEC61131 Compliant	•	•			

Reliable

We design and build our PLCs to the highest international standards gaining many marine and specialist approvals in the process. We do this as part of our drive to supply the best quality products possible. A prime example of Mitsubishi quality is the widespread use of our components in the global auto industry, where zero tolerance of product failure is fast becoming the norm.

Control to fit

A wide range of solutions

Mitsubishi PLC and controller solutions are divided into three simple groups.

Logic controllers

These Mitsubishi products are called Alpha controllers. They are small compact units with input/output (I/O), CPU, memory, power supply and HMI built into a single unit. The units are programmed with a very intuitive Function Block-style programming tool (AL-PCS/WIN).

Compact Alpha controllers with intuitive programming

Micro PLCs

Micro PLCs are widely used in applications ranging from machine control to networked systems. Mitsubishi's famous FX range of PLCs are some of the most popular micro PLCs on the market, as demonstrated by sales of over nine million controllers worldwide. Micro PLCs contain I/O, CPU, memory and power supply in a single unit.

The worlds best selling range of micro controllers

Moreover, it can extend its capabilities by selecting different options such as I/O, analogue or temperature control. One of the most popular additions is a networking connection. Network options can include Ethernet, Profibus-DP, CC-Link, DeviceNet as well as CANopen and AS-interface.

Modular PLCs

Modular controllers like Mitsubishi's System Q are high-performance PLC systems with broad functionality. The range, power and function of these high-end PLCs is impressive, with operation times measured in nanoseconds. They are equipped with a separate power supply, CPU, I/O and specialist options mounted on a backplane. Additional backplanes can be added as the system expands. Specialist options include analogue, communication, networking, a dedicated MES interface and connection to the internet through a webserver.

High level, high function modular PLC

	Logic controller	Compact PLC	Modular PLC
	Alpha2	FX Family	System Q
I/O	10–28	10–384	32–8192
Memory	200 Function Block	2–64 K steps	10–260 K steps
Cycle period/log. instruction	20 µs	0.065–0.55 µs	0.0095–0.2 µs

There is a solution to match your needs

Mitsubishi's System Q demonstrates one of the greatest benefits of an automation platform. It makes it possible to integrate PLC CPUs, motion controllers, robot controllers and process CPUs all in a single system. In addition there are options for systems built around industrial PCs, redundant PLCs, as well as a recent innovation, the C controller.

iQ Platform

Mitsubishi's iQ is the world's first automation platform combining all key automation types on one controller. No longer are valuable engineering resources spent trying to make different systems from separate vendors work together. With iQ,

Mitsubishi takes care of system integration. We provide an extensive array of controller types that seamlessly operate together on the same backplane. Now your engineering staff can concentrate on the demands of the application itself right from the beginning.

Seeing is believing

Production line or remote plant intelligence – Mitsubishi makes data accessible.

Mitsubishi's Vision 1000 concept brings together a wide range of human machine interfaces (HMIs) and software solutions that let you see what is really happening in the production process.

Vision 1000

This combination of three visualisation technologies from a single manufacturer, allows users to choose the best solution to fit their requirements.

The GOT 1000 series utilises the latest touch-screen technology.

■ Dedicated HMI solutions

The GOT1000 series of graphic operator terminals provide the very latest in touch-screen display technology. This gives users bright clear display of information with the flexibility of touch screen input.

The GOT units are designed for fundamental integration with Mitsubishi automation technology. This means easier, faster project development as well as increased system performance and additional access to core functions in Mitsubishi's automation hardware.

■ Open HMI solutions

The E1000 range of HMIs is designed and built on the latest open technology combining Microsoft's Windows CE platform with Intel Xscale processors. This leading edge technology delivers fast and reliable operation ensuring maximum uptime for HMI users.

A wide range of open HMI solutions

■ Industrial PC (IPC) solutions

Mitsubishi's range of IPC1000 solutions offer customers a robust platform for developing their own solutions.They are designed to provide the flexibility of high- performance PC power but with a sturdy industrial design to protect them during operation. This means users can install an IPC1000 in their manufacturing environment with complete confidence.

A range of Mitsubishi automation software called MELSOFT supports the IPCs. This provides users with a choice of software components that they can embed in their own solution to complete visualisation packages like SoftGOT1000.

High performance Industrial PCs

Perfect vision

Hardware with flexibility

When selecting the right visualisation application, a number of basic factors have to be taken into account.

■ Water protection

Vision1000 products from Mitsubishi Electric provide a wide range of solutions catering to virtually every application need. All units have an IP65 ingress protection rating or higher – they can be safely hosed down for cleaning, for example. This is often the case in the food industry where high levels of hygiene have to be maintained at all times.

■ Communication

An important part of automation is communication. This can be implemented at many levels, ranging from a Fieldbus to data networks to remote telemetry solutions using Mitsubishi Industrial Modems.

Vision1000 solutions can connect to leading networks like Ethernet, Profibus and CC-Link. With access to hundreds of drivers, Mitsubishi's HMI and SCADA solutions can also be used with automation products from other manufacturers.

■ Ease of use

Programming and using Mitsubishi HMIs is easy. All of the packages come with pre-defined graphic libraries to help users get started quickly. More than one hundred drivers are available, making it possible to use Mitsubishi's HMI solutions with automation products from third-party manufacturers.

MELSOFT

The MELSOFT automation software suite offers users a range of solutions including PLC and HMI programming software components such as OPC servers and Active X containers for embedding directly into a user's solution, as well as complete visualisation packages such as MX4SCADA.

Solutions for every visualisation and programming application.

There is a solution to match your needs

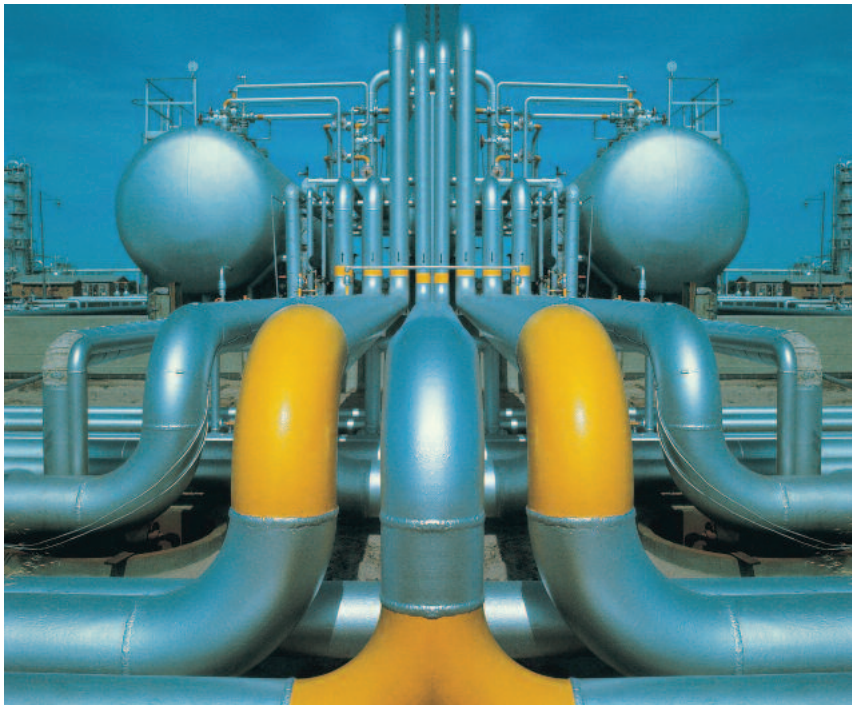
HMI Programming/Simulation

Feature \ Package	E Designer	GT Designer	MX4 HMI
Functions: Programming Simulation	• •	• •	• •
Graphics Library	•	•	•
HMI Hardware	E1000 series HMI	GOT900 and GOT1000 series/PC	PC
Soft HMI Capability		SoftGOT1000	•

PC based visualisation

Feature \ Package	SCADA	Soft HMI	PC Control		
	MX4SCADA	MX4HMI	MX Sheet	MX Components	MX OPC
OPC	•	•		•	•
Active X	•	•		•	
VB/VBA	•	•	•	•	•
Web Deployable	•			•	•
ODBC	•	•			
Operation: Information	•		•	•	•
Open Plant	•		•	•	•
Factory Floor	•	•	•	•	•

Driving performance



Intelligent solutions for every task

Cut costs

A standard industrial motor in a typical fan or pump application may only cost a few hundred euros to purchase. However, that same motor will consume hundreds of thousands of euros in electricity costs over its operational lifetime. Using an inverter can significantly reduce this outlay.

Inverters help reduce power consumption and machine wear.

Frequency inverters offer a good example of a widely accepted, widely used automation technology. Inverters allow engineers greater control over a motor's speed and torque performance. Increasingly, inverters are also seen as a simple but important way to reduce energy costs. Today, over 12 million Mitsubishi frequency inverters are in operation around the world in a wide range of applications.

High standards

Our commitment to meeting international standards guides the design of Mitsubishi inverters. Current certifications include the European CE, America's UL and cUL, the Russian GOST, as well as shipping approvals. These certifications help exporters who sell machines and systems with embedded inverters.

Mitsubishi inverters mean reliability and performance. This is why two consecutive IMS Customer Satisfaction Surveys gave Mitsubishi inverters top marks for reliability and technology.

Intelligent solutions for every task

Mitsubishi offers four types of inverter: Simple, Economy, Flexible and Advanced. Each has been optimized to offer the very best in control and performance.

In addition, depending upon the type selected, Mitsubishi inverters can support the following networks: RS485, ModbusRTU, BacNet, Profibus/DP, CC-Link, CANopen, DeviceNet, LONWorks, SSCNET and Ethernet. This extensive communication ability makes it easier to integrate inverter control into larger automation systems.

Powering the future

FR-D700

■ **Micro**

The latest generation of Mitsubishi Electric's entry level series combines ultra-compact dimensions with a wealth of new functions, including an emergency stop input for reliable stopping. Current vector control ensures that this frequency inverter can always deliver high torque, even at low speeds. An integrated brake transistor enables direct connection of a brake resistor for better braking performance. The FR-D700 is the ideal choice for driving fans, agitators and conveyor belt systems.

FR-F700

■ **Flexible**

Many frequency inverter drives save power but the FR-F700 saves more. Its innovative OEC technology (Optimum Excitation Control) ensures that exactly the right magnetic flux is always applied to the motor for maximum motor efficiency and minimum power consumption. FR-F700 inverters are particularly well suited for pump and fan, HVAC and building services applications.

Comprehensive range from ultra compact to ultra powerful

FR-E700

■ **Compact**

The FR-E700 is Mitsubishi Electric's latest generation of compact frequency inverter drives. Improved functions and capabilities make the FR-E700 inverters an economical and universal choice for a huge range of applications such as conveyor belts, hoists, stage systems, pumps, fans and extruders. Features include an integrated USB port, a built-in one-touch "Digital Dial" control with a display, improved power delivery in the low-speed range and a slot in which you can install one of the many available option cards for the 700 series.

FR-A700

■ **Powerful**

The frequency inverters of the FR-A700 series deliver high-end performance and power. Their RSV (Real Sensorless Vector control) technology ensures maximum torque and optimum smooth running. For greater flexibility these inverters have four overload ranges, options for controlled shutdown and integrated PLC functions. With their dynamic performance the FR-A700 inverters are ideal for cranes and hoisting gear, high-shelf storage systems, extruders, centrifuges and winding systems.

Inverter range

	FR-D700		FR-E700		FR-F700		FR-A700	
	D720S EC	D740 EC	E720S EC/E720S SC EC	E740 EC/E740 SC EC	F740 EC	F746 EC	A740 EC	A741
Input voltage	1-phase 200–240 V AC	3-phase 380–480 V AC	1-phase 200–240 V AC	3-phase 380–480 V AC	3-phase 380–480 V AC or 500 V	3-phase 380–480 V AC	3-phase 380–480 V AC or 500 V	3-phase 380–480 V AC
Output kW	0.1–2.2	0.4–7.5	0.1–2.2	0.4–15	0.75–630	0.75–55	0.4–630	5.5–55
Overload	200 %		200 %		120 %, 150 %		120 %, 150 %, 200 %, 250 %	150 %
Rati ng	IP20		IP20		IP20–00	IP54	IP20–00	IP00

Poetry in motion

Speed, accuracy and control when you need it

As the demands on manufacturing increase, there is a growing need to produce higher quantities of finished goods with lower wastage. To achieve this, all areas of automation are evolving to meet these new demands.

One area undergoing rapid growth is servo and motion control. The development of high performance servomotors combined with intuitive motion control is replacing traditional movement solutions.

Speed and performance

Servomotors allow users to create automation solutions that are faster, more precise and more compact.

Mitsubishi has been pushing forward the boundaries of servomotor design, creating ultra compact brushless motors. All motors of the MR-ES series have an encoder with a resolution of 131,072 pulses per revolution. All motors of the MR-J3 series have an encoder with a resolution of 262,144 pulses per second. This permits greater machine speed and accuracy.

Plug and play

Mitsubishi servo and motion solutions offer easy system building and configuration based on PC "plug and play" concepts.

- **Simple connections**

The availability of pre-made cables of different lengths means that connecting a servomotor to an amplifier or any other combination is quick and error free.

- **Automatic motor recognition**

When a Mitsubishi servomotor is connected to an amplifier it is automatically recognized. The correct parameters are then automatically loaded, ready for operation. This reduces the set-up time and the chance of errors.

- **Simple networking**

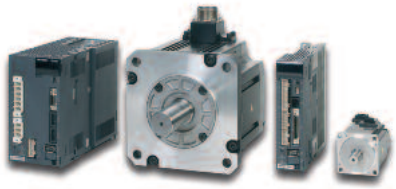
High-speed servo and motion applications need special high-speed networking. Mitsubishi's Servo System Controller Network (SSCNET) provides the system capability, connecting and fully synchronising up to 96 axes using a simple plug and cable construction.

*) The MR-J3 series products use SSCNET III, a fibre based version of the network giving complete noise immunity.

Power and precision

Powerful Amplifiers

A wide spectrum of Mitsubishi MR-J3 series amplifiers is available, ranging in power from 100 W to 37 kW for 200 V operation, and 600 W to 110 kW for 400 V systems. With such a wide choice of types and series users are sure to find the solution they need.



Plug and play technology

■ Performance

With a speed frequency response of up to 2100 Hz Mitsubishi servo systems offer world class performance.

■ Vibration suppression

Machine performance is often limited by mechanical constraints. The built-in vibration suppression of Mitsubishi's amplifiers overcome some of these limitations through precise control, reducing the effect of micro vibrations at the pulse point, helping users to get better more reliable machine performance.

■ Real Time Adaptive Tuning (RTAT)

Implemented by a single setting, RTAT is another Mitsubishi innovation that each servo amplifier brings to the user's machine. By constantly monitoring changing load conditions, the amplifier ensures that the system delivers maximum dynamic performance. This means faster and more accurate operation for RTAT-controlled systems.

*) The MR-J3 series features even more advanced and higher performance levels of vibration suppression and Real Time Adaptive Tuning.

Motor solutions for all

Featuring the most advanced concentrated winding techniques and the latest technology, Mitsubishi servomotors are among the most compact on the market.

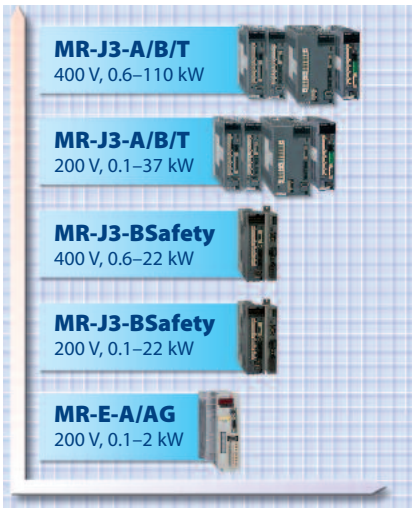
HF-KP motor – IP65 standard protection

Motors are available in a range of options from 50 W to 110 kW in different designs, including specialised motors such as hollow shaft and pancake designs that suit most application needs.

Moreover, Mitsubishi's low, ultra-low and medium inertia motor designs allow users to select the best motor characteristics for their application.

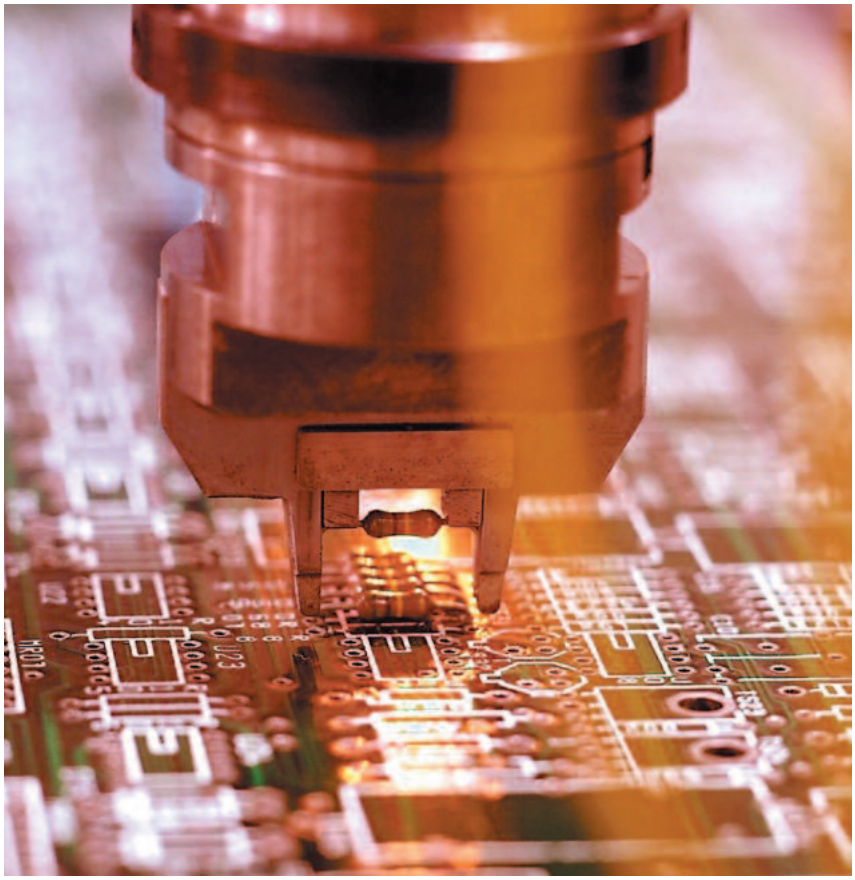
Motion controllers

Mitsubishi offer a range of solutions for motion and positioning applications. Options include simple pulse train positioning controllers and dedicated motion cards. And for the most complex applications there are dedicated System Q motion CPUs. Users are able to select the type and style of control they are most familiar with, making system construction fast and efficient.



A wide range of powerful amplifiers

Innovation in movement



High speed, high accuracy pick and place applications

Robots are already widely accepted as a cost-effective solution for high-speed, high-accuracy pick-and-place applications as well as some basic assembly tasks.

€ 1.65/hr

Robot usage can vary widely but an average application over a typical 7-year life cycle can cost as little as € 1.65 per hour to purchase and operate.

BASIC talk

Programming a Mitsubishi robot arm is easier than most people think. The programming language is a BASIC-like structure with commands reflecting the requested action. For example, the command MOV means "move", HCLOSE means "hand close". Furthermore, all Mitsubishi robots are programmed using the same language, reducing the user's learning curve.

Powerful software helps you get the most out of your robot application.

Making life easy

Users can also benefit from the extended programming and simulation software packages RT ToolBox 2 and MELFA Works. This leading edge software allows a robot application to be programmed and its operation simulated before the hardware is purchased. This makes system design and building quicker and easier. Moreover, it can identify potential hazards before robot integration begins.

Advanced control as standard

All Mitsubishi robot controllers are shipped with the full control software as standard. This means users do not need to buy additional task- driven software modules at a later date.

Task driven

Thoughtful design

The MELFA range of articulated arm robots demonstrate their power and productivity through market-leading technology and well-thought-out design.

■ Ease of connection

Mitsubishi robot arms feature a single connection point for power and pneumatics, making setup and commissioning easier.

In addition, each robot has body-mounted compressed air and signal connections mounted locally to the gripper flange for ease of use.

■ Standard gripper plates

All articulated arm gripper mounting flanges are designed and built in accordance with ISO9409-1, ensuring ease of connection to the user's choice of robot hand.

■ Extended axis

All MELFA robots can be mounted on an additional linear axis to provide greater reach and utilization of the robot arm.

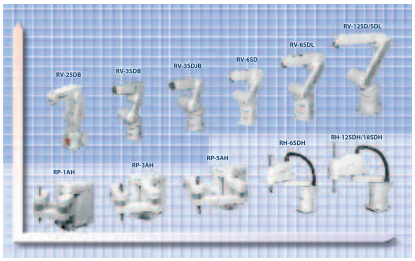
■ Networked

Mitsubishi's robot controllers can be embedded into larger automation cells by using networks such as Ethernet and CC-Link, keeping users in control at every step of their process.

Articulated arm robots

For small and mid-range loads weighing up to 3 kg, Mitsubishi has robot arms offering five and six degrees of freedom (DoF) respectively. Larger loads weighing up to 12 kg, can be handled with 6-DoF RV-S and RV-SL robot arms, which also offer an extended reach capability.

Articulated arm robots are equipped with internal cable connectors and compressed air supplies.



The ideal robots for all applications with payloads of up to 12 kg/18 kg

SCARA robots

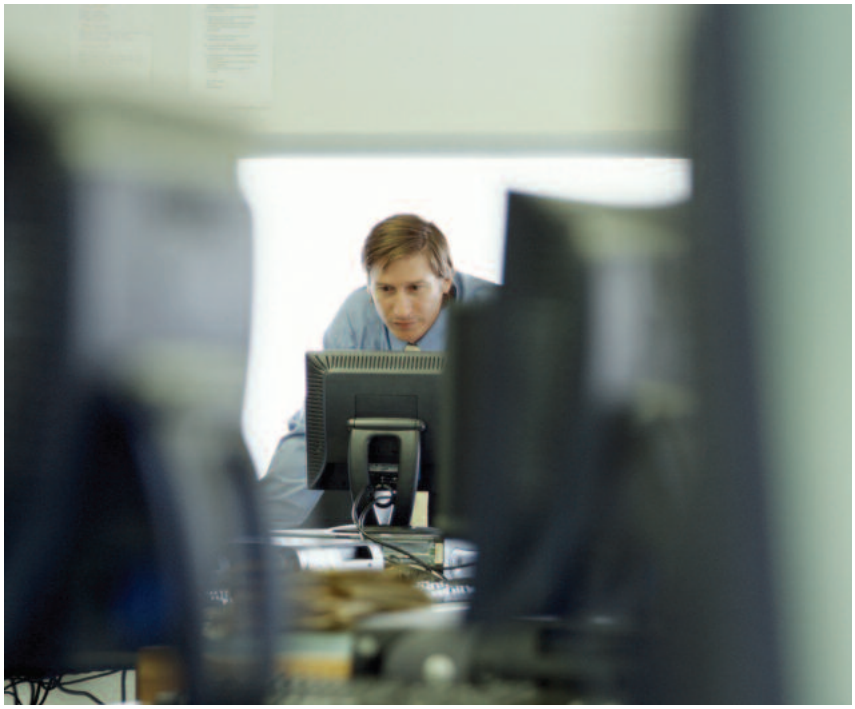
Mitsubishi's range of SCARA robots divides into two categories. The small RP-AH robots feature outstanding repeatability (+/- 0.005 mm) at very high speed, making them ideal for micro assembly tasks and the population and soldering of SMD circuit boards.

RH-SH is the second range of SCARA robots available. These models are ideal for palletizing and other specialised uses. These robots can be deployed where space is limited but loads weighing up to 18 kg need to be moved quickly.

SCARA robots for quick palletising even "on the fly".

Robot range			
Range	**RP**	**RH**	**RV**
Type	SCARA	SCARA	Articulated arm
Weight class (kg)	1–5	6–18	2–12
Reach (mm)	236–453	350–850	410–1385

Breakthrough technology



Groundbreaking research and design

Mitsubishi Electric has been active in the low voltage (LV) switchgear market since 1933. Ever since Mitsubishi developed and manufactured the first moulded case circuit breakers, the company has been committed to research and development in this field, making it one of the world's leading manufacturers of circuit breakers.

Innovation

Groundbreaking research and design has resulted in innovative LV switchgear, providing users with greater quality, safety and reliability. Today's LV products feature meticulously designed technology: even the casing material used in the PA (Polymer Ablation type Auto-Puffer) provides greater safety and high voltage breaking performance.

Leading edge

Jet Pressure Trip (JPT) is an extension of the PA concept, allowing switchgear to trip even faster than a traditional magnetic solution. This means that the switchgear can improve its current- limiting performance and circuit breaking reliability. Any connected devices are then better protected, a major benefit to users.

Other technologies such as ISTAC (Impulsive Slot-Type Accelerator, used as a high-speed arc-controlling technology) and developments in digital ETR (Electronic Trip Relay) and VJC (Vapour Jet Control) all contribute to making Mitsubishi's LV products leading edge.

Global products

All LV products are designed to comply with international standards such as IEC, UL/CSA, and JIS.

Standards are at the centre of our product development.

A complete solution

Mitsubishi offers a complete solution for line and load side distribution, ranging from air circuit breakers to moulded case breakers and magnetic contactors.

Air Circuit Breakers (ACBs)

These compact Super AE units come in a broad spectrum of performance categories from 1,000 to 6,300 Amps. The basic unit is available as a fixed or "draw out" design, which can be augmented with options for enhanced overload control, network and energy consumption.

Virtually maintenance free

Thanks to these features Mitsubishi's ACBs provide users with the flexibility to meet most applications.

Moulded Case Circuit Breakers (MCCBs)

Mitsubishi's MCCBs of the World Super Series (WSS) provide protection across the current range from 3 to 1,600 Amps. Each unit is available in a fixed or slot–in design and has a range of additional options such as electronic trips.

Compact circuit breakers

Magnetic Contactors, Thermal Overload Relays, Contactor Relays

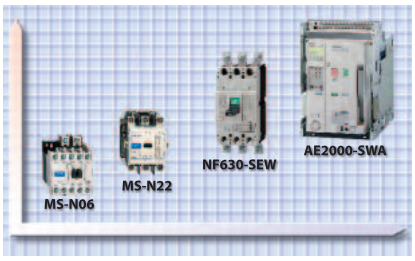
The MS-N range of LV switchgear is a reliable and customizable solution for load side connection. The MS-N range is made up of magnetic contactors, thermal overload relays and contactor relays.

These space-efficient products are up to 25 % smaller than similar units. In addition the MS-N range has enhanced performance. For example, the magnetic contactors withstand voltage drops of up to 35 % while still ensuring reliable operation.

The MS-N units can be customised with a wide range of options, including thermal

An MS-N series contactor relay

overload relays, time delay modules, auxiliary contacts and trip indicators to suit the user's specific needs.



Advanced low voltage technology

Where have Mitsubishi products been used?

Automotive control solutions

Customer applications with Mitsubishi products have been wide spread from critical applications in pharmaceutical industries to sublime applications in the leisure industry. Here are just a few examples of applications that customers have completed in the past

- Agriculture
  - Plant watering systems
  - Plant handling systems
  - Sawmill (wood)
- Building management
  - Smoke detection monitoring
  - Ventilation and temperature control
  - Lift (elevator) control
  - Automated revolving doors
  - Telephone management
  - Energy management
  - Swimming pool management
- Construction
  - Steel bridge manufacturing
  - Tunnel boring systems
- Food and drink
  - Bread manufacturing (mixing/baking)
  - Food processing (washing/sorting/slicing/packaging)
- Leisure
  - Multiplex cinema projection
  - Animated mechatronics (museums/theme parks)
- Medical
  - Respiration machine testing
  - Sterilization
- Pharmaceutical/chemical
  - Dosing control
  - Polution measurement systems
  - Cryogenic freezing
  - Gas chromotography
  - Packaging
- Plastics
  - Plastic welding systems
  - Energy management systems for injection molding machines
  - Loading/unloading machines
  - Blow molding test machines
  - Injection molding machines
- Printing
- Textiles
- Transportation
  - Sanitation on passenger ships
  - Sanitation on rail rolling stock
  - Fire tender pump management
  - Waste disposal truck management
- Utilities
  - Waste water treatment
  - Fresh water pumping

Remote management solutions include SCADA, Networking, Telemetry and Industrial Modems.

Technical Information Section

More information?

The catalogue at hand is designed to give an overview of the extensive product range of Mitsubishi Electric Europe B.V., Factory Automation.
If you cannot find the information you require in this catalogue, there are a number of ways you can get further details on configuration and technical issues, pricing and availability.

For technical issues visit the www.mitsubishi-automation.com website.

Our website provides a simple and fast way of accessing further technical data and up to the minute details on our products and services. Manuals and catalogues are available in several different languages and can be downloaded for free.

For technical, configuration, pricing and availability issues contact our distributors and partners.

Mitsubishi partners and distributors are only too happy to help answer your technical questions or help with configuration building.
For a list of Mitsubishi partners please see the back of this catalogue or alternatively take a look at the "contact us" section of our website.

About this technical information section

This section is a guide to the range of products available. For detailed configuration rules, system building, installation and configuration the associated product manuals must be read. You must satisfy yourself that any system you design with the products in this catalogue is fit for purpose, meets your requires and conforms to the product configuration rules as defined in the product manuals.

OVERVIEW

SOFTWARE

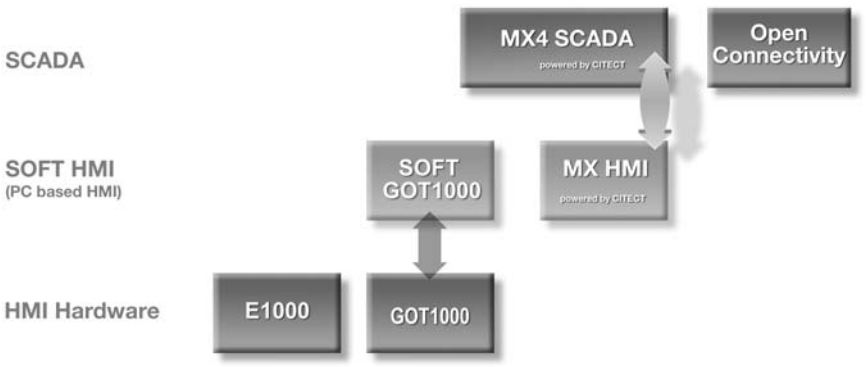
Our MELSOFT suite of Automation software is designed to help you integrate your production process and maximise your business potential. MELSOFT embodies a wide range of software to optimise your plant productivity; from visualisation and control systems to historic and downtime monitoring capabilities. A core design feature of our software is that it is scalable. It is a well accepted truism that one solution rarely fits all, so within each application category there are a range of products offering different levels of functionality and connectivity designed to meet your individual needs. All products are based on Microsoft standards (OPC etc), giving you a broad range of connectivity options and a familiar interface. The MELSOFT suite consists of three main areas:

- **Visualisation.** This type of software is aimed at monitoring and controlling your automation processes. We offer a variety of programs ranging from a high-end data analysis and monitoring program such as MX4 SCADA, to more control and programming orientated programs such as E View or MX4 HMI.
- **Programming.** Our extensive range of programming software enables users to write their own PLC code for their application. We have software solutions for each of the following products groups; Servos, Inverters, Logic Blocks, PLCs, HMIs and Networking.
- **Communication.** Our communication software is designed to integrate our products with common third party software packages. This provides you with the reliability and quality of Mitsubishi hardware, combined with the familiarity of software packages/tools such as Microsoft Excel, ActiveX and OPC.

Visualisation Software

Our visualisation software covers all your needs, from specialised automated data-gathering business systems to manually operated shop floor control units.

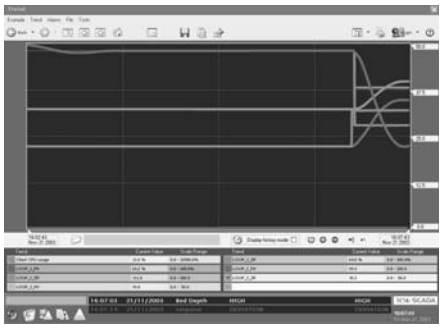
MX4 Software Integration



The MX4 range is a fully integratable and scalable software package. The key feature of the software is its ability to read shop floor data straight from a Soft HMI to a high end business systems.

SCADA

MX4 SCADA

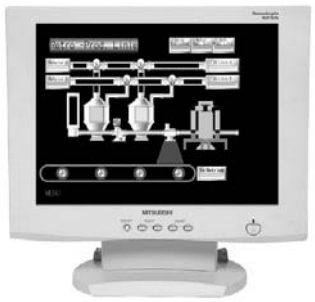


MX4 SCADA is a complete Supervisory Control And Data Acquisition system. It is able to support your business as it grows, whatever the size, since there is virtually no limit on the number of I/O points and drivers. The main features of MX4 SCADA are:

- A familiar Windows based environment shortens the learning curve, enabling users to adapt quickly and reduce disruptions to business processes.
- Pre-programmed basic functions, including alarms and reports provide you with common, but often important ready-to-use operations. This quick setup of the SCADA system cuts downtime to the business, and reduces the implementation time.
- Advanced mathematical and conditional executors can be programmed using either Cicode (Similar to C/C++) or VBA. This gives you greater control enabling you to customise your system to meet individual requirements.

Soft HMI

GT Works (GT SoftGOT1000)



GT Works is a wide-ranging visualisation control tool from Mitsubishi. A major benefit of GT Works is that visualisation screens can be created independently of their final target platform, i. e. a hardware platform such as GOT1000 or a PC based platform such as GT SoftGOT1000.
GT SoftGOT 1000 is a PC based HMI module within GT Works. A further benefit of GT SoftGOT1000 is that it inherits the advanced simulation features of GT Works. It can be simulated in a stand-alone configuration or in conjunction with GX simulator, linking both PLC and HMI simulation code for a true integrated approach.

- Advanced simulation of HMI operations and optional HMI/PLC simulation code.
- Platform independent, screens created can be used for SoftHMI or hardware based HMIs.
- Remote monitoring by intranet LAN.

MX4 HMI

MX4 HMI is a reduced version of MX4 SCADA. It includes many of the functions of MX4 SCADA, but has been designed for standalone HMI applications. The main features are:

- A large number of I/O points ranging from 100 to a maximum of 600, with the ability to connect to three different types of drivers.
- It is a scalable solution that can be upgraded from a HMI to a SCADA solution and then have additional upward connectivity to business systems.
- Basic functions like alarms, trend analysis and reports have been set-up and are ready-to-use, saving you time and the expertise needed to program them.
- The use of super genies enables you to save repetitive machinery processes, and replicate the process by a click of a button. This saves time and the cost of skilled labour, allowing a complex task to be performed much more simply.

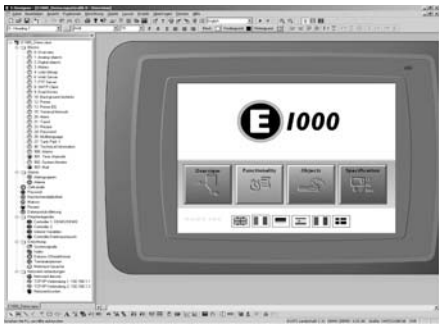
HMI Programming

GT Works (GT Designer)

As part of GT Works, GT Designer is a drawing program designed to create HMI screens for GOT1000 series. A user-friendly Windows environment provides the user with a simple and recognisable interface, reducing the time of their learning curve and the training costs associated with it. The package consists of:

- An extensive picture and graphics library editor that enables you to modify the graphics to meet your exact specifications.
- A tree format of the project gives you an overview of the structure of the project. This gives you the opportunity to navigate through your project and add, delete or move any programs or functions, creating a more logical flow to your menu structure.
- The combination of GT Simulator and GX Simulator allows you to test both the HMI and PLC coding offline, on your PC without the need to connect to physical hardware (also see GT SoftGOT1000).

E Designer

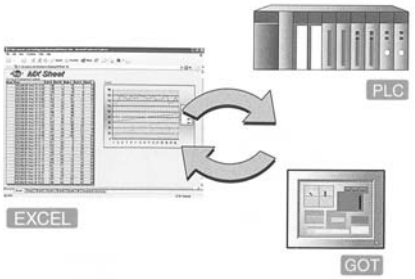


E Designer is a complete PC-based programming software program for the E Series HMIs. Projects are built from menu hierarchies or as sequences, providing the user with an easy to follow logical progression of operations. The main features of E Designer are:

- A pre-defined library of graphics and symbols provides a straightforward and efficient basis to set-up your project, reducing the cost and time of the implementation.
- The use of "Vector Graphics" gives you the flexibility to alter the design of your objects and symbols, and "personalise" them, to meet your individual requirements e.g. a flashing red and yellow graphic can be used to symbolise an alarm sounding, alerting the user of an occurring danger.
- E Designer supports a multi-language set-up. This enables you to program and run your project in a wide variety of languages, including: English, German, French, Spanish, Italian and Japanese.

PC Data Management

MX Sheet



The device data in the PLC can be monitored inreal-time with Excel, and recipe data in Excelcan be transfered to the PLC.

MX Sheet enables users to gather data from their PLC and analyse it using the familiar tools and functions of Excel. MX Sheet can analyse and display real-time data in tables, graphs and charts as it happens.

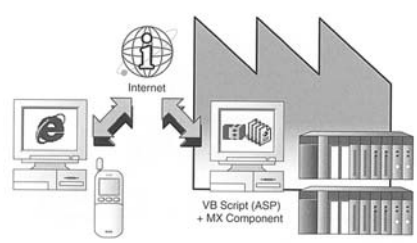
It also features a useful automatic report function, whereby data displayed on Excel automatically saves and prints at a specific time or condition triggered by the PLC.

MX OPC Server

The MX OPC Server is a Mitsubishi I/O driver OPC Data Access (DA) and Alarm/Events (AE) server that provides the interface and communications protocol between a wide range of Mitsubishi hardware and your process control software. Mitsubishi drivers incorporate OLE Automation technology and OPC compliance to provide flexibility and ease-of-use.

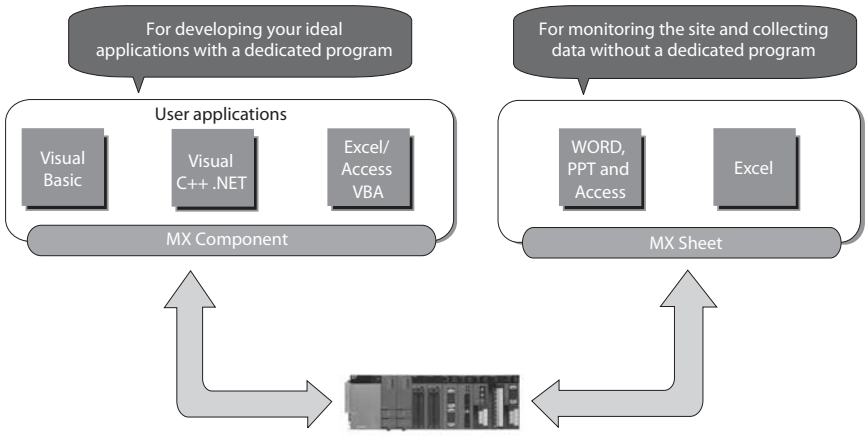
Mitsubishi's drivers incorporate OLE Automation technology and can therefore expose their features to scripting tools and other applications. Because the drivers are OLE Automation applications you can create and manipulate objects exposed in the I/O Server from another application. You can also create tools that access and manipulate driver objects.

MX Component



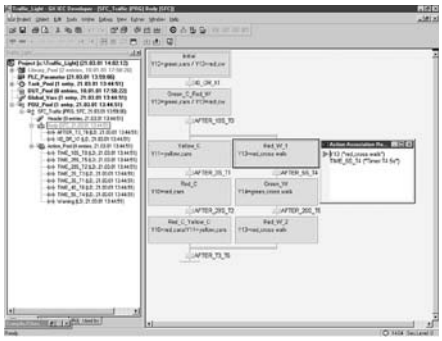
Just by accessing the Web Pages created with VBScript (ASP function) using Internet Explorer or mobile devices, the factory's PLC can be remotely monitored and operated.

MX Component provides users with powerful ActiveX controls that simplify the communication between a PC and PLC. Users to not have to design complex communication protocols and is ideal for implementing specific software applications requiring PLC connectivity.
MX Component supports a wide variety of powerful and standardised programming languages such as Visual C++ .NET, VBA and VB Script.



PLC Programming

GX IEC Developer



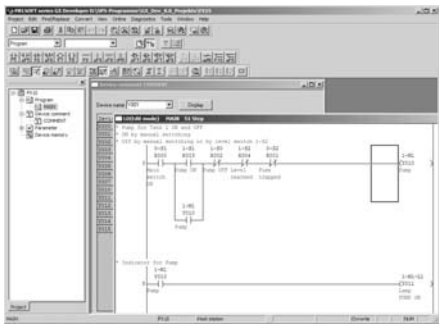
GX IEC Developer is a powerful programming and documentation package. It supports the implementation of our entire PLC range, from the initial project planning to everyday operation. It offers a user-friendly MS Windows environment and a choice of five programming languages to best suit your project.

- ST (Structured Text)
- SFC (Sequential Function Chart)
- LD (Ladder Diagram)
- FBD (Function Block Diagram)
- IL (Instruction List)

The main features of GX IEC Developer are:

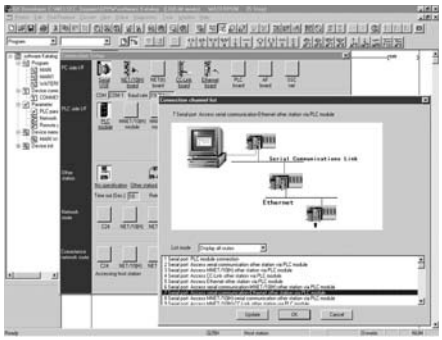
- It is compliant with the "IEC 1131.3" standard of PLC programming. This enables you to make standard reusable PLC code and function blocks, saving you significant development time and costs.
- Complex functions and programming code created by specialist software developers can be imported and used in your program.
- The use of GX IEC Developer encourages good data management and structure. Programs are often developed by a number of parties, all contributing together. This structure ensures all parties communicate changes and are kept up-to-date.
- Quick and easy to configure, controller components can be quickly programmed with the aid of tables, interactive dialogs and graphical support.
- It is also compatible with older Mitsubishi programming software like MELSEC MEDOC Plus, your existing programs and data can be imported into GX IEC Developer. The benefits are minimal disruption to existing programs and reduced re-engineering time, while having access to the wealth of new functions provided by GX IEC Developer.

GX IEC Developer FX



This version of GX IEC Developer is specifically designed for micro FX PLCs. The features and functions are optimized for the instruction set, parameter settings and general configuration of FX PLCs. As a result this product is offered at a price level that is cost effective compared to FX hardware pricing.

GX Developer



GX Developer is a simple programming software that supports our entire PLC range. It features a straight forward, easy to use, Windows based environment. The software supports four programming languages:

- Instruction List (IL)
- Ladder Diagram (LD)
- Sequential Function Chart (SFC)
- Structured Text (ST)

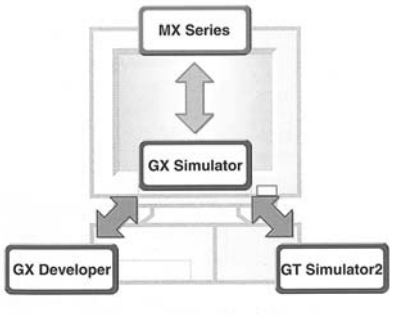
The main features of GX Developer are:

- The ability to switch between IL and LD while working on a project, means people are able to collaborate as a team. Individuals scan choose the programming method which best suits them, therefore reducing the time needed to learn a new language and the overall project timescale.
- GX Developer is compatible with our older DOS programs (MELSEC MEDOC). Existing customers with this older software can simply import their data into GX Developer, minimising the disruption to their business.
- Key functions can be tested first on the with GX Simulator, replicating realistic responses of applications and devices. Users can therefore verify these processes before they are implemented.

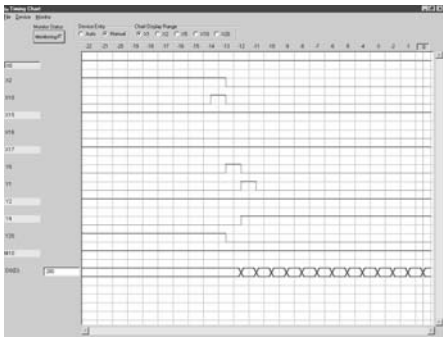
GX Developer FX

This is a cost-effective cut-down version of GX Developer, specifically designed for micro FX PLCs. Like the full version of GX Developer, it includes many of the features and functions along with achoice of three programming methods; MELSEC Instruction List, Ladder Diagram and Stepladder.

Simulator

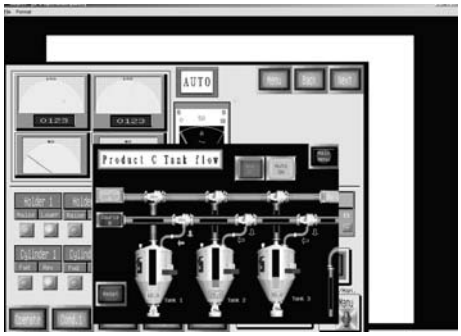


GX Simulator



GX Simulator allows you to create a virtual PLC on a PC. PLC code can be tested and errors debugged, all without connecting a PLC. This allows for great flexibility as code created can be tested by a number of different parties.
GX Simulator can also be used with MX4 HMI/SCADA to provide comprehensive, cross platform test and debugging of applications.

GT Simulator

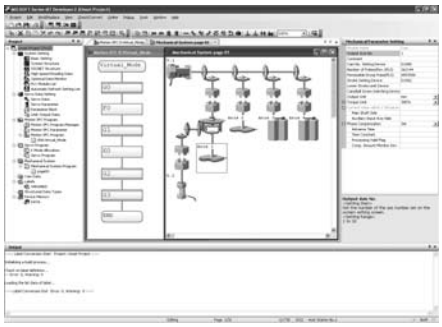


Similar to GX Simulator, any changes or modifications to the design of the GOT screen made in GT Designer can be checked and debugged using GT Simulator.

Note: This program can be used with GX Simulator to provide combined simulation of PLC and HMI projects.

Specials

MT Developer



MT Developer is an integral start-up software used to structure and configure a system for Q Series motion controller applications.

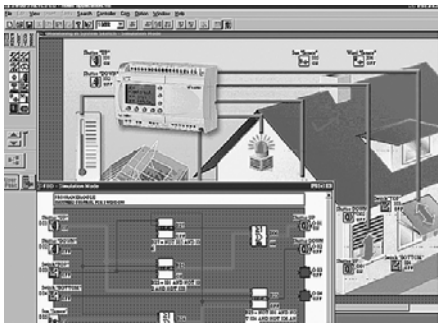
- The system settings and servo data can be set intuitively with graphical screens
- Various operating system software corresponding to the machine and control details is available with this motion controller. Providing a programming environment matching the application.
- Start-up and debugging time can be shortened by using system tests and program debugging.
- The system and program operation state can be checked with the monitor function and digital oscilloscope function allowing any problems to be resolved quickly.

RT ToolBox2

The RT ToolBox2 software helps you to program all MELFA robots and manage your projects. A intuitive user interface makes projects easy to understand and organise, even for beginners. RT ToolBox2 is also available with a simulator that enables you to simulate your robot program and calculate the expected work cycle times before you have built up your application.

- Function-based parameter management
- Range of recording and monitoring functions
- Program and monitor multiple robots in a network
- Includes both Position Repair and Maintenance Forecast functions
- Syntax highlighting and online Teach-In

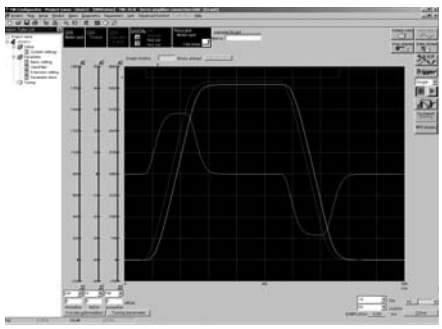
Alpha - ALVLS (AL-PCS/WIN)



The original visual based function block programming software for logic controllers. Easy to use Windows based software that requires no prior experience or training by the user. Program elements are placed on screen, with inputs on the left and outputs on the right and the function blocks in the middle.

- Easy to use and easy to learn
- Point, click, drag and drop programming
- Program simulation - no controller needed
- Real time program monitor
- Process visualisation

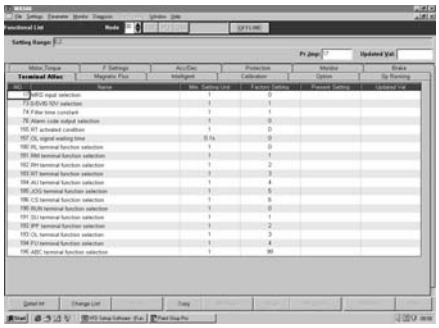
MR Configurator



This software supports all operations from servo set-up to maintenance. Various operations, including monitor display, diagnostics, parameter writing and reading, and test operation, can be carried out easily with this software.

- Graph display function allows the servo motor state to be easily monitored.
- Machine analyser function, gain search function and machine simulation function for high performance adjustments.
- Optimum Control, allows the response setting value to be set making use of the servo's "high level real-time automatic tuning".
- The servo motor can be tested easily using a PC.

FR Configurator (MX 500)



FR Configurator is a powerful frequency inverter configuration and management tool. It runs in Windows making it possible to manage your inverters with a standard PC. It allows the inverters to be monitored and the parameters to be configured, providing a user friendly environment to control single or multiple inverters.

- Machine analyser system, allows the resonant frequency of the machine to be tested as the motor is accelerated.
- Trace Function, emulates an oscilloscope.
- Parameter setting and editing
- Monitoring functions make maintenance easy
- Test Operation function and automatic tuning
- Diagnostics and help functions

GX Configurator DP

GX Configurator DP is a setup and configuration software for Profibus DP networks. It can be used to configure Mitsubishi Profibus DP master and all slave modules including Inverters and HMI's as well as other manufacturers products.

- Easy to use drag & drop configuration system
- Automatic generation of program modules that can be integrated directly in to the GX IEC Developer package
- Configurations can be transferred via the PLC's programming port or over networks

FX Configurator FP

FX Configurator FP is a special configurator tool for the FX3U PLC SSCNet III positioning module. This software reduces programming and setup time for any level of positioning application.

Coming soon: iQ Works

iQ Works integrates the functions necessary to manage every part of the system cycle.

System design

The intuitive system configuration diagram allows for the graphic assembly of systems, centralized management of disparate projects and batch configuration of the entire control system.

Programming

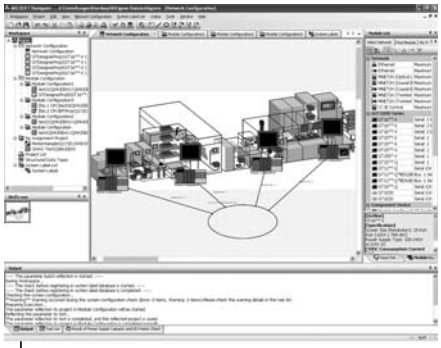
Use system labels to seamlessly share device data between GOTs, PLCs and motion controllers. Save the time and hassle of changing device values in each program by using the update system labels feature.

Test and startup

Debug and optimize programs using the simulation functions. Use the included diagnostics and monitoring functions to quickly identify the source of errors.

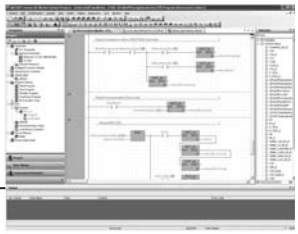
Operation and maintenance

Speed up the process of commissioning, configuring and updating the system by using the batch read feature. Virtually eliminate the confusion associated with system management.



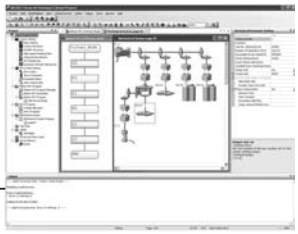
MELSOFT Navigator

is the heart of iQ Works. It enables the effortless design of entire upper-level systems and seamlessly integrates the other MELSOFT programs included with iQ Works. Functions such as system configuration design, batch parameter setting, system labels and batch read all help to reduce TCO.



MELSOFT GX Works

represents the next generation in MELSOFT PLC maintenance and programming software. Its functionality has been inherited from both GX and IEC Developer, with imporvements made throughout to increase productivity and drive down engineering costs.



MELSOFT MT Works

is a comprehensive motion CPU maintenance and program desing tool. Its many useful functions, such as intuitive settings, graphical programming and digital oscilloscope, simulator, different Motion OS support, assistance help, to reduce the TCO associated with motion systems.

MELSOFT GT Works

is a complete HMI programming, screen creation and maintenance program. In order to reduce the labor required to create detailed and impressive applications, the software's functionality has been built around the concepts of ease of use, simplifications (without sacrificing functionality) and elegance (in design and screen graphics).

NETWORKS

From simple stand alone systems and basic AS-Interface networks to Ethernet based networks and even Global networks based on Remote Telemetry Technology, Mitsubishi has the answers. Here is an overview of some of the networks Mitsubishi provides:

Ethernet

The standard network for business operations is Ethernet. There are various options available, 10 Mb rate is the most common, but many new installations are operating at 100 Mb transfer rate. Ethernet could be termed an OPEN network owing to its absolute acceptance within the IT environment and the sheer number of providers of Ethernet based IT products. Ethernet can be used with various different protocols. The most popular protocol used is TCP/IP which most people use every single time they log on to the Internet.

Modbus/TCP

This protocol is widely accepted as a manufacter neutral, defacto standard for automation. Modbus/TCP is widely supported by PLC manufactures, I/O vendors and by many other automation technology.

CC-Link (Process Solution/Fieldbus)

CC-Link covers all Mitsubishi automation products, from PLCs, motion controllers and CC-Link Safety to HMI control terminals and robots. Although CC-Link is an open network it is controlled by the CC-Link Partner Associztion (CLPA), which allows them to implement a strict control/testing regime of any product which connect onto CC-Link. This helps to guarantee and preserve the CC-Link network integrity.

Profibus (Process Solution/Fieldbus)

Profibus offers users the option to mix devices on the network, ranging from simple remote I/O stations and inverter stations through to more complex HMIs, data logging devices and PLCs.

DeviceNet (Process Solution/Fieldbus)

DeviceNet is an emerging Open vendor network. The DeviceNet network is based on the Controller Area Network (CAN) serial bus system. DeviceNet is a producer/consumer operation where peer-to-peer or master/slave configurations are possible.

CANopen

Cost effective network communications with fault-resistant network structure where components from different manufacturers can be integrated quickly and easily.

AS-Interface (Actuator - Sensor - interface)

This network is well supported by sensor manufacturers. AS-Interface can be used both with standard sensors and with special AS-Interface sensors. The dedicated AS-Interface sensors are typically more expensive than standard ones but do offer additional diagnostic functions and automatic configuration.

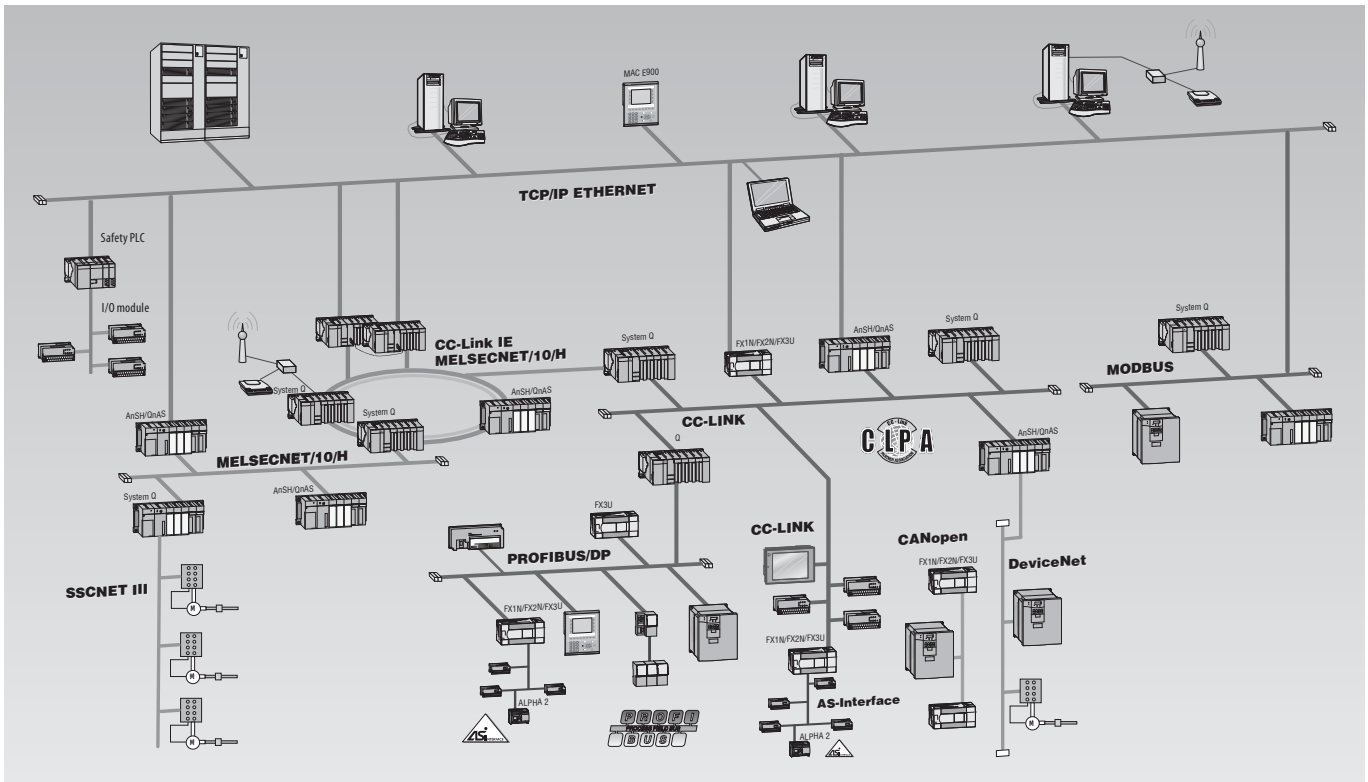
MELSECNET/H

This is Mitsubishi's own high-performance network. MELSECNET/H can be configured as a coaxial bus or twisted pair bus system or with double ring topology. This offers high network availability, as cable breaks are automatically detected and the active communication channel is automatically re-routed around the suspected break. Another major feature of the MELSECNet/H network is the ability to operate a floating master system. This allows other PLC's on the network to take up the position of network master should a fault develop with the currently selected master.

SSCNETIII

Mitsubishi's optical fibre based Servo System Controller Network (SSCNET III) offers noise resistance communication for high-speed servo and motion applications.

Typical Distributed Control Structure



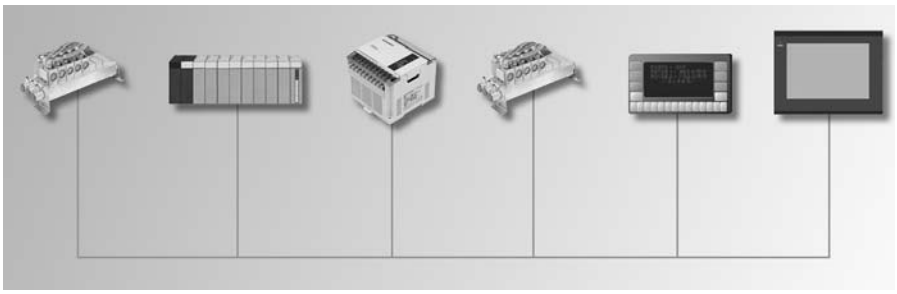
Series	ETHERNET	Modbus/TCP	CC Link	Profibus	DeviceNet	AS-Interface	MELSECNET/H	SSCNET	CANopen	Modbus/RTU
Modular PLC	●	●	●	●	●	●	●	●		●
Compact PLC	●		●	●	●	●		●	●	●
HMI	●	●	●	●			●			●
Inverter			●	●	●			●	●	●
Alpha						●				
Servo			●					●		
Breaker			●	●						●
Robot	●		●	●						

Ethernet

If you are looking for the widest possible set of connectable technologies, Ethernet is unrivalled. While being well established in the office and IT environments, its adoption into automation environments is both rapid and broad ranging.

Ethernet is a platform for a very wide range of data communications protocols. The combination of Ethernet and the extremely widespread TCP/IP protocol enables high-speed data communications between process supervision and the MELSEC PLC series. The MELSEC PLC compatible Ethernet modules also provide FTP server functionality, in addition to the normal TCP/IP communications services. This means that a personal computer running standard communications software can read from and write to the PLC CPU sequence program via the Internet.

There is also a growing demand for Ethernet tobe used as a peer-to-peer network. We recognise this important customer requirement and provide peer-to-peer communication with our Ethernet solutions.



- Up to 100 Mbps communication
- Monitor/program online *
- Q series module mounts on the backplane, FX module adds onto the system
- Allows connection to PC, PLC and other third party device
- Preferred connection method for SCADA
- Modbus/TCP protocol

* Not supported by all Ethernet products

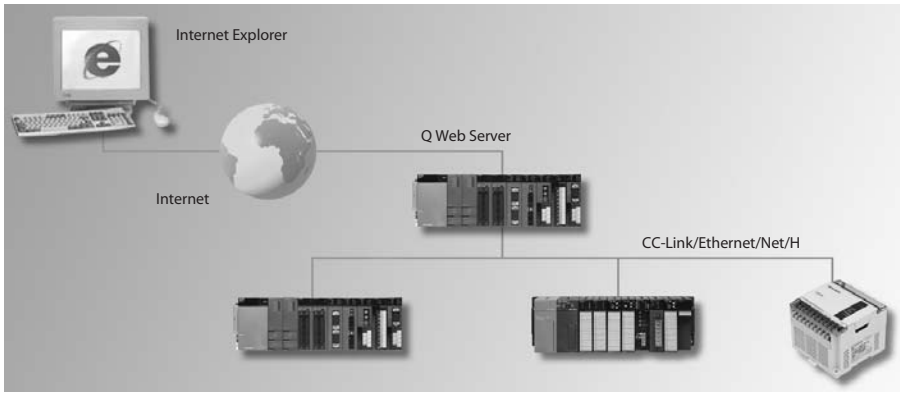
Model type	Series	Module	Description	Art. no.
Interface	Q series	QJ71E71-100	Ethernet interface module,100 Mbit/s,100BASETX/10BASE-T	138327
		QJ71E71-B2	Ethernet interface module,10BASE2	129614
		QJ71E71-B5	Ethernet interface module,10BASE5	147287
		QJ71MT91	Modbus/TCP Master and Client 10BASE-T/100BASETX	155606
	AnS	A1SJ71E71N3-T	Ethernet interface module,10 Base-T	163755
	FX series	FX2NC-ENET-ADP	Ethernet interface module,10 Base-T	157447
		FX3U-ENET	Ethernet interface module,100BASETX/10BASE-T	166086
	E series	IFC-ETTP	10-Base-T Twisted Pair Ethernet interface for E300/600/610/615/700/710/900/910 HMI's	140727
		IFC-ETCX	Coaxial 10-Base-T Ethernet interface for E300/600/610/615/700/710/900/910 HMI's	14726
	GOT series	A9GT-J71E71-T	10-Base-T Ethernet interface module for GOT HMIs	139395

Web Server

This unit allows direct access from Internet/ Intranet to System Q. With ample built-in memory, flexible communications and compact design, it is the perfect tool to give you visualisation of Q series PLC control processes. Q Web Server supports open standards such as HTML, JAVA, HTTP, FTP, etc. to give the easiest and most cost effective method of monitoring a single or networked system.

The Q Web Server is easy to set-up because everything you need to get started is built into the unit. Configuration is carried out via embedded web pages that guide the user through the set-up process. Settings like IP Address, Tag and Component Registration, Account Management and Data Logging Options are all easily set with a Web Browser. Furthermore, there is storage space for user generated web pages.

Finally, as you would expect from Mitsubishi, this unit is designed for harsh environments and has the same robust design as the rest of the System Q.



- 5 Mbyte of built in memory, option to expand up to 512 Mbyte (CompactFlash)
- 100 BaseTX Ethernet port
- Serial RS-232 port
- Pre-loaded HTML/JAVA samples to get you started
- Connects via Q Bus and down CC-Link, Ethernet, MELSECNET/H or Serial communication unit.

Model type	Series	Module	Description	Art. no.
Web Server	Q series	QJ71WS96	Q Web Server module	147115

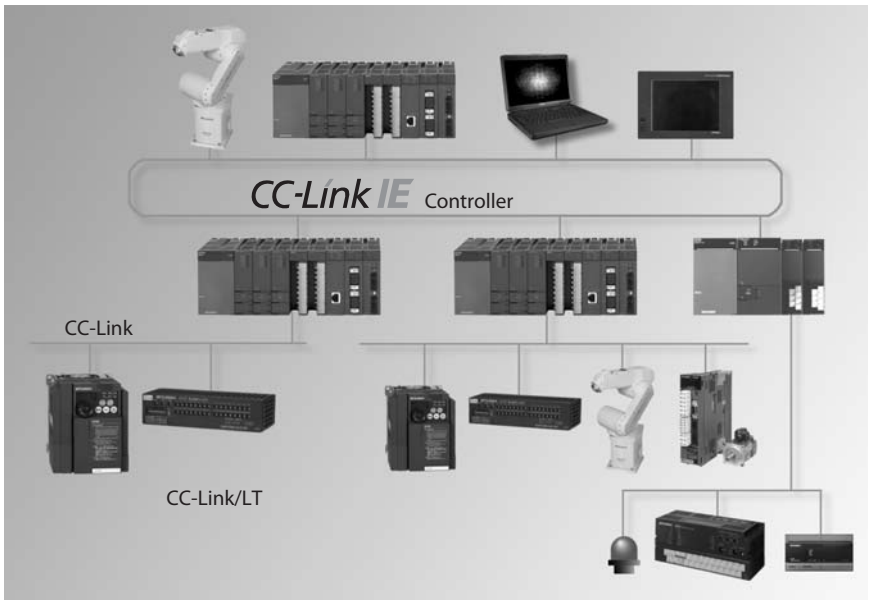
CC-Link and CC-Link IE and CC-Link Safety

If you need unparalleled ease of connection between Mitsubishi products or you are looking for a single supplier for your control network needs, then CC-Link is the natural choice.

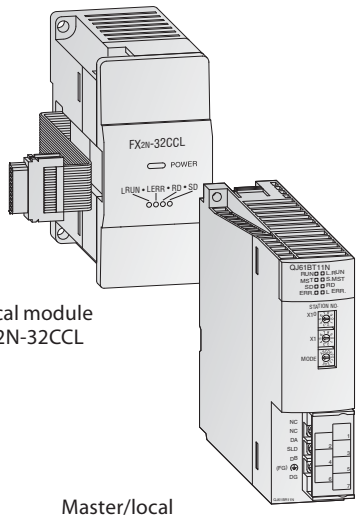
This open fieldbus and control network provides fast data communications with different devices. As with all manufacturer specific networks, CC-Link is quickly implemented and is guaranteed to work. CC-Link is also an open network and therefore allows many third-party products now appearing on the market with CC-Link connectivity. Companies such as SMC, Festo, Siemens, Sunx, Yokogawa, Kawasaki Heavy Industries, Izumi-DATALogic Co., Wago and Keyence have developed products for CC-Link. The CC-Link network has the capability to have a standby master which can also be used as a remote station.

The new CC-Link IE open standard offers maximum performance at maximum availability. It serves firstly as a network for the control level and furthermore implements the manufacturing level, the motion level and the safety level. In future, the network structure will be uniform at all levels.

Other interesting information on the CC-Link IE is provided in a separate brochure which is also available for download.



- Up to 13.2 km network distance
- Monitor/program online with Q series
- Max. transfer rate 10 MBaud with max. 64 bus stations
- Easy connection for Mitsubishi devices
- No programming needed for set-up with Q series
- Has built-in redundancy functions and excellent error tolerance
- CC-Link Safety, TÜV-certified safety network



Local module
FX2N-32CCL

Master/local
module QJ61BT11N

Standard CC-Link Modules

PLC	Master Modules	Description	Art. no.
Q series	QJ61BT11N	CC-Link master/local module	154748
	QS0J61BT12	Master modules for CC-Link Safety	203209
FX series	FX2N-16CCL-M	CC-Link master	133596
PCI Express	Q81BD-J61BT11	Master module/local module for PCI Express bus	221859
PCI	Q80BD-J61BT11N	Master /local module for PCI/F PC master	200758
	Slave Modules		
MELSEC System Q	QJ61BT11N	CC-Link master/ local module	154748
FX-Family	FX2N-32CCL	CC-Link local module	102961
	FX3U-64CCI	Local module for CC-Link on FX3	217915
Frequency inverters	FR-A7NC	CC-Link interface for A700/F700 inverters	156778
	FR-A7NC-Ekit	CC-Link interface for frequency inverters of the FR-E700 series	210671
HMI	GT15-75J61BT13-Z	CC-Link interface for GOT 1000	166310
Breakers	BIF-CC-W	CC-Link interface for SUPER AE air circuit breakers	168571
Servo amplifiers	MR-J3-T(4) series	MR-J3 Servo amplifier with CC-Link interface	page 104
Roboter	2A-HR 575H E	CC-Link interface for Robots for the CR-2,CR-2A and CR-1 controller	129808

CC-Link IE Modules

PLC	Master /Slave Modules	Description	Art. no.
Q series	QJ71GP21-SX	1 Gbps, master/slave module for FO GI	208815
	QJ71GP21S-SX	1 Gbps, master/slave module for FO GI with external voltage supply	208816
	Q80BD-J71GP21-SX	1 Gbps, PCI PC card, master/slave for FO GI	208817
	Q80BD-J71GP21S-SX	1 Gbps, PCI PC card, master/slave for FO GI with external voltage supply	208818

CC-Link Cable

This cable is designed for connecting together CC-Link network devices to create peer-to-peer systems (e.g.Mitsubishi Q series), master/slave systems (e.g. Mitsubishi Q series and Mitsubishi CC-Link Remote I/O) and provide connection with any CC-Link compatible product. It has been tested and certified by CLPA (CC-Link Partner Association) as a CC-Link compliant partner product.

ELECTRICAL CHARACTERISTICS

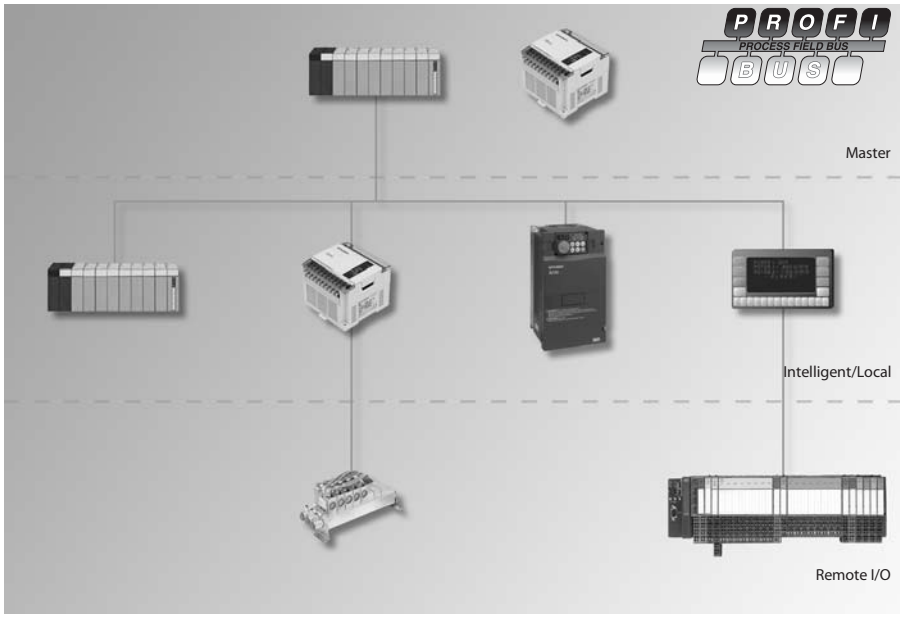
Max. Operating Voltage	300 V RMS
Nom. Capacitance Between Conductors @1 kHz	60 pF/m
Nom. Impedance @ 1MHz	110 Ω
Nom. Conductor DC Resistance @ 20°C	36 Ω/1000m
Nom. Attenuation @ 1 MHz	1.6 dB/100m
Nom. Attenuation @ 5 MHz	3.51 dB/100m
Insulation Resistance	10 G Ω/km Min

PROFIBUS/DP

Profibus is one of the most widely used automation networks in Europe. It provides a wide possible range of compatible devices while delivering fast and robust communication.

Profibus offers users the option to mix devices from different companies. It is an open network ranging from simple I/O stations through to complex PLCs. The network allows extremely fast data exchange with a wide variety of slave devices. The GX Configurator DP software and the profibus master modules combine to give a user-friendly plug and play technology. The configuration software is self-explanatory, using a graphical method to set up the network. You simply select the slave unit, assign the station number and specify where in the PLC the information is stored. As this is an open network, Mitsubishi Profibus units can also be connected to master and slave devices from other manufacturers.

- Widely supported by many manufacturers
- Up to 12 Mbps transmission speed
- Easy set-up with GX Configurator DP
- Full range of Mitsubishi Profibus products
- Master and slave available with Q and FX Series



MASTER

Series	Module	Description	Art. no.
Q series	QJ71PB92V	Profibus DP interface master module (DP V1/V2)	165374
FX	FX3U-64DP-M	Profibus DP master module for FX3U PLCs	166085

INTELLIGENT SLAVE

Series	Module	Description	Art. no.
Q series	QJ71PB93D	Profibus slave	143545
FX	FX0N-32NT-DP	Profibus DP slave module for FX1N/FX2N and FX3U PLC's	62125
	FX3U-32DP	Profibus DP slave module for FX3U PLC's	194214
Inverter	FR-A7NP	Profibus interface for A700 and F700 inverters	158524
	FR-A7NP-Ekit	PROFIBUS interface for frequency inverters of the FR-E700 series	210673
HMI	IFC-PBDP	Profibus DP slave interface for E300/600/610/615/700/710/900/910 HMI's	76676
Breaker	BIF-PR-W	Profibus interface for SUPER AE air circuit breakers	168572

SLAVE I/O

Series	Module	Description	Art. no.
All PLC types	ST series	Modular input/output system for connection to PROFIBUS/DP	refer to the following pages

I/O BRIDGE MODULE

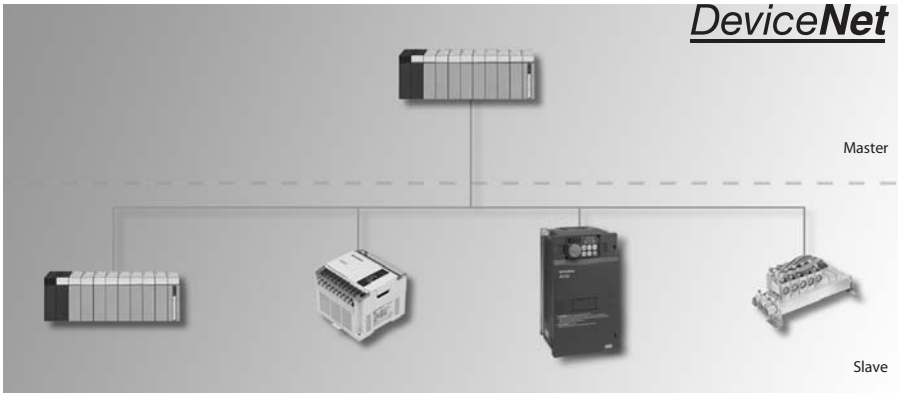
Series	Module	Description	Art. no.
FX	FX2N-32DP-IF	Profibus remote I/O using FX2N I/O & Special Function modules; 240 V AC power supply	145401
	FX2N-32DP-IF-D	Profibus remote I/O using FX2N I/O & Special Function modules; 24 V DC power supply	142763

DeviceNet

DeviceNet is another widely accepted open network type with a large variety of third party products. This network type is particularly popular in North America.

DeviceNet is based on a producer/consumer operation where peer-to-peer or master/slave configuration are possible. DeviceNet is based on CAN (Controller Area Network) serial bus system. DeviceNet is a cost-effective solution for network integration of low level terminal equipment.

- Widely supported by many manufacturers
- Up to 500 kbps transmission speed
- Easy set-up with GX Configurator DN for Q Series
- Wide range of Mitsubishi DeviceNet products
- Master and slave available with Q and AnS Series

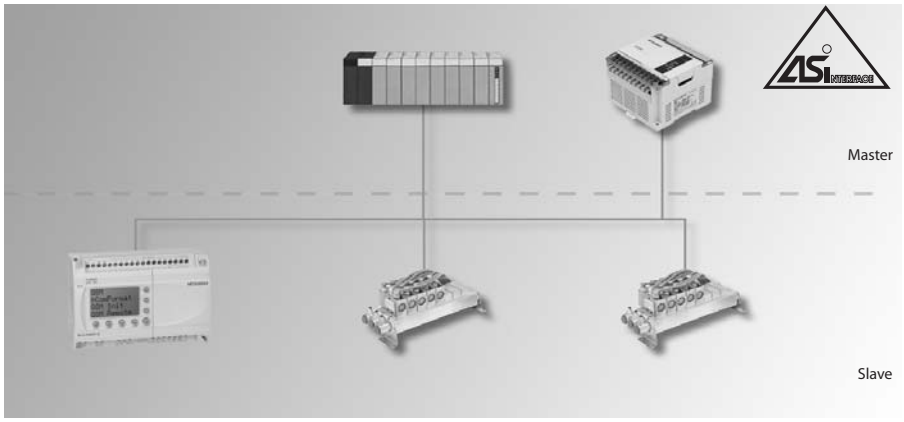


Model type	Series	Module	Description	Art. no.
Master	Q series	QJ71DN91	DeviceNet interface master/slave module	136390
	AnS/QnAS	A1SJ71DN91	DeviceNet master/slave module, for Ans and QnAS PLC's	124373
Intelligent Slave	FX	FX2N-64DNET	DeviceNet interface (slave)	131708
	Inverter	FR-A7ND	DeviceNet interface for A700 and F700 inverters	158525
		FR-A7ND-Ekit	DeviceNet interface for frequency inverters of the FR-E700 series	210704

AS-Interface

The Actuator Sensor Interface (AS-Interface) is the international standard for the lowest field bus level. The network suits versatile demands, as it's very flexible and easy to install. It is usually used to control sensors, actuators, I/O units and gateways. The AS-Interface network has its own distinctive yellow cable which acts as both a communication line and a power supply for connecting devices. By using special coupling bridges, any slave station on the network can be moved and placed at a new location without having to completely rewire or rebuild the network.

- FX series supports up to 31 stations/nodes per network
- Q and AnS series supports 2 networks/ 62 stations with a single module
- Easy to configure and swap modules
- Self healing cable needs no tools for installation or system changes



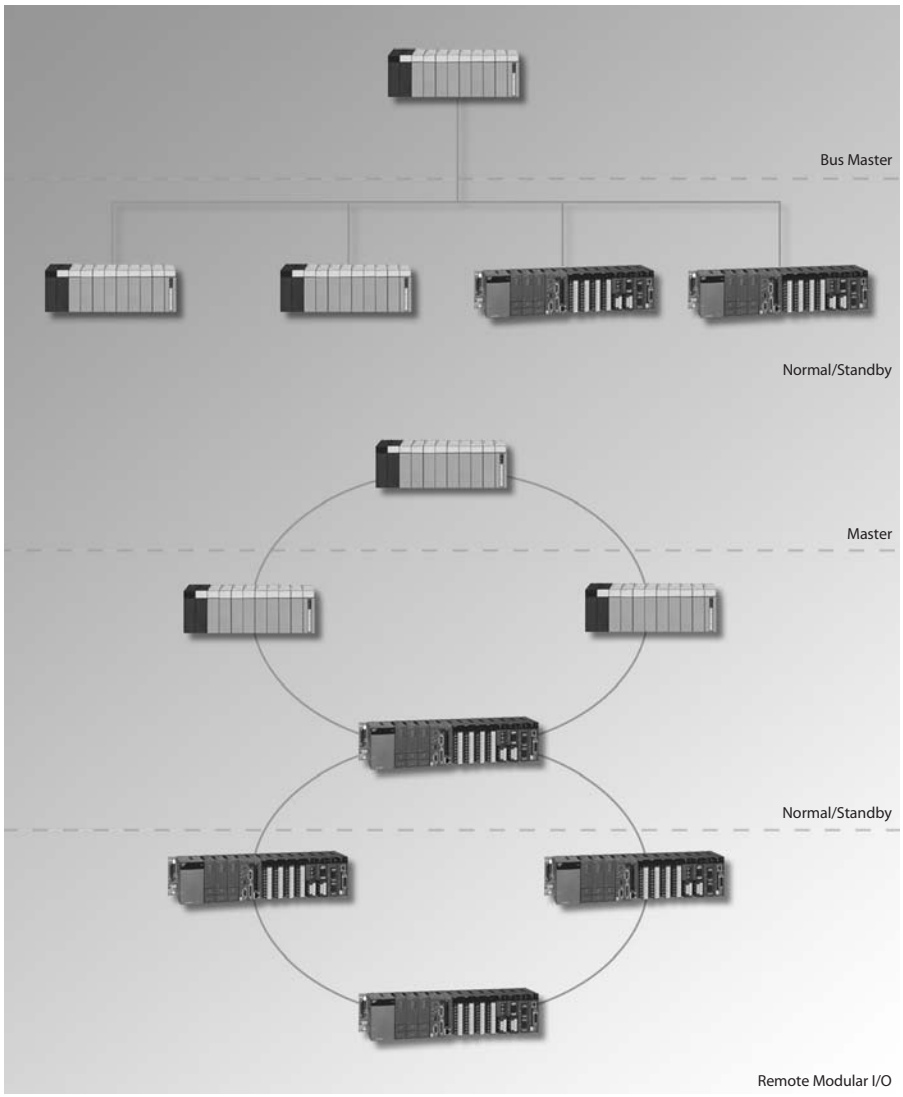
Model type	Series	Module	Description	Art. no.
Master	Q series	QJ71AS92	AS-i interface module, version 2.11, dual network master	143531
	AnS	A1SJ71AS92	AS-i master module for AnS (Double network master)	129936
	FX	FX2N-32ASI-M	AS-i master	103314
Intelligent Slave	Alpha	AL2-ASI-BD	AS-i interface board for use with AL2-14M or AL2-24Ms	142525

MELSECNET/H

For the systems that demand uncompromising reliability and high speed performance, only a dedicated network can deliver. MELSECNET/H and it's predecessor MELSECNET/10 use high speed, redundant functionality to give deterministic delivery of large data volumes.

This is Mitsubishi's own dedicated network. MELSECNET has a dual cable configuration. This offers high network availability, as cable breaks are automatically detected and the active communication channel is automatically re-routed around the suspected break. The MELSECNET network also allows a floating master. This allows other PLCs on the network to take up the position of network master should a fault develop with the currently selected master. The MELSECNET allows very large network coverage of up to 30 km.

- Up to 64 stations per network
- Up to 239 networks (MELSEC System Q) can be joined together
- Floating master give excellent redundancy if master station fails
- Fibre optic (GI or SI cable) and 50 Ω coaxial connection
- Used for peer-to-peer or remote I/O control
- Easy set-up, no programming needed
- Strong diagnostics built into the network interface, PLC CPU and programming software
- Up to 16 k words of data per network
- Maximum transmission speed 50 Mbps (SI fibre only, full duplex communication)
- Maximum transmission distance for single network, 30 km fibre loop or 500 m coaxial



Model type	Series	Module	Description	Art. no.
Master/local	Q series	QJ71BR11	MELSECNET/H master/local, coaxial cable	127592
		QJ71LP21GE	MELSECNET/H master/local, GI 62.5/125 fibre optic cable	138959
		QJ71LP21-25	MELSECNET/H master/local, SI fibre optic cable	136391
		QJ71NT11B	Master/local station for MELSECNET/H (twisted pair)	221861
	AnS	A1SJ71LP21GE	MELSECNET/10 master/local, GI 62.5/125 fibre optic cable	53457
		A1SJ71LP21	MELSECNET/10 master/local, SI fibre optic cable	47868
		A1SJ71BR11	MELSECNET/10 master/local, coaxial cable	47869
		A1SJ71QBR11	Q2AS MELSECNET/10 master/local, coaxial cable	66540
		A1SJ71QLP21GE	Q2AS MELSECNET/10 master/local, GI 62.5/125 fibre-optic cable	87152
Slave I/O	Q series	QJ72LP25-25	MELSECNET/H remote I/O controller, SI fibre optic cable	136392
		QJ72BR15	MELSECNET/H remote I/O controller, coaxial cable	136393
	QnAS	A1SJ72QBR15	QnAS MELSECNET/10 remote I/O controller, coaxial cable	68450
		A1SJ72QLP25	QnAS MELSECNET/10 remote I/O controller, SI fibre-optic cable	68449

SSCNET III

Mitsubishi Electric's SSCNET (Servo System Controller Network) is a dedicated motion controller network ensuring maximum control and flexibility for motion systems under all conditions.

The motion controllers and servo amplifiers can be linked via the SSCNET network

SSCNET III achieves speeds of up to 50 Mbps ensuring both high speed and high accurracy.

During operation, all parameters and operational data are available back at the main controller due to the communication provided by the SSCNET system bus. Servo amplifier settings can be changed directly from the controller.

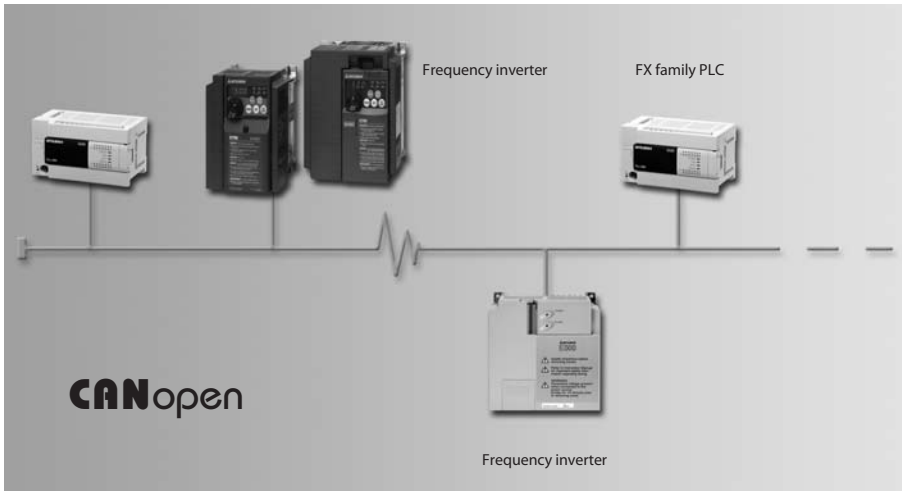
- "Plug and Play" for ease of connectivity, instant communication and reduced wiring faults.
- greater flexibilty for system integration.
- High speed networking with fast cycle time.
- Direct Bus operation with fast access
- Fibre-optic connection cables for noise immunity.

CANopen

CANopen is an "open" implementation of the Controller Area Network (CAN), which is defined in the EN50325-4 standard. It was developed by members of the CAN in Automation international users and manufacturers group. The CANopen application layer defines a range of communications services and protocols (e.g. process and service data) and a network management system.

CANopen networks are used for connecting sensors, actuators and controllers in industrial control systems, medical equipment, maritime electronics, railways, trams and commercial vehicles.

A CANopen bus system has a linear structure to which up to 127 bus stations can be connected. Multiple master stations can be connected to a single bus. The ends of the linear bus are terminated with resistors. Total network length can be up to 40 m at a data transfer rate of 1 Mbit/s. Lowering the data rate makes it possible to increase the length of the bus. For example, a transfer rate of 125 kBit/s allows a bus length of 500 m. This can be increased to a maximum of 5,000 m with the help of repeaters (at 10 kBit/s).



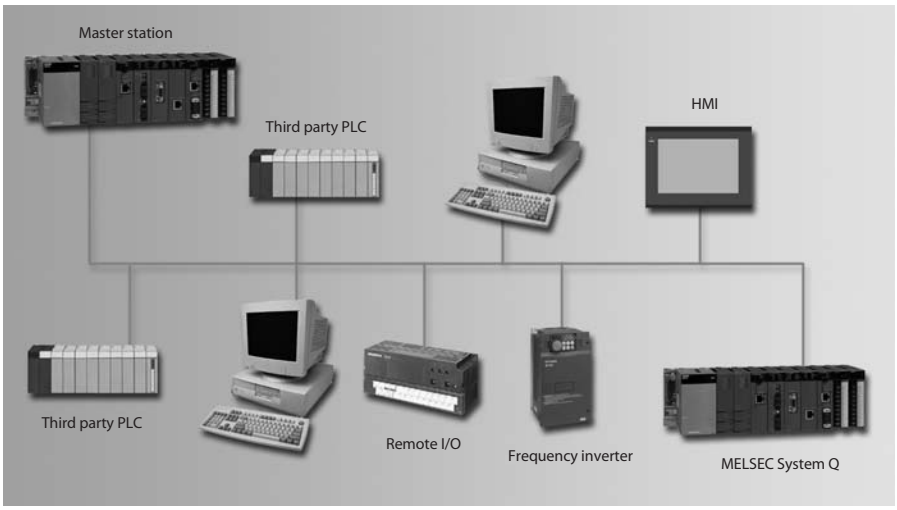
Model type	Series	Module	Description	Art. no.
Local	FX	FX2N-32CAN	Communications module for CANopen	141179
Slave	Inverter	FR-A7NCA	Communications board for FR-A700 series inverter	191424
		FR-A7NCA-Ekit	Communications card for frequency inverters of the FR E700 series	210705

MODBUS

The Modbus protocol is a messaging structure which is used to establish master-slave/client-server communication between intelligent devices. It is a de facto standard, truly open and a widely used network protocol in the industrial manufacturing environment.

Modbus allows communication between many devices connected to the same network, for example a system that measures temperature and humidity and communicates the results to a PC. Modbus is often used to connect a supervisory computer with a remote terminal unit (RTU) in supervisory control and data acquisition systems (SCADA). Versions of the Modbus protocol exist for serial port and Ethernet.

Modbus RTU is a compact, binary representation of the data.



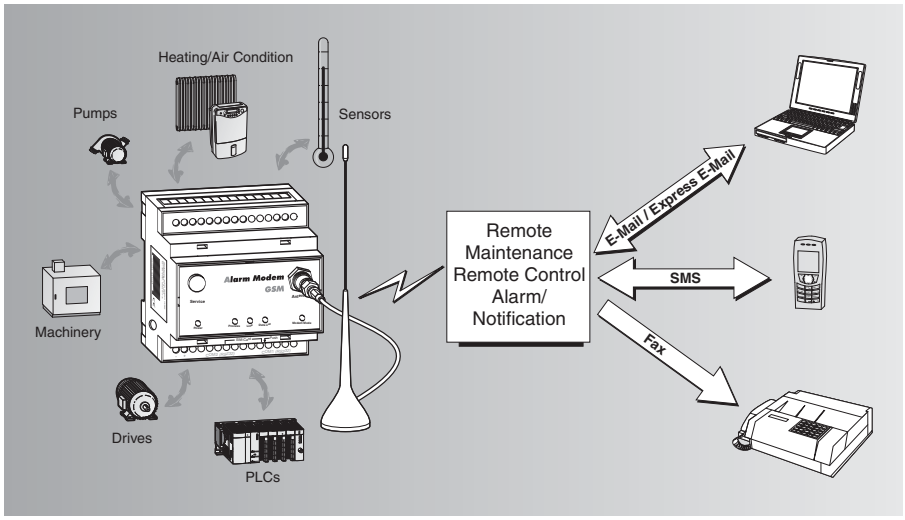
Model type	Series	Module	Description	Art. no.
Master/Slave	Q series	QJ71MB91	Serial MODBUS interface master/slave module	167757
		QJ71MT91	MODBUS/TCP interface master/slave module for Ethernet	155603
	FX	FX3U-232ADP-MB	Serial MODBUS RS232C interface master/slave module	165276
		FX3U-485ADP-MB	Serial MODBUS RS485 interface master/slave module	165277
Slave	AnS	A1SJ71UC24-R2-S2	MODBUS slave interface module	54355
		A1SJ71UC24-R4-S2	MODBUS slave interface module with RTU protocol	54354
	Breaker	BIF-MD-W	MODBUS interface for SUPER AE air circuit breakers	168573

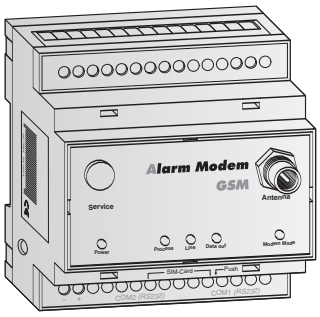
MODEMS for Data Communication

Mitsubishi modems are telecommunication devices capable of performing remote maintenance and Internet communication tasks fully automatically for any plant and equipment. Contrasting with conventional modems, a high-performance processor with large storage capacity ensures that the complicated communication protocols are transparent to the user.

The ability to connect the modems directly to any size controller provides a simple and cost-effective remote maintenance solution for small businesses, building management or industrial application.

The easy-to-use MX Alarm Editor software is available to configure the intelligent alarm modems. Configuration can be done locally or remotely.





Intelligent alarm modems with data logger and embedded Web server

Mitsubishi Alarm Modems are automatic modems with large data storage, numerous functions and integrated Internet technology. As intelligent communication computers, they have a 32 bit power CPU and 2 MB non-volatile data storage (flash memory) which can be extended with an SD card up to 2 GB and therefore also provides sufficient space for larger data volumes in the longer term.

Mitsubishi Alarm Modems independently perform the following functions:

- Transmit alarm and status messages via SMS, e-mail or fax
- Receive switch commands via SMS or e-mail and pass these on to a PLC
- Exchange data between controllers remotely
- Capture data and transmit logged data via e-mail
- Visualize PLC data with the embedded web server functionality
- Remote access to controllers or systems via the PLC programming software

The alarm modem communicates directly with Mitsubishi controllers via their PLC protocol. Modbus-RTU and Modbus-ASCII are also supported. Convenient software programs based on XML files enable simple configuration of the required functions.

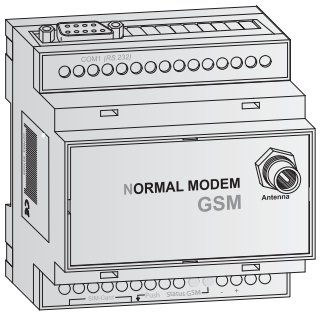
Based on the comprehensive functionality of the Mitsubishi modems, diverse areas of application are possible, such as monitoring of temperatures, pressures, filling levels or the activation of motors, fans, pumps, slides and flaps.

Mitsubishi Alarm Modems can be integrated into existing systems with minimum effort. As a rule, no changes are required in the PLC program.

Apart from suitable communication adapters and cables, appropriate GSM antennae are also available.

Specificatons		MAM-GM106	MAM-GM420	MAM-GM424
Interface	COM1	RS232	RS232	RS232
	COM2	—	RS232	RS485/422
Type of network connection		GSM/GPRS/EDGE, Quad Band, 900/1800 MHz		
Data transfer		GSM: CSD up to 14.4 kbps EDGE: max. Downlink: 220 kbps, max. Uplink: 100 kbps GPRS: max. Downlink: 40 kbps, max. Uplink: 13 kbps		
Fax transmission		Fax Group 3/Class 1 and 2; 2400 bps–14.4 kbps		
Power supply		10–30 V DC, 0.25 A maximum		
Dimensions (WxHxD)	mm	88x58x91		
Order information	Art. no.	221963	221964	221965

Specificatons		MAM-AM6	MAM-AM20	MAM-AM24
Interface	COM1	RS232	RS232	RS232
	COM2	—	RS232	RS485/422
Type of network connection		Analogue telephone connection (a/b interface), RJ11		
Data transfer		300 bps–56 kbps,		
Fax transmission		Fax Group 3/Class 1; 2400 bps–14.4 kbps		
Power supply		10–30 V DC, 0.2 A maximum		
Dimensions (WxHxD)	mm	88x58x91		
Order information	Art. no.	163283	163284	163274



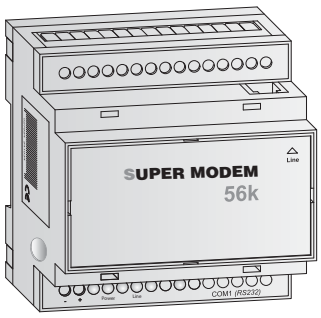
Industrial modems MIM

Normal modems GSM (MIM-G10)

The MIM-G10 is a GSM/GPRS mobile radio modem to transmit data, SMS messages, e-mails and fax messages in the 900 MHz and 1800 MHz GSM mobile radio network and supports the GPRS standard Class 10 high speeds. It is designed for installation in switchgear cabinets with DIN rails.

The GSM Mitsubishi normal modem requires a SIM card and logs onto the mobile radio network like a mobile phone. The micro controller Mitsubishi Alpha2 is able to send the display content as an SMS via this modem and a special function module, or to send e-mails. The normal modem has no storage for user data and no automatic functions. It can also be used for remote access to PLC systems.

Specificatons		MIM-G10
Telephone network		GSM
Type of network connection		GSM/GPRS/EDGE, Quad Band 850/900/1800/1900 MHz
Data transfer		GSM: CSD up to 14.4 kbps EDGE: max. Downlink: 220 kbps, max. Uplink: 100 kbps GPRS: max. Downlink: 40 kbps, max. Uplink: 13 kbps
Fax transmission		Fax Group 3/Class 1 and 2; 2400 bps–14.4 kbps
Power supply		10–30 V DC, max. 0.15 A/24 VDC
Interfaces		1 x RS232, 1 x USB (Typ B)
Dimensions (WxHxD)	mm	88x58x91
Order information	Art. no.	206367



Super modem 56k (MIM-A01)

The MIM-A01 is a 56 k modem for transmitting data, SMS messages, e-mails and fax messages via analogue fixed telephone network. It is designed for installation in switchgear cabinets with DIN rails.

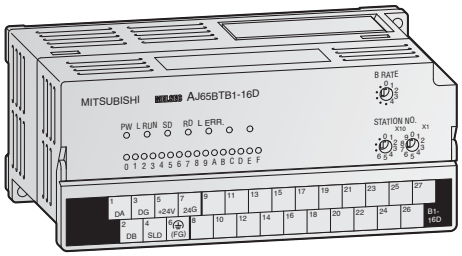
The super modem 56 k is an 11-bit industrial modem with some storage for user data, with the traditional modem functions and capable of sending messages via fixed network, controlled via simple AT commands. The modem is equipped with the following functions:

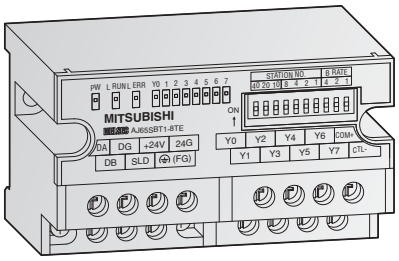
- SMS via fixed and mobile networks
- Express e-mail without Internet, i.e. e-mail directly via telephone line; in this way, controllers can, for instance, also interchange data
- Sending and retrieving e-mail via Internet (SMTP/POP3)
- Transmitting fax text messages to fax machines

As other modems, the Mitsubishi normal modem GSM requires PC software for message communication, such as RDT or a fax program. Mitsubishi super modems, on the other hand, can also transmit the above message types via simple AT commands; special PC software is not required.

Specificatons		MIM-A01
Telephone network		Analogue fixed network/56
Type of network connection		Analogue telephone connection (a/b interface), RJ11
Data transfer		300 bps–56 kbps
Fax transmission		Fax Group 3/Class 1; 2400 bps–14.4 kbps
Power supply		10–30 V DC, 0.15 A maximum
Dimensions (WxHxD)	mm	88x58x91
Order information	Art. no.	163285

CC-Link Remote Modules



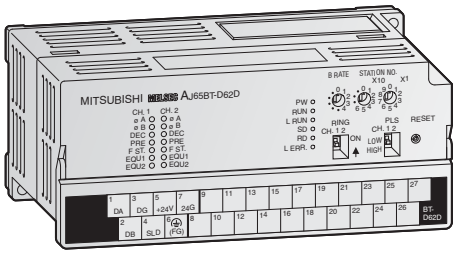


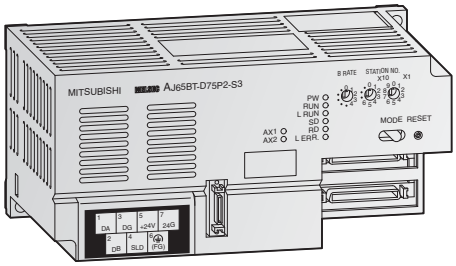
These remote modules are intended to be installed near the control target. The advantages are reduced cabling and the capability of aquiring data and operation results of individual machine modules autonomously.

For wet environments six types of low profile waterproof remote I/O modules with IP67 protection are available featuring Input, Output and Combination modules.

- Up to 64 I/O modules with a maximum of 32 inputs or 32 outputs each can be connected.
- All modules have a very compact design which is tough and highly shock-resistant.
- Status indicator LEDs for the inputs
- Standard electrical isolation between process and control via optocouplers
- Mounting with DIN rail adapters or screws
- Modules can be mounted in horizontal arrangement or in one of 4 orientations on a flat surface.
- Ready for use with all CC-Link master modules.

Product Range	Module		No. of input	No. of output	Description	Art. no.
Digital in	AJ65BTB1-16D	Remote module	16	—	DC input (+COM/-COM)	75447
	AJ65BTB2-16D		16	—	DC input with 8 potential terminals (+COM/-COM)	75450
	AJ65SBTB1-8D	Compact remote module	8	—	DC input (+COM/-COM)	104422
	AJ65SBTB1-16D		16	—	DC input (+COM/-COM)	136026
	AJ65SBTB3-16D			—	DC input (+COM/-COM), 3-wire sensors	151186
	AJ65SBTB1-16D1		16	—	Fast DC input (+COM/-COM)	140144
	AJ65SBTB1-32D1		32	—	Fast DC input (+COM/-COM)	140145
	AJ65SBTB1-32D		32	—	DC input (+COM/-COM)	136025
	AJ65FBTA4-16D	Waterproof remote module	16	—	Protection IP67, DC input (sink type)	137587
	AJ65FBTA4-16DE		16	—	Protection IP67, DC input (source type)	137588
Digital out	AJ65BTB1-16T	Remote module	—	16	Transistor output, (sink type), 0.5 A	75449
	AJ65BTB2-16R		—	16	Relay output, 2 A	75453
	AJ65SBTB1-8TE	Compact remote module	—	8	Transistor output (source type), short circuit proof, 0.1 A	129574
	AJ65SBTB2-8T1		—	8	Transistor output (sink type), 0.5 A	144062
	AJ65SBTB1-16TE		—	16	Transistor output (source type), 0.5 A	129575
	AJ65SBTB1-32T		—	32	Transistor output (sink type), 0.5 A	138957
	AJ65SBTB2N-8R		—	8	Relay output, 2 A	140148
	AJ65SBTB2N-16R		—	16	Relay output, 2 A	140149
	AJ65SBTB1-16T1		—	16	Transistor output (sink type), 0.5A	163966
	AJ65SBTB1B-16TE1		—	16	Transistor output (source type), 0.1 A	204679
	AJ65SBTB1-32TE1		—	32	Transistor output (source type), 0.1 A	204680
	AJ65SBTB2N-16S		—	16	Triac output, 0.6 A	159954
	AJ65FBTA2-16T	Waterproof remote module	—	16	Protection IP67, DC output (sink type), 0.5 A	150380
	AJ65FBTA2-16TE		—	16	Protection IP67, DC output (source type), 1 A	150381
Combine	AJ65BTB1-16DT	Remote module	8	8	DC input (sink type), transistor output (sink type)	75448
	AJ65BTB2-16DT		8	8	DC input with 16 potential terminals (sink type), transistor output (sink type)	75452
	AJ65BTB2-16DR		8	8	DC input (source type), relay output	75451
	AJ65FBTA42-16DT	Waterproof remote module	8	8	Protection IP67, DC output (sink type)	137589
	AJ65FBTA42-16DTE		8	8	Protection IP67, DC output (source type)	137590
	AJ65SBTB1-32DT1	Compact combined modules	16	16	DC input (sink type), DC output (sink type), short circuit proof	166822
	AJ65SBTB1-32DTE1		16	16	DC input (source type), DC output (source type)	204681
Analog in	AJ65BT-64AD	Remote module	4	—	4-channel input, -10 V to 10 V, -20 mA to +20 mA	75444
	AJ65BT-64RD3		4	—	4-channel input, for 3-wire-type Pt100 temperature sensors	88026
	AJ65BT-64RD4		4	—	4-channel input, for 4-wire-type Pt100 temperature sensors	88027
	AJ65BT-68TD		8	—	8-channel thermocouple input	88025
	AJ65SBT-64AD	Compact remote module	4	—	4-channel input, -10 V to 10 V, 0 A to +20 mA	140146
	AJ65SBT2B-64RD3		4	—	4-channel input, for Pt100 with three-wire technology	221862
Analog out	AJ65BT-64DAV	Remote module	—	4	4-channel voltage output, -10 V to 10 V	75446
	AJ65BT-64DAI		—	4	4-channel current output, 4 mA-20 mA	75445
	AJ65SBT-62DA	Compact remote module	—	2	2-channel voltage output, -10 V to10 V, 0 A to 20 mA	140147
	AJ65SBT2B-64DA		—	4	4-channel voltage output, -10 V– +10 V, 0 A–20 mA	221863
Repeater	AJ65SBT-RPT	Compact repeater	—	—	Repeater allowing 'T' branching and network extension	130353





High-speed counter

The high-speed counter modules acquire signals at frequencies beyond the range of normal digital input modules. Positioning tasks or frequency measurements for example can be performed.

Data exchange with peripherals

These modules allow communication with peripheral devices through a standard RS232C interface. The peripherals are connected point to point (1:1).

Open control loop positioning

Locating the positioning unit near the servo/mechanical system not only reduces cable costs but also eliminates problems arising from noise and cable losses.

Product range	Module	Type	Description	Art. no.
Counter	AJ65BT-D62	Remote module	2 high-speed counter inputs , 5–24 V DC, up to 200 kHz	88028
	AJ65BT-D62D		2 high-speed counter inputs , EIA standard RS-422 connection, up to 400 kHz (low current consumption)	88029
	AJ65BT-D62D-S1		2 high-speed counter inputs , EIA standard RS-422 connection, up to 400 kHz	88030
Interface	AJ65BT-R2N		Serial interface, RS232C (D-Sub, 9 pole), 1 channel	216545
Positioning	AJ65BT-D75P2-S3		2 axes positioning module, pulse output, linear and circular interpolation	88002

See also CC-Link Safety Remote I/O Modules, page 127
See also CC-Link Safety Relays, page 128

The CC-Link Partner Association set-up a European headquarters at the beginning of January 2001 at Mitsubishi's UK office.
The role of the organisation is to provide information, education, and the promotion of CC-Link technology and CLPA partner products throughout Europe. One of the primary responsibilities of the organisation is to provide technical support to CLPA partners who plan to incorporate CC-Link compatibility in their products.
"Our target is to significantly increase the use of CC-Link, and to promote the CC-Link compatible products manufactured by CLPA partners. Promotional activities include educational seminars, exhibiting at trade shows, trade press coverage, mailings and web-based listings. For more information please contact us."

Steve Jones, CLPA Europe

- Over 150 partner manufacturers of CC-Link products
- Over 700 CC-Link compatible products, including PLCs, servo drives, temperature controllers etc.
- Over 700 members, with a new partner manufacturer joining each month.

CC-LINK PARTNER ASSOCIATION EUROPE
Postbox 10 12 17
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Phone: +49 (0) 2102/486 1750
Fax: +49 (0) 2102/486 1751
e-mail: partners@clpa-europe.com
www.clpa-europe.com

Regional offices in UK, Poland and Ukrain for more information see the website.

The MELSEC ST Series for PROFIBUS/DP and CC-Link

System description

The new ST series is designed as a modular input/output system for connection to PROFIBUS/DP. It comprises of:

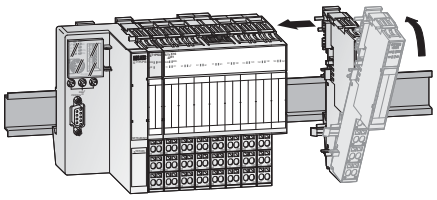
- basic module (head station and bus node for PROFIBUS/DP)
- power supply modules
- digital and analog I/O modules

They can be combined freely to provide an efficient system configuration depending on your demands.

The name "ST" means "Slice-type Terminal" and comes from the physical appearance of the very slim modules (12.6 mm). As well as slice type modules, cost saving block modules with 16 inputs or outputs are also available.

The extension modules are designed as a 2-component system, that means they consist of electronic modules for the function and base modules as modular backplane bus (available with two types of terminals: spring clamp or screw clamp terminals).

The electronic modules can be clipped easily in the base modules without any tool. The combined unit can then be mounted on a DIN rail. Exchange of the electronic modules can be made on-line, so the system keeps running. Re-wiring is not needed.

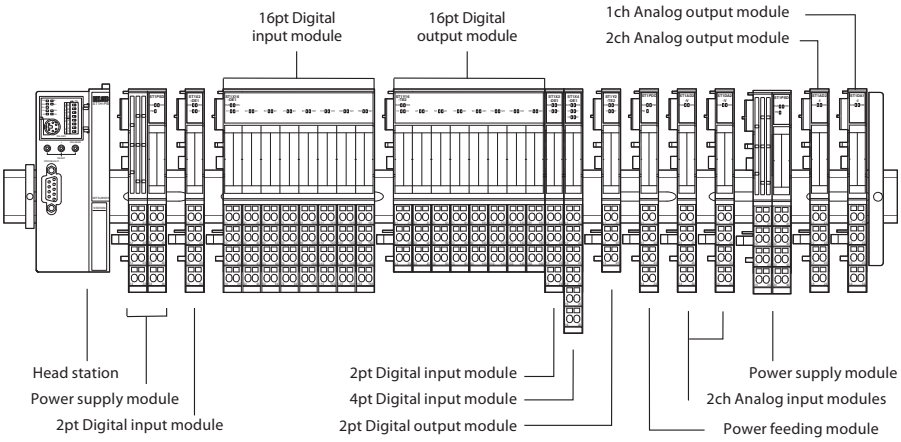


Every electronic module provides LEDs for quick and easy diagnostics and also additional information. Error and status messages are also shown on the basic module.

Special features:

- ST = Slice terminals, only 12.6 mm wide
- Modular structure with no restriction on installation position
- Easy and complete handling via 3 push buttons
- Connection diagram on every module
- Applicable wire size for all base modules 0.5–2.5 mm², flexible wire with ferrule or solid core wire without ferrule
- Expandable in two-point increments
- Replaceable electronic modules
- Hot swap function without re-wiring
- Quick diagnostics via LED´s
- Distributed 24 V DC for actuators/sensors
- Gold contacts for all bus and signal connections
- Electronic modules are coded to prevent an incorrect unit being inserted
- Easy parameter setting with GX Configurator DP

Product range

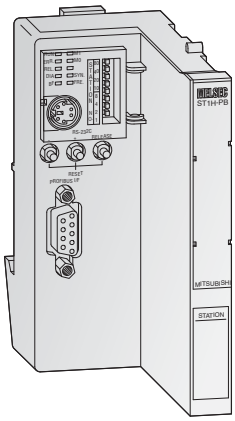


Product range and selection guide

The following table shows the possible combinations between electronic modules and the applicable base modules. However, two types of base modules featuring spring clamp terminals or screw clamp terminals are available. Choose the best solution for your special application.

Electronic modules	Base modules Spring clamp terminals	Screw clamp terminals
Head station		
ST1H-PB	no need	no need
ST1H-BT (CC-Link)	—	—
Power supply modules		
ST1PSD (first one)	ST1B-S4P2-H-SET	ST1B-E4P2-H-SET
ST1PSD (second and more)	ST1B-S4P2-R-SET	ST1B-E4P2-R-SET
ST1PDD	ST1B-S4P2-D	ST1B-E4P2-D
Digital input modules		
ST1X2-DE1	ST1B-S4X2	ST1B-E4X2
ST1X4-DE1	ST1B-S6X4	ST1B-E6X4
ST1X16-DE1	ST1B-S4X16	ST1B-E4X16
ST1X1616-DE1-S1	ST1B-S6X32	ST1B-E6X32
Digital output modules		
ST1Y2-TE2	ST1B-S3Y2	ST1B-E3Y2
ST1Y16-TE2	ST1B-S3Y16	ST1B-E3Y16
ST1Y16-TE8	ST1B-S3Y16	ST1B-E3Y16
ST1Y2-TPE3	ST1B-S3Y2	ST1B-E3Y2
ST1Y16-TPE3	ST1B-S3Y16	ST1B-E3Y16
ST1Y2-R2	ST1B-S4IR2	ST1B-E4IR2
Analog input modules		
ST1AD2-V	ST1B-S4IR2	ST1B-E4IR2
ST1AD2-I	ST1B-S4IR2	ST1B-E4IR2
Analog output modules		
ST1DA2-V	ST1B-S4IR2	ST1B-E4IR2
ST1DA1-I	ST1B-S4IR2	ST1B-E4IR2
Temperature modules		
ST1TD2	ST1B-S4TD2	ST1B-E4TD2
ST1RD2	ST1B-S4IR2	ST1B-E4IR2
Encoder modules		
ST1SS1	ST1B-S4IR2	ST1B-E4IR2

The MELSEC ST Series for PROFIBUS/DP and CC-Link

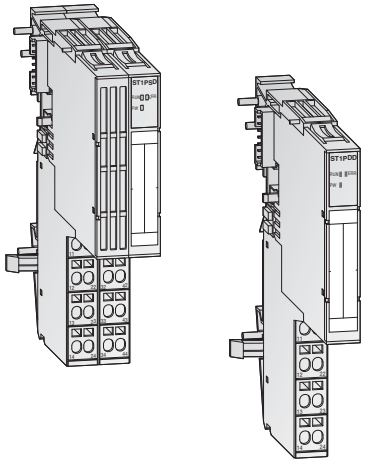


Basic module (head station) of the MELSEC ST series

The basic module ST1H-PB connects the remote I/O modules of the ST series to PROFIBUS/DP.

The ST1H-PB provides a Mini-DIN socket for diagnostics and parameter setting. The station number can be set via DIP switches on the basic module. LEDs show the status of the connected systems.

Specifications			ST1H-PB	ST1H-BT
Occupied I/O points			4/4	4 inputs/4 outputs
Communications	protocol		PROFIBUS/DP	CC-Link standard
	medium		Shielded 2-wire	CC-Link cable
Interface		type	RS485	CC-Link
Supported operation modes			Sync mode, freeze mode	Remote station (1–4)
Max. transmission distance		m	4800 (3 repeaters)	1200
Programming interface			RS232 Mini-DIN socket for diagnostics and programming	RS-232 mini-DIN connector for diagnostics and programming
Data exchange with master			304 total/32/64/128/256, selectable mode	304 total/32/64/128/256 I/Os, mode selectable
Number of addressable slices			Max. 63	Max. 63
Addressable I/O points	digital	bit	256	252
	analog	word	32	52
Internal power consumption (5 V DC)		mA	530	410
External power supply			Via ST1PSD	Via ST1PSD
Dimensions (WxHxD)		mm	50.5x114.5x74.5	50.5x114.5x74.5
Order information		Art. no.	152951	214496



Bus power for head station

The Bus power supply and refresh module ST1PSD can serve in two ways: distribute 24 V DC power supply for the basic module and I/O devices plus 5 V DC for the internal backplane bus (H mode) or distribute 24 V DC power supply for I/O devices and refresh the internal backplane bus with 5 V DC (R mode). Each mode (H or R) is indicated by the use of a different base module, marked with "H" or "R".

You need 1 ST1PSD with H-type base module beside the basic module to operate the ST station, a second or more (using the R-type base module) are only needed depending on the power consumption of the connected items (see bottom of this page).

LEDs on the module show the status for RUN and ERROR. Diagnosis can be made via the head module.

Power feeding module

The power feeding module ST1PDD distributes 24 V DC only for the I/Os of the actuators and sensors.

The number of ST1PDD modules needed can be calculated individually by addition of the current consumption of all connected devices.

The electronic module is fitted in a base module, which can be installed on a standard DIN rail.

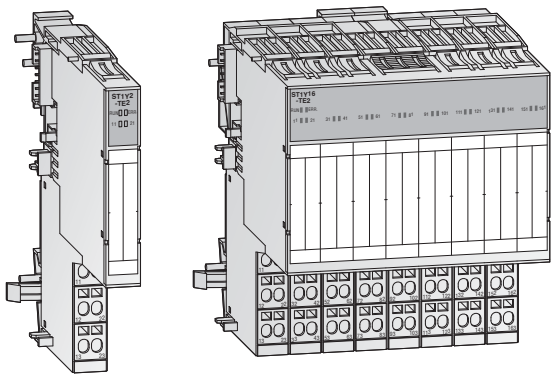
Specifications			ST1PSD	ST1PDD
Module type			Power supply for head station, internal 5 V DC backplane bus and 24 V DC for I/Os (double function)	Power feeding module
Occupied I/O points			2/2	2/2
Occupied slice number			2	1
Nominal voltage		V DC	24.0	24.0
Permissible range			24.0 (19.2–28.8 (±20 %))	24.0 (19.2–28.8 (±20 %))
System supply		V DC	24.0 for basic module and I/O´s, field supply/5.0 for internal backplane bus	
Ripple			< 5 %	< 5 %
Internal power consumption (5 V DC)		mA		60
Max. output current (5 V DC)		A	2.0	—
Max. output current (24 V DC)		A	8 (10 with fuse)	8 (10 with fuse)
Dimensions (WxHxD)		mm	25.2x55.4x74.1	12.6x55.4x74.1
Order information		Art. no.	152952	152953
Applicable base module for basic module supply	spring clamp type		ST1B-S4P2-H-SET, art. no. 152908	ST1B-S4P2-D, art. no. 152910
	screw clamp type		ST1B-E4P2-H-SET, art. no. 152918	ST1B-E4P2-D, art. no. 152920
Applicable base module for bus refreshing within the station	spring clamp type		ST1B-S4P2-R-SET, art. no. 152909	—
	screw clamp type		ST1B-E4P2-R-SET, art. no. 152919	—

Note: Calculation of the power consumption

The power consumption and the need of a power refresh module will be calculated exactly in the GX Configurator DP during your configuration of the System.

For a rough calculation of the internal 5 V DC power consumtion and a rough calculation for the number of needed PSD refresh modules, please refer to the attached table.

Module type	Power supply/consumtion	Description
ST1PSD	2.0 A	Power supply infeed
ST1H-PB	0.53 A	Power consumption
Slicemodule	0.1 A	Power consumption
Blockmodule	0.15 A	Power consumption



Digital input modules

The digital input modules of the ST series directly connect field devices (contacts, limit switches, sensors, etc.) on to a PROFIBUS/DP ST series slave node.

Digital output modules

The digital output modules of the ST series connect directly to field devices (e.g. contactors, valves, lights) and PROFIBUS/DP master module.

The TPE3 models provide advanced protection functions e.g. for thermal and short circuit failures.

The electronic modules are fitted in a base module, which can be installed on a standard DIN rail. Each module can be replaced without having to turn OFF the power ("Hot Swap"), without rewiring and without using any tool.

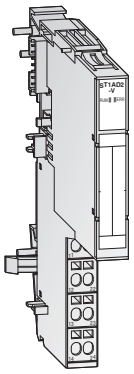
Special features:

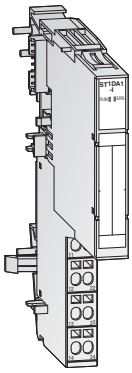
- DIN rail mounting
- LEDs for RUN and ERROR on the modules and also on the basic module
- Connection to the basic module (head station) via integrated backplane bus in the base modules
- Two selectable types of connecting terminals base modules:
  - spring clamp type terminals
  - screw clamp type terminals

Specifications			ST1X2-DE1	ST1X4-DE1	ST1X16-DE1	ST1X1616-DE1-S1
Module type			DC input module, 2 inputs	DC input module, 4 inputs	DC input module, 16 inputs	DC input module, 32 inputs
Occupied I/O points			2/2	4/4	16/16	16/16
Occupied slice number			1	1	8	8
Isolation method			Photo coupler	Photo coupler	Photo coupler	Photo coupler
Rated input voltage		V DC	24 (+20/-15 %, ripple ratio within 5 %)	24 (+20/-15 %, ripple ratio within 5 %)	24 (+20/-15 %, ripple ratio within 5 %)	24 (+20/-15 %, ripple ratio within 5 %)
Rated input current		mA	4	4	4	5
Inputs simultaneous ON			100 %	100 %	100 %	100 %
Input resistance		kΩ	5.6	5.6	5.6	4.7
Response time	OFF ⟶ ON	ms	0.5/1.5 or less (default: 1.5)			
	ON ⟶ OFF	ms	0.5/1.5 or less (default: 1.5)			
Internal current consumption (5 V DC)		mA	85	95	120	200
Dimensions (WxHxD)		mm	12.6x55.4x74.1	12.6x55.4x74.1	100.8x55.4x74.1	100.8x55.4x74.1
Applicable base module	spring clamp type		ST1B-S4X2, art. no. 152911	ST1B-S6X4, art. no. 152912	ST1B-S4X16, art. no. 152913	ST1B-S6X32, art. no. 169313
	screw clamp type		ST1B-E4X2, art. no. 152921	ST1B-E6X4, art. no. 152922	ST1B-E4X16, art. no. 152923	ST1B-E6X32, art. no. 169314
Connection cable type			3-wire 24 V DC (with shield)	3-wire 24 V DC	3-wire 24 V DC (with shield)	3-wire 24 V DC (with shield)
Order information		Art. no.	152964	152965	152966	169309

Specifications			ST1Y2-TE2	ST1Y16-TE2	ST1Y16-TE8	ST1Y2-TPE3	ST1Y16-TPE3	ST1Y2-R2
Module type			2 transistor outputs	16 transistor outputs	2 transistor outputs	2 transistor outputs	16 transistor outputs	Relay output
Occupied I/O points			2/2	16/16	2/2	2/2	16/16	2/2
Occupied slice number			1	8	1	1	8	1
Isolation method			Photo coupler	Photo coupler	Photo coupler	Photo coupler	Photo coupler	Relay
Rated load voltage			24 V DC (+20/-15 %)	24 V DC (+20/-15 %)	24 V DC (+20/-15 %)	24 V DC (+20/-15 %)	24 V DC (+20/-15 %)	24 V DC (+20/-15 %); 240 V AC
Max. load current		A	0.5/point; 1.0/common	0.5/point; 4.0/common	2.0/point; 4.0/common	1.0/point; 2.0/common	1.0/point; 4.0/common	2.0 (cos ϕ=1)/point; 4.0/common
Nax. swithing load			—	—	—	—	—	264 V AC/125 V DC
Max. inrush current		A	4.0 (10 ms or less)	4.0 (10 ms or less)	4.0 (10 ms or less)	2.0 (10 ms or less)	4.0 (10 ms or less)	—
Leakage current OFF		mA	0.1 or less	0.1 or less	0.1 or less	0.3 or less	0.3 or less	—
Max. voltage drop at ON			0.2 V DC (TYP) 0.5 A, 0.3 V DC (max.) 0.5 A	0.2 V DC (TYP) 0.5 A, 0.3 V DC (max.) 0.5 A	0.2 V DC (TYP) 2.0 A, 0.3 V DC (max.) 2.0 A	0.15 V DC (TYP) 1.0 A, 0.2 V DC (max.) 1.0 A	0.15 V DC (TYP) 1.0 A, 0.2 V DC (max.) 1.0 A	—
Response time	OFF ⟶ ON	ms	max. 1.0	max. 1.0	max. 1.0	max. 0.5	max. 0.5	max. 10
	ON ⟶ OFF	ms	max. 1.0 (rated load, resistive load)	max. 1.0 (rated load, resistive load)	max. 1.0 (rated load, resistive load)	max. 1.5 (rated load, resistive load)	max. 1.5 (rated load, resistive load)	max. 12
Protection functions			—	—	—	Thermal protection, short circuit protection (thermal and short circuit protection are activated in increments of 1 points. When the output section protection function is working, LED indicates it and signal is output to head module (automatic reset).		—
Internal current consumption (5 V DC)		mA	90	150	95	95	160	90
Dimensions (WxHxD)		mm	12.6x55.4x74.1	100.8x55.4x74.1	12.6x55.4x74.1	12.6x55.4x74.1	12.6x55.4x74.1	12.6x55.4x74.1
Applicable base module	spring clamp type		ST1B-S3Y2, art. no. 152914	ST1B-S3Y16, art. no. 152915	ST1B-S3Y16, art. no. 152915	ST1B-S3Y2, art. no. 152914	ST1B-S3Y16, art. no. 152915	ST1B-S4IR2, art. no. 152916
	screw clamp type		ST1B-E3Y2, art. no. 152924	ST1B-E3Y16, art. no. 152925	ST1B-E3Y16, art. no. 152925	ST1B-E3Y2, art. no. 152924	ST1B-E3Y16, art. no. 152925	ST1B-E4IR2, art. no. 152927
Connection cable type			2-wire 24 V DC with shield	2-wire 24 V DC with shield	2-wire 24 V DC with shield	2-wire 24 V DC with shield	2-wire 24 V DC with shield	2 wires (internal connected)
Order information		Art. no.	152967	152968	169408	152969	152970	152971

The MELSEC ST Series for PROFIBUS/DP





Analog input modules

The analog input modules of the ST series convert analog process data like pressure, temperature, etc. into digital values that are sent to the PROFIBUS/DP master.

Analog output modules

The analog output modules of the ST series convert the digital values sent from the PROFIBUS/DP master into an analog voltage signal. This signal can be used to control valves, inverters, servomotors, etc.

Analog temperature input module

The analog temperature input modules of the ST series convert analog temperature data into digital values that are sent to the PROFIBUS/DP master.

All modules are fitted in a base module, which can be installed on a standard DIN rail.

Special features:

- DIN rail mounting
- LEDs for RUN and ERROR on the modules and also on the basic module
- Connection to the basic module (head station) via integrated backplane bus in the base modules
- Modules can be replaced without having to turn OFF the power ("Hot Swap")
- Two selectable types of connecting terminals base modules:
  - spring clamp type terminals
  - screw clamp type terminals

Specifications			ST1AD2-V	ST1AD2-I	ST1TD2	ST1RD2
Module type			Analog input module	Analog input module	Analog temperature input module	Analog temperature input module
Occupied I/O points			4/4	4/4	4/4	4/4
Occupied Slice number			1	1	2	2
Number of input channels			2	2	2	2
Signal input			-10–+10 V, 0–+10 V, 0–5 V, 1–5 V	0–20 mA, 4–20 mA	Thermocouple input: K,T: 0.3 °C; E: 0.2 °C; J: 0.1 °C; B: 0.7 °C; R, S: 0.8 °C; N: 0.4 °C	PT100, PT1000
Resolution			12 bit + sign	12 bit + sign	Microvoltage: 4 µV	0.1 °C
Conversion speed			0.1 ms per channel	0.1 ms per channel	Cold junction temperature compensation setting: not set: 30 ms/channel; set: 60 ms/channel	80 ms per channel
Maximum input voltage			±15 V	—	±4 V	
Micro voltage input range			—	—	-80–+80 µV (input resistance < 1 MΩ)	—
Maximum input current			—	±30 mA	—	—
Output	temperature conversion		—	—	16-bit signed binary (-2,700–18,200)	16-bit signed binary (-2,000–8,500)
	micro conversion		—	—	16-bit signed binary (-20,000–20,000)	—
Total error			±0.8 % (0–55 °C)	±0.8 % (0–55 °C)	±0.32 mV (0–55 °C)	±1.2 °C (0–55 °C)
Input resistance	at single-end		1.0 MΩ	250 Ω	1 MΩ	1 MΩ
Isolation			Photo coupler isolation between the channels and backplane bus			
Internal current consumption (5 V DC)		mA	110	110	95	80
Dimensions (WxHxD)		mm	12.6x55.4x74.1	12.6x55.4x74.1	12.6x55.4x77.6	12.6x55.4x77.6
Applicable base module	spring clamp type		ST1B-S4IR2, art. no. 152916	ST1B-S4IR2, art. no. 152916	ST1B-S4TD2, art. no. 161736	ST1B-S4TD2, art. no. 161736
	screw clamp type		ST1B-E4IR2, art. no. 152927	ST1B-E4IR2, art. no. 152927	ST1B-E4TD2, art. no. 161737	ST1B-E4TD2, art. no. 161737
Order information		Art. no.	152972	152973	161734	169406

Specifications			ST1DA2-V	ST1DA1-I	ST1SS1
Module type			Analog output module	Analog output module	Absolute encoder interface with SSI (synchronal serial interface)
Occupied I/O points			4/4	4/4	4/4
Occupied slice number			1	1	2
Number of output channels			2	1	1
Signal output range			-10–+10 V, 0–+10 V, 0–5 V, 1–5 V	0–20 mA, 4–20 mA	31 bit binary (0–2147483647)
Resolution			12 bit + sign	12 bit + sign	2 to 31 bits
Conversion time			0.1 ms per channel	0.1 ms per channel	125 kHz, 250 kHz, 500 kHz, 1 MHz, 2 MHz
Maximum input voltage			±15 V	—	24 V DC (+20/-15 %)
Maximum input current			—	±30 mA	12 mA
Total error			±0.8 % (0–55 °C)	±0.8 % (0–55 °C)	±0.8 % (0–55 °C)
Data length			16 bit	16 bit	—
External load resistance value			1.0 kΩ–1.0 MΩ	0–500 Ω	—
Isolation			Photo coupler isolation between the channels and backplane bus	Photo coupler isolation between the channels and backplane bus	Photo coupler isolation between the channels and backplane bus
Internal current consumption (5 V DC)		mA	95	95	80
Dimensions (WxHxD)		mm	12.6x55.4x74.1	12.6x55.4x74.1	12.6x55.4x74.1
Applicable base module	spring clamp type		ST1B-S4IR2, art. no. 152916	ST1B-S4IR2, art. no. 152916	ST1B-S4IR2, art. no. 152916
	screw clamp type		ST1B-E4IR2, art. no. 152927	ST1B-E4IR2, art. no. 152927	ST1B-E4IR2, art. no. 152927
Order information		Art. no.	152975	152976	193660

MODULAR PLCs

System Q has been designed to be at the heart of your manufacturing process, as it is at the heart of Mitsubishi's component automation concept. It offers you total integration of your control and communication needs from a single platform - connecting your automation with your business needs.

- Communication- is a communication hub connecting to fieldbus or data networks including 100 Mbps ethernet
- Scalability- offers Multi CPU solutions on a single backplane
- Flexibility- solutions can combine 4 CPU types as a seamless solution; PLC, Motion, Robots, NC, PC and Process CPUs
- Visualisation- integrates your business data to whatever level and function you need, from HMI, Soft HMI through to SCADA and OPC
- MES and web server module for quick and simple connectivity to the IT world
- Redundancy options ranging from full redundant PLC hardware to redundant network options improve uptime and productivity

Equipment Features

The modular design of MELSEC System Q allows flexible usage in a broad range of applications.

The following modules are available for assembling the system:

To maximize the operational safety, all modules are isolated electrically by means of optocouplers.

Use of digital and special function modules

The use of digital and analog modules and most special function modules is dependent only on the maximum available number of addresses and thus on the CPU used in each case.

Pulse catch and interrupt modules

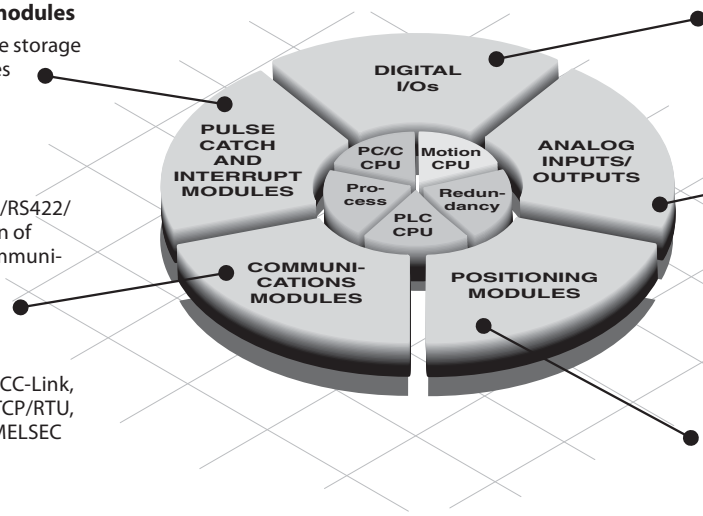
Digital input modules for pulse storage and for processing subroutines

Communications modules

Interface modules with RS232/RS422/ RS485 interface for connection of peripherals or for PLC-PLC communication.

Network modules

For interfacing with Ethernet, CC-Link, CC-Link IE, Profibus, Modbus TCP/RTU, DeviceNet, AS-Interface and MELSEC networks.



Digital input/output modules

For various signal levels with transistor, relay or triac switches

Analog input/output modules

For processing current/voltage signals and for temperature value acquisition as well as temperature control with direct connection of Pt100 resistance thermometers or thermocouples. A HART enabled module for current input is also available.

Positioning modules

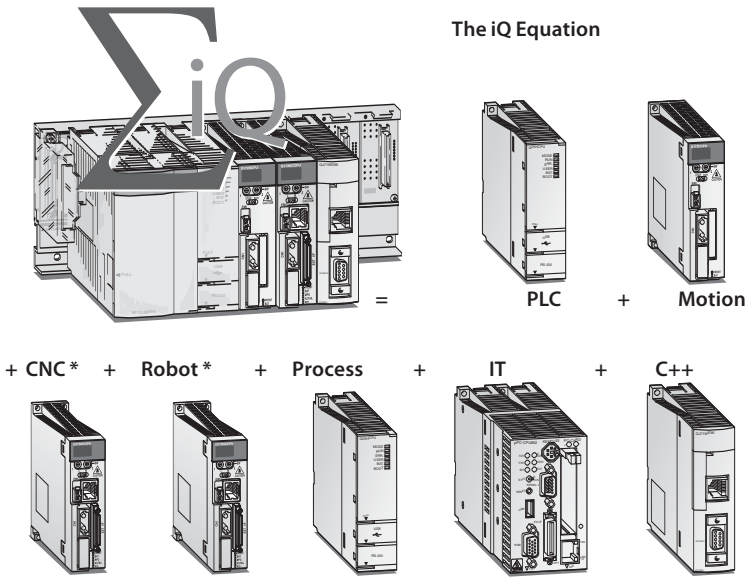
High-speed counter modules with possibility for connection of incremental shaft encoder or multiaxial positioning modules for servo and step drives with up to 8 axes per module.

iQ Platform

The universal automation solution for maximising ROI

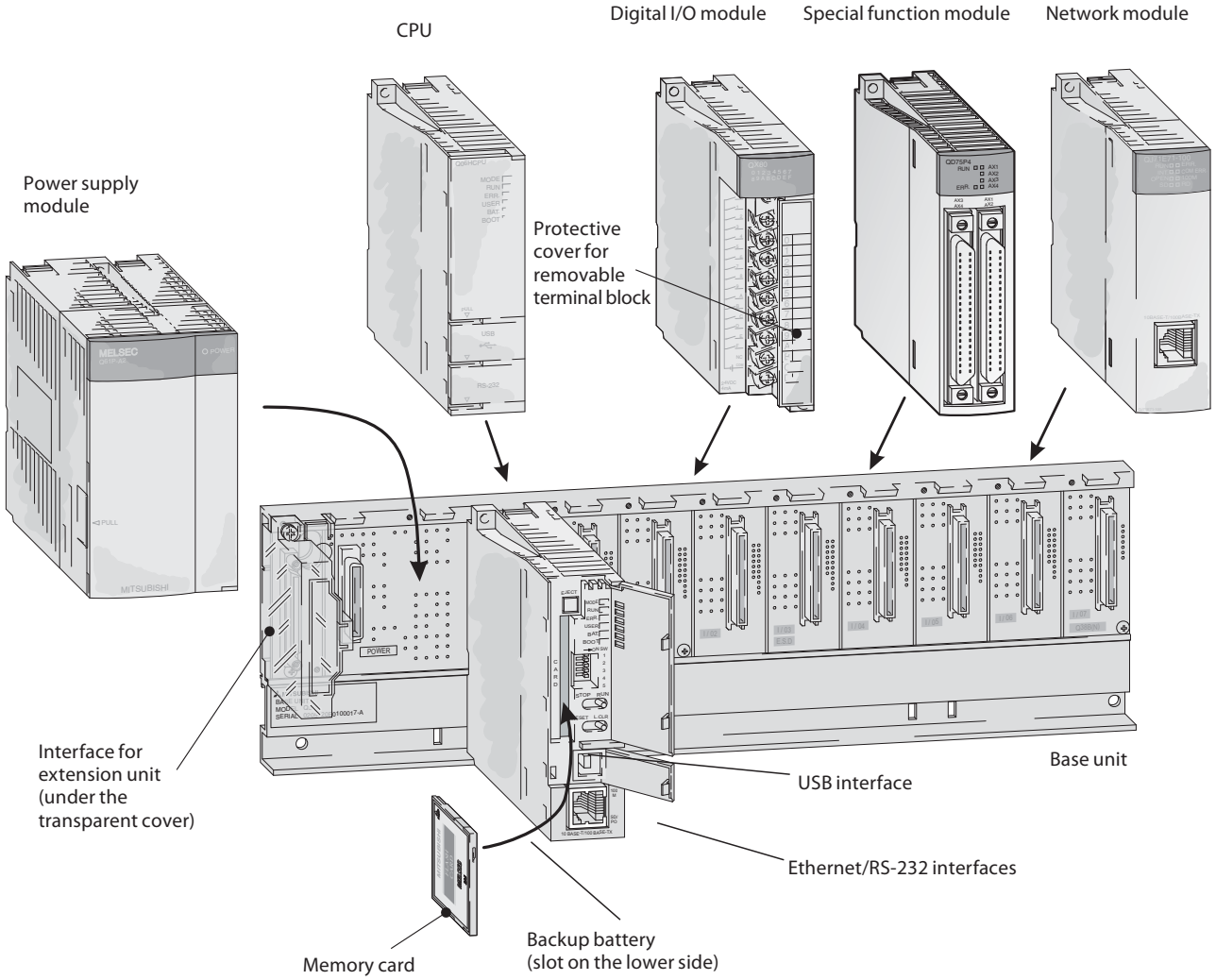
Mitsubishi's iQ Platform is the hardware foundation for our e-F@ctory concept – an advanced, integrated automation strategy based on our long experience and expertise as a global manufacturing company. The main features of iQ Platform include:

- Minimum Total Cost of Ownership
- Seamless integration
- Maximum productivity
- Transparent communications



* Descripiton follows

What a System Looks Like



System structure

The CPU and modules are connected to a base unit which has an internal bus connection for communication between the individual modules and the CPUs. The power supply module which supplies the voltage for the entire system is also installed on this base unit.

The base units are available in 4 different versions with 3 to 12 module slots.

Each base unit can be supplemented by means of an extension unit providing additional slots.

If you wish to keep open the option of subsequent extension of your PLC or if you have free slots on your base unit, you can insert dummy modules in vacant module positions.

They serve to protect the free slots from soiling or from mechanical effects and can also be used for reserving I/O points.

For cabling larger systems and machines - e.g. in a modular design - the use of remote I/O modules offers additional communications facilities.

What You Need

Base units

The base unit is for mounting and connecting all modules and provides power and communication buses between modules. There is a minimum of one base unit per system but extension base units can be added, with or without power supply modules up to a maximum of 7 extension bases (depending on CPU model).

Power supply

This provides 5 V DC power for all modules on the back plane. There are several types of power supplies available, the selection is dependant on each individual modules power consumption and available supply voltage. You can only use one power supply per backplane.

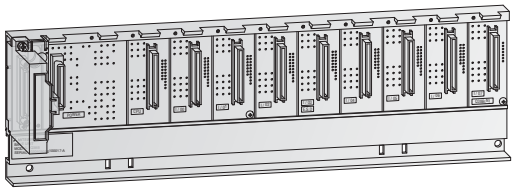
CPU

There are three main CPU types: Basic models (Q00JCPU through Q01CPU), advanced models (Q02CPU through Q25HCPU) and universal models (Q00UJ through Q26UDEHCPU).
Upto 4 CPUs can be used in a single system, which allows a wide range of combinations for optimal system performance.

I/O

There is a wide selection of digital input and output modules depending on the signal level, sink or source designation, density of points required and support for AC or DC voltage. Modules are available in 16 point input or output with screw terminals mounted on the module, higher densities of 32 and 64 point require a connector, cable and terminal block.

Base Units



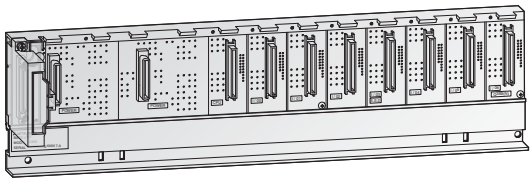
Main base units

The main base unit is used for mounting and connecting CPUs, power supply unit, input modules, output modules and special function modules.

- The modules are automatically addressed
- The units are mounted by means of screws or on a profiled rail with an integrated adapter

Specifications		Q32SB	Q33B-E	Q33SB	Q35B-E	Q35SB	Q38B-E	Q38DB*	Q38RB-E	Q312B-E	Q312DB*
Slots for I/O modules		2	3	3	5	5	8	8	8	12	12
Slots for power supply modules		1	1	1	1	1	1	1	2	1	1
Installation		All base units provide installation holes for M4 screws.									
Dimensions (WxHxD)	mm	114x98x18.5	189x98x44.1	142x98x18.5	245x98x44.1	197.5x98x18.5	328x98x44.1	328x98x44,1	439x98x44,1	439x98x44,1	439x98x44,1
Order information	Art. no.	147273	136369	147284	127586	147285	127624	207608	157573	129566	207609
Accessories		Connection cables, adapter for DIN rail mounting									

* These base units are required for the new iQ Platform motion, NC and robot CPUs.



Extension base units

The extension base units are connected to the main base unit by means of pre-assembled bus cables.

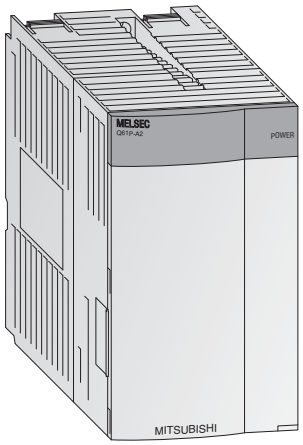
- Q6*B extension units provide a slot for their own power supply module
- A total of max.7 extension units can be connected to a main base unit with up to 64 I/O modules for a single system
- The maximum distance from the first to the last base unit is 13.2 m

An extension base unit with a power supply module must be used in the following cases:

- If the power consumption of the inserted modules exceeds the capacity of the power supply module on the base unit
- If the voltage drops below 4.75 V between the base unit and the extension unit

Specifications		Q52B	Q55B	Q63B	Q65B	Q68B	Q68RB	Q612B	Q65WRB
Slots for power supply modules		—	—	1	1	1	2	1	1
Slots for I/O modules		2	5	3	5	8	8	12	5
Installation		All base units provide installation holes for M4 screws.							
Dimensions (WxHxD)	mm	106x98x44.1	189x98x44.1	189x98x44.1	245x98x44.1	328x98x44.1	439x98x44.1	439x98x44.1	439x98x44.1
Order information	Art. no.	140376	140377	136370	129572	129578	157066	129579	210163
Accessories		Connection cables adapter for DIN rail mounting							

Power Supply Modules

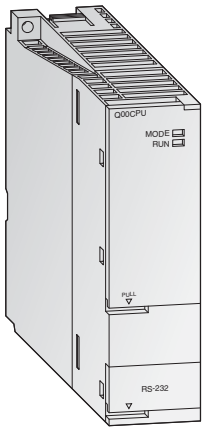


These units power all the modules on the backplane. The choice is dependent on the power consumption of the individual modules (this is especially important when using multiple CPUs).

- LED indicator shows operating status
- Use Q63P for applications powered by 24 V DC
- The power supply module Q62P can be used world-wide with it's wide input range from 100 to 240 V AC at 50/60 Hz

Specifications			Q61P	Q61P-D	Q61SP	Q62P	Q63P	Q63RP	Q64PN	Q64RP
Input voltage	(+10 %, -15 %)	V AC	85–264	100–240	85–264	100–240	—	—	100–240	100–240
	(+30 %, -35 %)	V DC	—	—	—	—	24	24	—	—
Input frequency		Hz	50/60 (±5 %)	50/60 (±5 %)	50/60 (±5 %)	50/60 (±5 %)	—	—	50/60 (±5 %)	50/60 (±5 %)
Inrush current			20 A within 8 ms	20 A within 8 ms	20 A within 8 ms	20 A within 8 ms	81 A within 1 ms	150 A within 1 ms	20 A within1 ms	20 A within1 ms
Max.input apparent power			120 VA	130 VA	40 VA	105 VA	45 W	65 W	160 VA	160 VA
Rated output current	5 V DC	A	6	6	2	3	6	8.5	8.5	8.5
	24 V DC ±10 %	A	—	—	—	0.6	—	—	—	—
Overcurrent protection	5 V DC	A	≥ 6.6	≥ 6.6	≥ 2.2	≥ 3.3	≥ 5.5	≥ 5.5	≥ 9.9	≥ 14.4
	24 V DC	A	—	—	—	≥ 0.66	—	—	—	—
Overvoltage protection	5 V DC	V	5.5–6.5	5.5–6.5	5.5–6.5	5.5–6.5	5.5–6.5	5.5–6.5	5.5–6.5	5.5–6.5
Efficiency			≥ 70 %	≥ 70 %	≥ 70 %	≥ 65 %	≥ 70 %	≥ 65 %	≥ 70 %	≥ 65 %
Insulation withstand voltage	between primary and 5 V DC		2830 V AC, 1 min.	2830 V AC, 1 min.	2830 V AC, 1 min.	2830 V AC, 1 min.	500 V AC, 1 min.	500 V AC, 1 min.	2830 V AC, 1 min.	2830 V AC, 1 min.
	between primary and 24 V DC		—	—	—	2830 V AC, 1 min.	—	—	—	—
Max.compensation time at power failure		ms	20	20	20	20	10	10	20	20
Dimensions (WxHxD)		mm	55.2x98x90	55.2x98x90	27.4x98x104	55.2x98x90	55.2x98x90	83x98x115	55.2x98x115	83x98x115
Order information		Art.no.	190235	221860	147286	140379	136371	166091	217627	157065

PLC CPU Modules



The CPU modules of the MELSEC System Q are available as single and multi processor CPUs through which they achieve a wide application range. The performance of the controller can match the application by simply replacing the CPU (except Q00J).

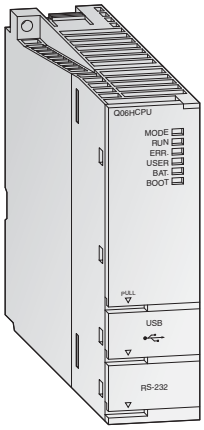
Basic PLC CPUs

While Q00CPU and Q01CPU are separate CPUs, the Q00JCPU forms an inseparable unit consisting of CPU, power supply and base unit and thus enables a low-priced entry into the modular PLC technology.

These CPUs were developed especially for applications where compact system configuration is important.

- Every CPU is equipped with an RS232C interface for easy programming and monitoring from a personal computer or operating panel.
- Integrated Flash ROMs for memory operation without additional memory cards
- Processing the inputs and outputs with refresh mode for optimal response

Specifications		Q00JCPU-E	Q00CPU	Q01CPU
Type		Combination of CPU module (single processor), 5 slot base unit and power supply	CPU module (single processor)	CPU module (single processor)
I/O device points		256/2048	1024/2048	1024/2048
CPU self-diagnostic functions		CPU error detection, Watch Dog, battery error detection, memory error detection, program check, power supply error detection, fuse error detection		
Battery buffer		All CPU modules are fitted with a lithium-battery with a life expectancy of 5 years.		
Memory type		ROM	RAM, ROM	RAM, ROM
Memory capacity	overall	58 kByte	94 kByte	94 kByte
	max. for PLC program	8 k steps (32 kByte)	8 k steps (32 kByte)	14 k steps (56 kByte)
Program cycle period		0.20 µs/log. instruction	0.16 µs/log. instruction	0.10 µs/log. instruction
No.of instructions		318	327	327
Dimensions (WxHxD)	mm	245x98x98	27.4x98x89.3	27.4x98x89.3
Order information	Art.no.	140378	138323	138324



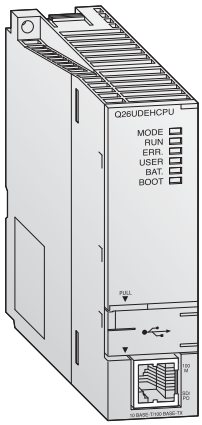
High-performance PLC CPUs

With the high-performance CPUs fast processing speed and expandability are the key features. Flexible system configuration that suits a wide range of applications is possible due to a varied set of functions and a well designed programming, configuration and debugging environment.

In total five different high-performance CPUs with graded performance are available for the MELSEC System Q. All versions are upwardly compatible. Thus, the MELSEC System Q can grow with the application by changing the CPU.

- Q02HCPU and upwatds are equipped with a USB interface for easy programming and monitoring from a personal computer
- Processing the inputs and outputs with refresh mode for optimal response
- Floating point arithmetic according to IEEE 754
- Special statements for processing PID control loops
- Mathematical functions, such as angle/exponential functions and logarithm

Specifications		Q02CPU	Q02HCPU	Q06HCPU	Q12HCPU	Q25HCPU
Type		Multi processor CPU module				
I/O points		4096/8192	4096/8192	4096/8192	4096/8192	4096/8192
CPU self-diagnostic functions		CPU error detection, Watch Dog, battery error detection, memory error detection, program check, power supply error detection, fuse error detection				
Battery buffer		All CPU modules are fitted with a lithium-battery with a life expectancy of 5 years.				
Memory type		RAM, ROM, FLASH	RAM, ROM, FLASH	RAM, ROM, FLASH	RAM, ROM, FLASH	RAM, ROM, FLASH
Memory capacity	overall	≤ 32 MByte	≤ 32 MByte	≤ 32 MByte	≤ 32 MByte	≤ 32 MByte
	max. for PLC program	28 k steps (112 kByte)	28 k steps (112 kByte)	60 k steps (240 kByte)	124 k steps (496 kByte)	252 k steps (1008 kByte)
Program cycle period		79 ns/ log. instruction	34 ns/ log. instruction	34 ns/ log. instruction	34 ns/ log. instruction	34 ns/ log. instruction
Dimensions (WxHxD)	mm	27.4x98x89.3	27.4x98x89.3	27.4x98x89.3	27.4x98x89.3	27.4x98x89.3
Order information	Art.no.	132561	127585	130216	130217	130218



Universal PLC CPUs

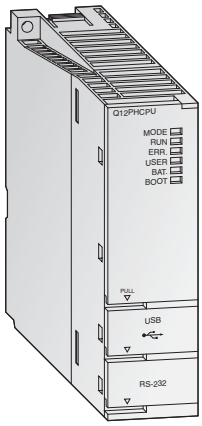
These universal PLC CPUs are the latest generation of modular CPUs for the MELSEC System Q controller platform and they are the foundation of the iQ Platform system. They can be combined with the motion, robot and NC CPUs to configure scalable and highly flexible modular automation systems.

- Integrated mini USB interface for programming
- Integrated Ethernet interface for efficient communication with the nUDEH modules
- Extremely fast bit processing, 9.5 ns
- High-speed data access

Specifications		Q00UJCPU	Q00UCPU	Q01UCPU	Q02UCPU	Q03UDCPU, Q03UDECPU
Type		Multi processor CPU module				
I/O points		256/8192	1024/8192	1024/8192	2048/8192	4096/8192
CPU self-diagnostic functions		CPU error detection, Watch Dog, battery error detection, memory error detection, program check, power supply error detection, fuse error detection				
Battery buffer		All CPU modules are fitted with a lithium-battery with a life expectancy of 5 years.				
Memory type		RAM, ROM, FLASH	RAM, ROM, FLASH	RAM, ROM, FLASH	RAM, ROM, FLASH	RAM, ROM, FLASH
Memory capacity	overall	≤ 32 MByte	≤ 32 MByte	≤ 32 MByte	≤ 32 MByte	≤ 32 MByte
	max. for PLC program	10 k steps (40 kByte)	10 k steps (40 kByte)	15 k steps (60 kByte)	20 k steps (80 kByte)	30 k steps (120 kByte)
Program cycle period		120 ns/log. instruction	80 ns/log. instruction	60 ns/log. instruction	40 ns/log. instruction	20 ns/log. instruction
Dimensions (WxHxD)	mm	245x98x98	27.4x98x89.3	27.4x98x89.3	27.4x98x89.3	27.4x98x89.3
Order information	Art. no.	221575	221576	221577	207604	207605, 217899

Specifications		Q04UDHCPU, Q04UDEHCPU	Q06UDHCPU, Q06UDEHCPU	Q10UDHCPU, Q10UDEHCPU	Q13UDHCPU, Q13UDEHCPU	Q20UDHCPU, Q20UDEHCPU	Q26UDHCPU, Q26UDEHCPU
Type		Multi processor CPU module					
I/O points		4096/8192	4096/8192	4096/8192	4096/8192	4096/8192	4096/8192
CPU self-diagnostic functions		CPU error detection, Watch Dog, battery error detection, memory error detection, program check, power supply error detection, fuse error detection					
Battery buffer		All CPU modules are fitted with a lithium-battery with a life expectancy of 5 years.					
Memory type		RAM, ROM, FLASH	RAM, ROM, FLASH	RAM, ROM, FLASH	RAM, ROM, FLASH	RAM, ROM, FLASH	RAM, ROM, FLASH
Memory capacity	overall	≤ 32 MByte	≤ 32 MByte	≤ 32 MByte	≤ 32 MByte	≤ 32 MByte	≤ 32 MByte
	max. for PLC program	40 k steps (160 kByte)	60 k steps (240 kByte)	100 k steps (400 kByte)	130 k steps (520 kByte)	200 k steps (800 kByte)	260 k steps (1040 kByte)
Program cycle period		9.5 ns/log. instruction	9.5 ns/log. instruction	9.5 ns/log. instruction	9.5 ns/log. instruction	9.5 ns/log. instruction	9.5 ns/log. instruction
Dimensions (WxHxD)	mm	27.4x98x89.3	27.4x98x89.3	27.4x98x89.3	27.4x98x89.3	27.4x98x89.3	27.4x98x89.3
Order information	Art. no.	207606, 217900	207607, 215808	221578, 221579	217619, 217901	221580, 221581	217620, 217902

Process CPU Modules

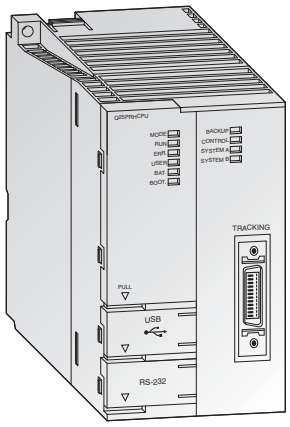


The System Q process CPU allows flexible system design based on off-the-shelf components, which reduces both initial and implementation costs. Using either PX Developer/GX Developer or GX IEC Developer, process applications can be designed, debugged, monitored and maintained. The MELSEC Process Control system is best suited for food manufacturing and chemical plant applications, where liquid or solid materials are stored in a tank and a level must be maintained within a specific range. The Process CPU combines DCS functions with PLC operability into one compact module.

- Simplified control and engineering
- Extensive Loop control
- High-speed Loop control
- Improved reliability and serviceability
- Hot-swap module replacement in run mode
- Works with CC-Link IE, MELSECNET/H for multiplex remote I/O system
- Loop Control and sequence control with one CPU
- Utilisation and expandability
- Use with isolated analog modules, ideal for process control
- Smoothed analog input value

Specifications			Q02PHCPU	Q06PHCPU	Q12PHCPU	Q25PHCPU
Type			Process CPU module			
I/O points			4096/8192	4096/8192	4096/8192	4096/8192
CPU self-diagnostic functions			CPU error detection, Watch Dog, battery error detection, memory error detection, program check, power supply error detection, fuse error detection			
Battery buffer			All CPU modules are fitted with a lithium-battery with a life expectancy of 5 years.			
Memory type			RAM, ROM, FLASH	RAM, ROM, FLASH	RAM, ROM, FLASH	RAM, ROM, FLASH
Memory capacity	overall		≤ 32 MByte	≤ 32 MByte	≤ 32 MByte	≤ 32 MByte
	max. for PLC program		28 k steps (112 kByte)	60 k steps (240 kByte)	124 k steps (496 kByte)	252 k steps (1008 kByte)
Program cycle period			34 ns/log. instruction	34 ns/log. instruction	34 ns/log. instruction	34 ns/log. instruction
Dimensions (WxHxD)		mm	27.4x98x89.3	27.4x98x89.3	27.4x98x89.3	27.4x98x89.3
Order information		Art. no.	218138	218139	143529	143530

Redundant PLC CPU Modules



Two PLC systems with the same configuration can provide a hot standby system through automatic synchronisation of data. This is the key to a redundant system and high availability. Down time and costs for re-starting are also dramatically reduced. The higher hardware costs for a redundant system are negligible when compared to the reduced costs in case of an error.

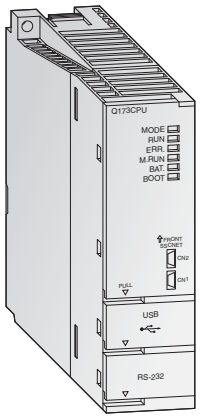
If the control system fails, the standby system takes over without interruption of the process.

The modular concept allows different stages of redundancy: Redundant power supply, redundant control systems, redundant network modules.

- A redundant system with QnPRH consists mainly of standard components. Existing hardware can be used.
- Embedding is possible in existing and non redundant applications
- Short system switching time can be set by parameters (min. 22 ms, 48 k words)
- Can be programmed like a standard system, no special software required
- Automatic detection of the control system with MX-Components/MX-OPC Server.
- The I/O-level can be connected via MELSECNET/H network (redundant ring), CC-Link, CC-Link IE, Ethernet or Profibus. The availability of these networks can be increased by using redundant master modules.

Specifications			Q12PRHCPU	Q25PRHCPU
Type			Process CPU module, redundant	
I/O points			4096/8192	4096/8192
CPU self-diagnostic functions			CPU error detection, Watch Dog, battery error detection, memory error detection, program check, power supply error detection, data tracking	
Battery buffer			All CPU modules are fitted with a lithium-battery with a life expectancy of 5 years.	
Memory type			RAM, ROM, FLASH	RAM, ROM, FLASH
Memory capacity	overall		≤ 32 MByte	≤ 32 MByte
	max. for PLC program		124 k steps (496 kByte)	252 k steps (1008 kByte)
Program cycle period			34 ns/log. instruction	34 ns/log. instruction
Dimensions (WxHxD)		mm	52.2x98x89.3	52.2x98x89.3
Order information		Art. no.	157070	157071

Motion CPU Modules



The high-speed dynamic motion CPU

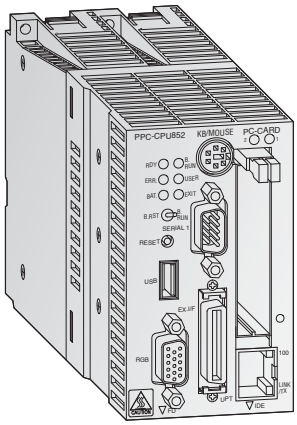
The motion controller CPU controls and synchronises the connected servo amplifiers and servo motors. A motion system requires a motion controller CPU, and a PLC CPU.

In this configuration the Motion CPU controls large-scale servo movements the PLC CPU is responsible for the machine control and the communication.

- Using multiple CPU's to distribute the load improves the overall performance of the whole system
- Use of up to 3 motion CPU's within one system
- Large scale control system for up to 96 axes per system
- Interpolation of 4 axes simultaneously
- Software cam control
- Virtual and real master axes
- Integration in the high-speed SSCNETIII network for communication with high-performance servo amplifiers at up to 5.6 Mbit/s

Specifications		Q172CPUN	Q172DCPU	Q172HCPU	Q173CPUN	Q173DCPU	Q173HCPU
Type		Motion CPU					
I/O points		8192; 8	8192; 8	8192; 8	8192; 32	8192; 32	8192; 32
Interpolation functions		Linear interpolation for up to 4 axes, circular interpolation for 2 axes, helical interpolation for 3 axes					
Programming language		Motion SFC, dedicated instructions, software for conveyor assembly (SV13), virtual mechanical support language (SV22)					
Interfaces		USB, RS232C, SSCNET	SSCNETIII (USB, RS-232C via PLC CPU)	USB, RS232C, SSCNET	USB, RS232C, SSCNET	SSCNETIII (USB, RS-232C via PLC CPU)	USB, RS232C, SSCNET
Real I/O points (PX/PY)		256 (these I/Os can be allocated directly to the motion CPU)					
Dimensions (WxHxD)	mm	27.4x98x114.3	27.4x98x119.3	27.4x98x114.3	27.4x98x114.3	27.4x98x119.3	27.4x98x114.3
Order information	Art. no.	142695	209788	162417	142696	209787	162696

Q-PC Module



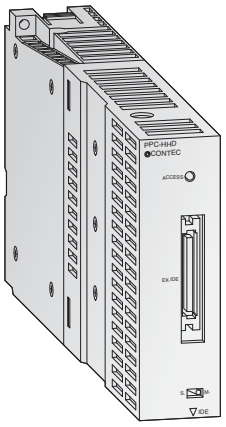
The personal computer for the base unit

The PC CPU module is a compact personal computer which can be installed on the main base unit for PC typical applications as well as PLC applications. Therefore, it is suitable as an integrated PC within control systems - e.g. for visualization, data bases, log-trace functions, Microsoft applications or for programming the System Q in a high-level language. In addition, the system can be controlled as soft PLC according to IEC 1131.3 via the optional SX-Controller software. I/O and special function modules from the MELSEC System Q can be used in the same way as MELSEC System Q CPUs.

- Low power consumption
- Intel CPU (600 MHz) allows processing of large data volumes
- Windows 2000 operating system supported (XP versions available on request)
- Silicon disk units available for applications that are subject to vibration and shock
- Outstanding noise immunity
- Fan-less operation and suitable for clean-room applications
- Control of a complete system in a high- level language such as C++ or Visual Basic

Specifications		PPC-CPU 852(MS)-128
Type		Personal Computer CPU
CPU		Ultra low voltage Intel® Celereon® M processor (FSB 400 MHz)
Processing frequency	MHz	600
Memory		512 MB (main), 2x32 kB L1, 1x512 kB L2
Video		Integrated graphics board for a maximum resolution of 1280x1024 pixels and 16 Mio. colours
Interfaces	serial (RS232C)	2 (1 integrated 9-pin D-SUB connector and 1 optional interface at the extension box which is connnected to "EX I/F")
	parallel	1
	USB	4 (3 x USB 2.0 compliant at front and bottom, 1 x optional USB1.1 interface at the extension box which is connnected to "EX I/F")
	keyboard/mouse	1 x PS/2 connector (keyboard and mouse can be used at the same time with the conversion cable PPC-YCAB-01.)
	LAN	1 x ETHERNET interface (100BASE-TX/10BASE-T)
	monitor	1 x 15-pin HD-SUB
Connections for drives		1 x disk drive, 2 x hard disk (silicon hard disks are supported)
PC card slots		2 x PCMCIA, CardBus
No. of occupied I/O points		4096/8192
Dimensions (WxHxD)	mm	55.2x98x115
Order information		PPC-SET-Nil Art. no.: 207875 Set with 1 x PC CPU modul; 512 MB RAM, no hard disk, driver PPC-DRV-02, without OS PPC-SET-Win Art. no.: 207876 Set with 1 x PC CPU modul; 512 MB RAM, 20 GB hard disk, driver PPC-DRV-02, OS Windows 2000 Pro PPC-SET-WinXPpro Art. no.: 207877 Set with 1 x PC CPU module; 512 MB RAM, 20 GB hard disk, driver PPC-DRV-02, operating system Win XPpro pre-installed PPC-SET-WinXPemb Art. no.: 207878 Set with 1 x PC CPU module; 512 MB RAM, 20 GB hard disk, driver PPC-DRV-02, operating system Win XP embedded pre-installed on CF card
Accessories		Additional hard disks (refer to next page; Soft PLC for the Q PC CPU: SX-Controller for Windows NT/2000 without realtime environment (SX-Controller V0100-1L0C-E, art. no.: 144006)

Disk Drives for Q-PC

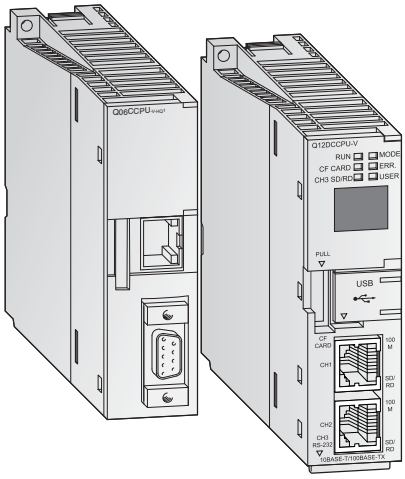


Memory units

Two different disk drives are available for the Q-PC that can be mounted additionally on the base unit directly beside the CPU module. The connection to the CPU is established via a short cable link underneath the modules. Besides a conventional hard disk with a storage capacity of 20 GB, a 1 GB CF card is also available for use in applications subject to strong vibrations or shocks.

Specifications		PPC-HDD	PPC-CF-1GB-R
Type		Hard disk	CF card
Memory capacity		20 GB	1 GB
Order information	Art. no.	207879	207880
Accessories		Hard disk vibration protection PPC-HBR-01; art. no.:140126	

Q-C Controller CPU



High-level language programming in combination with real time operating system

The C-Controller allow the integration and programming of the System Q automation platform with C++. Using the worldwide established real time operating system VxWorks, the realisation of complex tasks, communication and protocols becomes very easy.

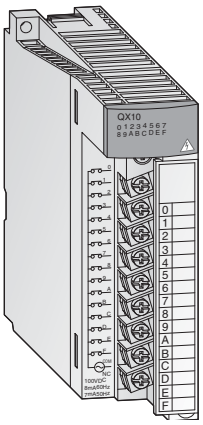
- Integration in a multi CPU - System Q or use as a stand alone system.
- Dedicated development environment of C-/C++ language
- Compact Flash card makes handling for large quantities of data easy
- High performance addition to the existing range of automation products
- 7-segment LED display for efficient debugging and troubleshooting (Q12CCPU-V only)
- Ethernet and RS-232 interface on board
- Q12DCCPU-V with additional USB interface
- Real time OS VxWorks and Telnet pre-installed
- Standard C/C++ Code can be embedded
- Remote access via networks and support of FTP
- VxWorks communication library and QBF libraries for easy setup
- CoDeSys compatibility

Specifications		Q06CCPU-V-H01	Q12DCCPU-V
Memory		Standard ROM: 16 MB (user area: 6 MB); Work RAM: 32 MB (user area: 14 MB); Battery-backed-up RAM: 128 kB	Standard RAM: 3 MB; Work RAM: 128 MB; Battery-backed-up RAM: 128 kB
Operating system		VxWorks Version 5.4	VxWorks Version 6.4 (preinstalled)
Programming language		C or C++, CoDeSys	
Development tool		Tornado 2.1 (OS license must be obtained separately from Wind River Systems Alameda, CA, USA), CoDeSys	Workbench 2.6.1
Communication interfaces		RS232 (1 ch.), 10BASE-T/100BASE-TX (1 ch.)	RS232 (1 ch.), 10BASE-T/100BASE-TX (2 ch.), USB (1 ch.)
CF card I/F		1 slot for a TYPE I card (Max. 1 GB CF card is supported)	1 slot for a TYPE I card (Max. 8 GB CF card is supported)
Number of I/O points		4096 (X/Y0 to X/YFFF)	
5 V DC internal current consumption	A	0.71	0.93
Dimensions (WxHxD)	mm	27.4x98x89.3 (Standard CPU size)	27.4x98x115
Order information	Art. no.	165353	221925

iQ Platform CPUs

Robot CPU (see Robots chapter)
NC CPU (please contact your nearest Mitsubishi distributor for more details)

Digital Input Modules



Input module - Detection of process signals

Various input modules are available for converting digital process signals with different voltage levels into the levels required by the PLC.

- Potential isolation between process and control by means of an optocoupler is a standard feature
- Indication of input status via LED

Special features:

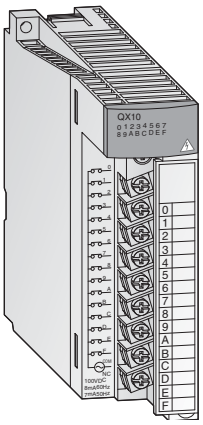
- Modules with 16 connection points have removable terminal blocks with screws
- Modules with 32/64 connection points are connected with a D-sub or 40-pin plug
- Assembled cables are available for modules with D-sub plugs

Input Modules

Specifications			QX10	QX10-TS	QX28	QX40	QX40-TS	QX41	QX42
Input points			16	16	8	16	16	32	64
Rated input voltage			100–120 V AC (50/60 Hz)	100–120 V AC (50/60 Hz)	100–240 V AC (50/60 Hz)	24 V DC	24 V DC	24 V DC	24 V DC
Operating voltage range		V	85–132	85–132	85–264	20.4–28.8	20.4–28.8	20.4–28.8	20.4–28.8
Rated input current		mA	7 (100 V AC, 50 Hz), 8 (100 V AC, 60 Hz)	8 (100 V AC, 60 Hz), 7 (100 V AC, 50 Hz)	7 (100 V AC, 50 Hz), 8 (100 V AC, 60 Hz), 14 (200 V AC, 50 Hz), 17 (200 V AC, 60 Hz)	ca. 4	ca. 4	ca. 4	ca. 4
ON	voltage	V	≥ AC 80	≥ AC 80	≥ AC 80	≥ DC 19	≥ DC 19	≥ DC 19	≥ DC 19
	current	mA	≥ AC 5	≥ AC 5	≥ AC 5	≥ DC 3	≥ DC 3	≥ DC 3	≥ DC 3
OFF	voltage	V	≤ AC 30	≤ AC 30	≤ AC 30	≤ DC 11	≤ DC 11	≤ DC 11	≤ DC 11
	current	mA	≤ AC 1	≤ AC 1.7	≤ AC 1	≤ DC 1.7	≤ DC 1.7	≤ DC 1.7	≤ DC 1.7
Load resistance		kΩ	Ca. 18 (50 Hz) ca. 15 (60 Hz)	ca. 12 (60 Hz) ca. 15 (50 Hz)	ca. 15 (50 Hz) ca. 12 (60 Hz)	ca. 5.6	—	ca. 5.6	ca. 5.6
Common terminal arrangement			16	16	8	16	16	32	32
Connection terminal			18-point removable terminal block	Removable terminal block with spring terminals	18-point removable terminal block	18-point removable terminal block	Removable terminal block with spring terminals	40-pin connector	40-pin connector x 2
No. of occupied I/O points			16	16	16	16	16	32	64
Dimensions (WxHxD)		mm	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90
Order information		Art. no.	129581	221838	136396	132572	221839	132573	132574

Specifications			QX50	QX80	QX80-TS	QX81	QX82-S1
Input points			16	16	16	32	64
Rated input voltage			48 V DC	24 V DC	24 V DC	24 V DC	24 V DC
Operating voltage range		V	40.8–52.8	20.4–28.8	20.4–28.8	20.4–28.8	20.4–28.8
Rated input current		mA	Ca. 4	ca. 4	ca. 4	ca. 4	ca. 4
ON	voltage	V	≥ DC 28	≥ DC 19	≥ DC 19	≥ DC 19	≥ DC 19
	current	mA	≥ DC 2.5	≥ DC 3	≥ DC 3	≥ DC 3	≥ DC 3
OFF	voltage	V	≤ DC 10	≤ DC 11	≤ DC 11	≤ DC 11	≤ DC 9.5
	current	mA	≤ DC 1.7	≤ DC 1.7	≤ DC 1.7	≤ DC 1.7	≤ DC 1.5
Load resistance		kΩ	Ca. 11.2	ca. 5.6	—	ca. 5.6	ca. 5.6
Common terminal arrangement			16	16	16	32	32x2
Connection terminal			18-point removable terminal block	18-point removable terminal block	Removable terminal block with spring terminals	Compact connector 37-pin D-Sub	40-pin connector x 2
No. of occupied I/O points			16	16	16	32	64
Dimensions (WxHxD)		mm	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90
Order information		Art. no.	204678	127587	221840	129594	150837

Digital Output Modules



Output module - Adapted output technology

The MELSEC System Q output modules have different switching elements for adaptation to many control tasks.

- Output modules with relay, transistor or triac switches
- Potential isolation between process and control by means of an optocoupler is a standard feature
- Modules with potential isolation between the channels

Special features:

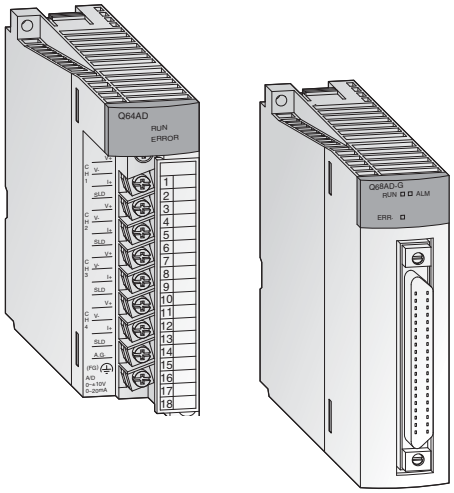
- Modules with 16 connection points have removable terminal blocks with screws
- Modules with 32/64 connection points are connected with a D-sub or 40-pin plug
- Assembled cables are available for modules with D-sub plugs

Output Modules

Specifications			QY10	QY10-TS	QY18A	QY22	QY40P	QY40P-TS	QY41P	QY42P
Outputs			16	16	8	16	16	16	32	64
Output type			Relay			Triac	Transistor (sink type)			
Common terminal arrangement		points	16	16	8	16	16	16	32	32
Rated output voltage			24 V DC/240 V AC	24 V DC/240 V AC	24 V DC/240 V AC	100–240 V AC	12/24 V DC (sink type)	12/24 V DC (sink type)	12/24 V DC (sink type)	12/24 V DC (sink type)
Operating voltage range			—	—	—	—	10.2–28.8 V DC	10.2–28.8 V DC	10.2–28.8 V DC	10.2–28.8 V DC
Connection terminal			18-point removable terminal block	Removable terminal block with spring terminals	18-point removable terminal block			Removable terminal block with spring terminals	40-pin connector	40-pin connector x 2
No. of occupied I/O points			16	16	16	16	16	16	32	64
Ext. power supply req.	voltage		—	—	—	—	12–24 V DC	12–24 V DC	12–24 V DC	12–24 V DC
	current	mA	—	—	—	—	10 (24 V DC)	10 (24 V DC)	20 (24 V DC)	20 (24 V DC)
Dimensions (WxHxD)		mm	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90
Order information		Art. no.	129605	221841	136401	136402	132575	221842	132576	132577
Accessories			40-pin connector and ready to use connection cables and system terminals; Spring clamp terminal block for exchange against the standard screw terminal block; IDC terminal block adapter for all 32 point I/O modules with 40-pin connector							

Specifications			QY50	QY68A	QY80	QY80-TS	QY81P
Outputs			16	8	16	16	32
Output type			Transistor (sink type)	Transistor (sink/source type)	Transistor (source type)		
Common terminal arrangement		points	16	All independent	16	16	32
Rated output voltage			12/24 V DC (sink type)	5–24 V DC	12/24 V DC (source type)	12/24 V DC (source type)	12/24 V DC (source type)
Operating voltage range			10.2–28.8 V DC	4.5–28.8 V DC	10.2–28.8 V DC	10.2–28.8 V DC	10.2–28.8 V DC
Connection terminal			18-point removable terminal block	18-point removable terminal block	18-point removable terminal block	Removable terminal block with spring terminals	Compact connector 37-pin D-Sub
No. of occupied I/O points			16	16	16	16	32
Ext. power supply req.	voltage		12–24 V DC	—	12–24 V DC	12–24 V DC	12–24 V DC
	current	mA	20 (24 V DC)	—	20 (24 V DC)	20 (24 V DC)	40 (24 V DC)
Dimensions (WxHxD)		mm	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90
Order information		Art. no.	132578	136403	127588	221843	129607
Accessories			40-pin connector and ready to use connection cables and system terminals; Spring clamp terminal block for exchange against the standard screw terminal block; IDC terminal block adapter for all 32 point I/O modules with 40-pin connector				

Analog Input Modules



Detection of analog process signals

The analog input modules convert analog process signals, for example pressure, flow or fill level, linearly into digital values, which are further processed by the Q CPU.

- Up to 8 channels per module (Q68AD□) and up to 512 channels per system (Q CPU)
- Calculation of average value over the time or measurement cycles can be configured
- Potential isolation between process and control by means of an optocoupler is a standard feature

Channel isolated and high resolution

The analog input modules Q62AD-DGH, Q64AD-GH, Q66AD-DG and Q68AD-G convert analog process signals into digital values with high accuracy. All channels are isolated between each other and against the external power supply with high dielectric withstand voltage for both. This eliminates the need for external isolation amplifiers.

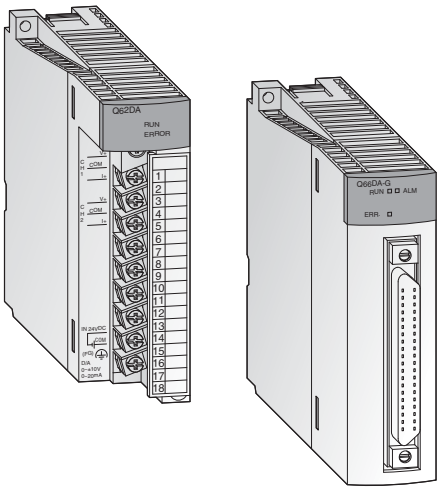
The Q66AD-DG additionally features the embedded signal conditioning function, so that signal converters for 2-wire transmitters are not needed.

- Reduced cost for analog I/O that require channel isolstion
- Less space and wiring in the control panel required

Input Modules

Specifications			Q62AD-DGH	Q64AD	Q64AD-GH	Q66AD-DG	Q68AD-G	Q68ADV	Q68ADI	ME1AD8HAI-Q
Input points			2	4	4	6	8	8	8	8
Analog input	voltage	V	—	-10 V–+10	-10 V–+10	—	-10–+10	-10–+10	—	0–+4
	current	mA	4–20	0–20	0–20	0–20/4–20	0–20	—	0–20	0–20
Resolution			16/32 bits binary (incl. sign)	16 bits binary (incl. sign)	16 bits binary (incl. sign)	16 bits binary (incl. sign)	16 bits binary (incl. sign)	16 bits binary (incl. sign)	16 bits binary (incl. sign)	16 bits signed binary
Load resistance	voltage	MΩ	—	1	1	—	1	1	—	—
	current	Ω	250	250	250	250	250	250	250	250
Max. input	voltage	V	—	±15	±15	—	±15	±15	—	—
	current	mA	±30	±30	±30	±30	±30	±30	±30	±30
I/O characteristics	analog input		0–20 mA	-10–+10 V; 0–20 mA	-10–+10 V; 0–20 mA	0–20 mA	-10–+10 V; 0–20 mA	-10–+10 V	0–20 mA	0–20 mA; 4–20 mA
	digital output		1/ 32000, 1/64000	1/4000, 1/12000, 1/16000; 1/4000, 1/8000, 1/12000	±1/ 32000, ±1/64000; 1/ 32000, 1/64000	1/4000, 1/12000	±1/ 4000; ±1/12000, ±1/ 16000	1/4000, 1/12000, 1/16000	1/4000, 1/8000, 1/12000	1/32000
Max. resolution	voltage input		—	0.83 mV	62.5 µV	—	0.333 mV	1 mV	—	—
	current input		0.25 µA	3.33 µA	0.25 µA	1.33 µA	1.33 µA	—	0–20 mA/4–20 mA	625 nA/ 500 nA
Overall accuracy			±0.05 %	±0.4 % (0–55 °C), ±0.1 % (20–30 °C)	±0.05 %	±0.1 %	±0.1 %	±0.4 % (0–55 °C), ±0.1 % (20–30 °C)	±0.4 % (0–55 °C), ±0.1 % (20–30 °C)	±0.15 %
Max. conversion time			10 ms/2 channels	80 µs/channel (+160 µs with temperature drift compensation)	10 ms/4 channels	10 ms/channel	10 ms/channel	80 µs/channel (+160 µs with temperature drift compensation)	80 µs/channel (+160 µs with temperature drift compensation)	—
Connection terminal			18-point removable terminal block	18-point removable terminal block	18-point removable terminal block	40-pin connector	40-pin connector	18-point removable terminal block	18-point removable terminal block	Removable terminal block with 18 screw terminals
I/O points			16	16	16	16	16	16	16	32
Dimensions (WxHxD)		mm	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90
Order information		Art. no.	145036	129615	143542	204676	204675	129616	129617	229238

Analog Output Modules



Output of analog control signals

The analog output modules convert digital values predetermined by the CPU into analog current or voltage signal. For example, frequency inverters, valves or slide valves are controlled by means of these signals.

- Up to 8 channels per module (Q68DA□) and up to 512 channels per system
- Resolution of 0.333 mV and 0.83 µA
- Conversion time of 80 µs/channel
- Potential isolation between process and control by means of an optocoupler is a standard feature

Channel isolated and high resolution

The analog output module Q66DA-G converts a digital value into an analog voltage or current signal with high accuracy . All channels are isolated between each other and against the external power supply with high dielectric withstand voltage for both. This eliminates the need for external isolation amplifiers.

- Reduced cost for analog I/O that require channel isolstion
- Less space and wiring in the control panel required

DA modules with isolated external power supply

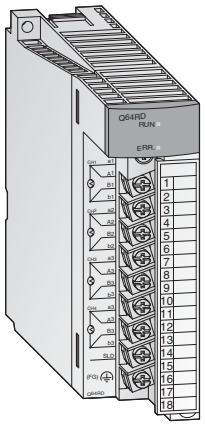
The new analog output modules Q62DAN, Q64DAN, Q68DAVN and Q68DAIN isolate the analog output channel from the external power supply to ensure, that any power fluctuations caused by external noise do not disrupt the analog output.

- Improved noise resistance
- Improved safety on the strength of short circuit protection caused by incorret wiring

Output Modules

Specifications			Q62DAN	Q62DA-FG	Q64DAN	Q66DA-G	Q68DAVN	Q68DAIN
Output points			2	2	4	6	8	8
Digital input			-16384–+16383	-16384–+16383	-16384–+16383	-16384–+16383	-16384–+16383	-16384–+16383
Analog output			-10 V DC–+10 V DC (0 mA–+20 mA DC)	-10 V DC–+10 V DC (0 mA–+20 mA DC)	-10 V DC–+10 V DC (0 mA–+20 mA DC)	-12 V DC–+12 V DC (0 mA–+22 mA DC)	-10 V DC–+10 V DC	0 mA–+20 mA DC
Load resistance	voltage output		1 kΩ–1 MΩ	1 kΩ–1 MΩ	1 kΩ–1 MΩ	1 kΩ–1 MΩ	1 kΩ–1 MΩ	—
	current output		0–600 Ω	0–600 Ω	0–600 Ω	0–600 Ω	—	0–600 Ω
Max. output	voltage	V	±12	±13	±12	±13	±12	—
	current	mA	21	23	21	23	—	21
I/O characteristics	analog output		-10–+10 V; 0–20 mA	-10–+10 V; 0–20 mA	-10–+10 V; 0–20 mA	-10–+10 V; 0–20 mA	-10–+10 V; 0–20 mA	-10–+10 V; 0–20 mA
	digital input		±1/ 4000; ±1/12000, ±1/ 16000	±1/ 4000; ±1/12000, ±1/ 16000	±1/ 4000; ±1/12000, ±1/ 16000	±1/ 4000; ±1/12000, ±1/ 16000	±1/ 4000; ±1/12000, ±1/ 16000	±1/ 4000; ±1/12000, ±1/ 16000
Maximum resolution	voltage output		0.333 mV	0.183 mV	0.333 mV	0.210 mV	0.333 mV	0.333 mV
	current output		0.83 µA	0.671 µA	0.83 µA	0.95 µA	0.83 µA	0.83 µA
Overall accuracy			±0.1 %	±0.1 %	±0.1 %	±0.1 %	±0.1 %	±0.1 %
Max. concversion time			80 µs/channel	10 ms/2 channels	80 µs/channel	6 ms/channel	80 µs/channel	80 µs/channel
Connection terminal			18-point removable terminal block	18-point removable terminal block	18-point removable terminal block	40-pin connector	18-point removable terminal block	18-point removable terminal block
I/O points			16	16	16	16	16	16
Dimensions (WxHxD)		mm	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90
Order information		Art. no.	200689	145037	200690	204677	200691	200692

Analog Modules for Temperature Measurement



Temperature measurement by thermocouple

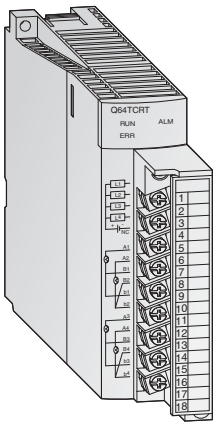
These modules are designed to convert external platinum temperature-measuring resistor input values into16 or 32-bit signed binary temperature measurement values and scaling values.

The reference temperature is determined by means of a thermocouple for the Q64TD and Q64TDV-GH.

- Temperature of 8 channels can be measured by one module
- Two kinds of platinum temperature measuring resistors (Pt100, JPt100) compliant with JIS and IEC standards are supported
- The disconnection of a platinum temperature-measuring resistor or cable can be detected on each channel
- Selection of sampling processing/time averaging processing/count averaging processing
- Error compensation by offset/gain value setting
- Alarm output when limit value is exceeded
- Potential isolation between process and control by means of an optocoupler is a standard feature. Additional potential isolation between the channels for the Q64TDV-GH
- The module is provided with a removable terminal block fastened with screws

Specifications		Q64RD	Q64RD-G	Q64TD	Q64TDV-GH	Q68RD3-G	Q68TD-G-H01/H02
Input channels		4	4	4	4	8	8
Connectable thermocouple	type	Pt100 (conf. JIS C 1604-1989 and DIN IEC 751), JPt100 (conforms to JIS C 1604-1981)	Pt100 (conf. JIS C 1604-1997 and DIN IEC 751-1983), JPt100 (conf. to JIS C 1604-1981), Ni100Ω (conf. to DIN 43760-1987)	K, E, J, T, B, R, S, N (conf. to JIS C1602-1995, IEC 584-1 and 584-2)	K, E, J, T, B, R, S, N (conf. to JIS C1602-1995, IEC 584-1 and 584-2)	Pt100 (conf. JIS C 1604-1997 and DIN IEC 751), JPt100 (conf. to JIS C 1604-1981), Ni100Ω (conf. to DIN 43760-1987)	K, E, J, T, B, R, S, N (conf. to JIS C1602-1995, IEC 584-1 and 584-2)
Temperature measuring range		Pt100: -200–850 °C, JPt 100: -180–600 °C	Pt100: -200–850 °C, JPt 100: -180–600 °C, Ni100Ω: -60–180 °C	Depends on the thermocouple used	Depends on the thermocouple used	Pt100: -200–850 °C, JPt 100: -180–600 °C, Ni100Ω: -60–180 °C	Depends on the thermocouple used
Temperature scaling value		16-bit, signed binary: -2000–+8500 32-bit, signed binary: -200 000–+850 000	16-bit, signed binary: -2000–+8500 32-bit, signed binary: -200 000–+850 000	16-bit, signed binary: -2700–+18 200 32-bit, signed binary: —	16-bit, signed binary: -25 000–+25 000 32-bit, signed binary: —	16-bit, signed binary: -2000–+8500	16-bit, signed binary: -2700–+18200
Max. resolution		0.025 °C	0.025 °C	B, R, S, N: 0.3 °C; K, E, J, T: 0.1 °C	B: 0.7 °C; R, S: 0.8 °C, K, T: 0.3 °C; ET: 0.2 °C; J: 0.1 °C; N: 0.4 °C; Voltage: 4 µV	0.1 °C	B, R, S, N: 0.3 °C; K, E, J, T: 0.1 °C
Cold junction temp. compensation accuracy		—	—	±1.0 °C	±1.0 °C	—	provided
Max. conversion time		40 ms/channel	40 ms per channel	20 ms/channel	20 ms/channel	320 ms/8 channels	320 ms/8 channels (H01), 640 ms/8 channels (H02)
Analog inputs		4 channels/module	4 channels/module	4 channels/module + Pt100 connection	4 channels/module + Pt100 connection	8 channels	8 channels/module
Channel isolation		—	provided	—	provided	provided	provided
Dimensions (WxHxD)	mm	27.4x98x90	27.4x98x112	27.4x98x90	27.4x98x90	27.4x102x130	27.4x98x90 (H01) 27.4x102x130 (H02)
Order information	Art. no.	137592	154749	137591	143544	216482	216481/221582

Temperature Control Modules



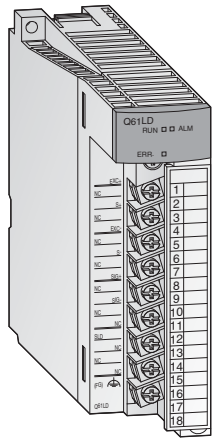
Temperature control modules with PID algorithm

These modules enable PID algorithm temperature control without placing any load on the PLC CPU for the temperature control tasks.

- Four temperature input channels
- Auto-tuning function for the 4 PID control circuits
- Temperature control can continue even when the PLC program is stopped
- Transistor output with pulse train to drive the actuator in the control circuit
- The module is provided with a removable terminal block fastened with screws.

Specifications		Q64TCRT	Q64TCRTBW	Q64TCTT	Q64TCTTBW
Control output	type	Transistor	Transistor	Transistor	Transistor
Inputs		4 channels per module	4 channels per module/ broken wire detection	4 channels per module	4 channels per module/ broken wire detection
Supported thermocouples		Pt100 (-200–+600 °C), JPt100 (-200–+500 °C)		R, K, J, T, S, B, E, N, U, L, P L II, W5Re/W26Re	
Sampling cycle		0.5 s/4 channels	0.5 s/4 channels	0.5 s/4 channels	0.5 s/4 channels
Control output cycle	s	1–100	1–100	1–100	1–100
Input filter		1–100 s (0 s: input filter OFF)	1–100 s (0 s: input filter OFF)	1–100 s (0 s: input filter OFF)	1–100 s (0 s: input filter OFF)
Temperature control method		PID ON/OFF impulse or 2-position control		PID ON/OFF impulse or 2-position control	
Dimensions (WxHxD)	mm	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90
Order information	Art. no.	136386	136387	136388	136389

Load Cell Input Module

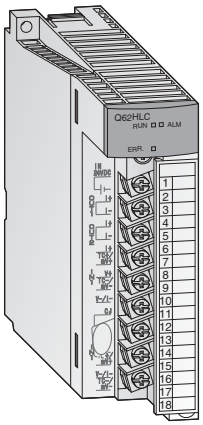


The load cell input module Q61LD can connect load cells directly to MELSEC Q series programmable controllers. External signal converters are no longer required.

- An external signal converter is not required. Man-hours and costs are reduced by using a load cell input module that can be connected directly to a programmable contoller.
- The module achieves a highly accurate measurement with steady data conversion speed that guarantees the accuracy of load cells.
- Enhanced convenience with functions like zero offset, two-point calibration and input signal error detection.

Specifications		Q61LD
Analog input (load cell output) points		1
Analog input (load cell output)	mV/V	0.0–3.3
Analog input range (load cell rated output)	mV/V	0.0–1.0 0.0–2.0 0.0–3.0
Load cell applied voltage		5 V DC ±5 %, Output current within 60 mA (Four 350 Ω load cells can be connected in parallel.) 6-wire system (Combination use of remote sensing method and ratiometric method)
Digital output		32-bit signed binary, 0–10 000
Gross weight output (Max. weighing output value)		32-bit signed binary, -99999–99999 (Excluding decimal point and unit symbol)
Zero adjustment range	mV/V	0.0–3.0
Gain adjustment range	mV/V	0.3–3.2
Resolution		0–10 000
Accuracy		Nonlineality: within ±0.01 %/FS (Ambient temperature: 25 °C)
Conversion speed	ms	10
Insulation method		Photocoupler insulation
Number of occupied I/O points		16
External connection system		18-point terminal block
Applicable wire size	mm	0.3–0.75
Internal power consumption (5 V DC)	A	0.48
Dimensions (WxHxD)	mm	27.4x98x90
Order information	Art. no.	229237

Loop Control Module



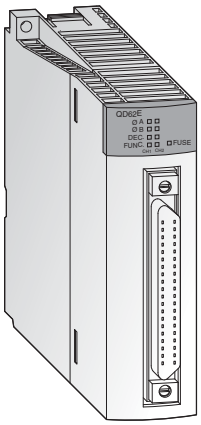
For fast response control

The Q62HLC loop control module uses a continuous proportional PID control format, which features a sampling period of 25ms for high-accuracy, high-resolution thermocouple inputs, microvoltage inputs, voltage inputs, current inputs, and current outputs. These features make the Q62HLC ideal for applications such as rapid temperature increase control, pressure control, and flow rate control.

- 25 ms sampling and control update time makes the Q62HLC to one of the fastest in the industry
- Supports sensor types, such as thermocouple, microvoltage, voltage and current input ranges
- Continous proportional PID control by 4 to 20 mA current output results in highly stable and accurate control
- Program control function can be specified where set values and PID constants are automatically changed at specific times
- Cascade control function can be performed with channel 1 as the master and channel 2 as the slave

Specifications			Q62HLC
Input points			2 (2 channels)
Analog input	thermocouple	°C	-200–+2300 (resolution 0.1 °C)
	microvoltage	mV	-100–+100 (resolution 0.5–10 μV)
	voltage	V	-10–+10 (resolution 0.05–1 mV)
	current	mA	0–20 (resolution 0.8–1 μA)
Digital output			-2000–+23000, -10000–+10000, -10000–+10000, 0–20000
Supported thermocouples			K, J, T, S, R, N, E, B, PL II, W5re/W26Re
Conversion speed			25 ms /2 channels
No. of occupied I/O points			16
Dimensions (WxHxD)		mm	27.4x98x112
Order information		Art. no.	200693

High-Speed Counter Modules



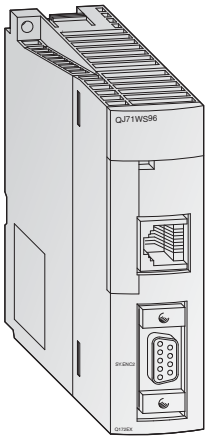
High-speed counter with automatic detection of rotational direction

These counter modules detect high frequency signals which cannot be handled by normal input modules. For example, simple positioning tasks or frequency measurements can be realised.

- Input for incremental shaft encoder with automatic forward and reverse detection
- Preset count via external signals or the PLC program with the aid of the PRESET function
- Ring counter function for counting up to a predefined value with automatic resetting to the starting value
- Functions such as speed measurement, definition of switching points or periodic counting are available
- 40-pin connector interface

Specifications			QD62	QD62E	QD62D	QD60P8-G	QD63P6
Counter inputs			2	2	2	8	6
Signal levels			5/12/24 V DC (2–5 mA)	5/12/24 V DC (2–5 mA)	5/12/24 V DC (2–5 mA) (RS422A)	5/12/24 V DC	5 V DC (6.4–11.5 mA)
Max. counting frequency		kHz	200	200	500 (differential)	30	200
Max. counting speed	1-phase-input	kHz	200 or 100	200 or 100	500 or 200	30	200,100 or 10
	2-phase-input	kHz	200 or 100	200 or 100	500 or 200	—	200,100 or 10
Counting range			32 bits + sign (binary), -2147483648– +2147483647	32 bits + sign (binary), -2147483648– +2147483647	32 bits + sign (binary), -2147483648– +2147483647	16 bits binary: 0–32767, 32 bit binary: 0–99999999, 32 bit binary: 0–2147483647	32 bits + sign (binary), -2147483648– +2147483647
External digital input points			Preset, function start	Preset, function start	Preset, function start	Preset, function start	Preset, function start
I/O points			16	16	16	32	32
Dimensions (WxHxD)		mm	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90
Order information		Art. no.	132579	128949	132580	145038	213229

MELSEC System Q Web Server Module



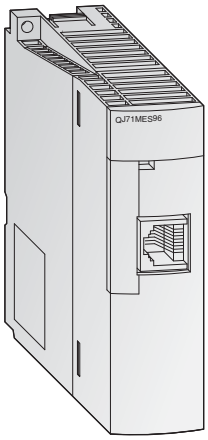
QJ71WS96

The web server module QJ71WS96 enables the remote control monitoring of System Q.

- Access to the PLC via the internet
- Very easy setting functions integrated
- User needs only a Web browser for setting and monitoring.
- RS232 interface for modem connection
- Various connections for data exchange are possible: ADSL, modem, LAN, etc.
- Sending and receiving data via mail or FTP
- Integration of a self-designed web site and Java applets is possible
- Standard connection via ETHERNET to exchange data between other PLCs or PCs
- Events and CPU data protocol, storage functions

Specifications			QJ71WS96
Module type			Web server, FTP server/client
Communications method			ETHERNET: CSMA/CD
Interface		type	10BASE-T/100BASE-TX
RS-232 communications data	interface		RS232, 9-poles D-SUB
	transfer type		Duplex
	synchronisations method		Start/stop synchronisation
	transfer speed	Mbit/s	9.6/19.2/38.4/57.6/115.2
	transmission distance	m	Max. 15
	data format		1 start bit, 8 data bits, 1 stop bit
	transfer control		floating control is possible (RS/CS)
Memory capacity		MB	5 (Standard-ROM); expandable with Compact Flash™ Card up to 512
I/O points			32
Internal power consumption (5 V DC)		mA	500
Dimensions (WxHxD)		mm	27.5x98x90
Order information		Art. no.	147115

MELSEC System Q MES Interface Module



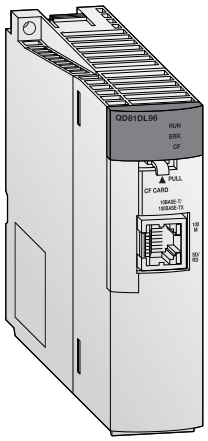
QJ71MES96

The new Qseries MES module allows users to interface their production control systems directly to an MES database.

- It removes the need for an interfacing PC layer - reducing hardware costs and installation time.
- It removes the need for specialist interfacing software run on the PC layer; saving on expensive software and services while reducing installation costs.
- It simplifies the MES architecture reducing the total commissioning time.
- It can improve reliability and accessibility as the module is based on industrial PLC design standards.
- The simplified system provides greater direct data visibility increasing the opportunity to achieve higher productivity.

Specifications			QJ71MES96
Module type			MES interface module
Communications method			ETHERNET
Interface		type	10BASE-T/100BASE-TX
DB interface function	general		Interacts with databases via user-defined jobs
	tag function		Collects device data of the PLCs CPU on the network in units of tags.
	trigger monitor function		Monitors the status of conditions (time, tag values, etc.)
	trigger buffering function		The MES module buffers the data and trigger time to internal memory.
	SQL text transmission		Automatically generates the correct SQL message according to requirements.
	arithmetic processing		Formulas can be applied to data before sending from the MES interface module.
	program execution function		Executes programs in the application server computer
Memory capacity			1 Compact Flash™ Card can be installed
I/O points			32
Internal power consumption (5 V DC)		mA	650
Dimensions (WxHxD)		mm	27.5x98x90
Order information		Art. no.	200698

High Speed Data Logger Module



Easy data logging

The high speed data logger module can log programmable controller devices without using a personal computer.

By easily configuring the module, sampled data can be saved in the optimal file format to a CompactFlash card.

- Trigger logging function for accelerated problem analysis
- Data can be saved in list or report format to a CompactFlash Card
- Equipment error detection and failure prediction
- A single QD81DL96 module can access up to a maximum of 64 PLC CPUs

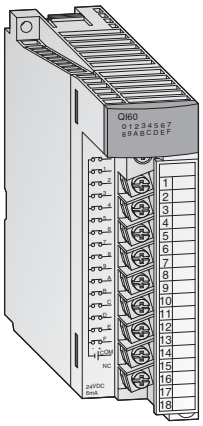
Specifications			QD81DL96
Ethernet	Interface ①		10BASE-T/100BASE-TX
	Data transmission rate		10BASE-T: 10 Mbps/100BASE-TX: 100 Mbps
	Transmission method		Base band
	No. of cascaded stages		10BASE-T: max. 4/100BASE-TX: max. 2
	Max. segment length ②	m	100
	Supported function		Auto-negotiation function supported (automatically distinguishes 10BASE-T/100BASE-TX)
Compact Flash card	Supply power voltage		3.3 V ±5 %
	Supply power capacity	mA	Max. 150
	Card size		TYPE I card
	No. of installable cards		1
I/O points			32
Clock			Obtained from a programmable controller CPU (in multiple CPU system, CPU No. 1) or SNTP server Time accuracy after obtaining the time is a daily variation of ±9.504 seconds ③
Internal power consumption (5 V DC)		A	0.46
Weight		kg	0.15
Dimensions (WxHxD)		mm	27.4x98x90
Order information		Art. no.	221934

① The high speed data logger module distinguishes 10BASE-T from 100BASE-TX according to the external device. For connection to a hub without an auto-negotiation function, set the hub to half-duplex communications mode.

② Distance between a hub and node.

③ For programmable contoller CPU, everyday (once in 24 hours); for SNTP server, re-obtains the time at the user specified interval.

Interrupt Module and High-Speed Inputs



Branching to subroutines

The interrupt module QI60 is suitable for applications demanding quick responses.

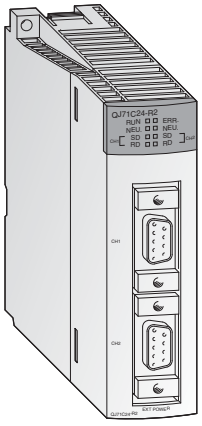
- Every input in this module is assigned to a pointer which serves as a breakpoint for a subroutine
- If an interrupt/alarm signal is applied at an input, the PLC program is interrupted after it has worked through the current statement and a subroutine assigned to the input is first processed
- Galvanic isolation between process and controller by means of a photocoupler is a standard feature
- Only one QI60 can be installed per PLC system

High-speed input modules

- Fast response times, 5 µs–1 ms adjustable
- Input voltage 24 V and 5 V
- Can be configured as interrupt or input module

Specifications			QI60	QX40H	QX70H	QX80H	QX90H
Input points			16	16	16	16	16
Rated input voltage		V DC	24 (sink type)	24	5	24	5
Operating voltage range		V DC	20.4–28.8	20.4–28.8	4.25–6	20.4–28.8	4.25–6
Input	resistance		Ca. 3.9 kΩ	ca. 3.9 kΩ	ca. 470 Ω	ca. 3.9 kΩ	ca. 470 Ω
	current	mA	Ca. DC 4/8	ca. DC 6	ca. DC 6	ca. DC 6	ca. DC 6
ON	voltage	V	≥DC 19	≥DC 13	≥DC 3,5	≥DC 13	≥DC 3.5
	current	mA	≥DC 4	≥DC 3	≥DC 3	≥DC 3	≥DC 3
OFF	voltage	V	≤DC 11	≤DC 8	≤DC 1	≤DC 8	≤DC 1
	current	mA	≤DC 1.7	≤DC 1.6	≤DC 1	≤DC 1.6	≤DC 1
No. of occupied I/O points			16	16	16	16	16
Dimensions (WxHxD)		mm	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90
Order information		Art. no.	136395	221844	221855	221856	221857

Interface Module



Data exchange with peripheral devices

This module enables communication with peripheral devices via a standard RS232 interface.

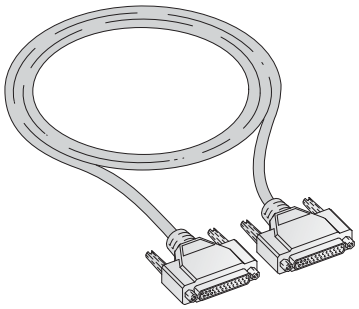
The peripherals are connected point-to-point on a 1:1 basis.

- The QJ71C24 provides one RS232 and one RS422/485 interface and the QJ71C24-R2 provides two RS232 interfaces
- Enables PCs connected to the system to access the full data set of the MELSEC Q CPU using graphic process supervision or monitoring software
- Support for plain ASCII data exchange with connected devices such as barcode readers, scales and identification systems
- Options for connection of a printer
- Integrated flash ROM memory for logging quality, productivity or alarm data that can be printed out when required
- Module and communications status shown by LED

Specifications			QJ71C24N	QJ71C24N-R2	QJ71C24N-R4	QJ71MB91
Interface type			RS232 (9-pin Sub-D)	RS232 (9-pin Sub-D)	RS422/RS485 (screw terminals)	RS232 (9-pin Sub-D)
Communications mode			Full duplex/half duplex	Full duplex/half duplex	Full duplex/half duplex	Full duplex/half duplex
Synchronisation			Asynchronous communications	Asynchronous communications	Asynchronous communications	Master/Slave
Data transfer	rate	bit/s	50–230400 (channel 1 only) 115200 (channel 1+2 simultaneously)			300–115200
	distance	m	15	15	—	15
Max. no of stations in a multidrop network			No restrictions/64	—	no restrictions/64	Master (32 slaves) Slave (242)
Data format			1 start bit, 7 or 8 data bits, 1 or 0 parity bits, 1 or 2 stop bits			Modbus
Error correction			Parity check, checksum	Parity check, checksum	Parity check, checksum	—
DTR/DSR control			YES/NO selectable	YES/NO selectable	—	—
X ON/X OFF (DC1/DC3)			YES/NO selectable	YES/NO selectable	YES/NO selectable	—
I/O points			32	32	32	32
Dimensions (WxHxD)		mm	27.4x98x90	27.4x98x90	27.4x98x90	27,4x98x90
Order information		Art. no.	149500	149501	149502	167757

Accessories

Connection Cables



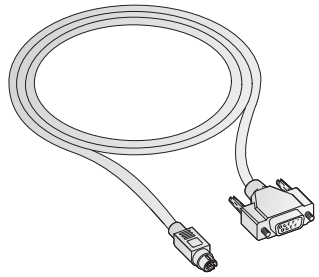
Connection cable for extension units

These connection cables are used for connecting base units to the extension units.

When multiple extension cables are used, the overall distance of the cables should be within 13.2 m.

Specifications		QC06B	QC12B	QC30B	QC50B	QC100B
For extension base units		Q63B, Q65B, Q68B, Q612B	Q63B, Q65B, Q68B, Q612B	Q63B, Q65B, Q68B, Q612B	Q63B, Q65B, Q68B, Q612B	Q63B, Q65B, Q68B, Q612B
Length	m	0.6	1.2	3.0	5.0	10.0
Order information	Art. no.	129591	129642	129643	129644	129645

Programming Cable



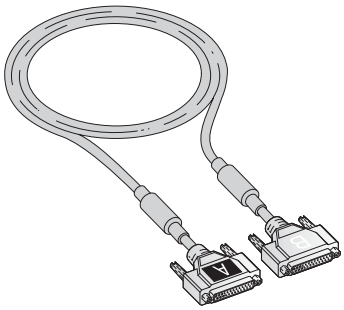
Programming cable for RS232 interface

The QC30R2 and QC30-USB cables are used for programming a MELSEC System Q CPU via the RS-232 and standard USB ports.

The programming cable provides a 9-pin D-sub connector for the PC side and a 6-pin Mini-DIN connector for the PLC interface.

Specifications		QC30R2	QC30-USB	USB-CAB-5M
Connection cable for		Connection between a PCs and a MELSEC system Q PLC via RS232 interface	Connection of a PC to a MELSEC System Q CPU via a standard USB port	Connection of a PC to an iQ CPU in the MELSEC System Q via a mini-USB port
Length	m	3.0	3.0	5.0
Order information	Art. no.	128424	136577	221540
Accessories		Connector disconnection prevention holder Q6HLD-R2		

Tracking Cable



Connection cable for redundant PLCs

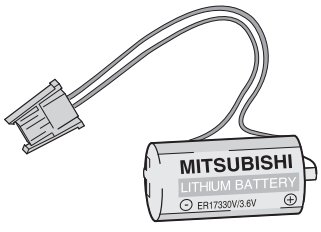
The tracking cable is used for connecting the two PLCs of a redundant system. For connection in a redundant system only the cables QC10TR and QC30TR can be used.

The connectors of the tracking cable are marked with "A" and "B" for "System A" and "System B".

When both systems are started at the same time System A becomes the control system and System B the standby system.

Specifications		QC10TR	QC30TR
Connection cable for		Connection between the two PLCs of a redundant system	
Length	m	1.0 m	3.0 m
Order information	Art. no.	157068	157069

Battery Q6BAT



Backup battery

The lithium battery Q6BAT is the replacement for the battery integrated for data backup in any MELSEC System Q CPU.

Specifications		Q6BAT
Voltage	V DC	3.0
Capacity	mAh	1800
Dimensions (ØxH)	mm	Ø16x30
Order information	Art. no	130376

COMPACT PLCs

FX Family

Micro PLCs have opened up the world of opportunities in Industrial Automation due to their small size and low cost. Now many applications that were never previously considered can benefit – from barriers to security systems and a host of others. The FX family is the world's best selling cost-effective 'brick' type PLCs, consisting of five independent but compatible product ranges.

Depending on your application and control needs, you can choose from the small, attractively priced, "stand-alone" FX1S series, the expandable FX1N series or the more powerful FX3G, FX3U and FX3UC series.

With the exception of the FX1S, all FX series PLCs can be expanded to adapt them to the changing needs of your installations and applications.

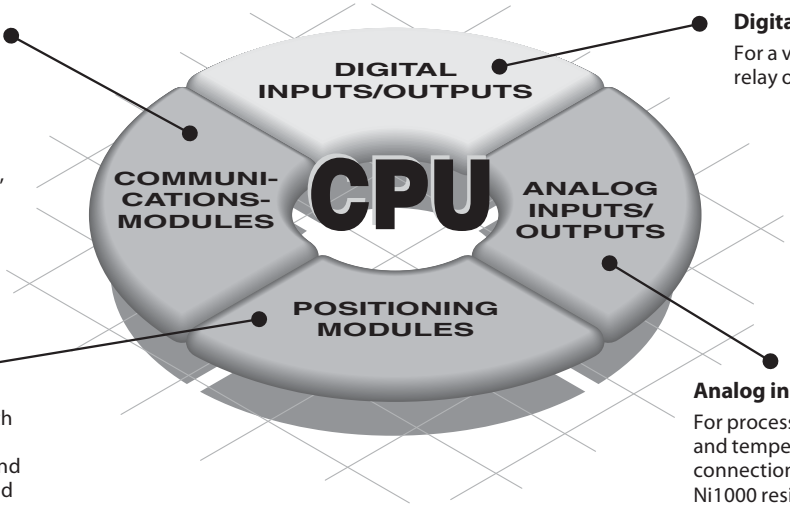
Network integration is also supported, making it possible for your FX controllers to communicate with other PLCs, controllers and HMIs.

Special versions with E-Mark Label (ECE-R10 regulations) are available upon request for vehicle applications.

Equipment Features

Communications modules

Interface modules with RS232/RS422/RS485 or USB for the connection of peripherals and PLC–PLC links. Network modules for Profibus/DP, CC-Link, AS-Interface, CANopen, Ethernet, Modbus RTU/ASCII and for the configuration of proprietary Mitsubishi networks.



Digital input/output modules

For a variety of signal levels with relay or transistor switches.

Positioning modules

High-speed counter modules with support for the connection of incremental rotary transducers and positioning modules for servo and stepping motor drives.

Analog input/output modules

For processing current/voltage signals and temperature registration with a direct connection option for Pt100, Pt1000 and Ni1000 resistance thermometers and thermocouplers.

Expandability and Power

The MELSEC FX family is highly flexible, enabling fast and efficient configuration and programming for the application at hand.

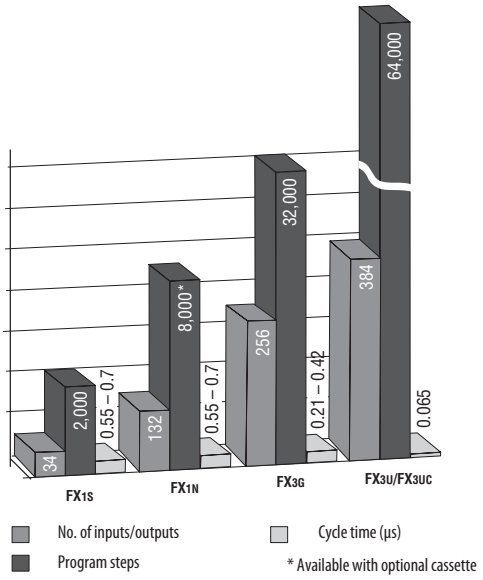
It is the ideal choice, no matter whether you need to install a simple control application requiring up to 30 I/Os (FX1S) or a demanding, complex system with up to 384 I/O points (FX3U/FX3UC).

The capacity of the CPUs of the FX family can be expanded with memory cassettes. Non-volatile memory cassettes with a capacity of up to 64 k program steps are available for reliable, long-term storage of your PLC projects.

In addition to the other advantages this enables you to switch programs at very short notice, simply by replacing a cassette.

There are five series in the FX family, each of which is designed for a different application profile. The diagram highlights the capabilities of each FX PLC type.

The Alpha can also be expanded to provide a small increase in I/O, analogue output, temperature input or networking capability.



Micro Controllers Alpha Series

Alpha fills the gap between traditional relays and timers and a PLC. Offering functionality, reliability and flexibility but without the worry of cost of overheads. Alpha is the perfect maintenance product, and yet can adequately control a new process from the start.

The Alpha 2 can process up to 200 function blocks in a single program, and every single function (timers, counters, analog signal processing, calendar, clock etc.) can be used as many times as you need in all your programs.

What Components Are Required for an FX PLC System?

A basic FX PLC system can consist of a stand alone base unit, with the functionality and I/O range increased by adding extension I/O and special function modules. The following section provides an overview of options available.

Base units

The entire FX PLC range can be AC or DC powered with a mix of input and output styles. The PLCs can be programmed with the user friendly GX or GX IEC Developer programming software, allowing programs to be transferred between different FX PLCs. All PLC base units include an integrated real time clock.

Base units are available with different I/O configurations from 10 to 128 points but can be expanded to 384 points depending upon the FX range selected.

Extension boards

Extension adapter boards can be installed directly into the base unit and therefore do not require any additional installation space. For a small number of I/O (2 to 4) an extension adapter boards can be installed directly into the (left-hand side) FX1S, FX1N, FX3G or FX3U controller. Interface adapter boards can also provide the FX PLC with additional RS232, RS422, RS485 or USB interfaces. To connect special function modules (e.g. Ethernet module) a communication adapter has to be installed (except FX3UC).

Extension I/O modules

Unpowered and powered extension I/O modules can be added to the FX1N, FX3G, FX3U and FX3UC PLCs.

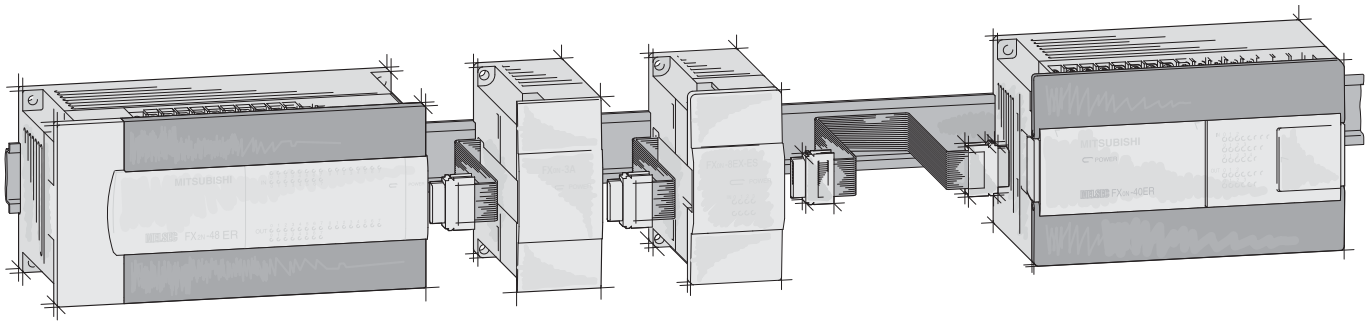
For expansion modules powered by the base unit, the power consumption has to be calculated as the 5 V DC bus can only support a limited number of expansion I/O (for further details please refer to next page – calculation of the power consumption).

Special function modules

A wide variety of special function modules are available for the FX1N, FX3G, FX3U and FX3UC PLCs. They cover networking functionality, analog control, pulse train outputs, data logging function and temperature inputs.

Memory extension and operator terminals

Each FX family base unit can be equipped with a memory cassette. The programming unit interface enables the connection of programming tools like PC and hand held programming units as well as graphical operator terminals.



Expansion possibilities		ALPHA 2	FX1S	FX1N	FX3G	FX3U	FX3UC
Extensions for inside PLC installation	Digital	●	●	●	●	●	●
	Analog	●	●	●	●	●	●
Extension modules (installation outside the PLC)	Digital	—	—	●	●	●	●
	Analog	—	—	●	●	●	●
	Temperature	●	—	●	●	●	●
Network modules	AS-Interface	●	—	●	—	●	●
	Ethernet	—	●	●	●	●	●
	CC-Link	—	—	●	●	●	●
	CAN open	—	—	●	●	●	●
	Profibus/DP	—	—	●	●	●	●
	DeviceNet	—	—	—	—	●	●
	Modbus RTU/ASCII	—	—	—	❶	●	●
	SSCNET	—	—	—	—	●	●
Communications boards	RS232	●	●	●	●	●	—
	RS422	—	●	●	●	●	—
	RS485	—	●	●	●	●	—
	USB	—	—	—	—	●	—
Communications modules	RS232	—	●	●	●	●	●
	RS485	—	●	●	●	●	●
Dedicated function modules	High speed counter	—	—	—	—	●	●
	Positioning	—	—	—	—	●	●
Memory cassettes		●	●	●	●	●	●
External Display		—	●	●	●	●	—

❶ only via IEC function blocks

Calculation of the Power Consumption

The power consumption figures on the 5 V DC bus for the special function modules are shown in the specifications tables on the following pages.

The maximum permissible currents on the 5 V DC and 24 V DC bus are shown in the table below.

Modules	Max. current	
	5 V bus	24 V bus
FX3G-14/24M□-ES(ESS)	—	400 mA
FX3G-40/60M□-ES(ESS)	—	400 mA
FX3U-16/32M□-ES(ESS)	500 mA	400 mA
FX3U-48–128M□-ES(ESS)	500 mA	600 mA
FX3UC-16MT/D(DSS)	600 mA	—
FX3UC-32MT/D(DSS)	560 mA	—
FX3UC-64MT/D(DSS)	480 mA	—
FX3UC-96MT/D(DSS)	400 mA	—

The residual currents for the 24 V DC service voltage at different input/output configurations are shown in the tables on the right.

A maximum of 256 I/Os are possible for FX3U/FX3UC (128 I/Os for FX3G).

Max. residual current values (in mA) for FX3U-16M□-E□□ through FX3U-32M□-E□□ for the permissible configuration

Number of additional outputs									
40	25								
32	100	50	0						
24	175	125	75	25					
16	250	200	150	100	50	0			
8	325	275	225	175	125	75	25		
0	400	350	300	250	200	150	100	50	0
	0	8	16	24	32	40	48	56	64
	Number of additional inputs								

Max. residual current values (in mA) for FX3U-48M□-E□□ through FX3U-128M□-E□□ for the permissible configuration

Number of additional outputs													
64	0												
56	75	25											
48	150	100	50	0									
40	225	175	125	75	25								
32	300	250	200	150	100	50	0						
24	375	325	275	225	175	125	75	25					
16	450	400	350	300	250	200	150	100	50	0			
8	525	475	425	375	325	275	225	175	125	75	25		
0	600	550	500	450	400	350	300	250	200	150	100	50	0
	0	8	16	24	32	40	48	56	64	72	80	88	96
	Number of additional inputs												

An external power supply is necessary, if the residual current for the 24 V supply of the special function modules is not sufficiant.

Sample Calculations

The tables below and on the right show different examples for sample power calculation for a PLC system.

The current values for the special function modules can be found in the specifications on the following pages.

Comparison with the current value tables show that the calculated figures for the 5 V bus lie within the allowable ranges.

In the example below all units can be supplied sufficiently with the internal 24 V power supply.

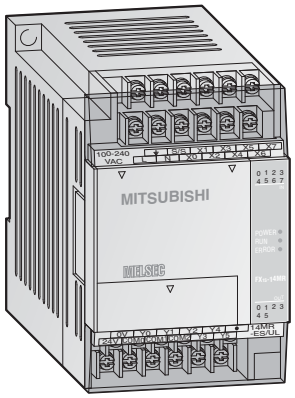
Module	No.	24 V DC calculation		5 V DC calculation	
		Current/module	Calculation	Current/module	Total current
FX3U-80MR/ES	1	600 mA	+600 mA	+500 mA	+500 mA
FX3U-4AD	3	90 mA	-180 mA	110 mA	-220 mA
FX3U-4DA	2	160 mA	-320 mA	120 mA	-240 mA
FX3U-ENET	1	240 mA	-240 mA	—	—
			-140 mA !!!		**500–460 mA**
				Result:	**40 mA (OK !)**

An external 24 V power supply has to be added in the example above.

Module	No.	Number of I/Os			24 V DC calculation		5 V DC calculation	
		X	Y	X/Y	Total ①	Total current ②	Current/module	Total current
FX3U-48MR/ES	1	24	24	—	X = 8 Y = 24 →	+325 mA	500 mA	+500 mA
FX2N-16EYR-ES/UL	1	—	16	—			—	0 mA
FX2N-8EX-ES/UL	1	8	—	—			—	0 mA
FX2N-8EYR-ES/UL	1	—	8	—			—	0 mA
FX3U-4AD-PT-ADP	1	—	—	—		-50 mA	30 mA	-15 mA
						+275 mA (OK!)		**+485 mA (OK!)**
FX2N-32ER-ES/UL	1	16	16	—	X = 16 Y = 0 →	+150 mA residual current for extension unit FX2N-32ER-ES/UL	690 mA	+690 mA
FX2N-16EX-ES/UL	1	16	—	—			—	0 mA
FX2N-10PG	1	—	—	8		0 mA	120 mA	-120 mA
FX2N-32CCL	1	—	—	8		-50 mA	130 mA	-130 mA
	Result:	**64 + 64 + 16 = 144! (< 256) OK!**				**+100 mA (OK!)**		**+440 mA (OK!)**

① Total no. of I/Os which are connected to a base unit to calculate the max. residual current values (see tables) ② see tables above (max. residual current values)

FX1S Series



The FX1S series base units are available with 10 to 30 input/output points.

It is possible to choose between relay and transistor output types.

- Integrated power supply (AC or DC powered)
- Maintenance-free EEPROM memory
- Ample memory capacity (2000 steps) and device ranges
- High-speed operations
- Incorporated positioning control
- Integrated real-time clock
- System upgrades by exchangeable interface and I/O adapter boards for direct fitting into the base unit
- LEDs for indicating the input and output status
- Standard programming unit interface
- User-friendly programming systems, including IEC 1131.3 (EN 61131.3) compatible programming software, HMIs and hand-held programming units

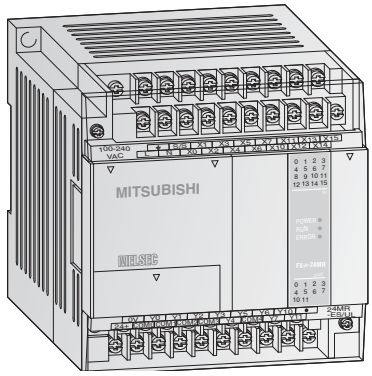
Base Units with 10–14 I/Os

Specifications		FX1S-10 MR-DS	FX1S-10 MR-ES/UL	FX1S-10 MT-DSS	FX1S-14 MR-DS	FX1S-14 MR-ES/UL	FX1S-14 MT-DSS
Max. number inputs/outputs		10	10	10	14	14	14
Power supply		24 V DC	100–240 V AC	24 V DC	24 V DC	100–240 V AC	24 V DC
Integrated inputs		6	6	6	8	8	8
Integrated outputs		4	4	4	6	6	6
Output type		Relay	Relay	Transistor (source)	Relay	Relay	Transistor (source)
Power consumption	W	6	19	6	6.5	19	6.5
Weight	kg	0.22	0.3	0.22	0.22	0.3	0.22
Dimensions (WxHxD)	mm	60x90x49	60x90x75	60x90x49	60x90x49	60x90x75	60x90x49
Order information	Art. no.	141240	141243	141246	141247	141248	141249

Base Units with 20–30 I/Os

Specifications		FX1S-20 MR-DS	FX1S-20 MR-ES/UL	FX1S-20 MT-DSS	FX1S-30 MR-DS	FX1S-30 MR-ES/UL	FX1S-30 MT-DSS
Max. number inputs/outputs		20	20	20	30	30	30
Power supply		24 V DC	100–240 V AC	24 V DC	24 V DC	100–240 V AC	24 V DC
Integrated inputs		12	12	12	16	16	16
Integrated outputs		8	8	8	14	14	14
Output type		Relay	Relay	Transistor (source)	Relay	Relay	Transistor (source)
Power consumption	W	7	20	7	8	21	8
Weight	kg	0.3	0.4	0.3	0.35	0.45	0.35
Dimensions (WxHxD)	mm	75x90x49	75x90x75	75x90x49	100x90x49	100x90x75	100x90x49
Order information	Art. no.	141251	141252	141254	141255	141256	141257

FX1N Series



The FX1N series base units are available with 14 to 60 input/output points and are expandable up to 128 I/O points.

It is possible to choose between relay and transistor output types.

- Integrated serial interface for communication between PCs and HMI
- LEDs for indicating the input and output status
- Detachable terminal blocks for units with 14, 24, 40, and 60 I/Os.
- Slot for memory cassettes
- All DC models with variable voltage from 12 up to 24 V
- Integrated real-time clock
- Integrated positioning control
- Exchangeable interface and I/O adapter boards for direct fitting into the base unit
- Expandable with digital I/O modules and special function modules
- User-friendly programming systems, including IEC 1131.3 (EN 61131.3) compatible programming software, HMIs and hand-held programming units

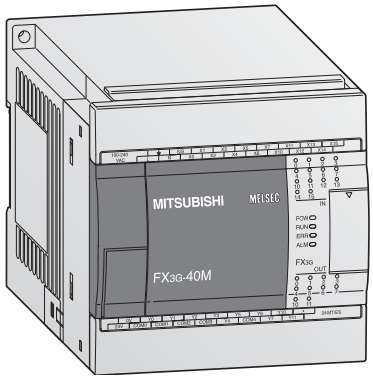
Base Units with 14–24 I/Os

Specifications		FX1N-14 MR-DS	FX1N-14 MR-ES/UL	FX1N-14 MT-DSS	FX1N-24 MR-DS	FX1N-24 MR-ES/UL	FX1N-24 MT-DSS
Integrated inputs/outputs		14	14	14	24	24	24
Power supply		12–24 V	100–240 V	12–24 V	12–24 V	100–240 V	12–24 V
Integrated inputs		8	8	8	14	14	14
Integrated outputs		6	6	6	10	10	10
Output type		Relay	Relay	Transistor (source)	Relay	Relay	Transistor (source)
Power consumption	W	13	29	13	15	30	15
Weight	kg	0.45	0.45	0.45	0.45	0.45	0.45
Dimensions (WxHxD)	mm	90x90x75	90x90x75	90x90x75	90x90x75	90x90x75	90x90x75
Order information	Art. no.	141258	141259	141260	141261	141262	141263

Base Units with 40–60 I/Os

Specifications		FX1N-40 MR-DS	FX1N-40 MR-ES/UL	FX1N-40 MT-DSS	FX1N-60 MR-DS	FX1N-60 MR-ES/UL	FX1N-60 MT-DSS
Integrated inputs/outputs		40	40	40	60	60	60
Power supply		12–24 V DC	100–240 V AC	12–24 V DC	12–24 V DC	100–240 V AC	12–24 V DC
Integrated inputs		24	24	24	36	36	36
Integrated outputs		16	16	16	24	24	24
Output type		Relay	Relay	Transistor (source)	Relay	Relay	Transistor (source)
Power consumption	W	18	32	18	20	35	20
Weight	kg	0.65	0.65	0.65	0.8	0.8	0.8
Dimensions (WxHxD)	mm	130x90x75	130x90x75	130x90x75	175x90x75	175x90x75	175x90x75
Order information	Art. no.	141264	141265	141266	141267	141268	141269

FX3G Series



The FX3G series base units are available with 14 to 60 input/output points .

It is possible to choose between relay and transistor output types.

- Integrated USB interface for communication between PLCs and PC
- Integrated serial interface for communication between PCs and HMI
- LEDs for indicating the input and output status
- Detachable terminal blocks for all units
- Slot for memory cassettes
- Integrated real-time clock
- Integrated positioning control
- Exchangeable interface and extension adapters for direct mounting into a base unit
- Expandable with digital I/O modules, special function modules and ADP modules
- User-friendly programming systems, including IEC 1131.3 (EN 61131.3) compatible programming software, HMIs and hand-held programming units

Base Units with 14–24 I/Os

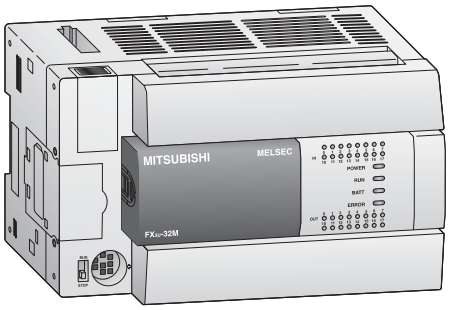
Specifications		FX3G-14 MR/ES	FX3G-14 MT/ESS	FX3G-14 MR/DS	FX3G-14 MT/DSS	FX3G-24 MR/ES	FX3G-24 MT/ESS	FX3G-24 MR/DS	FX3G-24 MT/DSS
Integrated inputs/outputs		14	14	14	14	24	24	24	24
Power supply		100–240 V	100–240 V	12–24 V	12–24 V	100–240 V	100–240 V	12–24 V	12–24 V
Integrated inputs		8	8	8	8	14	14	14	14
Integrated outputs		6	6	6	6	10	10	10	10
Output type		Relay	Transistor (source)*	Relay	Transistor (source)*	Relay	Transistor (source)*	Relay	Transistor (source)*
Power consumption	W	31	31	19	19	32	32	21	21
Weight	kg	0.50	0.50	0.50	0.50	0.55	0.55	0.55	0.55
Dimensions (WxHxD)	mm	90x90x86	90x90x86	90x90x86	90x90x86	90x90x86	90x90x86	90x90x86	90x90x86
Order information	Art. no.	231466	231470	231474	231478	231467	231471	231475	231479

Base Units with 40–60 I/Os

Specifications		FX3G-40 MR/ES	FX3G-40 MT/ESS	FX3G-40 MR/DS	FX3G-40 MT/DSS	FX3G-60 MR/ES	FX3G-60 MT/ESS	FX3G-60 MR/DS	FX3G-60 MT/DSS
Integrated inputs/outputs		40	40	40	40	60	60	60	60
Power supply		100–240 V	100–240 V	12–24 V	12–24 V	100–240 V	100–240 V	12–24 V	12–24 V
Integrated inputs		24	24	24	24	36	36	36	36
Integrated outputs		16	16	16	16	24	24	24	24
Output type		Relay	Transistor (source)*	Relay	Transistor (source)*	Relay	Transistor (source)*	Relay	Transistor (source)*
Power consumption	W	37	37	25	25	40	40	29	29
Weight	kg	0.70	0.70	0.70	0.70	0.85	0.85	0.85	0.85
Dimensions (WxHxD)	mm	130x90x86	130x90x86	130x90x86	130x90x86	175x90x86	175x90x86	175x90x86	175x90x86
Order information	Art. no.	231468	231472	231476	231480	231469	231473	231477	231481

* Units with sink transitor outputs on request.

FX3U Series



The FX3U series base units are available with 16, 32, 48, 64, 80 or 128 input/output points expandable to 384 points.

Models are available for selection with relay or transistor outputs.

- Integrated serial interface for communication between PCs and HMI
- Integrated positioning control
- Exchangeable interface modules for direct mounting into a base unit
- LEDs for indicating the input and output status
- Slot for memory cassettes
- Integrated real-time clock
- Expandable with digital I/O modules, special function modules and ADP modules
- User-friendly programming systems, including IEC 1131.3 (EN 61131.3) compatible programming software, HMIs and hand-held programming units

Base Units with 16–128 I/Os

Specifications		FX3U-16 MR/ES	FX3U-32 MR/ES	FX3U-48 MR/ES	FX3U-64 MR/ES	FX3U-80 MR/ES	FX3U-128 MR/ES
Integrated inputs/outputs		16	32	48	64	80	128
Power supply		100–240 V AC	100–240 V AC	100–240 V AC	100–240 V AC	100–240 V AC	100–240 V AC
Integrated inputs		8	16	24	32	40	64
Integrated outputs		8	16	24	32	40	64
Output type		Relay	Relay	Relay	Relay	Relay	Relay
Power consumption	W	30	35	40	45	50	65
Weight	kg	0.6	0.65	0.85	1.0	1.2	1.8
Dimensions (WxHxD)	mm	130x90x86	150x90x86	182x90x86	220x90x86	285x90x86	350x90x86
Order information	Art. no.	231486	231487	231488	231489	231490	231491

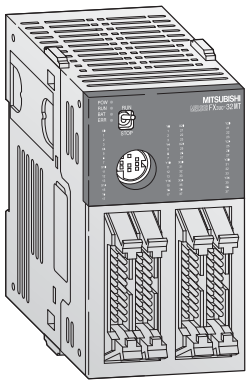
Specifications		FX3U-16 MT/ESS	FX3U-32 MT/ESS	FX3U-48 MT/ESS	FX3U-64 MT/ESS	FX3U-80 MT/ESS	FX3U-128 MT/ESS
Integrated inputs/outputs		16	32	48	64	80	128
Power supply		100–240 V AC	100–240 V AC	100–240 V AC	100–240 V AC	100–240 V AC	100–240 V AC
Integrated inputs		8	16	24	32	40	64
Integrated outputs		8	16	24	32	40	64
Output type		Transistor (source type)*	Transistor (source type)*	Transistor (source type)*	Transistor (source type)*	Transistor (source type)*	Transistor (source type)*
Power consumption	W	30	35	40	45	50	65
Weight	kg	0.6	0.65	0.85	1.0	1.2	1.8
Dimensions (WxHxD)	mm	130x90x86	150x90x86	182x90x86	220x90x86	285x90x86	350x90x86
Order information	Art. no.	231492	231493	231494	231495	231496	231497

Specifications		FX3U-16 MR/DS	FX3U-32 MR/DS	FX3U-48 MR/DS	FX3U-64 MR/DS	FX3U-80 MR/DS
Integrated inputs/outputs		16	32	48	64	80
Power supply		24 VDC	24 VDC	24 VDC	24 VDC	24 VDC
Integrated inputs		8	16	24	32	40
Integrated outputs		8	16	24	32	40
Output type		Relay	Relay	Relay	Relay	Relay
Power consumption	W	25	30	35	40	45
Weight	kg	0.6	0.65	0.85	1.0	1.2
Dimensions (WxHxD)	mm	130x90x86	150x90x86	182x90x86	220x90x86	285x90x86
Order information	Art. no.	231498	231499	231500	231501	231502

Specifications		FX3U-16 MT/DSS	FX3U-32 MT/DSS	FX3U-48 MT/DSS	FX3U-64 MT/DSS	FX3U-80 MT/DSS
Integrated inputs/outputs		16	32	48	64	80
Power supply		24 VDC	24 VDC	24 VDC	24 VDC	24 VDC
Integrated inputs		8	16	24	32	40
Integrated outputs		8	16	24	32	40
Output type		Transistor (source type)*	Transistor (source type)*	Transistor (source type)*	Transistor (source type)*	Transistor (source type)*
Power consumption	W	25	30	35	40	45
Weight	kg	0.6	0.65	0.85	1.0	1.2
Dimensions (WxHxD)	mm	130x90x86	150x90x86	182x90x86	220x90x86	285x90x86
Order information	Art. no.	231503	231504	231505	231506	231507

* Units with sink type transistor outputs on request.

FX3UC Series



The base units of the FX3UC series are available in versions with 16, 32, 64 or 96 inputs/outputs (expandable to 384 I/Os).

The units are available with transistor outputs only.

- Integrated serial interface for communication between PCs and HMI
- Same instruction set as FX3U
- Integrated positioning control
- Very compact dimensions
- LEDs for indicating the input and output status
- Slot for memory cassette
- Adapter modules and system cabling sets available for units with ribbon cable connectors
- Expandable with digital I/O modules, special function modules and ADP modules
- User-friendly programming systems, including IEC 1131.3 (EN 61131.3) compatible programming software, HMIs and hand-held programming units

Base Units with 16–96 I/Os

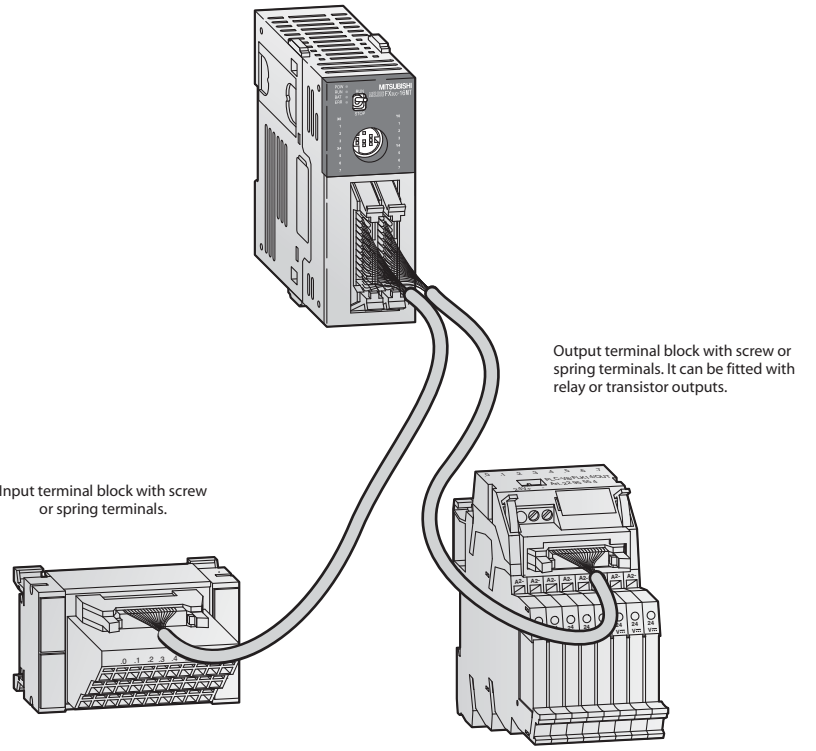
Specifications		FX3UC-16 MT/DSS	FX3UC-32 MT/DSS	FX3UC-64 MT/DSS	FX3UC-96 MT/DSS
Integrated inputs/outputs		16	32	64	96
Power supply		24 V DC (+20 %, -15 %)	24 V DC (+20 %, -15 %)	24 V DC (+20 %, -15 %)	24 V DC (+20 %, -15 %)
Integrated inputs		8	16	32	48
Integrated outputs		8	16	32	48
Output type		Transistor (source type)*	Transistor (source type)*	Transistor (source type)*	Transistor (source type)*
Power consumption	W	6	8	11	14
Weight	kg	0.2	0.2	0.3	0.35
Dimensions (WxHxD)	mm	34x90x74	34x90x74	59.7x90x74	85.4x90x74
Order information	Art. no.	231508	231509	231510	231511

* Units with sink type transistor outputs on request.

System Cabling

A choice of terminal blocks with screw or spring terminals are available for easy wiring of the FX3UC modules with standard ribbon cable connectors.

For detailed informations about the terminal blocks, please refer to the FX Family catalogue.

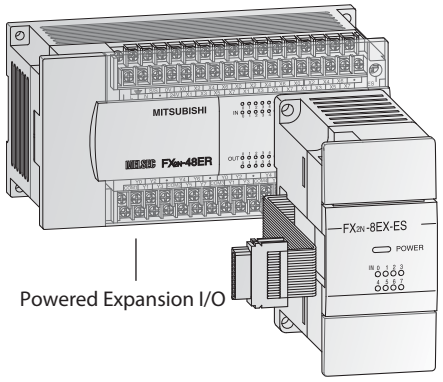


Expandability and Functionality

Additional special function and expansion modules are available that make it possible to extend the capacity of the PLC system. There are three basic categories of modules:

- Modules that occupy digital I/Os (connected on the right hand side of the base unit). These are the digital unpowered and powered extension units, as well as the special function modules.
- Communication and adapter modules that are connected to the left hand side of the base unit, for example FX3U-4AD-ADP and FX2NC-485ADP.
- Internal adapter boards for the FX1S/FX1N/FX2N series and the FX3U series. These expansion units are installed directly in the base unit and do not occupy any digital I/O.

Note: To connect special function modules or extension units of the FX0N/FX2N/FX3U series to an FX3UC series base unit, an adapter FX2NC-CNV-IF or the power supply FX3UC-1PS-5V is required.



Various unpowered and powered extension units (FX3UC unpowered only) are available for extending the base units.

The unpowered units contain 16 or 32 digital inputs/outputs max. and do not need a separate power supply, since they are powered via the system bus.

The powered extension units contain a larger number of inputs/outputs and an integrated power supply unit, to power the system bus and the digital inputs.

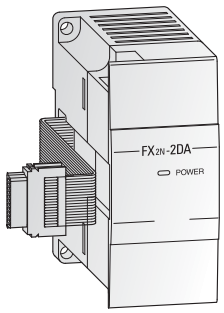
Specifications			POWERED		UNPOWERED						
			FX2N-32 ER-ES/UL	FX2N-48 ER-ES/UL	FX2N-8 ER-ES/UL	FX2N-8 EX-ES/UL	FX2N-8 EYR-ES/UL	FX2N-8 EYT-ESS/UL	FX2N-16 EX-ES/UL	FX2N-16 EYR-ES/UL	FX2N-16 EYT-ESS/UL
Integrated inputs/outputs			32	48	8	8	8	8	16	16	16
Application			FX1N, FX3G and FX3U/FX3UC series base units								
Power supply	AC range (+10 %, -15 %)		100–240 V	100–240 V	All modular extension blocks are supplied by the base unit.						
Integrated inputs			16	24	4	8	—	—	16	—	—
Integrated outputs			16	24	4	—	8	8	—	16	16
Output type			Relay	Relay	Relay	—	Relay	Transistor (source)**	—	Relay	Transistor (source)**
Switching voltage (max.)			Generally for relay version: < 240 V AC, < 30 V DC; for transistor version: 5–30 V DC								
Max. output current	per output	A	2	2	2	—	2	0.5	—	2	0.5
	per group *	A	8	8	8	—	8	0.8	—	8	1.6
Related I/O points			32	48	16	8	8	8	16	16	16
Dimensions (WxHxD)		mm	150x90x87	182x90x87	43x90x87	43x90x87	43x90x87	43x90x87	40x90x87	40x90x87	40x90x87
Order information		Art. no.	65568	65571	166285	166284	166286	166287	65776	65580	65581

* This limitation applies only per reference terminal for each group. Please observe the terminal assignments for the group identification. ** Units with sink type transistor outputs on request.

Specifications			FX2NC-16 EX-T-DS	FX2NC-16 EYR-T-DS	FX2NC-16 EX-DS	FX2NC-16 EYT-DSS	FX2NC-32 EX-DS	FX2NC-32 EYT-DSS
Integrated inputs/outputs			16	16	16	16	32	32
Application			All FX3UC series base units					
Power supply			All modular extension units are supplied by the base unit.					
Integrated inputs			16	—	16	—	32	—
Integrated outputs			—	16	—	16	—	32
Output type			—	Relay	—	Transistor (source)**	—	Transistor (source)**
Switching voltage (max.)		V	Generally for relay version: < 240 V AC, < 30 V DC; for transistor version: 5–30 V DC					
Max. output current	per output	A	—	2	—	0.1/0.3 ①	—	0.1/0.3 ①
	per group *	A	—	4/8	—	0.8	—	0.8
Max. switching power	inductive load	VA	—	80	—	2.4/7.2 ②	—	2.4/7.2 ②
	lamp load	W	—	100	—	0.3/0.9 ③	—	0.3/0.9 ③
Connection type			Removable screw terminal blocks		Ribbon cable connector	Ribbon cable connector	Ribbon cable connector	Ribbon cable connector
Related I/O points			16	16	16	16	32	32
Dimensions (WxHxD)		mm	20.2x90x89	24.2x90x89	14.6x90x87	14.6x90x87	26.2x90x87	26.2x90x87
Order information		Art. no.	128152	128153	104503	104504	104505	104506

① for Y0 and Y1 = 0.3 A; all others 0.1 A ② 7.2 W for Y0 to Y3; all others 2.4 W ③ 0.9 W for Y0 to Y3; all others 0.3 W

* This limitation applies only per reference terminal for each group. Please observe the terminal assignments for the group identification. ** Units with sink type transistor outputs on request.

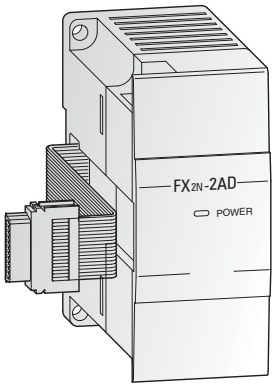


Analog output modules

The analog output modules provide the user with 2 to 4 analog outputs. The modules convert digital values from the FX1N/FX3G and FX3U/FX3UC controller to the analog signals required by the process. The modules can output both current and voltage signals.

Specifications		FX2N-2DA	FX2N-4DA	FX3U-4DA*
Analog channels	inputs	—	—	—
	outputs	2	4	4
Analog output range		0 –+10 V DC/0–+5 V DC/ 4–+20 mA	-10 –+10 V DC/0 –+20 mA/ 4–+20 mA	-10 –+10 V DC/0 –+20 mA/ 4–+20 mA
Resolution		2.5 mV/4 µA (12 bit)	5 mV (10 bit)/20 µA (11 bit + sign)	0.32 mV (15 bit + sign) 0.6 µA (15 bit)
Fullscale overall accuracy		±1 %	±1 %	±0.3–0.5 % **
Power supply	5 V DC	30 mA (from base unit)	30 mA (from base unit)	100 mA (from base unit)
	24 V DC	85 mA	200 mA	160 mA
Related I/O points		8	8	8
Dimensions (WxHxD)	mm	43x90x87	55x90x87	24.2x90x89
Order information	Art. no.	102868	65586	169509

* for FX3G/FX3U/FX3UC only **Dependent on the ambient temperature

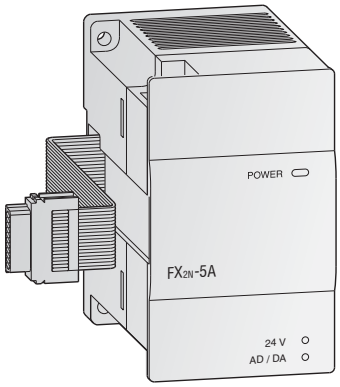


Analog input modules

The analog input modules provide the user with 2 to 8 analog inputs. The module converts analog process signals into digital values which are further processed by the MELSEC FX1N/FX3G/FX3U/FX3UC controller. The actual values or mean values over several measurements may be output.

Specifications		FX2N-2AD	FX2N-4AD	FX3U-4AD/FX3UC-4AD*	FX2N-8AD
Analog channels	inputs	2	4	4	8
	outputs	—	—	—	—
Analog input range		0 –+10 V DC/0–+5 V DC/0/ 4–+20 mA	-10–+10 V DC /-20–+20 mA/4–+20 mA	-10 –+10 V DC/-20–+20 mA/4–+20 mA	-10 –+10 V DC/-20–+20 mA/4–+20 mA
Resolution	voltage	2.5mV, 1.25mV, 4 µA (12 bits)	5 mV (11 bit + sign)	0.32 mV (15 bit+sign)	0.63 mV (14 bit + sign)
	current		20 µA (10 bit + sign)	1.25 µA (14 bit+sign)	2.5 µA (13 bit + sign)
Fullscale overall accuracy		±1 %	±1 %	±0.3–0.1 %	±0.3–0.5 % **
Power supply	5 V DC	20 mA (from base unit)	30 mA (from base unit)	110 /100 mA (from base unit)	50 mA (from base unit)
	24 V DC	50 mA (from base unit)	55 mA	90 mA/80 mA	80 mA
Related I/O points		8	8	8	8
Dimensions (WxHxD)	mm	43x90x87	55x90x87	20.2x90x89	75x105x75
Order information	Art. no.	102869	65585	169508/210090	129195

Note: The FX2N-8AD can be configured to accept standard analog inputs as well as selected temperature inputs such as K, T or J type thermocouples.
* for FX3G/FX3U/FX3UC only **Dependent on the ambient temperature

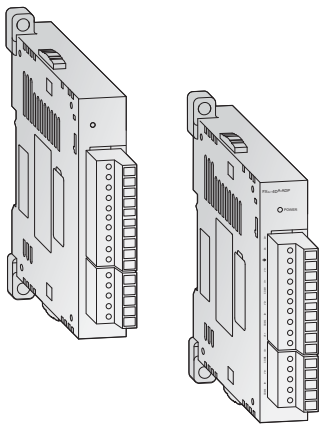


Combined analog I/O modules

The analog input/output modules are available in two different models. They provide the user with 2 or 4 analog inputs and 1 analog output.
They serve for conversion of analog process signals into digital values, and vice versa.

As of the FX2N-5A module the analog inputs can be selected between current or voltage input signals.

Specifications		FX0N-3A	FX2N-5A	FX3U-3A-ADP
Analog channels	inputs	2	4	2
	outputs	1	1	1
Resolution (input)	voltage	0–+10 V (8 bit), 0–+5 V (8 bit)	-10–+10 V (15 bit + sign), -100–+100 mV (11 bit + sign)	0–+10 V (2.5 mV/12 bit)
	current	0/4–+20 mA (8 bit)	-20–+20 mA (14 bit + sign), 0/4–+20 mA (14 bit)	4–+20 mA (5 µA/12 bit)
Resolution (output)	voltage	0–+10 V (8 bit), 0–+5 V (8 bit)	-10–+10 V (12 bit)	0–+10 V (2.5 mV/12 bit))
	current	4–+20 mA (8 bit)	0/4–+20 mA (10 bit)	4–+20 mA (4 µA/12 bit)
Power supply	5 V DC	30 mA (from base unit)	70 mA (from base unit)	20 mA (from base unit)
	24 V DC	90 mA (from base unit)	90 mA (from base unit)	90 mA
Related I/O points		8	8	0
Dimensions (WxHxD)	mm	43x90x87	55x90x87	17.6x90x89.5
Order information	Art. no.	41790	153740	221549



Analog I/O adapters

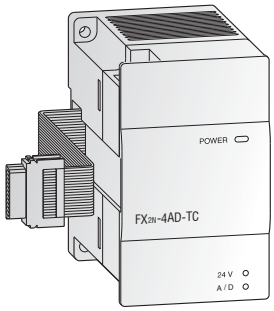
The FX3U-4AD-ADP adapter module for analog input is a special function adapter to add four analog input points to the FX3G or FX3U/FX3UC PLC system.

The FX3U-4DA-ADP adapter module for analog output is a special function adapter to add four analog output points to the FX3U/FX3UC PLC system.

Specifications		FX3U-4AD-ADP	FX3U-4DA-ADP
Analog channels	inputs	4	—
	outputs	—	4
Analog range		0–+10 V DC, 4–+20 mA	0–+10 V DC, 4–+20 mA
Resolution		2.5 mV/10 µA (12 bit/11 bit)	2.5 mV/4 µA (12 bit)
Overall accuracy		±0.5 %*/±1 %	±0.5 %*/±1 %
Power supply	5 V DC	15 mA (from base unit)	15 mA (from base unit)
	24 V DC	40 mA	150 mA
Related I/O points		0	0
Dimensions (WxHxD) mm		17.6x90 (106)x89.5	17.6x90 (106)x89.5
Order information Art. no.		165241	165271

*Dependent on the ambient temperature and signal quality

Note: when connecting these adapter modules to a FX3U, a communications adapter FX3U-□□□-BD is required. When connecting an adapter to a FX3G PLC the communications adapter FX3G-CNV-ADP is required.



Analog temperature input modules

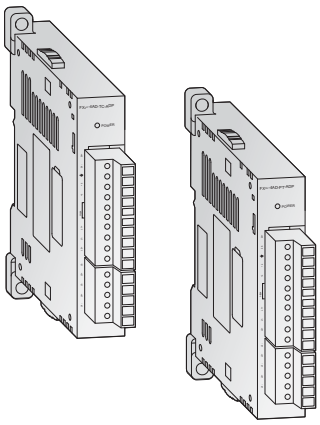
The analog input module for thermocouples FX2N-4AD-TC is used for processing temperatures. It has 4 independent inputs for detecting signals from thermocouples of types J and K. The type of thermocouple can be chosen independently for each point.

The analog input module for Pt100 inputs FX2N-4AD-PT permits the connection of four Pt100 sensors to the FX1N, FX3G or FX3U/FX3UC series controller.

The temperature control module FX2N-2LC is equipped with two temperature input points and two transistor (open collector) output points. It is used to read temperature signals from thermocouples and Pt100 sensors, and performs PID output control.

Specifications		FX2N-4AD-TC	FX2N-4AD-PT	FX2N-2LC
Analog inputs		4 (J or K type)	4 (Pt100 sensors)	2 channels*
Compensated temperature range ℃		-100–+600 (J type) /-100–+1200 (K type)	-100–+600	Thermocouple and Pt100 sensor
Digital outputs		-1000–+6000 (J type)/ -1000–+12000 (K type)	-1000–6000 (12 bit conversion)	2 transistor output points
Resolution		0.3 (J type)/0.4 (K type)	0.2–0.3 ℃	0.1 ℃ or 1 ℃
Power supply	5 V DC	40 mA (from base unit)	30 mA (from base unit)	70 mA (from base unit)
	24 V DC	60 mA	50 mA	55 mA
Related I/O points		8	8	8
Dimensions (WxHxD) mm		55x90x87	55x90x87	55x90x87
Order information Art. no.		65588	65587	129196

* Temperature input modules with 10 channels on request.



Analog temperature input adapters

The analog input adapter for thermocouples FX3U-4AD-TC-ADP is used for processing temperatures. It has 4 independent inputs for detecting signals from thermocouples of types J and K.

The FX3U-4AD-PNK-ADP analog input adapter enables the connection of up to four Pt1000/Ni1000 thermocouples.

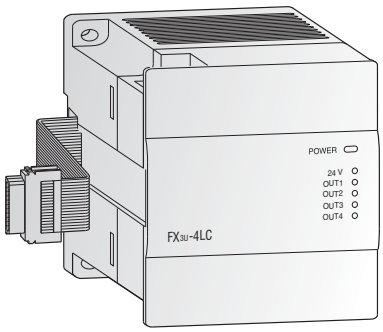
The FX3U-4AD-PT-ADP and FX3U-4AD-PTW-ADP analog input adapters enable the connection of up to four Pt100 thermocouples to the PLC system.

All analog adapters can be used in combination with the base units of the FX3G/FX3U/FX3UC series only.

Specifications		FX3U-4AD-TC-ADP	FX3U-4AD-PNK-ADP	FX3U-4AD-PT-ADP	FX3U-4AD-PTW-ADP
Analog inputs		4 (J or K type)	(Pt1000/Ni1000 sensors, 2/3 wire)	4 (Pt100 sensors)	4 (Pt100 sensors, 3-wire)
Compensated temperature range ℃		-100–+600 (J type) / -100–+1000 (K type)	-50 – +250 (Pt1000) / -40 – +110 (Ni1000)	-50–+250	-100 – +600
Digital outputs		-1000–+6000 (J type)/ -1000–+10000 (K type)	-500 – +2500 (Pt1000) / -400 – +1100 (Ni1000)	-500–+2500	-1000 – +6000
Resolution ℃		0.3 (J type)/0.4 (K type)	0.1	0.1	0.2–0.3
Total accuracy		±0.5 % fullscale	±0.5–1.0 % (fullscale)*	±0.5–1.0 % (fullscale)*	±0.5–1.0 % (fullscale)*
Power supply	5 V DC	15 mA (from base unit)	15 mA (from base unit)	15 mA (from base unit)	15 mA (from base unit)
	24 V DC	45 mA	45 mA	50 mA	50 mA
Related I/O points		0	0	0	0
Dimensions (WxHxD) mm		17.6x90 (106)x89.5	17.6x90 (106)x89.5	17.6x90 (106)x89.5	17.6x90 (106)x89.5
Order information Art. no.		165273	214172	165272	214173

*Dependent on the ambient temperature

Note: when connecting these adapter modules to a FX3U, a communications adapter FX3U-□□□-BD is required. When connecting an adapter to a FX3G PLC the communications adapter FX3G-CNV-ADP is required.



Temperature control module

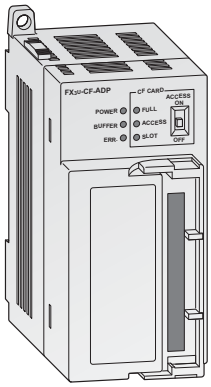
The temperature control module FX3U-4LC is equipped with four temperature input points and four transistor (open collector) output points. It is used to read temperature signals from thermocouples and Pt100 sensors, and performs PID output control.

The proportional band, the integral time and the derivative time can be easily set by auto tuning.

The channels are isolated against each other.

Self-diagnosis functions are provided, and the disconnection of heaters can be detected by current detection (CT).

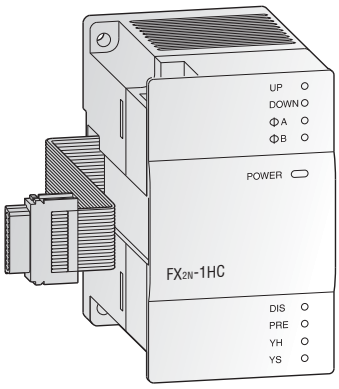
Specifications			FX3U-4LC
Analog inputs			4 (Thermocouple and Pt100 sensors)
Compensated temperature range		°C	-200 to +2300
Digital outputs			4 NPN transistor open collector output points
Resolution		°C	0.1 or 1
Total accuracy			±0.3 to 0.7 % (fullscale, dependent on the ambient temperature)
Power supply	5 V DC		160 mA (from base unit)
	24 V DC		50 mA
Related I/O points			8
Dimensions (WxHxD)		mm	90x90x86
Order information		Art. no.	232806



Data logger module

The FX3U-CF-ADP is a general purpose data logging adapter. The difference to other available logging units is that the PLC main unit controls the data logging based on user requirements, e.g. periodical or even based. For tracing a timestamp is automatically added to all data storages, that eases alarm and other time critical logging. Another usage is the storage of bigger recipe data. A CompactFlash® memory card up to 2GB can be used. Six applied instructions allow all kinds of data writing, manipulation or reading, making this adapter the optimum solution towards customer requirements.

Specifications			FX3U-CF-ADP
Data access method			Controlled by the main unit, no polling from the logging unit possible.
Connectable units			A maximum of one FX3U-CF-ADP can be connected per PLC.
Time stamp function			The real time clock data of the base unit is used.
Recommended storage media			CompactFlash® memory card (GT05-MEM-256MC, -512MC,-1GC, -2GC)
Max. file size			512 MB
File format			CSV
Max. numbers of files			63 (Plus one FIFO file.)
FIFO function			One pattern (The file name gets automatically generated.)
Power supply	24 V DC		130 mA
Related I/O points			0
Dimensions (WxHxD)		mm	45x90x89.5
Order information		Art. no.	230104

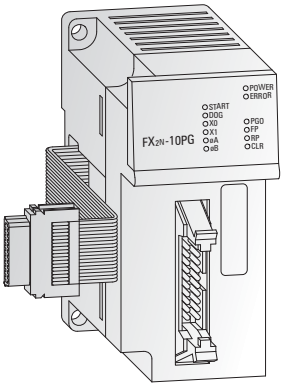


High speed counter and pulse train modules

These high speed modules provide additional counting and pulse train output features to the FX3U/FX3UC PLC. The high speed counters allow 1- or 2-phase pulses with counting speeds up to a maximum of 50 kHz for the FX2N-1HC and 200 kHz for the FX3U modules.
The FX3U-2HSY-ADP pulse train output module can provide pulse streams up to 200 kHz for use in basic positioning applications.

Specifications			FX2N-1HC	FX2NC-1HC*	FX3U-4HSX-ADP **	FX3U-2HSY-ADP **	FX3U-2HC
Signal level			5, 12, 24 V DC/7 mA		5 V DC	Differential line driver	5, 12, 24 V DC
Counter	inputs		2 (1 phase) or 1 (2 phase)		4	—	2
	outputs		—		—	2	2
Max. frequency	inputs	kHz	50		100/200	—	100/200
	outputs	kHz	—		—	200	—
Counting range (Up/down & ring counter)		16 bit	0–65535		—	—	0–65535
		32 bit	-2147483648–+2147483647		—	—	-2147483648–+2147483647
Output			5–24 V DC; 0.5 A		—	less than 25 mA	5–24 V DC; 0.5 A
Power supply	5 V DC		90 mA (from base unit)		30 mA (from base unit)		245 mA (from base unit)
	24 V DC		—		30 mA (from base unit)	60 mA (from base unit)	—
Related I/O points			8		0	0	8
Dimensions (WxHxD)		mm	55x90x87	20.2x90x89	17.6x90 (106)x89.5	17.6x90 (106)x89.5	55x90x87
Order information		Art. no.	65584	217916	165274	165275	232805

*for FX3UC only ** for FX3U only



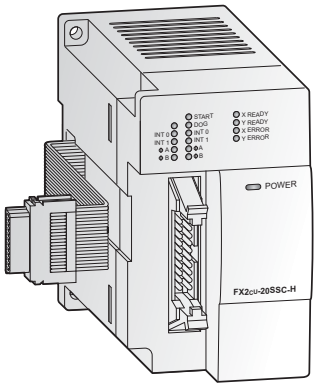
Positioning modules

The positioning modules FX2N-1PG-E and FX2N-10PG are extremely efficient single-axis positioningmodules for controlling either step drives or servo drives (by external regulator) with a pulse chain. It is very suitable for achieving accurate positioning in combination with the FX3U-/FX3UC series PLCs.

The configuration and allocation of the position data are carried out directly via the PLC program.

A very wide range of manual and automatic functions are available to the user.

Specifications			FX2N-1PG-E	FX2N-10PG
Accessible axes			1	1
Output frequency		pulse/s	10–100 000	1–1 000 000
Signal level for digital inputs			24 V DC/40 mA	5 V DC/100 mA; 24 V DC/70 mA
Power supply	5 V DC		55 mA (from base unit)	120 mA (from base unit)
	24 V DC		—	—
Related I/O points			8	8
Dimensions (WxHxD)		mm	43x90x87	43x90x87
Order information		Art. no.	65583	140113



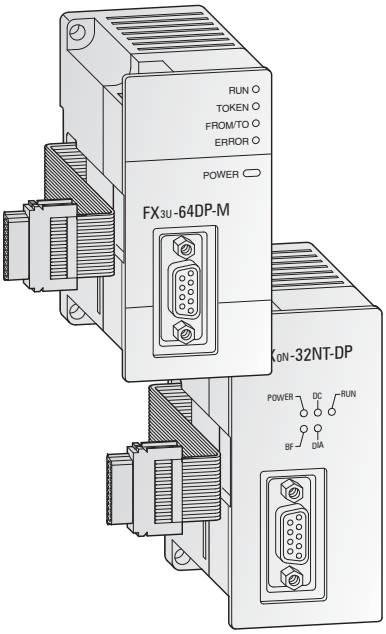
SSCNET III module FX3U-20SSC-H

The SSCNET module FX3U-20SSC-H can be used in combination with a FX3U/FX3UC programmable controller to achieve a cost effective solution for high precision, high speed positioning. The plug- and-play fiber optic SSCNET cabling reduces setup time and increases control distance for positioning operations in a wide range of applications.

Servo parameters and positioning information for the FX3U-20SSC-H are easily set up with an FX3U or FX3UC base unit and a personal computer. For parameter setting, monitoring and testing the easy programming software FX Configurator-FP is available.

Specifications			FX3U-20SSC-H
Accessible axes			2 (independent or interpolation) via SSCNET III (servo bus)
Output frequency			1 Hz to 50 MHz
Communications speed			50 Mbps
Starting time		ms	1.6 (+1.7 SSCNET cycle time)
Max. to PLC connectable modules			Up to 8 can be connected to the FX3U PLC
Power supply	5 V DC		100 mA
	24 V DC		—
Related I/O points			8
Dimensions (WxHxD)		mm	55x90x87
Order information		Art. no.	206189

Note: The FX3U-20SSC-H can only be used in combination with a FX3U/FX3UC series base unit. For applicable servo amplifiers and motors please refer to the MR-J3 servo section of this catalogue.



Master and slave modules for PROFIBUS/DP

The Mitsubishi PROFIBUS modules provide an FX family CPU with an intelligent PROFIBUS/DP link for the implementation of decentralised control tasks.

The FX3U-64DP-M is a PROFIBUS/DP master module that allows the integration of a MELSEC FX3U or FX3UC PLC system as a class 1 master in a PROFIBUS/DP network.

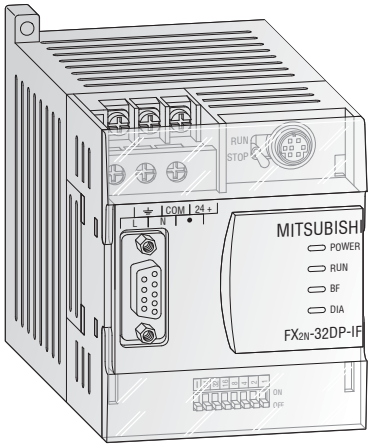
The FX3U Profibus/DP master supplys comprehensive data and alarm processing to the Profibus/DP V1 standard. It is easily set up with the GX Configurator-DP software.

The FX0N-32NT-DP and FX3U-32DP are PROFIBUS/DP slave modules that make it possible to integrate a FX1N/FX3G or FX3U/FX3UC in an existing PROFIBUS/DP network.*

It links the system to the master PLC in the PROFIBUS/DP network for efficient and trouble-free data exchange.

Specifications			FX3U-64DP-M	FX3U-32DP	FX0N-32NT-DP
Module type			Master	Slave	Slave
Transmission type			Bus network		
Transmission data			32 byte/slave (normal service mode) 244 byte/slave (extended service mode)		
Interface			PROFIBUS/DP (with 9 pole D-SUB connector)		
Max. number of master per configuration			1	—	—
Repeaters			3	—	—
Max. number of slaves			64	—	—
Communications speed			PROFIBUS standard		
Communications distance		m	Max. 1,200 (depends on communication speed)		
Communication cable			PROFIBUS cable with 9-pin D-SUB connector		
Power supply	5 V DC		—	—	Max. 170 mA (from base unit)
	24 V DC		Max. 155 mA (from base unit)	145 mA (from base unit)	60 mA
Related I/O points			8	8	8
Dimensions (WxHxD)		mm	43x90x87	43x90x87	43x90x87
Order information		Art. no.	166085	194214	62125

*Note: the FX3U-64DP-M can be used in combination with a FX3U/FX3UC base unit only. The FX3U-32DP can be used in combination with FX3G/FX3U/FX3UC base unit only.



Remote I/O station FX2N-32DP-IF

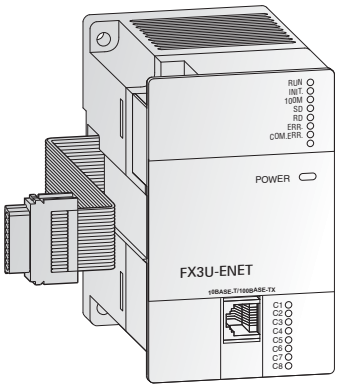
The remote I/O station FX2N-32DP-IF forms an extremely compact communication unit and provides a connection of I/O modules with up to 256 I/O points and/or up to 8 special function modules of the FX2N series as an alternative (analog I/Os, network, communications and positioning modules).

It features an entire electrical isolation of the PROFIBUS/DP connector and of the sensor/actuator circuits.

The FX2N-32DP-IF includes a 240 V power supply unit and a 24 V service voltage terminal, e.g. for analog modules. The FX2N-32DP-IF-D is supplied with 24 V DC.

PROFIBUS data such as the baud rate or I/O data can be monitored directly with the programming software or on the hand-held programming unit FX-30P. This facilitates an easy error diagnosis directly on the remote I/O station.

Specifications			FX2N-32DP-IF	FX2N-32DP-IF-D
Power supply			100–240 V AC (+10 %/-15 %) 50/60 Hz	24 V DC (+20 %/-30 %)
Power consumption			30 VA	14 W
Internal current consumption			5 V DC/max. 220 mA (from base unit), 24 V DC/500 mA	5 V DC/max. 220 mA (from base unit)
Interface (connectors)			9-pin D-SUB for PROFIBUS/DP, 8-pin Mini-DIN for PC or programming unit FX-30P	
Communication speed	1200 m	kbps	9.6/19.2/45.45/93.75	
	1000 m	kbps	187.5	
	400 m	kbps	500	
	200 m	kbps	1500	
	100 m	kbps	3000/6000/12000	
Communication distance		m	Max. 1200 (depends on communication speed)	
Communication cable			PROFIBUS cable with 9-pin D-SUB connector	
Max. number of controllable I/O points			256	
Related I/O points			0	
Dimensions (WxHxD)		mm	75x98x87	
Order information		Art. no.	145401	142763
Accessory			Hand-held programming unit FX-30P; art.-no.: 221540	



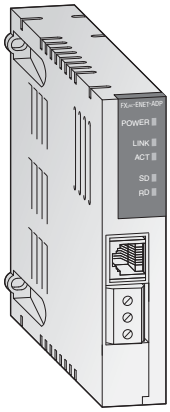
Network module for Ethernet

The FX3U-ENET communications modules provides the FX3G or FX3U/FX3UC PLC with a direct connection on to an Ethernet network.

With the Ethernet module installed an FX3G or a FX3U/FX3UC PLC can exchange data quickly and easily with process visualization systems in addition to supporting full program UP/DOWN load as well as comprehensive monitoring support.

The FX3U-ENET also support Peer to Peer connection and MC Protocol. Up to 8 independent connections are available. It is easily set-up with the FX Configurator-EN software.

Specifications		FX3U-ENET
Protocol		TCP/IP, UDP
Communication mode		Full-duplex/half-duplex
No. of simultaneous open connections		8
Fixed buffer communication		1023 word x 8
Communication with mail server		SMTP, POP3
Interface		IEEE802.3u (100BaseTX), IEEE802.3 (10BaseT)
Connector		RJ45
Max. transfer rate		100 Mbits/s, 10 Mbit/s
Max. segment length	m	100
Cable		CAT5 STP or 3 STP
Power supply		24 V DC/240 mA (from base unit)
Related I/O points		8
Dimensions (WxHxD)	mm	55x90x87
Order information	Art. no.	166086



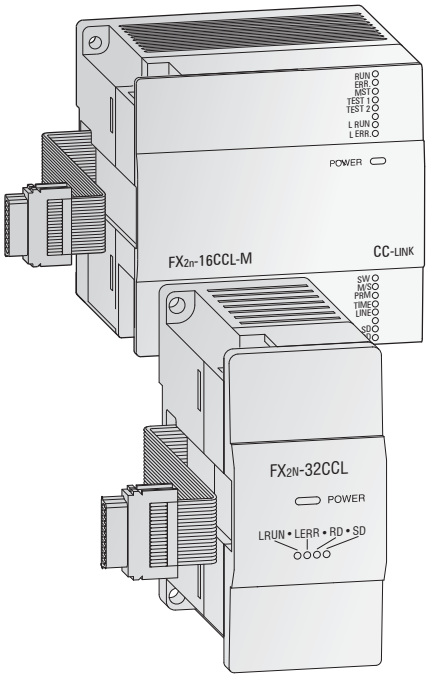
Ethernet communications adapter FX2NC-ENET-ADP

The FX2NC-ENET-ADP communications adapter is an Ethernet interface with 10BASE-T specifications for the FX1S or FX1N series.

The FX2NC-ENET-ADP enables upload, download, monitor and test sequence of programs via Ethernet from a personal computer (the software GX Developer or MX Components must be installed).

Specifications		FX2NC-ENET-ADP
Protocol		TCP/IP
No. of simultaneous open connections		1
Interface		IEEE802.3u (100BaseTX), IEEE802.3 (10BaseT)
Connector		RJ45 (to Ethernet), 3 screw terminals (to ground)
Max. transfer rate		10 Mbit/s
Cable		CAT5 STP or 3 STP
Power supply	5 V DC	135 mA (from base unit)
	24 V DC	—
Related I/O points		0
Dimensions (WxHxD)	mm	19.1x90x78
Order information	Art. no.	157447

Note: when connecting this adapter module to a FX1S or FX1N PLC the communications adapter FX1N-CNV-BD is required.



CC-Link master and slave modules

The CC-Link network enables the controlling and monitoring of decentralized I/O modules at the machine.

The CC-Link master module FX2N-16CCL-M is a special extension block which assigns an FX series PLC as the master station of the CC-Link system.

The setting of all modules within the network is handled directly via the master module.

Up to 15 remote stations and remote device stations can be connected to the master station as decentralized I/O stations. These remote stations can be up to 7 I/O modules and up to 8 remote device stations. 2 master modules can be connected to one FX1N-, FX3G or FX3U/FX3UC base unit.

The maximum communications distance is 1200 m without repeater.

The communication modules FX2N, 32CCL and FX3U-64CCL enables the user to connect the FX PLC as a slave on an existent CC-Link network.

The buffer memory of the FX2N-32CCL is read and written by FROM/TO instructions.

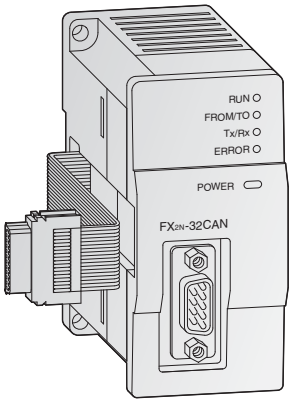
The slave modules can be used in combination with a FX1N/FX3G and FX3U/FX3UC PLC.

The connection of the modules is to the extension bus on the right-hand-side of the controller.

Specifications		FX2N-16CCL-M	FX2N-32CCL	FX3U-64CCL*
Module type		Master station	Remote station	Intelligent station
Link points per station	I/O points	32	32	64
	register	8	8	16
Max. number of I/O points		128 (with FX1N PLC), 256 (with FX3G PLC), 384 (with FX3U PLC)**	—	—
Number of connectable modules		Max. 15	—	1–4
Power supply	5 V DC	—	Max. 130 mA (from base unit)	—
	24 V DC	150 mA	50 mA	220 mA
Related I/O points		8	8	8
Dimensions (WxHxD)		85x90x87	43x90x87	55x90x87
Order information	Art. no.	133596	102961	217915

Note: Refer to the Network section of this catalog for I/O blocks and power supply units.

* for FX3G/FX3U/FX3UC only **Total number of I/O points for a base unit and extension unit inside the CC-Link network.



Network module for CANopen

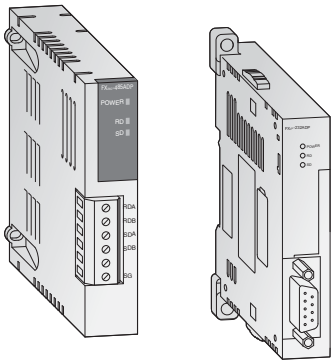
The FX2N-32CAN communications module makes it possible to connect an FX1N/FX3G or FX3U/FX3UC PLC to an existing CANopen network.

In addition to real-time capabilities and high-speed data transfer at rates of up to 1Mbit/s the CANopen module also has high transfer reliability and simple network configuration. Up to 120 data words can be sent and received as process data objects (30 PDOs).

The number of words that can be transmitted in each direction can be set between 1 and 120.

Communication with the module's memory buffer is performed with simple FROM/TO instructions.

Specifications		FX2N-32CAN
Module type		CANopen master
CAN standard		ISO 11898/1993
CANopen standard by CiA		DS-301 version 3.0
Additional CANopen features		NMT, Guarding, and Guarding request based on DS-302 V2.0. network variables based on DS-405 V1.0
Max. nbr. of modules that can be connected to the network		30 without repeater; 127 with repeater
Station numbers		1–127
Supported baud rate	kBaud	10, 20, 50, 125, 250, 500, 800, 1000
Power supply	5 V DC	290 mA
	24 V DC	—
Related I/O points		8
Dimensions (WxHxD)	mm	43x90x88.7
Order information	Art. no.	141179



Active data modules (RS485 and RS232)

The addition of active data interface modules permit active communication between the PLC and surrounding devices. With RS232 communications this can include modems, printers, bar code readers, PC's, PLCs etc. Information can be sent and received and is handled by the PLC program with the RS instruction.

With RS485 communication can be configured as either 1:N multidrop, parallel link or peer to peer operation.

FX3U-232ADP-MB and FX3U-485ADP-MB also support Modbus RTU and Modbus ASCII.

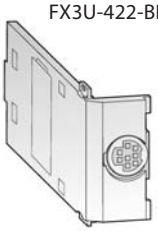
Specifications			FX2NC-232ADP ①	FX3U-232ADP-MB ②	FX2NC-485ADP ①	FX3U-485ADP-MB ②
Interface			RS232C with 9 pin D-SUB compact plug (photocoupler isolation)	RS232 with 9-pin D-SUB connector; Modbus RS232C	RS485	RS485; Modbus RS485
Communication speed*		kbps	0.3–19.2	0.3–19.2	0.3–19.2	0.3–19.2
Max. communication distance		m	15	15	500	500
Power supply	5 V DC		100 mA (from base unit)	30 mA (from base unit)	max. 150 mA (from base unit)	20 mA (from base unit)
	24 V DC		—	—	—	—
Related I/O points			0	0	0	0
Dimensions (WxHxD)		mm	19.1x90x83	17.6x90 (106)x74	19.1x90x78	17.6x90 (106)x74
Order information		Art. no.	149110	206190	149111	206191

① Application for FX1S/FX1N base unit ② Application for FX3G/FX3U/FX3UC base units

* Speed depends on communication method (Parallel link, N:N Network, No protocol, Dedicated protocol etc.)

Note: When connecting these adapter modules to a FX3U, a communications adapter FX3U-□□□-BD is required. When connecting the FX2NC adapters to a FX1S or FX1N PLC the communications adapter FX1N-CNV-BD is required. When connecting an FX3U adapter to a FX3G PLC the communications adapter FX3G-CNV-ADP is required.

FX3U-422-BD



FX3G-422-BD

Interface adapters

The FX□□-232-BD interface adapters provide an RS232C interface for serial data communications with the MELSEC FX1S, FX1N, FX3G or FX3U PLC.

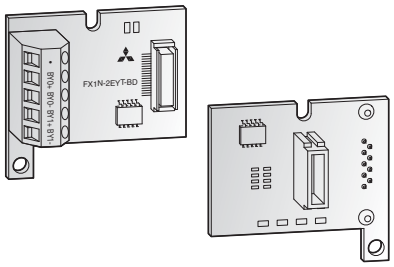
With the help of the interface adapter FX□□-422-BD a RS422 interface can be added to a MELSEC FX1S, FX1N, FX3G or FX3U PLC.

The interface adapters FX□□-485-BD provide a MELSEC FX1S, FX1N, FX3G or FX3U PLC with an additional RS485 interface. The adapter, which is simply inserted into the base unit's expansion slot, enables the configuration of RS485 1:n multidrop, parallel link or peer-to-peer networks with FX systems.

Specifications		FX1N-232-BD	FX3G-232-BD	FX3U-232-BD
Applicable for		Base units FX1S/FX1N	Base units FX3G	Base units FX3U
Interface		RS232C with 9 pole D-SUB connector		
Power supply		5 V DC/20 mA (from base unit)		
Related I/O points		—	—	—
Dimensions (WxHxD)	mm	43x38.5x22	35x51x12	19.3x46.1x62.7
Order information	Art. no.	130743	221254	165281

Specifications		FX1N-422-BD	FX3G-422-BD	FX3U-422-BD
Applicable for		Base units FX1S/FX1N	Base units FX3G	Base units FX3U
Interface		RS422 with 8 pole Mini-DIN connector		
Power supply		5 V DC/60 mA (from base unit)		5 V DC/20 mA (from base unit)
Related I/O points		—	—	
Dimensions (WxHxD)	mm	43x38.5x20	35x51x12	19.6x46.1x53.5
Order information	Art. no.	130741	221252	165282

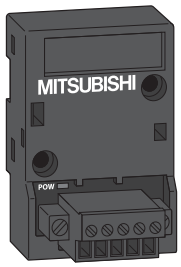
Specifications		FX1N-485-BD	FX3G-485-BD	FX3U-485-BD
Applicable for		Base units FX1S/FX1N	Base units FX3G	Base units FX3U
Interface		RS485/RS422		
Power supply		5 V DC/60 mA (from base unit)		
Related I/O points		—	—	—
Dimensions (WxHxD)	mm	43x38.5x22	35x51x12	19.6x46.1x69
Order information	Art. no.	130742	221253	165283



Digital and analog extension adapters FX1S/FX1N/FX3U

Two different digital and analog extension adapters are available at a time for direct intallation in the base unit controllers of the FX1S, FX1N and FX3U series.

Specifications		FX1N-4EX-BD	FX1N-2EYT-BD	FX1N-2AD-BD	FX1N-1DA-BD
Applicable for		Base units FX1S/FX1N	Base units FX1S/FX1N	Base units FX1S/FX1N	Base units FX1S/FX1N
Function		4 digital inputs	2 transistor outputs	AD converter	DA converter
Dimensions (WxHxD)	mm	43x38.5x22	43x38.5x22	43x38.5x22	43x38.5x22
Order information	Art. no.	139418	139420	139421	139422



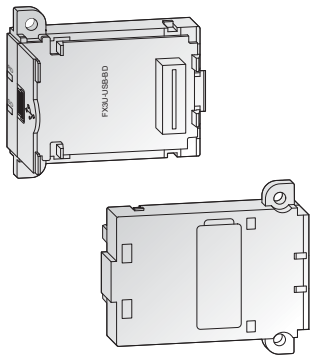
Extension adapters FX3G

For the FX3G series PLCs a analog-digital converter with two analog inputs and a digital-analog converter with one analog output is available.

The FX3G-8AV-BD analog setpoint adapter enable the user to set 8 analog setpoint values

All adapters are inserted directly into the extension slot of the base unit.

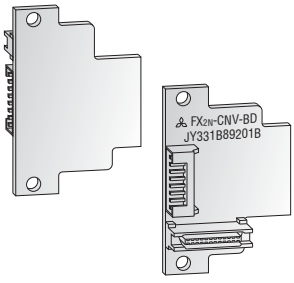
Specifications		FX3G-2AD-BD	FX3G-1DA-BD	FX3G-8AV-BD
Applicable for		Base units FX3G	Base units FX3G	Base units FX3G
Function		A-D converter	D-A converter	Analog setpoint
Dimensions (WxH)	mm	35x51	35x51	35x51
Order information	Art. no.	221265	221266	221267



Communication Adapter Board FX3U-USB-BD

This adapter board is an additional USB 2.0 interface for a FX3U base unit and allows the program transfer from a notebook PC which is not equipped with a serial interface.

Specifications		FX3U-USB-BD
Applicable for		Base units FX3U
Power supply		5 V DC (from base unit)
Weight	kg	0,02
Dimensions (WxHxD)	mm	19.6x46.1x53.5
Order information	Art. no.	165284



Communications adapter

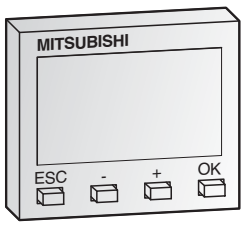
The below listed communications adapters enable the connection of the adapter modules FX□□-□□□ADP on the left hand side of the FX1N, FX3G and FX3U base units.

Specifications		FX1N-CNV-BD	FX3G-CNV-ADP	FX3U-CNV-BD
Applicable for		Base units FX1S/FX1N	Base units FX3G	Base units FX3U
General specifications		Conforms to FX1N/FX2N base units	Conforms to FX3G base units	Conforms to FX3U base units
Power supply		Not necessary		
Related I/O points		0	0	0
Dimensions (WxHxD)	mm	43x38x14	14.6x74x90	19.6x46.1x53.5
Order information	Art. no.	130745	221268	165285

Power supply modules

To enhance the power supply of a FX3G or FX3U/FX3UC base unit, discrete power supply modules are available.

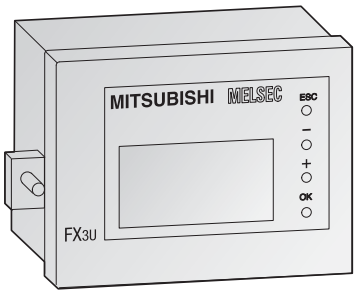
For detailled informations please refer to the power supplies chapter in this catalogue.



Display modules FX1N-5DM and FX3G-5DM

The display modules FX1N-5DM and FX3G-5DM are inserted directly with space-saving into the controller and enable monitoring and editing of the data stored in the PLC.

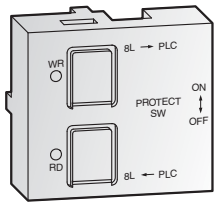
Specifications		FX1N-5DM	FX3G-5DM
Applicable for		Base units FX1S/FX1N	Base units FX3G series
Display		LCD (with backlight)	LCD (with backlight)
Power supply		5 V DC ± 5 % (from base unit)	5 V DC ± 5 % (from base unit)
Current consumption	mA	110	n/a
Dimensions (WxHxD)	mm	40x32x17	49x34x12
Order information	Art. no.	129197	221270



Control and display panel FX3U-7DM, holder FX3U-7DM-HLD

The FX3U-7DM display module can be incorporated in the main unit, or can be installed in the enclosure using the FX3U-7DM-HLD display module holder.

Specifications		FX3U-7DM	FX3U-7DM-HLD
Applicable for		Base units FX3U	Base units FX3U
Display		16 letters x 4 lines	—
Resolution		—	—
Power supply		5 V DC (from base unit)	—
Current consumption	mA	20	—
Extension cable		—	Included
Dimensions (WxHxD)	mm	48x35x11.5	66.3x41.8x13
Order information	Art. no.	165268	165287



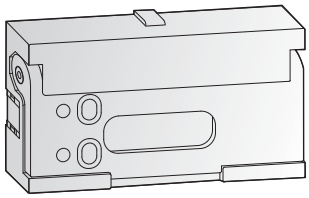
Memory cassettes for FX1S, FX1N and FX3G

All FX1S, FX1N and FX3G base units are equipped with a slot for the optional, robust FX memory cassettes. By connection of these memory cassettes, the internal memory of the controller is switched off and only the program specified in the respective memory cassette is run.

The memory cassettes can upload/download programs to and from the FX PLC internal memory with the help of 2 buttons.

The memory cassette FX3G-EEPROM-32L can also be placed on top of the standard BD expansion boards.

Specifications		FX1N-EEPROM-8L	FX3G-EEPROM-32L
Applicable for		Base units FX1S/FX1N	Base units FX3G
Memory type		EEPROM	EEPROM
Size		2000/8000 steps	32000 steps
Protect switch		Provided	Provided
Data transfer buttons		Provided	Provided
Order information	Art. no.	130746	221269



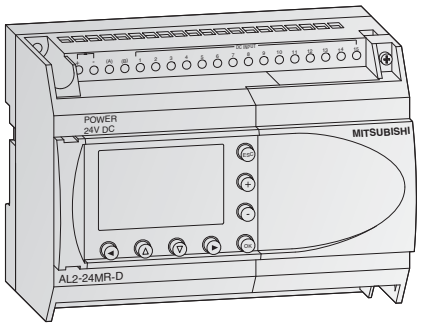
Memory cassettes for FX3U

The memory cassette can be installed in the main unit, and when installed, the memory cassette's internal program is used in place of the internal RAM memory.

The loader functionality in the FX3U-FLROM-64L allows the memory cassette to upload and download programs to and from the internal PLCmemory with the help of 2 buttons.

Specifications		FX3U-FLROM-16	FX3U-FLROM-64	FX3U-FLROM-64L
Applicable for		Base units FX3U	Base units FX3U	Base units FX3U
Number of steps		16000	64000	64000
Memory type		Flash memory	Flash memory	Flash memory
Protect switch		Provided	Provided	Provided
Data transfer buttons		Not provided	Not provided	Provided
Dimensions (WxHxD)	mm	37x20x6.1	37x20x6.1	37x20x6.1
Order information	Art. no.	165278	165279	165280

The ALPHA 2 Series



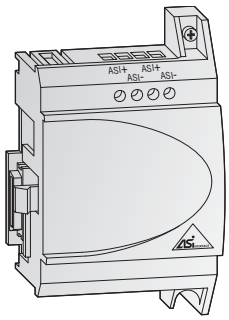
Alpha base units

The Alpha 2 brings the benefits of the Alpha closer to the functionality of a Micro PLC. A program capacity of 200 functions and 38 function blocks including mathematical operations, PWM,1KHz high speed counter and SMS text messaging, along with a wide operating temperature (-25 to 55°C) open up new possibilities in all areas of building and industrial automation.The large back lit screen features display options including bar graphs and scrolling text. Optional extension units canincrease the I/O by 4 points of digital I/O. Features include:

- Expandable with transistor and relay output options
- Analog input/output
- High Speed counters up to 1 kHz
- GSM function for communication with mobile phones
- Multi language support for 8 different languages

Base Units with 10–24 I/Os

Specifications		AL2-10MR-A	AL2-10MR-D	AL2-14MR-A	AL2-14MR-D	AL2-24MR-A	AL2-24MR-D
Electrical specifications							
Integrated inputs/outputs		10	10	14	14	24	24
Power supply		100–240 V AC	24 V DC	100–240 V AC	24 V DC	100–240 V AC	24 V DC
Digital inputs		6	6	8	8	15	15
Analog inputs		—	6	—	8	—	8
Channels		—	6	—	8	—	8
Integrated outputs		4	4	6	6	9	9
Max. power consumption	W	4.9	4.0	5.5	7.5	7.0	9.0
Typ. power consumption All I/Os ON /OFF	W	3.5/1.85 240 V AC 3.0/1.55 120 V AC	2.5/0.75	4.5/2.0 240 V AC 3.5/1.5 120 V AC	4.0/1.0	5.5/2.5 240 V AC 4.5/2.0 120 V AC	5.0/1.0
Weight	kg	0.2	0.2	0.3	0.3	0.35	0.3
Dimensions (WxHxD)	mm	71.2x90x55	71.2x90x55	124.6x90x52	124.6x90x52	124.6x90x52	124.6x90x52
Order information	Art. no.	215070	215071	215072	215073	215074	215075
Accessories		Power supplies with DIN-rail or wall mounting possibility for powering the 24 V DC modules (refer to the power supply chapter in this catalogue); IP40 mounting frame AL-FRAME-20-IP40, art. no.: 132333; IP54 mounting frame AL-FRAME-20-IP54, art. no.: 132337 for AL2-14/24 IP40 mounting frame AL-FRAME-6/10-IP40, art. no.: 132332; IP54 mounting frame AL-FRAME-6/10-IP54, art. no.: 132335 for AL2-10					



AS interface module AL2-ASI-BD

The Actuator Sensor Interface module AL2-ASI-BD in combination with an ALPHA 2 controller facilitates the data communications via an AS interface system. The AL2-ASI-BD is attached to an ALPHA 2 series module and forms a slave unit. Up to 4 inputs and 4 outputs can be exchanged with the AS Interface master.

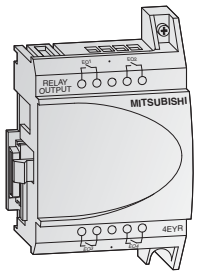
The addresses of the slave devices are assigned either automatically via the master in the network or via a programming device (software).

The maximum communication distance is 100 m without a repeater. If 2 repeaters are used, the distance is extended to up to 300 m.

For the AS-Interface a separate power supply is required. The communication signal is superimposed on the power supply of the AS-Interface bus.

Note: The AL2-ASI-BD cannot be used with the AL2-10MR series.

Specifications		AL2-ASI-BD
Module type		Slave module
Number of I/O points		4 inputs, 4 outputs
External power supply		30.5 V DC (AS interface power supply)
External current consumption	mA	Max. 40
Communications protocol		AS Interface standard
Weight	kg	0.05
Dimensions (WxHxD)	mm	53.1x90x24.5
Order information	Art. no.	142525



Digital extension modules

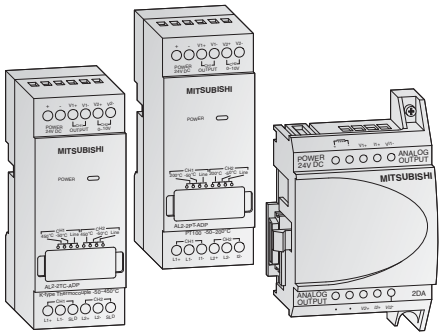
There are 4 different extension modules available for the ALPHA 2, which allow the controller to be extended through additional inputs or outputs. The modules are inserted directly into the ALPHA 2 and therefore do not take up any additional space.

The AL2-4EX has the additional feature that 2 inputs may be used as high-speed counters with a counting frequency of 1 kHz.

All modules feature photocoupler isolation for all I/Os.

Digital extension modules specifications		AL2-4EX-A2	AL2-4EX	AL2-4EYR	AL2-4EYT
Inputs					
Integrated inputs		4	4	—	—
Input voltage		220–240 V AC	24 V DC (+20 %, -15 %)	—	—
Input current		7.5 mA at 240 V AC (50 Hz), 9.0 mA at 240 V AC (60 Hz)	5.4 mA ±1 mA at 24 V DC	—	—
Outputs					
Integrated outputs		—	—	4	4
Output type		—	—	Relay	Transistor
Switched voltage (max.)	V	—	—	250 V AC, 30 V DC	5–24 V DC
Rated current	A	—	—	2 A per output	1 A per output
Electrical specifications					
Power Supply	AC range (+10 %, -15 %)	220–240 V AC	24 V DC	100–240 V AC	24 V DC
Mechanical specifications					
Dimensions (WxHxD)	mm	53.1x90x24.5	53.1x90x24.5	53.1x90x24.5	53.1x90x24.5
Order information	Art. no.	142522	142521	142523	142524

Note: I1 and I2 of the AL2-4EX can be used as high-speed counter inputs. In each case the response time for the high-speed counter inputs will be 0.5 ms or less.
The AL2-4EX-A2, AL2-4EX, AL2-4EYR and AL2-4EYT modules can not be used with the AL2-10MR series.



Analog extension modules

The analog extension modules significantly increase the range of applications for the ALPHA 2. With these modules it is possible to output voltage or current signals or to measure temperatures.

Three different analog extension modules are available:

- The AL2-2DA offers two additional analog outputs for the ALPHA 2 and converts a digital input value into a voltage or a current. This module is inserted directly onto the ALPHA 2.
- The AL2-2PT-ADP connects an external Pt100 sensor to convert temperature readings into analog signals (0–10 V).
- The AL2-2TC-ADP connects thermocouple sensors (K type) to convert temperature readings into analog signals (0–10 V).

Analog extension modules specifications		AL2-2DA	AL2-2PT-ADP	AL2-2TC-ADP
Analog inputs				
Integrated inputs		—	2	2
Connectable temperature sensors		—	Pt100 sensor Temp. coefficient 3.850 ppm/°C (IEC 751)	Thermocouple (K type), isolated type (IEC 584-1 1977, IEC 584-2 1982)
Compensated range		—	-50–+200 °C	-50–+450 °C
Analog outputs				
Integrated outputs		2	—	—
Analog output range	voltage	0–10 V DC (5 kΩ 1 MΩ)	—	—
	current	4–20 mA (max. 500 Ω)	—	—
Electrical specifications				
Number of channels		2	2	2
Power Supply		24 V DC (-15–+10 %), 70 mA	24 V DC (-15–+20 %), 1 W	24 V DC (-15–+20 %), 1 W
Mechanical specifications				
Dimensions (WxHxD)	mm	53.1x90x24.5	35.5x90x32.5	35.5x90x32.5
Order information	Art. no.	151235	151238	151239

Note: the AL2-2DA module can not be used with the AL2-10MR series

HUMAN MACHINE INTERFACES

HMI Control Units Facilitate Communication Between Operator and Machine

HMI control units make systems and their functions transparent, facilitating a process-oriented dialogue between operators and machine. They enable the user to monitor and change their parameters as required. Installation is simple as the HMI units are installed directly at the machine, with no additional modules required for connection to the PLC.

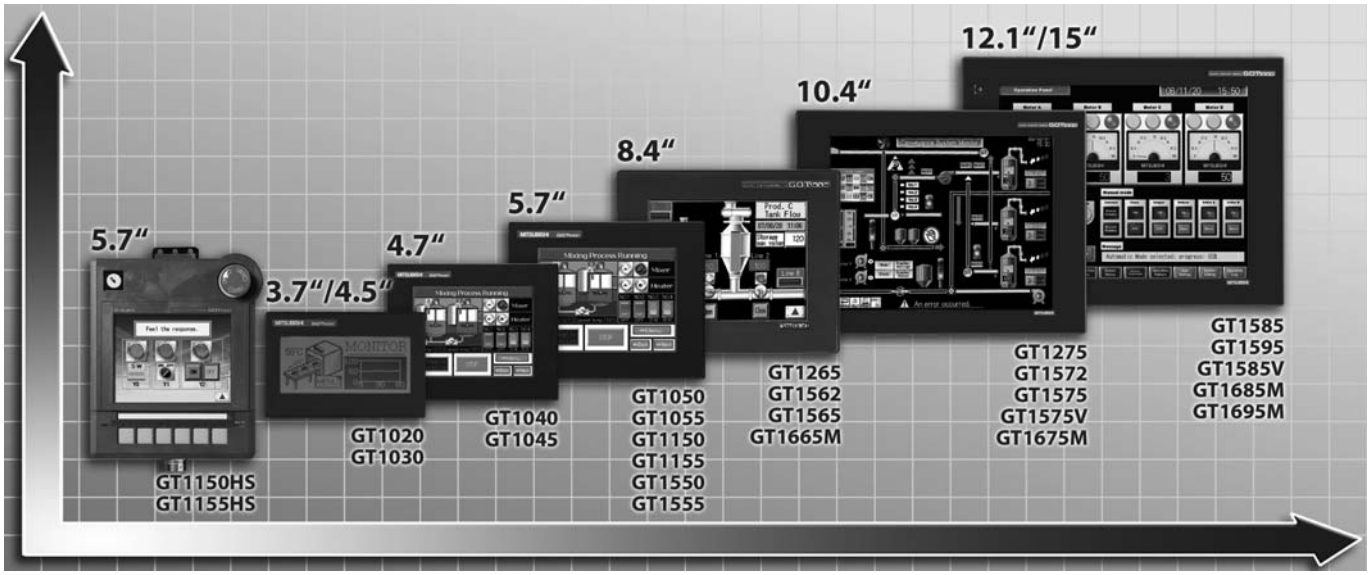
All the information required is at your fingertips, providing maximum transparency for all system processes and with an IP65 rating (IP67 for GOT1000) the HMIs can be used under heavy-duty conditions.

Mitsubishi offers two ranges of Human Machine Interfaces (HMI), the E Series range and the GOT range.These HMIs can be text or graphic and key or touch based.

The graphs below are showing the full range of both main ranges of HMIs.

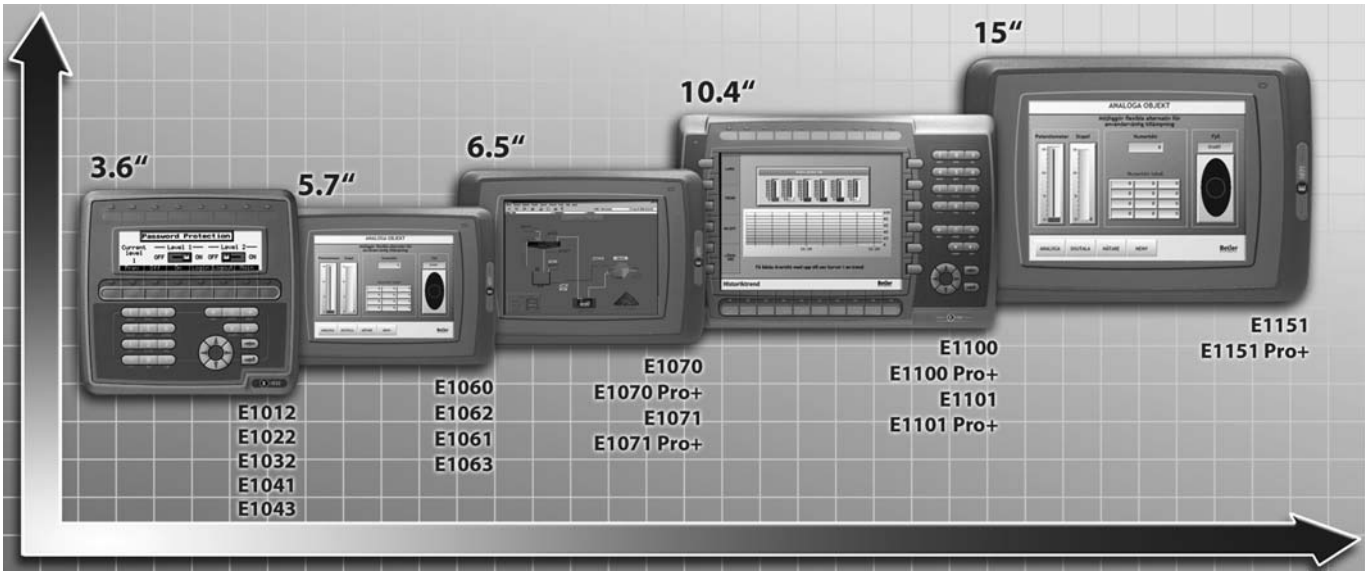
GOT Series Range

The GOT series is the ultimate in control unit quality and performance. The impressive array of functions, monitor sizes, and simple touchscreen operation give users everything they want and need.



E Series Range

The E Series is a superb example of successful industrial design. All units are graphic terminals. Users can select between models with functions keys and high-end touchscreen terminals. Both variants are available with different monitor sizes.



HMI Control Units for Human-Machine Communication

GOT series

Mitsubishi Electric has once again set new standards in human-machine communication with their new GOT1000 series of touch-screen operation terminals. Providing the features customers have been asking for was a top priority in the design of these units – combined with advanced technology and the experience drawn from other series. The result is products that will make work easier for programmers and service staff as well as operators.

The terminals are outstandingly user-friendly. The capabilities of the GOT1000 series really become apparent when they are used in combination with Mitsubishi Electric's MELSEC controllers – whether compact PLCs or modular systems like the advanced System Q platform – or as human-machine interfaces (HMI) for servo amplifiers or frequency inverter drives.

Some of the highlights of the GOT series are:

- High-resolution screens with 256 or even up to 65,536 colours can also display complex graphics
- Video supported assistance if an error occurs due to multimedia capability
- Fast USB ports, mostly the front of the units, with transparent mode to MELSEC Controllers, servo amplifiers and frequency inverters
- Compact Flash cards or USB memory sticks to transfer and save project data and operation system updates
- Unicode enables display of all international languages
- Online language-switching up to 10 different languages
- Optional interfaces available for Ethernet, Melsecnet/10/H, CC-Link IE as well as additional RS232C and RS422/RS485
- Remote maintenance solution in combination with SoftGOT

The control units are programmed with the GT Designer3 software package running on a standard PC under MS Windows®.

E series

The most important benefits for the E series include:

- user-friendly text
- control parameters
- data editing
- alarm handling
- recipes
- menu operation
- international characters are supported

The following interfaces are possible on E series HMI units

- RS422/RS232C/RS485
- Profibus/DP
- Ethernet TCP/IP

Programming the E Series range of HMIs is done with the E Designer programming software on a PC running Windows 98 or above. For the GOTs, the programming software is GT Designer3, which runs on any standard Windows PC.

Drivers for the E series HMI can be easily updated over the Internet. Data communications over longer distances via modems is also possible. This means you can monitor and edit your configuration, programs and data from the comfort of your desk.

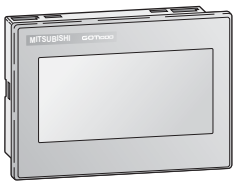
Mitsubishi's HMIs can support a large range of international character sets. Like all products in the MELSEC range, the HMI units have CE approval.

All units are applicable for all MELSEC PLC systems and all major third party PLC manufacturers.

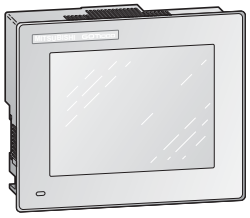
GOT series		GT10 (14 models)	GT11 (5 models)	GT12 (2 models)	GT15 (22 models)	GT16 (12 models)
Display	type	STN	STN	TFT color LCD	STN, TFT	TFT
	dimensions	3.7"/ 4.5"/4.7"/5.7"	5.7"	10.4"/8.4"	5.7"–15"	8.4"–15"
	text (lines x characters)	User definable	User definable	16-dot standard font: 40 chars. x 30 lines (2-byte) 12-dot standard font: 53 chars. x 40 lines (2-byte)	User definable	User definable
	graphical resolution (pixels)	160x64/288x96/320x240	320x240	640x480	320x240 to 1024x768	680x480 to 1024x768
Power supply		5 V DC/24 V DC	24 V DC	100 to 240 V AC	24 V DC/220 V AC	24 V DC/220 V AC
Internal memory capacity		512 KB/1.5 MB/3.0 MB	3 MB	6 MB	5–9 MB (expandable up to 57 MB)	15 MB (expandable up to 57 MB)
External memory card		—	1 (Compact-Flash, 2 GB max.)	1 (Compact-Flash, 2 GB max.)	1 (Compact-Flash, 2 GB max.)	1 (Compact-Flash)
Keyboard		Touch-panel	Touch-panel	Touch-panel	Touch-panel	Touch-panel
Function keys		Touch keys	Touch keys + 6 function keys	Touch keys	Touch keys	Touch keys
Interfaces	serial	2 x RS232, RS422/RS232 (depending on model)	RS232, RS422	RS232, RS422/485	RS232	RS232
	others	GT104□/GT105□: USB (back side)	USB (front)	USB	USB (front)	USB (front), USB host for memory stick
Network possibilities		Serial	Serial	Serial	Ethernet (TCP/IP), CC-Link (IE), RS232, RS422, RS485, A-Bus, Q-Bus, MELSECNET/10/H, Modbus TCP	
IP Rating (front panel)		IP67	IP67/IP65 (portable models)	IP67	IP67	IP67

E series		E1012	E1022	E1032	E1041 E1043	E1060 E1062	E1061 E1063	E1070 E1071	E1100 E1101	E1151
Display	type	LCD, monochrome	LCD, monochrome	LCD, monochrome	TFT	TFT	TFT	TFT	TFT	TFT
	dimensions	89.6x17.9 mm	90.2x24.0 mm	135x36 mm	3.5"	5.7"	5.7"	6.5"	10.4"	15"
	text (lines x characters)	User definable								
	graphical resolution (pixels)	160 x32	240x64	240x64	320x240	320x240	320x240	640x480	800x600	1024x768
Power supply		24 V DC (20–30 V)								
Internal memory capacity		512 kB	512 kB	12 MB	12 MB	12 MB	12 MB	12 MB (expandable)	12 MB (expandable)	12 MB (expandable)
External memory card		—	—	—	—	—	—	1 (CF)	1 (CF)	1 (CF)
Keyboard		Membrane	Membrane	Membrane	Touch-panel	Membrane	Touch-panel	Membrane/ Touch-panel	Membrane/ Touch-panel	Touch-panel
Function keys		Yes	Yes	Yes	Touch keys	Yes	Touch keys	Yes/Touch keys	Yes/Touch keys	Touch keys
Interfaces	serial	RS232, RS422/RS232								
	others	—	—	USB	USB	USB	USB	USB	USB	USB
Network possibilities		Ethernet (TCP/IP) (optional)		Ethernet (TCP/IP), Modbus TCP, MPI (all integrated); Profibus/DP (optional)						
IP Rating (front panel)		IP66								

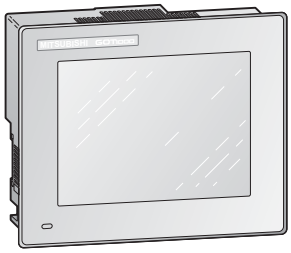
GT1020
GT1030



GT1040
GT1045



GT1050
GT1055



The micro GOTs **GT1020** and **GT1030** offer a bright monochrome STN 3.7" or 4.5"display with touchscreen functionality and tri-colour background illumination (LBD**W** and LBL**W** models, also with white background available) for a broad variety of applications.

Small in dimensions, the versatile micro GOTs offer a number of outstanding powerful features. Different fonts and languages can be used, and when an error occurs the background can be light-up in red as an eye catcher.

They are available with an RS422 (LBL and LBD models) or RS232 (LBL**2** and LBD**2** models) programming interface.

The new models **GT1040** and **GT1050** provide a 2-colour (16 scales of blue/white) STN display, **GT1045** and **GT1055** a 256 colour STN display. The monitor sizes of GT1040/GT1045 amount to 4.7" and of GT1050/GT1055 amount to 5.7". All displays feature a graphical resolution of 320 x 240 pixels and are designed as touch screens.

The internal memory, used for projects and system data, is 3 MB. This is twice as big as the memory of a GT1030. With an option module it is possible to save GOT project data. Suitable connection cables for the back side interfaces (e.g. USB, RS422, and RS232) are available, too.

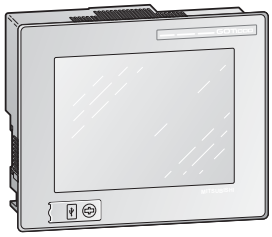
Apart from many automation components of MITSUBISHI ELECTRIC also devices of third party manufacturers and PCs can be connected. The integrated high-speed USB interface (not available for GT1020/GT1030) allows the programming of Mitsubishi PLCs, frequency inverters and servo amplifiers by using transparent mode.

All GOT1000 can be programmed easily via PC with the software package GT Designed .

All GOT1000 panels can be mounted and used horizontal or vertical, which increases the flexibility in planning and application.

Specifications		GT1020-LBL/-LBD/-LBD2/LBLW/-LBDW/-LBDW2 GT1030-LBD/-LBD2/-LBDW/-LBDW2 GT1030-LBL /LBLW	GT1040-QBBD GT1050-QBBD	GT1045-QSBD GT1055-QSBD
Display unit	type	STN, monochrome	STN, blue/white, 16 scales	STN, 256 colours
	dimensions (mm)	86.4x34.5 (3.7")/109.4x36 (4.5")	96x72 (4.7")/115x86 (5.7")	96x72 (4.7")/115x86 (5.7")
	text (lines x characters)	User definable	User definable	User definable
	character height (mm)	User definable, Windows fonts	User definable, Windows fonts	User definable, Windows fonts
	graphical resolution (pixels)	160x64/288x96	320x240	320x240
Power supply		GT1020: 5 V DC/24 V DC GT1030: 24 V DC 5 V DC/24 V DC	24 V DC	24 V DC
Internal memory capacity		512 kB/1.5 MB	3.0 MB	3.0 MB
Memory card slot		—	—	—
Keyboard type		Touch-panel	Touch-panel	Touch-panel
Function keys	internal	Touch keys	Touch keys	Touch keys
	external	—	—	—
LED indicators		—	—	—
Interfaces	serial	RS232, RS422/2 x RS232	RS232, RS422	RS232, RS422
	parallel	—	—	—
	others	—	USB	USB
Interface slot for optional cards		—	1, for saving project data	1, for saving project data
Real-time clock		GT1020: —/GT1030: integrated	Integrated	Integrated
Network communication possibilities	type	Serial (max. 2 GOTs per FX or Q PLC), Multidrop master (max. 16 GOTs via master unit per FX or Q PLC, Modbus RTU)		
	max. no. of nodes	2	2	2
IP Rating (front panel)		IP67	IP67	IP67
Dimensions WxHxD (mm)		113x74x27/145x76x29.5	139x112x41/164x135x56	139x112x41/164x135x56
Weight (kg)		0.2/0.3	0.45/0.7	0.45/0.7
Order information	Art. no.	200738/200491/200492/208670/208668/208669 206969/206970/206971/206972 228100/228101	221929 218492	221930 218491
Accessories		Programming software (refer to page 5), cables and interface adapters (refer to page 77)		

GT1150
GT1155

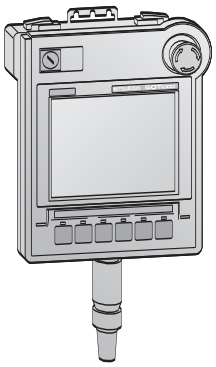


The GT11 series graphic operating terminals **GT1150-QLBD** and **GT1150HS-QLBD** (display with 16 grey scales), **GT1155-QSBD** and **GT1155HS-QSBD** (256 colours) are the standard models of the versatile GOT1000 series. They offer a wide range of basic functions for stand-alone use.

Beside their outstanding speed and performance they features a modern design and a first on the market front USB port for project download and PLC maintenance.

The panels can be mounted and used horizontally or vertically.

GT1150HS
GT1155HS

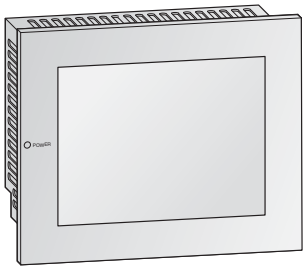


The **GT1150HS-QLBD** and **GT1155HS-QSBD** are handsome portable terminals that boast top level quality for medium sized terminals. They share the same functions as all GT11 series terminals.

Mitsubishi Electric Controllers, inverters and servo amplifiers can be easily programmed via the transparent USB functionality.

All GT11 terminals feature recipes, alarms, multi-language and Unicode support.
Furthermore they offer various graphical object libraries.

GT1275-VNBA
GT1265-VNBA

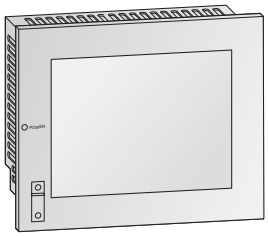


The new **GT12** models offer flexible configurations and expandability. The built-in interfaces (Ethernet, RS422/485 and RS232) enable connection to up to two kinds of FA equipment simultaneously.

The **GT1275-VNBA** has a 10,4" color touch screen, while the screen size of the **GT1265-VNBA** is 8,4".

Both operator terminals provide many essential functions suited for engineering solutions.

GT1550
GT1555



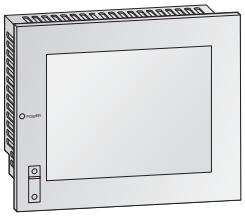
The **GT1550** and **GT1555** models provide an exceptionally clear 5.7" display comprising 16 grey scale steps over 4,096 colours up to 65,536 colours and full VGA resolution quality (640x480 pixels).

Windows fonts are utilized for clear text presentation as well as CF card interface for project operation systems and data storage are available.

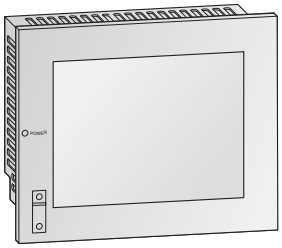
These models open the door to visualization of complex processes with modern functions and full network support.

Specifications		GT1150-QLBD/ GT1155-QSBD/GT1155-QTBD	GT1150HS-QLBD/ GT1155HS-QSBD	GT1275-VNBA/ GT1265-VNBA	GT1550-QLBD/GT1555-QSBD/ GT1555-QTBD/GT1555-VTBD
Display unit	type	QL: STN, 16 grey scales QS: STN, 256 colours QT: TFT, 256 colours	QL: STN, 16 grey scales QS: STN, 256 colours	TFT color LCD	QL: STN monochrome QS: STN 4096 colours QT, VT: TFT, 65536
	dimensions (mm)	115x86 (5.7")	115x86 (5.7")	10.4"/8.4"	115x86 (5.7")
	text (lines x characters)	User definable	User definable	16-dot standard font: 40 chars. x 30 lines (2-byte) 12-dot standard font: 53 chars. x 40 lines (2-byte)	User definable
	character height (mm)	User definable, Windows fonts	User definable, Windows fonts	User definable, Windows fonts	User definable, Windows fonts
	graphical resolution (pixels)	320x240	320x240	640x480	320x240/VTBD: 640x480
Power supply		24 V DC	24 V DC	100 to 240 V AC	
Internal memory capacity		3 MB	3 MB	6 MB	9 MB
Memory card slot		1 (CF)	1 (CF)	1 (Compact-Flash, 2 GB max.)	1 (CF)
Keyboard type		Touch-panel	Touch-panel	Touch-panel	Touch-panel
Function keys	internal	Touch keys	Touch keys + 6 function keys	Touch keys	Touch keys (300 per screen)
	external	—	—	—	—
LED indicators		1 (Power ON)	1 (Power ON)	1 (Power ON)	1 (Power ON)
Interfaces	serial	RS232C, RS422 (2ch)	RS232C, RS422 (1ch)	RS232, RS422/485	RS232
	parallel	—	—	—	—
	others	USB (front side)	USB (top side)	USB	USB (front side)
Interface slot for optional cards		—	—	—	2
Real-time clock		Integrated	Integrated	Integrated	Integrated
Network communication possibilities	type	Serial (max. 2 GOTs per FX or Q PLC), Multidrop master (max. 16 GOTs via master unit per FX or Q PLC, Modbus RTU)	—	Ethernet, RS422/485, RS232	Ethernet, Melsecnet/10/H, CC-Link IE, RS422/RS485, RS232, A-BUS, Q-BUS
	max. no. of nodes	2	—	—	2
IP Rating (front panel)		IP67F	IP67F	IP67	IP67F
Dimensions WxHxD (mm)		164x135x56	176x220x93	303x214x53/241x190x58	167x135x60
Weight (kg)		0.7	1.0	2.3/1.7	1.1
Order information	Art. no.	162709/ 162710/215077	170180/170181	229836/ 229837	203472/203471/203470/ 209823
Accessories		Programming software (refer to page 5), cables and interface adapters (refer to page 77)			

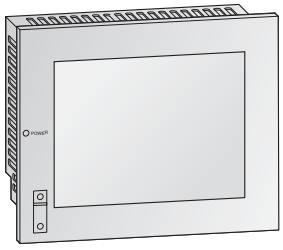
GT1562
GT1565



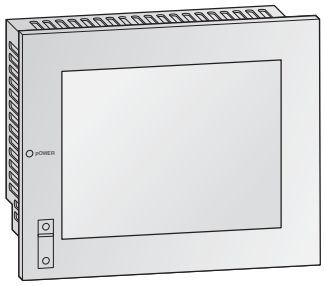
GT1572



GT1575
GT1575V



GT1585
GT1595
GT1585V



The proprietary operating system as well as the completely new developed hardware result in an outstanding performance and quality of the GT15 operator terminals. The user can choose between several fast project up- and download options; high-speed serial connection with 115 kBaud, USB or project transfer via CF-card is available.

In addition, the GT15 offer Ethernet project transfer via the optional Ethernet interface GT15-J71E71-100.

MELSEC PLCs can easily be programmed using the front USB port with integrated Transparent Mode, so updates on PLCs, servo amplifiers, inverters and GOT terminals can be accomplished without opening the cabinet.

The file system of the CF card is PC compatible. Projects and operating system components can be downloaded to the CF card. The GT15 can load the files from the CF card. This is a crucial advantage for manufacturers of serial machines.

In terms of networks, the GT15 are especially powerful with options for MELSECNET/10/H, CC-Link (IE) and Ethernet as well as the four-driver-concept (4 drivers at the same time and the possibility of data exchange via gateway between the drivers as well as third party manufacturers).

By using an MES option card the GT15 are able to communicate direct with Windows databases without needing a Gateway-PC.

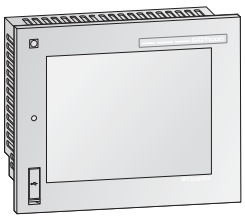
The Video models **GT1585V-STBD** and **GT1575V-STBD** additionally support video/RGB input to monitor images from PC's, cameras and vision sensors directly on the GOT.

All GT15 operator terminals listed on this page are available as AC type (-A models*) or as DC type (-D models).

*Not for the video models

Specifications		GT1562-VNBA/GT1565-VTBA GT1562-VNBD/GT1565-VTBD	GT1572-VNBA/GT1575-VNBA GT1572-VNBD/GT1575-VNBD	GT1575-VTBA/GT1575-STBA GT1575-VTBD/GT1575-STBD, GT1575V-STBD	GT1585-STBA/GT1595-XTBA GT1585-STBD/GT1595-XTBD, GT1585V-STBD
Display unit	type	TFT, 16 colours/65536 colours	TFT, 16 colours/256 colours	TFT, 65536 colours (expandable)	TFT, 256 colours (expandable)
	dimensions (mm)	171x128 (8.4")	211x158 (10.4")	211x158 (10.4")	246x185 (12.1")/304x228 (15")
	text (lines x characters)	User definable	User definable	User definable	User definable
	character height (mm)	User definable, Windows fonts	User definable, Windows fonts	User definable, Windows fonts	User definable, Windows fonts
	graphical resolution (pixels)	640x480	640x480	640x480/800x600	800x600/1024x768
Power supply	A types	100–240 V AC	100–240 V AC	100–240 V AC	100–240 V AC
	D types	24 V DC	24 V DC	24 V DC	24 V DC
Internal memory capacity		VN types: 5 MB (expandable up to 53 MB) VT types: 9 MB (expandable up to 57 MB)	5 MB (expandable up to 53 MB)	9 MB (expandable up to 57 MB)	9 MB (expandable up to 57 MB)
Memory card slot		1 (compact flash 256 MB max.)	1 (compact flash 256 MB max.)	1 (compact flash 256 MB max.)	1 (compact flash 256 MB max.)
Keyboard type		Touch-panel	Touch-panel	Touch-panel	Touch-panel
Function keys	internal	Touch keys	Touch keys	Touch keys	Touch keys
	external	—	—	—	—
LED indicators		1	1	1	1
Interfaces	serial	RS232C	RS232C	RS232C	RS232C
	parallel	—	—	—	—
	others	USB (on panel front)	USB (on panel front)	USB (on panel front)	USB (on panel front)
Interface slot for optional cards		1/2	1	2	2
Real-time clock		Integrated	Integrated	Integrated	Integrated
Network communication possibilities		Ethernet, Melsecnet/10/H, CC-Link IE, RS422/RS485, RS232, A-BUS, Q-BUS	Ethernet, Melsecnet/10/H, CC-Link IE, RS422/RS485, RS232, A-BUS, Q-BUS	Ethernet, Melsecnet/10/H, CC-Link IE, RS422/RS485, RS232, A-BUS, Q-BUS	Ethernet, Melsecnet/10/H, CC-Link IE, RS422/RS485, RS232, A-BUS, Q-BUS
IP Rating (front panel)		IP67	IP67	IP67	IP67
Dimensions WxHxD (mm)		241x150x56	303x214x56	303x214x56	316x242x56/397x296x61
Weight (kg)		1.9	2.3	2.3/2.4	2.8/4.9
Order information	Art. no.	166240/162705 169480/169481	166241/166242 169482/169483	162706/162707/169484/169485, video model 203496	162708/169464/169486/203469, video model 203495
Accessories		Programming software (refer to page 5), cables and interface adapters (refer to page 77)			

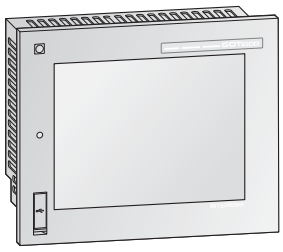
GT1665M



The new all-in-one models of the GT16 series are packed with all the solutions to meet the needs of customers. This leads GT16 terminals to become full components of system control management.

Many of the well-known useful functions are already integrated, e.g. a variety of network connections such as Ethernet and RS422/RS485 beside the generously measured project and data memory of 15 MB (with CF card expandable up to 57 MB max.).

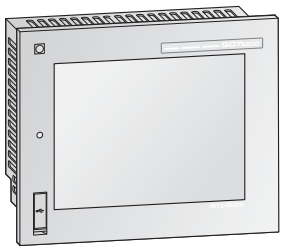
GT1675M



Using separate expansions units it is very easy to upgrade the GT16 with increased memory, special functions or additional interfaces. The high-speed USB ports on the front panel allow the user to save and restore project data and PLC programs via standard USB memory sticks. This is very helpful if the PLC CPU needs to be exchanged. The PLC program can be saved and restored using the USB port of the GT16.

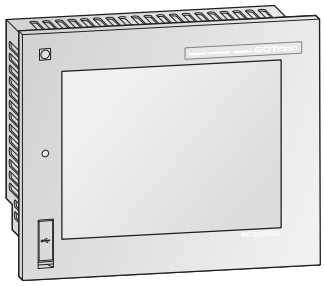
The high-resolution TFT monitor shows pictures, windows, diagrams and touchkeys in highest quality and up to 65536 colours. All screens can be created individually with the GT Designer3 software, installed on a standard PC. Every item can be moved freely on the whole 15" monitor. This makes using easier even for complex applications.

GT1685M



Up to four CCD cameras can be connected, and with an installed multimedia option card it is possible to record and analyze event-driven videos.

GT1695M



Ports for Microphones and speakers are integrated. The build-in Self-diagnosis function recognizes problems and plays an instruction video or shows helpful hints. In perfect interaction with the powerful iQ platform this function helps to decrease downtimes.

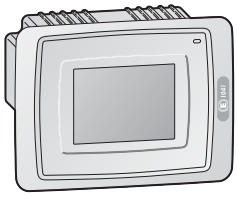
Using an MES option card GT16 operation terminals can communicate directly with Windows databases without the need of a gateway PC.

Specifications		GT1665M-STBA, GT1665M-STBD, GT1665M-VTBA, GT1665M-VTBD	GT1675M-STBA, GT1675M-STBD, GT1675M-VTBA, GT1675M-VTBD	GT1685M-STBA, GT1685M-STBD	GT1695M-XTBA, GT1695M-XTBD
Display unit	type	8.4", TFT, 65536 colours	10.4", TFT, 65536 colours	12.1", TFT, 65536 colours	15", TFT, 65536 colours
	dimensions (mm)	171x128	211x158	249x184.5	304.1x228.1
	text (lines x characters)	User definable	User definable	User definable	User definable
	character height (mm)	User definable, Windows fonts	User definable, Windows fonts	User definable, Windows fonts	User definable, Windows fonts
	graphical resolution (pixels)	STB□: 800x600 VTB□: 640x480	STB□: 800x600 VTB□: 640x480	800x600 (SVGA)	1024x768 (XGA)
Power supply	A types	100–240 V AC	100–240 V AC	100–240 V AC	100–240 V AC
	D types	24 V DC	24 V DC	24 V DC	24 V DC
Memory capacity		15 MB	15 MB	15 MB	15 MB (expandable up to 57 MB)
Internal memory capacity		1 (compact flash)	1 (compact flash)	1 (compact flash)	1 (compact flash)
Keyboard type		Touch-panel	Touch-panel	Touch-panel	Touch-panel
Function keys	internal	Touch keys	Touch keys	Touch keys	Touch keys
	external	—	—	—	—
LED indicators		1 (POWER)	1 (POWER)	1 (POWER)	1 (POWER)
Interfaces		Ethernet (TCP/IP), RS232, RS422/485, USB (front), CF slot, Human sensor, optional: function cards, Video out			
Interface slot for optional cards		1 CF-Slot	1 CF-Slot	1 CF-Slot	1 CF-Slot
Multimedia capability		Integrated	Integrated	Integrated	Optional
Real-time clock		Integrated	Integrated	Integrated	Integrated
Network communication possibilities		Ethernet (TCP/IP), CC-Link (IE), Modbus, RS232, RS422/485, A-Bus, Q-Bus, MELSECNET/10/H			
IP Rating (front panel)		IP67	IP67	IP67	IP67
Dimensions WxHxD (mm)		241x190x52	303x214x49	316x242x52	397x296x61
Weight (kg)		1.7	2.1	2.7	5.0
Order information	Art. no.	221949/221950 221951/221952	221945/221946 221947/221948	221360 221361	221358 221359
Accessories		Programming software (refer to page 5), cables and interface adapters (refer to page 77)			

E1012
E1022
E1032

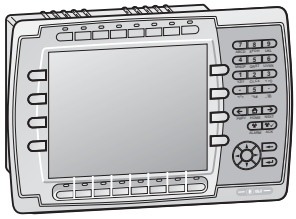
E1012, **E1022** and **E1032** have programmable function keys and a separate keypad. The graphic-capable displays illustrate symbols, alarms, line diagrams and text in arbitrary sizes. Formulas, text and changes in the sequence program can be done directly via the keys.

E1041
E1043



The **E1041** and **E1043** terminals have a 3.5" TFT touch screen (65,536 colours or 16 grey scales). Recipes, text and editing changes are entered via keys. Password levels protect the system against unauthorised access, while sixteen separate alarm groups keep you informed on all-important developments. The unit features two PLC ports, a USB host port to connect mouse, keyboard, printer and USB memory as well as an integrated Ethernet interface. Profibus/DP is available via a separate extension module.

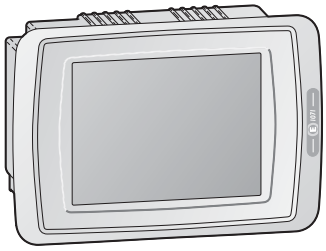
E1060
E1062



The **E1060** and **E1062** units provide a 5.7" TFT display with 65,536 colours or 2 colours (blue/white). Both models feature screen-oriented function keys for user- friendly operation.

The **E1061** and **E1063** terminals have a 5.7" TFT touch screen (65,536 colours or 16 grey scales). Recipes, text and editing changes are entered via touch keys on the display.

E1061
E1063



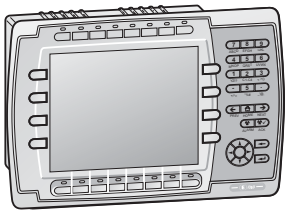
More features of the **E1060 to E1063** are: Recipes,text and editing changes are entered via keys. Password levels protect the system against unauthorised access, while sixteen separate alarm groups keep you informed on all-important developments.

Each unit features two PLC ports, one USB host port to connect mouse, keyboard, printer and USB memory sticks as well as an integrated Ethernet interface.

Profibus/DP is available via a separate extension module.

Specifications		E1012/E1022	E1032	E1041/E1043	E1060/E1062	E1061/E1063
Display unit	type	LCD monochrome	LCD monochrome	TFT colour/TFT grey scale	TFT colour/TFT grey scale	TFT colour/TFT grey scale
	dimensions (mm)	89.6x17.9/90.2x24.0	135x36	75x54 (3.5")	120x91 (5.7")	145x110 (5.7")
	text (lines x characters)	User definable	User definable	User definable	User definable	User definable
	character height (mm)	User definable, Windows fonts	User definable, Windows fonts	User definable, Windows fonts	User definable, Windows fonts	User definable, Windows fonts
	graphical resolution (pixels)	160x32/240x64	240x64	320x240	320x240	320x240
Power supply		24 V DC (20–30 V)	24 V DC (20–30 V)	24 V DC (20–30 V)	24 V DC (20–30 V)	24 V DC (20–30 V)
Internal memory capacity		512 kB	12 MB	12 MB	12 MB	12 MB
Flash memory		—	32 MB (Intel Strata Flash)	32 MB (Intel Strata Flash)	32 MB (Intel Strata Flash)	32 MB (Intel Strata Flash)
Keyboard type		Membrane	Membrane	Touch-panel	Membrane	Touch-panel
Function keys	internal	6	8	Touch keys	16	Touch keys
	external	—	—	—	—	—
LED indicators		6 (integrated in keys)	16 (8 integrated in keys)	1 (Power ON)	16 (8 integrated in keys)	1 (Power ON)
Interfaces	serial	RS232C, RS422/RS485	RS232C, RS422/RS485	RS232C, RS422/RS485	RS232C, RS422/RS485	RS232C, RS422/RS485
	parallel	—	—	—	—	—
	others	—	USB	USB	USB	USB
Interface slot for optional cards		1	1	1	1	1
Real-time clock		Integrated	Integrated	Integrated	Integrated	Integrated
Network communication possibilities		Ethernet (TCP/IP) (optional)	Ethernet (TCP/IP), Modbus TCP, MPI (all integrated); Profibus/DP (optional)	Ethernet (TCP/IP), Modbus TCP, MPI (all integrated); Profibus/DP (optional)	Ethernet (TCP/IP), Modbus TCP, MPI (all integrated); Profibus/DP (optional)	Ethernet (TCP/IP), Modbus TCP, MPI (all integrated); Profibus/DP (optional)
IP Rating (front panel)		IP66	IP66	IP66	IP66	IP66
Dimensions WxHxD (mm)		155x114x40/155x155x41	202x187x63	156x119x63	275x168x63	201x152x63
Weight (kg)		0.4/0.5	0.9	0.56	1.1	0.87
Order information	Art. no.	202084/202085	169297	169298/169299	216254/216306	216305/216307
Accessories		Programming software E-Designer (refer to page 6), cables and interface adapters (refer to page 77)				

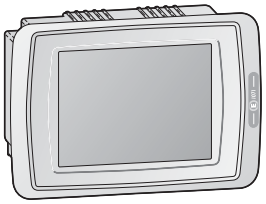
E1070
E1070 Pro+



The operator terminal **E1070** offers a 6.5" TFT display with 65,536 colours and a resolution of 640 x 480 pixels. 16 freely programmable function keys facilitate the inputs directly at the terminal.

The 6.5" TFT colour display of the **E1071** with 65,536 colours provides a user-friendly touch screen operation. Recipes, text and editing changes are entered via touch keys.

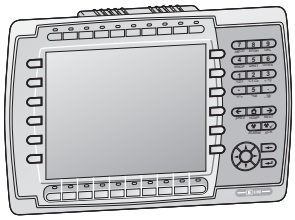
E1071
E1071 Pro+



The operator terminal **E1100** offers a 10.4" TFT display with 65,536 colours and a resolution of 800 x 600 pixels. Freely programmable function keys facilitate the inputs directly at the terminal.

The operator terminals **E1101** and **E1151** provide a user-friendly TFT colour touchscreen. The E1101 offers a resolution of 800 x 600 pixels on a 10.4" screen, the E1151 provides a 15" screen with 1024 x 768 pixels.

E1100
E1100 Pro+

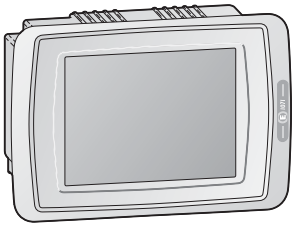


All **E1000** operator terminals on this page provide two PLC ports, a USB host port to connect mouse, keyboard, printer and USB memory as well as an integrated Ethernet interface. Profibus/DP is available via a separate extension module.

The internal memory of 12 MB can be expanded.

The integrated password protection protect the system against unauthorised access, and sixteen separate alarm groups keep you informed on all-important developments.

E1101, E1101 Pro+
E1151, E1151 Pro+
DT1151

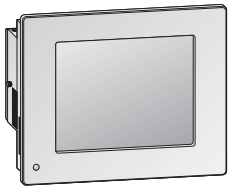


Using an **E1000 Pro**+ operator terminal gives the user all the functionality of the standard E1000 family but also makes it possible to view external files such as PDF files, HTML pages and PowerPoint presentations directly on the screen of the operator terminal.

The **DT1151** is an industrial monitor with a 15" TFT-LCD touch screen, designed to be mounted in a cabinet and connected to an industrial PC. The monitor is optimized for a max. resolution of 1024 x 768 pixels.

Specifications		E1070/E1070 Pro+	E1071/E1071 Pro+	E1100/E1100 Pro+	E1101/E1101 Pro+, E1151/E1151 Pro+, DT1151
Display unit	type	TFT	TFT	TFT	TFT
	dimensions (mm)	134x100 (6.5")	134x100 (6.5")	211x158 (10.4")	211x158 (10.4") , 304x228 (15")
	text (lines x characters)	User definable	User definable	User definable	User definable
	character height (mm)	User definable, Windows fonts	User definable, Windows fonts	User definable, Windows fonts	User definable, Windows fonts
	graphical resolution (pixels)	640x480	640x480	800x600	800x600 , 1024x768
Power supply		24 V DC (20–30 V)	24 V DC (20–30 V)	24 V DC (20–30 V)	24 V DC (20–30 V)
Internal memory capacity		12 MB (expandable)	12 MB (expandable)	12 MB (expandable)	12 MB (expandable)
Memory card (intern./extern.)		2 (compact flash 4–1024 MB)	2 (compact flash 4–1024 MB)	2 (compact flash 4–1024 MB)	2 (compact flash 4–1024 MB)
Keyboard type		Membrane	Touch-panel	Membrane	Touch-panel
Function keys	internal	16 (8 with integrated LEDs)	Touch keys	20 (10 with integrated LEDs)	Touch keys
	external	Max. 64 (optional with MAC-E-Key16)	Max. 64 (optional with MAC-E-Key16)	Max. 64 (optional with MAC-E-Key16)	Max. 64 (optional with MAC-E-Key16)
LED indicators		18	1 (Power ON)	20	1 (Power ON)
Interfaces	serial	RS232C, RS422, RS485	RS232C, RS422, 485	RS232C, RS422, RS485	RS232C, RS422, 485
	parallel	—	—	—	—
	others	USB	USB	USB	USB
Interface slot for optional cards		1	1	1	1
Real-time clock		Integrated	Integrated	Integrated	Integrated
Network communication possibilities		Ethernet TCP/IP, Modbus TCP, MPI (all integrated); Profibus/DP (optional)	Ethernet TCP/IP, Modbus TCP, MPI (all integrated); Profibus/DP (optional)	Ethernet TCP/IP, Modbus TCP, MPI (all integrated); Profibus/DP (optional)	Ethernet TCP/IP, Modbus TCP, MPI (all integrated); Profibus/DP (optional)
IP Rating (front panel)		IP65	IP65	IP65	IP65
Dimensions WxHxD (mm)		285x177x62	219x154x61	382x252x64	302x228x64 , 398x304x60
Weight (kg)		1.3	1.1	2.3	2.0/3.7
Order information	Art. no.	156096/203301	156097/203302	156098/203303	156099/203324 156100/203325/DT1151: 203326
Accessories		Programming software (refer to page 5), cables and interface adapters (refer to page 77)			

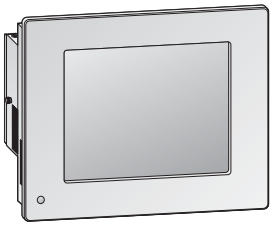
IPC-MC1121



Personal computers are a part of everyday life as Industrial PCs are a part of automation and process control.

The **IPC1000** line based on ETX technology offers supreme computing performance with processors based on Intel®'s Celeron®/ Core-Duo technology giving extremely low power consumption.

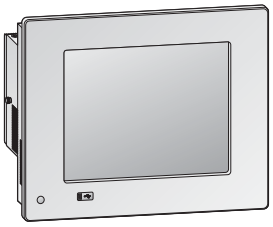
IPC-MC1151



The ETX technology permits scalable CPU performances for a wide range of industrial applications.

Ruggedly designed for heavy-duty industrial applications and environments, these PCs feature high quality, fast performance, attractive design and brilliantly legible displays.

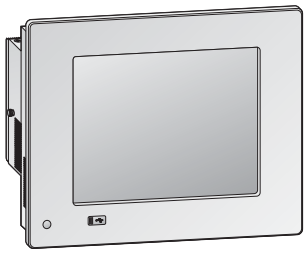
IPC-VP1151



A wide operating and storage temperature range, tough vibration resistance and high IP ratings mean these IPCs can be used in locations users could never consider before.

The integrated innovative cooling concept realizes passive and fanless cooling for the highest processor performance but at the same time reducing one of the major moving parts that could fail.

IPC-VP1171



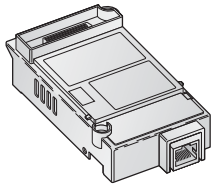
The CANopen, DeviceNet or Profibus field buses can optionally be integrated directly on board of the V panels.

Specifications		IPC-MC1121	IPC-MC1151	IPC-VP1151	IPC-VP1171
Display unit	type	TFT	TFT	TFT	TFT
	dimensions (mm)	12.1"	15"	15"	17"
	graphical resolution (pixels)	800x600	1024x768	1024x768	1280x1024
Power supply		24 V DC	24 V DC	24 V DC	24 V DC
Processor type		Intel Celereon 800 MHz	Intel Celereon 800 MHz	Intel Pentium M370 1.5 GHz	Intel Pentium M370 1.5 GHz
Processor cooling system		Fanless	Fanless	Fanless	Fanless
Operating system		Windows XP Professional	Windows XP Professional	Windows XP Professional	Windows XP Professional
Internal memory capacity		512 MB RAM	512 MB RAM	512 MB RAM	512 MB RAM
Screen type		Resistive analog touch-panel	Resistive analog touch-panel	Resistive analog touch-panel	Resistive analog touch-panel
Integrated harddisk		40 GB	40 GB	40 GB	40 GB
LED indicators		1 (Power ON)	1 (Power ON)	1 (Power ON)	1 (Power ON)
Interfaces	serial	1 x RS232C	1 x RS232C	2 x RS232C	2 x RS232C
	others	2 x USB (2 x rear side)	2 x USB (2 x rear side)	5 x USB (1 x front; 4 x rear side)	5 x USB (1 x front; 4 x rear side)
LAN network interface		1x10/100	1x10/100	1x10/100, 1x100/1000	1x10/100, 1x100/1000
Free card slots		—	—	2xPCI, PCMCIA slot optional	2xPCI, PCMCIA slot optional
Field busses		CANopen or DeviceNet or Profibus	CANopen or DeviceNet or Profibus	CANopen or DeviceNet or Profibus	CANopen or DeviceNet or Profibus
Internal Drives		CompactFlash, HDD optional	CompactFlash, HDD optional	CompactFlash, HDD optional	CompactFlash, HDD optional
IP Rating		IP65 (front)	IP65 (front)	IP65 (front)	IP65 (front)
Operating temperature range		0–50 °C	0–50 °C	0–50 °C	0–50 °C
Storage temperature range		-20–+60 °C	-20–+60 °C	-20–+60 °C	-20–+60 °C
Operating humidity range		20–85 % (no condensation)	20–85 % (no condensation)	20–85 % (no condensation)	20–85 % (no condensation)
Vibration resistance		1 G: resistant to vibrations from 10–500 Hz along all 3 axes (acc. to EN 60068-2-6)			
Dimensions WxHxD (mm)		380x300x53	452x362x57	450x354x158	461x399x166
Order information	Art. no.	204305	204306	204307	204308

Interface Adapters and Cables

The HMI communications and interface adapters support connection directly to a PLC or directly to a network.

All GT15 modules can be used for the bew GT16 terminals, too, except the Ethernet module GT15-J71E71-100.



Adapter type (use)	Interface name	Application	Order number
MELSEC A-Bus interface	**GT15-75ABUSSL**	GT15/GT16 (1 channel), slim model	166243
	GT15-ABUS	GT15/GT16 (1 channel), standard model	169467
	GT15-75ABUS2SL	GT15/GT16 (2 channels), slim model	166304
	GT-15ABUS2	GT15/GT16 (2 channels), standard model	169468
MELSEC Q-Bus interface	**GT15-75QBUSSL**	GT15/GT16 (1 channel), slim model	166305
	GT15-QBUS	GT15/GT16 (1 channel), standard model	169465
	GT15-75QBUS2SL	GT15/GT16 (2 channels), slim model	166306
	GT15-QBUS2	GT15/GT16 (2 channels), standard model	169466
Ethernet RJ45	**GT15-J71E71-100**	GT15	166309
Serial interface	**GT15-RS2-9P**	GT15/GT16 (serial interface RS232, 9-pin D-Sub)	169469
	GT15-RS2T4-9P	GT15/GT16 (converter RS232 -> RS422; 9-pin D-Sub) *	166307
	GT15-RS4-9S	GT15/GT16 (serial interface RS422/485, 9-pin D-Sub)	169470
	GT15-RS4-TS	GT15/GT16 (serial interface RS422/485, screw terminals)	169471
	GT15-RS2T4-25P	GT15/GT16 (converter RS232 -> RS422; 25-pin D-Sub)	166308
	GT01-RS4-M	RS-485 Multi-drop master unit, 16 GOT's to one FX/Q PLC	225497
CC-Link interface	**GT15-J61BT13**	GT15/GT16	203494
	GT15-J71GP23-SX	GT15/GT16, CCLink IE interface, 1 GBaud, optical ring	218576
MELSECNET/10	**GT15-J71LP23-25**	GOT Melsecnet/H/10 for GT15/GT16 HMIs, optical ring(SI)	229842
	GT15-J71BR13	GOT Melsecnet/H/10 for GT15/GT16 HMIs, coaxial bus	229843
USB	**GT15-PRN**	GT15/GT16 (for USB connection to pictbridge compatible printers)	170169
MES option card (for direct database connection)	**GT15-MESB48M**	GT15 option card with 48 MB expansion memory and MES functionality	203473
	GT16M-MESB	GT16 option card with MES functionality	221369

* not supported by GT15, 5.7"

For all GOT and E series operator terminals a wide variety of different cables are available.

All cables and interfaces have to be ordered separately due to the specific application. All GT15 cables can be used for GT16, too.

The following table shows an overview of the available cables.

Operator terminal	Interface	Cable name	Connector	Application	Available length (m)	Order number
E1000	RS232	**CAB30**	D-SUB female connector 9 pin<–> D-SUB female connector 9 pin	Personal Computer	3	163002
E1000	RS232	**CAB34/3**	D-SUB male connector 9 pin<–> MINI-DIN male connector 6 pin	MELSEC System Q	3	163006
E1000	RS422	**CAB36**	D-SUB male connector 25 pin <-> D-SUB male connector 9 pin	Siemens S7/MPI direct	3	205178
GT1020/GT1030	RS232	**GT01-C30R2-6P**	Mini-DIN male connector 6 pin <-> D-SUB male connector 9 pin	Personal Computer	3	163959
GT1020/GT1030	RS422	**GT10-C30R4-8P**	Open terminals <-> MINI-DIN male connector 8 pin	MELSEC FX family	3	200494
GT1020/GT1030	RS232	**GT10-C30R2-6P**	Open terminals <-> MINI-DIN male connector 6 pin	MELSEC System Q	3	200498
GT1020/GT1030	RS232	**GT10-RS2TUSB-5S**	Mini-DIN male connector 6 pin <-> MINI-B USB	PC + GT09-C20USB-5P	3	200500 +166373
GT10 QVGA, GT11, GT15, GT16	RS232	**FX-232-CAB1**	D-SUB male connector 9 pin <–> D-SUB male connector 9 pin	Personal Computer	3	124972
GT10 QVGA, GT11, GT15, GT16	USB	**GT09-C20USB-5P**	USB <–> USB		2	166373
GT10 QVGA, GT11, GT15, GT16	RS232	**GT01-C30R2-6P**	D-SUB male connector 9 pin<–> MINI-DIN male connector 6 pin	MELSEC System Q	3	163959
GT10 QVGA, GT11, GT15, GT16	RS232	**GT01-C30R2-9S**	D-SUB male connector 9 pin <–> D-SUB male connector 9 pin	MELSEC FX family	3	163957
GT10 QVGA, GT11, GT15, GT16	RS422	**GT01-C□□□R4-8P**	D-SUB female connector 9 pin<–> MINI-DIN female connector 8 pin	MELSEC FX family	1, 3, 10, 20, 30	163948 (3m)
GT10 QVGA, GT11, GT15, GT16	RS422	**GT01-C□□□R4-25P**	D-SUB female connector 9 pin <–> D-SUB female connector 25 pin	MELSEC A/Q series	3, 10, 20, 30	163953 (3m)
GT10 QVGA, GT11, GT15, GT16	Q(A)nS Bus	**GT15-A1SC□□B**	Special Bus connector	MELSEC (Q)AnS series	0.7, 1.2, 3, 5	166358 (3m)
GT10 QVGA, GT11, GT15, GT16	A Bus, QnA Bus	**GT15-C□□□NB**	Special Bus connector	GT15/GT16 via AnA-/QnA-Bus	0.7, 1.2, 3, 5, 10, 20, 30	166371 (3m)
GT10 QVGA, GT11, GT15, GT16	System Q Bus	**GT15-QC□□□B**	Special Bus connector	MELSEC System Q	0.6, 1, 3, 5, 10	166348 (3m)
GT16	RS422/RS485	**GT16-C20R4-9S**	D-SUB female connector 25 pin <-> D-SUB female connector 9 pin	MELSEC System Q	0.2	221380

For further connection possibilities please refer to HMI Technical cataloge

FREQUENCY INVERTERS

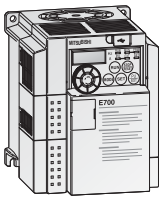
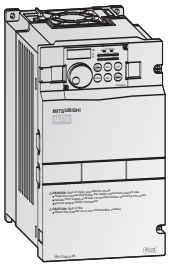
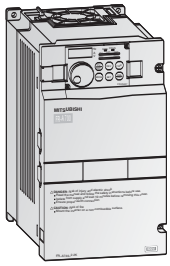
Mitsubishi's comprehensive range of frequency inverters offers a wealth of benefits for the user, making it easy to choose the perfect solution for every drive application.

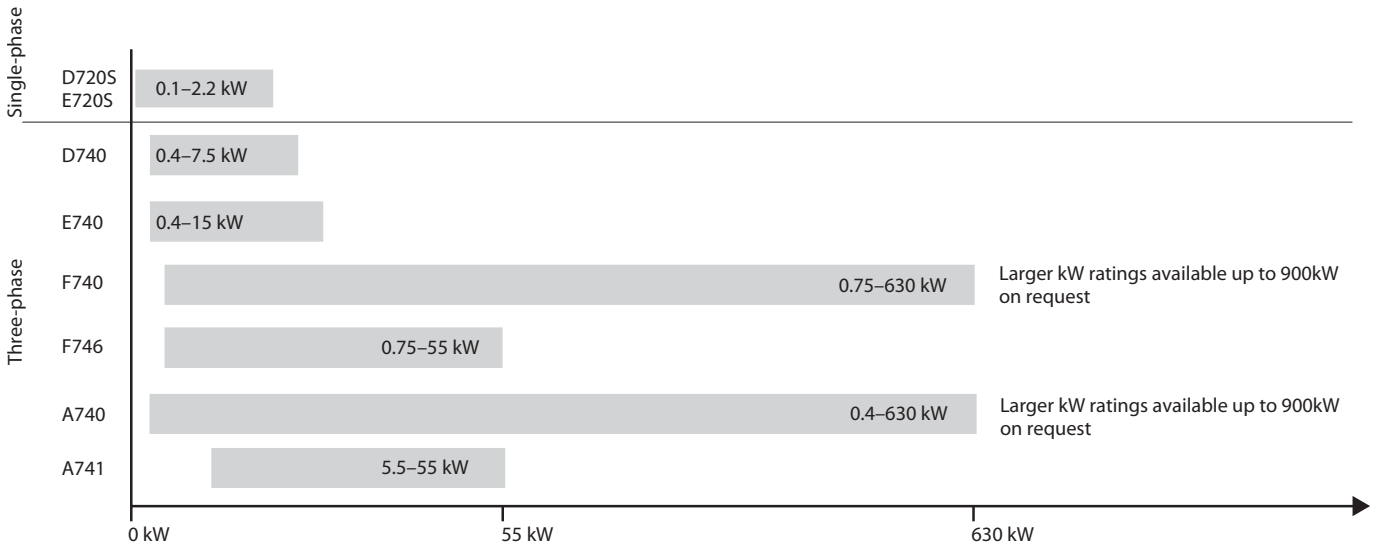
With most Mitsubishi Frequency Inverters an overload capacity of 200 % is standard. This means they deliver double the performance of the competing inverters with the same rating.

Mitsubishi Electric inverters also have active current limiting. This provides the perfect response characteristics of the current vector system and gives you the confidence you need for demanding drive applications. The system instantly identifies overcurrents and limits them automatically with its fast response, allowing the motor to continue operating normally at the current threshold.

Mitsubishi inverters are also able to communicate with industry standard bus systems like Ethernet TCP/IP, Profibus/DP, DeviceNet, CC-Link, CANopen, LonWorks, RS485/Modbus RTU making it possible to integrate frequency inverters as part of a complete automation system.

Mitsubishi inverters are real energy savers achieving maximum drive capacity utilisation with minimum power consumption. Flux optimisation ensures that the connected motor only gets exactly the amount of magnetic flux required for optimum efficiency. This is particularly important at low speeds as motors are normally using a voltage/frequency control system.

Feature	FR-D700	FR-E700	FR-F700	FR-A700
				
Rated motor output range	0.1–7.5 kW	0.1–15 kW	0.75–630 kW	0.4–630 kW
Frequency range	0.2–400 Hz	0.–400 Hz	0.5–400 Hz	0.2–400 Hz
Power supply	Single-phase, 200–240 V (-15 %/+10 %) Three-phase, 380–480 V (-15 %/+10 %)	Single-phase, 200–240 V (-15 %/+10 %) Three-phase, 380–480 V (-15 %/+10 %)	Three-phase, 380–480 or 500 V (-15 %/+10 %)	Three-phase, 380–480 or 500 V (-15 %/+10 %)
Protection	IP20	IP20	FR-F700: IP00/IP20 FR-F746: IP54	FR-A740: IP00/IP20 FR-A741: IP00
Special functions	● Sensorless vector control ● V/f control ● Brake transistor ● Safe Torque Off (STO) according EN 61800-5-2 ● Energy saving control (Optimum excitation control) ● Maintenance timer	● Real sensorless vector control ● V/f control ● Brake transistor ● Safe Torque Off (STO) according EN 61800-5-2 ● Torque limit ● Ext. brake control ● Flying start ● Remote I/O ● Maintenance timer	● Energy saving control ● Simple magnetic flux vector control ● V/f control ● Traverse function ● Switch motor to direct mains operation ● Advanced PID function (multi pump function) ● Regeneration avoidance function ● Flying start ● Life time diagnostics	● Torque control ● Positon control ● Real sensorless vector control ● Closed loop vector control ● Power regeneration (FR-A741 only) ● Regeneration avoidance function ● Integrated PLC function ● Easy gain tuning ● Life time diagnostics
Specifications	Refer to page 80	Refer to page 81	Refer to page 82	Refer to page 84



Intelligent Motor Control Functions

Compatible with many new applications

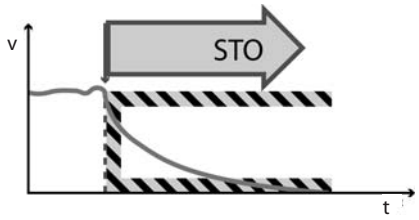
- PID control
  The integrated PID control for example supports a flow control for pumps.
- Torque boost
  Torque boost selection is possible.

Comprehensive protection functions for safe operation

- Built-in electronic overcurrent protection
- Selection of the protection function for automatic retry after alarm occurence.

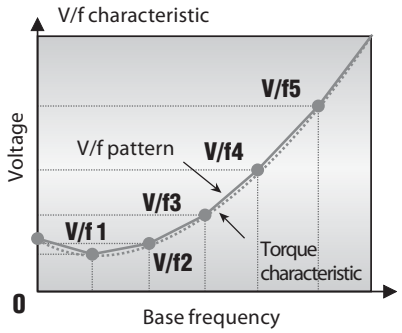
Safety function "Safe Torque Off" (STO) according EN 61800-5-2

The "Safe Torque Off" function (STO) disconnects the power from the motor and prevents an unexpected re-start. Thereupon the motor coasts to a halt. Compared to the traditional technology with contactors, this integrated Safety function reduces the effort in hardware, wiring and maintenance and offers higher performance and lifetime.



Flexible 5-point V/f curve

The integrated flexible 5-point V/f curve enables you to match the torque curve perfectly to the characteristics of your machine.



Magnetic flux vector control

The integrated flux vector control of the inverter system makes it possible to achieve high torques, even at low motor speeds.

The sensorless vector control system of the FR-A700 series enables fast, high-precision speed and torque regulation, even when using general-purpose motors without an encoder.

When the FR-A7AP is mounted to the FR-A700, full-scale vector control operation can be performed using a motor with encoder. Fast response/high accuracy speed control (zero speed control, servo lock), torque control, and position control can be performed. Vector control offers excellent control characteristics when compared to V/F control and other control techniques, achieving the control characteristics equal to those of DC machines.

Compatible with numerous I/Os

- Multi-speed operation
  (15 different pre-selected speeds are available)
- 0/4 to 20 mA and 0 to 5 V DC /
  0 to 10 V DC control input
- Multi-input terminals: selection of different input functions
- Multi-output terminals: selection of different output functions
- 24 V external power supply output
  (permissible values: 24 V DC/0.1 A)

Operating functions and other convenient functions

- Frequency jumps (three points) to avoid the machine's resonant frequency
- Fast acceleration/deceleration mode
- Full monitoring capabilities for monitoring actual operating time and much more
- User-selectable alternative configurations with up to three parameter sets
- Zero current detection

Second electronic thermal function

This function is used to rotate two motors of different rated currents individually by a single inverter.

Regeneration avoidance function

The regeneration avoidance function can prevent the inverter from being shut down by regenerative overvoltages when strong regenerative loads cause power to be released into the frequency inverter (for example when braking the motor or with loads that actively drive the motor).

The inverter can automatically increase the output frequency or disable the braking ramp when a programmed threshold value is reached. The response sensitivity, dynamics and working range are all adjustable.

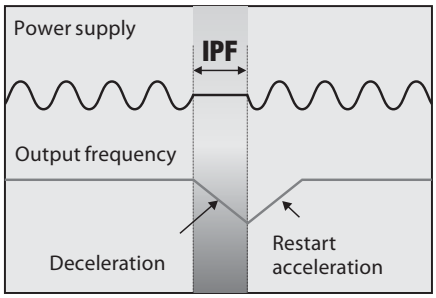
For example, this function can prevent a shutdown with an overvoltage error when the speed of a fan controlled by the inverter is increased by the draft from another fan operating in the same ventilation duct.
The function then temporarily increases the output frequency above the setpoint value.

This function can also be used to brake loads with the DC bus voltage, without using braking modules.

Automatic restart after instantaneous power failures

In pump and fan applications normal operation can be continued automatically after brief power failures. The system simply reactivates the coasting motor and automatically accelerates it back up to its setpoint speed.

The graphic below shows how the frequency inverter can respond to a brief power outage. Instead of coasting down completely and stopping, the motor is automatically "caught" by the frequency inverter and re-accelerated back up to its previous speed.



Maintenance timer

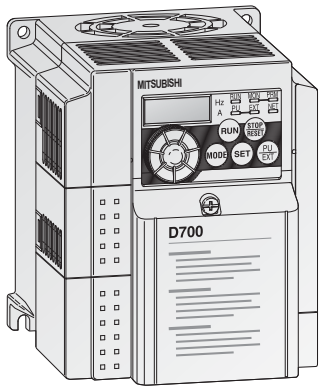
The maintenance timer function can be used to monitor the service life of different components.

Power regeneration

The new FR-A741 is equipped with power regeneration function for improving braking performance. Feeding the energy generated by braking back into the power grid generates much less heat than a braking resistor. In addition to cutting power consumption this also reduces installation space requirements by eliminating the need for cooling hardware.

The energy fed back into the grid can also be used for other purposes, reducing operating costs still further. The integrated power regeneration function makes it possible to use smaller and much less expensive drive systems and enables simpler and more compact switchgear cabinet layouts.

FR-D700 Ultra-Compact Standard Inverters



The ultra compact FR-D700 series frequency converters excel through their very simple operation whilst still providing many functions.

The spring clamp controller connections version enables simple and fast set-up of the frequency inverter. The FR-D700 is equipped with a safety stop function.

The small dimensions render the FR-D700 series frequency inverters ideal for use in restricted spaces. New functions such as intermediate circuit control of the ouput frequency, the dancer roll control or the traverse function, facilitate universal use in numerous applications such as

- Pumps
- Fans
- Presses
- Conveyor belts
- Industrial washing machines
- Automatic shelf systems

The FR-D720S is available in the output power range from 0.1 to 2.2 kW, the FR-D740 in the output power range from 0.4 to 7.5 kW.

The frequency inverters FR-D720S EC are for single-phase use 200 to 240 V AC. The freqency inverters FR-D740 EC are designed for three-phase connections 380 to 480 V AC (50/60 Hz).

The output frequency ranges from 0.2 to 400 Hz.

Product line			FR-D720S EC						FR-D740 EC						
			008	014	025	042	070	100	012	022	036	050	080	120	160
Output	Rated motor capacity [kW] ①		0.1	0.2	0.4	0.75	1.5	2.2	0.4 (0.55)	0.75 (1.1)	1.5 (2.2)	2.2 (3)	3.7 (4)	5.5 (7.5)	7.5 (11)
	Rated output capacity [kVA] ②		0.3	0.5	1	1.6	2.8	3.8	1.2	2	3	4.6	7.2	9.1	13
	Rated current [A] ③		0.8	1.4	2.5	4.2	7	10	1.2 (1.4)	2.2 (2.6)	3.6 (4.3)	5 (6)	8 (9.6)	12 (14.1)	16 (19.2)
	Overload capacity ④		150 % of rated motor capacity for 60 s; 200 % for 0.5 s												
	Voltage ⑤		3-phase, 0 V up to power supply voltage												
Input	Power supply voltage		1-phase, 200–240 V AC, -15 %/+10 %						3-phase, 380–480 V AC, -15 %/+10 %						
	Voltage range		170–264 V AC at 50/60 Hz						325–528 V AC at 50/60 Hz						
	Frequency range		50/60 Hz ± 5 %						50/60 Hz ± 5 %						
	Rated input capacity [kVA] ⑥		0.5	0.9	1.5	2.3	4	2.2	1.5	2.5	4.5	5.5	9.5	12	17
Control-specifications	Control method		V/f control, optimum excitation control or general-purpose magnetic flux vector control												
	Modulation control		Sine evaluated PWM, Soft PWM												
	PWM switching frequency		0.7–14.5 kHz, user adjustable												
	Frequency range [Hz]		0.2–400												
	Possible starting torque		≥ 150 %/1 Hz (for vector control oder slip compensation)												
	Torque boost		Manual torque boost												
	Acceleration/deceleration time		0.1–3600 s												
	Acceleration/deceleration characteristics		Linear or S-pattern acceleration/deceleration mode selectable												
	Braking torque	DC braking	Operating frequency: 0–120 Hz, operating time: 0–10 s, voltage: 0–30 % (externally adjustable)												
	Motor protection		Electronic motor protection relay (rated current user adjustable)												
Control signals for operation	Frequency setting signal		0–5 V DC, 0–10 V DC, 0/4–20 mA, from operation panel (parameter unit). Frequency setting increment is selectable.												
	Input signals		Any of 5 signals can be selected using parameters 178 to 182 (input terminal function selection): multi-speed selection, remote setting, second function selection, terminal 4 input selection, JOG operation selection, PID control valid terminal, external thermal input, PU-external operation switchover, V/F switchover, output stop, start self-holding selection, traverse function selection, forward rotation, reverse rotation command, inverter reset, PU-NET operation switchover, external-NET operation switchover, command source switchover, inverter operation enable signal, and PU operation external interlock												
	Operation functions		Maximum/minimum frequency setting, frequency jump operation, external thermal relay input selection, automatic restart after instantaneous power failure operation, forward/reverse rotation prevention, remote setting, second function, multi-speed operation, regeneration avoidance, slip compensation, operation mode selection, offline auto tuning function, PID control, computer link operation (RS485), optimum excitation control, power failure stop, speed smoothing control, Modbus-RTU												
	Output signals	Operating status	Can be selected using parameters 190 and 192 (output terminal function selection): inverter operation, up-to-frequency, overload alarm, output frequency detection, regenerative brake prealarm, electronic thermal relay function prealarm, inverter operation ready, output current detection, zero current detection, PID lower limit, PID upper limit, PID forward/reverse rotation output, fan alarm, heatsink overheat pre-alarm, deceleration at an instantaneous power failure, PID control activated, PID output interruption, during retry, life alarm, current average value monitor, remote output, alarm output, fault output, fault output 3, maintenance timer alarm												
		Analog signal	0–10 V DC												
Others	Cooling		Self cooling				Fan cooling		Self cooling			Fan cooling			
	Protective structure ⑦		IP20												
	Frequency inverter weight [kg]		0.5	0.5	0.9	1.1	1.5	2.0	1.3	1.3	1.4	1.5	1.5	3.3	3.3
	Dimensions (WxHxD)	mm	68x128x80.5		68x128 x142.5	68x128 x162.5	108x128 x155	140x150 x145	108x128x129.5		108x128 x135.5	108x128 x155.5	108x128 x165.5	220x150x155	
Order information		Art. no.	214189	214190	214191	214192	214193	214194	212414	212415	212416	212417	212418	212419	212420

Remarks:

① The rated motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi 4-pole standard motor. The motor capacity ratings in brackets are for ambient temperatures up to 40 °C.

② The specifications of the rated output capacity are related to a motor voltage of 440 V.

③ The rated output current in brackets are for ambient temperatures up to 40 °C.

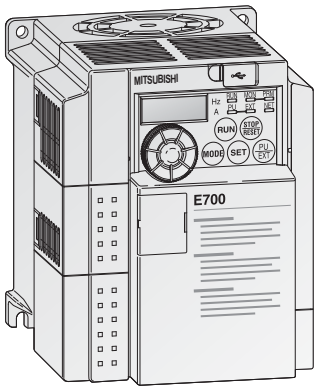
④ The % value of the overload capacity rating indicated is the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100 % load.

⑤ The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. However, the pulse voltage value of the inverter output side voltage remains unchanged at about √2 that of the power supply.

⑥ The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).

⑦ FR-DU07: IP40 (except for the PU connector)

FR-E700 Compact Inverters



Improved functions and equipment features such as an integrated USB interface, an integrated "digital dial" with display, improved efficiency in the low speed range as well as the possibility of using one of many option cards such as the exchangeable I/O cards, for instance, render the FR-E700 a commercial universal genius for many applications, such as

- Textile machines
- Door and gate actuators
- Elevators
- Cranes
- Material handling systems

Improved speed/power limitation guarantees increased machine protection. This reliably prevents damage to the machines.

The FR-E720S is available in the output power range from 0.1 to 2.2 kW, the FR-E740 in the output power range from 0.4 to 15 kW.

The frequency inverters FR-E720S EC are for single-phase use 200 to 240 V AC. The freqency inverters FR-E740 EC are designed for three-phase connections 380 to 480 V AC (50/60 Hz).

The output frequency ranges from 0.2 to 400 Hz.

Product line			FR-E720S EC						FR-E740 EC								
			008	015	030	050	080	110	016	026	040	060	095	120	170	230	300
Output	Rated motor capacity [kW] ①		0.1	0.2	0.4	0.75	1.5	2.2	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15
	Rated output capacity [kVA] ②		0.3	0.6	1.2	2	3.2	4.4	1.2	2	3	4.6	7.2	9.1	13	17.5	23
	Rated current [A] ③		0.8 (0.8)	1.5 (1.4)	3 (2.5)	5 (4.1)	8 (7)	11 (10)	1.6 (1.4)	2.6 (2.2)	4 (3.8)	6 (5.4)	9.5 (8.7)	12	17	23	30
	Overload capacity ④		150 % of rated motor capacity for 60 s; 200 % for 3 s														
	Voltage ⑤		3-phase, 0 V up to power supply voltage														
Input	Power supply voltage		1-phase, 200–240 V AC, -15 %/+10 %						3-phase, 380–480 V AC, -15 %/+10 %								
	Voltage range		170–264 V AC at 50/60 Hz						325–528 V AC at 50/60 Hz								
	Frequency range		50/60 Hz ± 5 %														
	Rated input capacity [kVA] ⑥		0.5	0.9	1.5	2.5	4	5.2	1.5	2.5	4.5	5.5	9.5	12	17	20	28
Control-specifications	Control method		V/f control, optimum excitation control, general-purpose magnetic flux vector control or advanced magnetic flux vector control														
	Modulation control		Sine evaluated PWM, Soft PWM														
	PWM switching frequency		0.7–14.5 kHz, user adjustable														
	Frequency range [Hz]		0.2–400														
	Possible starting torque		≥ 200 %/0.5 Hz (advanced magnetic flux vector control (3.7 K or less))														
	Torque boost		Manual torque boost														
	Acceleration/deceleration time		0.01–360 s, 0.1–3600 s (may be set individually for acceleration and deceleration)														
	Acceleration/deceleration characteristics		Linear or S-pattern acceleration/deceleration mode selectable														
	Braking torque	DC braking	Operating frequency: 0–120 Hz, operating time: 0–10 s, voltage: 0–30 % (externally adjustable)														
	Motor protection		Electronic motor protection relay (rated current user adjustable)														
Control signals for operation	Frequency setting signal		0–5 V DC, 0–10 V DC, 0/4–20 mA, from operation panel (parameter unit)														
	Input signals		Any of 7 signals can be selected using parameters 178 to 184 (input terminal function selection): multi-speed selection, remote setting, stop-on contact selection, second function selection, terminal 4 input selection, JOG operation selection, PID control valid terminal, brake opening completion signal, external thermal input, PU-external operation switchover, V/F switchover, output stop, start self-holding selection, forward rotation, reverse rotation command, inverter reset, PU-NET operation switchover, external-NET operation switchover, command source switchover, inverter operation enable signal, PU operation external interlock														
	Operation functions		Maximum/minimum frequency setting, frequency jump operation, external thermal relay input selection, automatic restart after instantaneous power failure operation, forward/reverse rotation prevention, remote setting, brake sequence, second function, multi-speed operation, stop-on contact control, droop control, regeneration avoidance, slip compensation, operation mode selection, offline auto tuning function, PID control, computer link operation (RS485)														
	Output signals	Operating status	Can be selected using parameters 190 to 192 (output terminal function selection): inverter operation, up-to-frequency, overload alarm, output frequency detection, regenerative brake prealarm, electronic thermal relay function prealarm, inverter operation ready, output current detection, zero current detection, PID lower limit, PID upper limit, PID forward/reverse rotation output, brake opening request, fan alarm, heatsink overheat pre-alarm, deceleration at an instantaneous power failure, PID control activated, during retry, life alarm, current average value monitor, remote output, alarm output, fault output, fault output 3, maintenance timer alarm.														
		Analog signal	0–10 V DC														
Others	Cooling		Self cooling			Fan cooling			Self cooling		Fan cooling						
	Protective structure ⑦		IP20														
	Frequency inverter weight [kg]		0.6	0.6	0.9	1.4	1.5	2.0	1.4	1.4	1.9	1.9	1.9	3.2	3.2	5.9	5.9
	Dimensions (WxHxD)	mm	68x128x80.5		68x128 x142.5	108x128 x135.5	108x128 x161	140x150x 155.5	140x150x114		140x150x135			220x150x147		220x260x190	
Order information		Art. no.	219221	219222	217895	217896	217897	217898	211955	211956	211957	211958	211959	211960	211961	211962	211963

Remarks:

① The rated motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi 4-pole standard motor.

② The specifications of the rated output capacity are related to a motor voltage of 440 V.

③ The rated output current in the parentheses applies when low acoustic noise operation is to be performed at an ambient temperature higher than 40 °C with the parameter 72 (PWM frequency selection) value set to 2 kHz or higher.

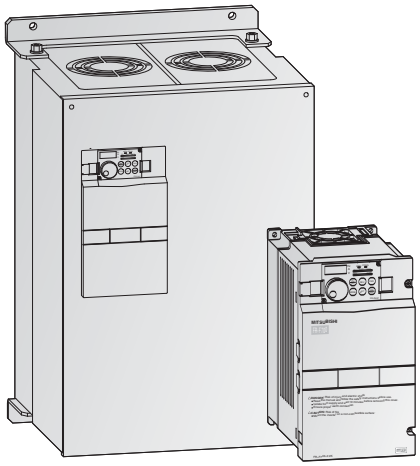
④ The %-value of the overload capacity indicated is the ratio of the overload current to the inverters rated output current. For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100 % load.

⑤ The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range. However, the pulse voltage value of the inverter output side voltage remains unchanged at about √2 that of the power supply.

⑥ The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).

⑦ FR-DU07: IP40 (except for the PU connector)

FR-F700 Energy Saving Inverters



Mitsubishi Electric's FR-F700 series is a range of frequency inverters with truly exceptional power conservation capabilities. These inverters are ideal for pumps, ventilation fans and applications with reduced overload requirements such as:

- Air conditioning systems, e.g. in building management
- Air extraction systems
- Fans and blowers
- Hydraulics systems
- Compressors
- Sewage and drains systems
- Ground water pumps
- Heat pumps
- Drive systems with high idling rates

These inverters are very user-friendly and they are available with output ratings matched to users' real needs.

The FR-F740 is available in the output power range from 0.75 to 630 kW.

The FR-F746 with its waterproof structure IP54 is available in the output power range from 0.75 to 55 kW.

All the inverters in the series are designed for connection to three-phase 380 to 480 V/500 V (50/60 Hz) power supplies.

The output frequency ranges from 0.5 to 400 Hz.

Product line				FR-F740/FR-F746 EC												
				00023	00038	00052	00083	00126	00170	00250	00310	00380	00470	00620	00770	00930	01160
Output	Rated motor capacity [kW] ①	120 % overload capacity (SLD) ⑤		0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
		150 % overload capacity (LD)		0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
	Rated current [A] ⑥	120 % overload capacity (SLD) ⑤	I_{rated}	2.3	3.8	5.2	8.3	12.6	17	25	31	38	47	62	77	93	116
			$I_{max.\ 60\ s}$	2.5	4.2	5.7	9.1	13.9	18.7	27.5	34.1	41.8	51.7	68.2	84.7	102.3	127.5
			$I_{max.\ 3\ s}$	2.8	4.6	6.2	10	15.1	20.4	30	37.2	45.6	56.4	74.4	92.4	111.6	139.2
		150 % overload capacity (LD)	I_{rated}	2.1	3.5	4.8	7.6	11.5	16	23	29	35	43	57	70	85	106
			$I_{max.\ 60\ s}$	2.5	4.2	5.8	9.1	13.8	19.2	27.6	34.8	42	51.6	68.4	84	102	127.2
			$I_{max.\ 3\ s}$	3.1	5.2	7.2	11.4	17.2	24	34.5	43.5	52.5	64.5	85.5	105	127.5	159
	Rated output capacity [kVA]	SLD ⑤		1.8	2.9	4.0	6.3	9.6	13	19.1	23.6	29.0	35.8	47.3	58.7	70.9	88.4
		LD		1.6	2.7	3.7	5.8	8.8	12.2	17.5	22.1	26.7	32.8	43.4	53.3	64.8	80.8
	Overload capacity ②	SLD		120 % of rated motor capacity for 3 s; 110 % for 1 min. (max. ambient temperature 40 °C) – typical for pumps and fans													
		LD		150 % of rated motor capacity for 3 s; 120 % for 1 min. (max. ambient temperature 50 °C) – typical for conveyor belts and centrifuges													
	Voltage ③			3-phase AC, 0 V to power supply voltage													
	Frequency range			0.5–400 Hz													
	Carrier frequency			0.7–14.5 kHz (user adjustable)													
Input	Power supply voltage			3-phase, 380–480 V AC, -15 %/+10 %													
	Voltage range			323–528 V AC at 50/60 Hz													
	Power supply frequency			50/60 Hz ±5 %													
	Rated input capacity [kVA] ④	SLD ⑤		2.8	5	6.1	10	13	19	22	31	37	45	57	73	88	110
		LD		2.5	4.5	5.5	9	12	17	20	28	34	41	52	66	80	100
Others	Cooling	FR-F740		Self cooling			Fan cooling										
		FR-F746		Fan cooling													
	Protective structure ⑧	FR-F740		IP20 ⑦											IP00		
		FR-F746		IP54													
	Power loss [kW]	SLD ⑤		0.06	0.08	0.1	0.16	0.19	0.24	0.34	0.39	0.49	0.58	0.81	1.0	1.17	1.51
		LD		0.05	0.08	0.09	0.14	0.18	0.22	0.31	0.35	0.44	0.52	0.71	0.93	1.03	1.32
	Frequency inverter weight [kg]	FR-F740		3.5	3.5	3.5	3.5	3.5	6.5	6.5	7.5	7.5	13	13	23	35	35
		FR-F746		12.5	12.5	12.5	12.5	12.5	18.5	18.5	21.5	21.5	30	30	30	42	42
	Dimensions (WxHxD) [mm]	FR-F740		150x260x140						220x260 x170	220x300x190		250x400x190		325x550 x195	435x550x250	
		FR-F746		249x395x210						319x395 x240	319x445x260		354x560x260		360x590 x265	471x660x320	

Order information FR-F740 ⑧	Frequency inverters	156569	156570	156571	156572	156573	156594	156595	156596	156597	156598	156599				
	Input power frame												169827	169828	169829	
	Control card FR-CF70-EC												189878	189878	189878	
Order information FR-F746	Art. no.	163796	163797	163798	163799	163800	163801	163802	163803	163804	163805	163806	163807	163808	163809	

Remarks:

Explanation for ① to ⑨ see next page.

Product line			FR-F740 EC													
			01800	02160	02600	03250	03610	04320	04810	05470	06100	06830	07700	08660	09620	10940	12120
Output	Rated motor capacity [kW] ①	120 % overload capacity (SLD) ⑤	90	110	132	160	185	220	250	280	315	355	400	450	500	560	630
		150 % overload capacity (LD)	75	90	110	132	160	185	220	250	280	315	355	400	450	500	560
	Rated current [A] ⑥	120 % overload capacity (SLD) ⑤ I rated	180	216	260	325	361	432	481	547	610	683	770	866	962	1094	1212
		I max. 60 s	198	238	286	357	397	475	529	602	671	751	847	953	1058	1203	1333
		I max. 3 s	216	259	312	390	433	518	577	656	732	820	924	1039	1154	1313	1454
		150 % overload capacity (LD) I rated	144	180	216	260	325	361	432	481	547	610	683	770	866	962	1094
		I max. 60 s	173	216	259	312	390	433	518	577	656	732	820	924	1039	1154	1313
		I max. 3 s	216	270	324	390	487	541	648	721	820	915	1024	1155	1299	1443	1641
	Rated output capacity [kVA]	SLD ⑤	137	165	198	248	275	329	367	417	465	521	587	660	733	834	924
		LD	110	137	165	198	248	275	329	367	417	465	521	587	660	733	834
	Overload capacity ②	SLD	120 % of rated motor capacity for 3s; 110 % for 1 min. (max. ambient temperature 40 °C) – typical for pumps and fans														
		LD	150 % of rated motor capacity for 3s; 120 % for 1 min. (max. ambient temperature 50 °C) – typical for conveyor belts and centrifuges														
	Voltage ③		3-phase AC, 0 V to power supply voltage														
	Frequency range		0.5–400 Hz														
	Carrier frequency		0.7–6 kHz (user adjustable)														
Input	Power supply voltage		3-phase, 380–500 V AC, -15 %/+10 %														
	Voltage range		323–550 V AC at 50/60 Hz														
	Power supply frequency		50/60 Hz ±5 %														
	Rated input capacity [kVA] ④	SLD ⑤	137	165	198	248	275	329	367	417	465	520	587	660	733	834	924
		LD	110	137	165	198	248	275	329	367	417	465	520	587	660	733	834
Others	Cooling		Fan cooling														
	Protective structure ⑧		IP00														
	Power loss [kW]	SLD ⑤	2.7	3.3	3.96	4.8	5.55	6.6	7.5	8.4	9.45	10.65	12	13.5	15	16.8	18.9
		LD	2.25	2.7	3.3	3.96	4.8	5.55	6.6	7.5	8.4	9.45	10.65	12	13.5	15	16.8
	Frequency inverter weight [kg]		37	50	57	72	72	110	110	220	220	220	260	260	370	370	370
	Reactor weight [kg]		20	22	26	28	29	30	35	38	42	46	50	57	67	85	95
	Dimensions (WxHxD) [mm]		435x550 x250	465x620x300		465x740x360		498x1010x380		680x1010x380			790x1330x440		995x1580x440		

Order information ⑨	Frequency Inverters															
	Input Power Frame	169830	169831	169832	169833	169834	169835	169836	169837	169838	169839	169840	169841	169842	169843	169844
	Control Card FR-CF70-ECT	189879	189879	189879	189879	189879	189879	189879	189879	189879	189879	189879	189879	189879	189879	189879

Remarks:

① The applied motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi 4-pole standard motor.

② The overload capacity in % is the ratio of the overload current to the inverter's rated current in the respective operating mode. For repeated duty cycles allow sufficient time for the inverter and the motor to cool below the temperature reached at 100 % load. The waiting periods can be calculated using the r.m.s. current method (I^2 x t), which requires knowledge of the duty.

③ The maximum output voltage cannot exceed the power supply voltage. The output voltage can be varied over the entire power supply voltage range.

④ The rated input capacity varies depending on the impedance values on the power supply side of the inverter (including the cables and input reactor).

⑤ When the load curve with 120 % overload capacity is selected the maximum permitted ambient temperature is 40 °C.

⑥ When operating with carrier frequencies ≥ 3 kHz this value is reduced automatically as soon as the frequency inverter exceeds 85 % of the rated output current.

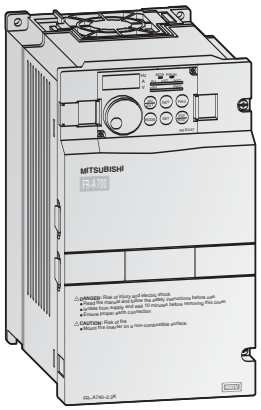
⑦ When the cable bushing for the optional expansion cards is broken out the unit has an IP00 protection rating.

⑧ FR-DU07: IP40 (except for the PU connector)

⑨ The inverter types FR-F740-01800 and above are all delivered with PCBs with two coats of protective varnish. For types FR-F740-00023 through 01160 varnished PCBs are standard. The double-coated version is available as an option.

Common specifications FR-F740/F746 EC			Description
Control specifications	Voltage/frequency characteristics		Base frequency adjustable from 0 to 400 Hz; selection between constant torque, variable torque or optional flexible 5-point V/f characteristics
	Starting torque		120 % (3 Hz) when set to simple magnetic flux vector control and slip compensation
	Acceleration/deceleration time		0; 0.1–3600 s (can be set individually)
	Acceleration/deceleration characteristics		Linear or S-form course, user selectable
	DC injection brake		Operating frequency (0–120 Hz), operating time (0–10 s) and operating voltage (0–30 %) can be set individually. The DC brake can also be activated via the digital input.
	Motor protection		Electronic motor protection relay (rated current user adjustable)
	Control method		V/f control, optimum excitation control or simple magnetic flux vector control
	Modulation control		Sine evaluated PWM, Soft PWM
Control signals for operation	Input signals		Any of 12 signals can be selected using parameters 178 to 189 (input terminal function selection)
	Output signals	Operating status	Any of 7 signals can be selected using parameter 190 to 196 (output terminal function selection)
		When using the FR-A7AY, FR-A7AR option	In addition to the above operating modes parameters 313–319 (function selection for the additional 7 output terminals) can also be used to assign the following four signals: control circuit capacitor life, main circuit capacitor life, cooling fan life, inrush current limit circuit life
		Pulse/analog output	You can also use parameter 54 (assign analog current output) and 158 (assign analog voltage output) to assign the following displays to one or both outputs.
Display	Parameter unit display (FR-PU07/ FR-DU07)	Operating status	Output frequency, motor current (steady or peak value), output voltage, alarm indication, frequency setting, motor running speed, converter output voltage (steady or peak value), electronic thermal load factor, input power, output power, road meter, cumulative energization time, actual operation time, motor load factor, watt-hours meter, power saving effect, cumulative saving power, regenerative brake circuit duty (01800 and above), PID set point, PID process value, PID deviation monitor, I/O terminal monitor, optional input terminal monitor (FR-DU07 only), optional output terminal monitor (FR-DU07 only), option fitting state monitor (FR-PU07 only), terminal assignment state (FR-PU07 only)
		Alarm definition	Alarm definition is displayed when the protective function is activated, the output voltage/current/frequency/cumulative energization time right before the protection function was activated and the past 8 alarm definitions are stored.
		Interactive guidance	Operation guide/trouble shooting with a help function (FR-PU07 only)

FR-A700 High End Inverters



The FR-A700 frequency inverters combine innovative functions and reliable technology with maximum power, economy and flexibility.

The FR-A740 is the appropriate inverter for demanding drive tasks with requirements for high torque and excellent frequency precision. Its extensive functions allow adaption to many applications. The outstanding drive features of the FR-A740 suit various needs, like:

- Conveyor technology
- Chemical machines
- Winding machines
- Printing machines
- Cranes and lifting gear
- High-bay warehousing systems
- Extruders
- Centrifuges
- Machine tools

The FR-A740 is available in the output power range from 0.4 to 630 kW.

All the inverters in the series are designed for connection to three-phase 380 to 480 V/500 V (50/60 Hz) power supplies.

The output frequency ranges from 0.2 to 400 Hz.

Product line				FR-A740 EC												
				00023	00038	00052	00083	00126	00170	00250	00310	00380	00470	00620	00770	00930	01160
Output	Rated motor capacity [kW] ①	120 % overload capacity (SLD)		0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
		150 % overload capacity (LD)		0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
		200 % overload capacity (ND) ①		0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45
		250 % overload capacity (HD)		0.25	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37
	Rated current [A] ③	120 % overload capacity (SLD)	I_{rated}	2.3	3.8	5.2	8.3	12.6	17	25	31	38	47	62	77	93	116
			$I_{max.\ 60\ s}$	2.5	4.2	5.7	9.1	13.9	18.7	27.5	34.1	41.8	51.7	68.2	84.7	102.3	127.6
			$I_{max.\ 3\ s}$	2.8	4.6	6.2	10	15.1	20.4	30	37.2	45.6	56.4	74.4	92.4	111.6	139.2
		150 % overload capacity (LD)	I_{rated}	2.1	3.5	4.8	7.6	11.5	16	23	29	35	43	57	70	85	106
			$I_{max.\ 60\ s}$	2.5	4.2	5.8	9.1	13.8	19.2	27.6	34.8	42	51.6	68.4	84	102	127.2
			$I_{max.\ 3\ s}$	3.2	5.3	7.2	11.4	17.3	24	34.5	43.5	52.5	64.5	85.5	105	127.5	159
		200 % overload capacity (ND)	I_{rated}	1.5	2.5	4	6	9	12	17	23	31	38	44	57	71	86
			$I_{max.\ 60\ s}$	2.3	3.8	6	9	13.5	18	25.5	34.5	46.5	57	66	85.5	106.5	129
			$I_{max.\ 3\ s}$	3	5	8	12	18	24	34	46	62	76	88	114	142	172
		250 % overload capacity (HD)	I_{rated}	0.8	1.5	2.5	4	6	9	12	17	23	31	38	44	57	71
			$I_{max.\ 60\ s}$	1.6	3	5	8	12	18	24	34	46	62	76	88	114	142
			$I_{max.\ 3\ s}$	2	3.8	6.3	10	15	22.5	30	42.5	57.5	77.5	95	110	142.5	177.5
	Rated output capacity [kVA] ②	SLD		1.8	2.9	4	6.3	9.6	13	19.1	23.6	29	35.8	47.3	58.7	70.9	88.4
		LD		1.6	2.7	3.7	5.8	8.8	12.2	17.5	22.1	26.7	32.8	43.4	53.3	64.8	80.8
		ND		1.1	1.9	3	4.6	6.9	9.1	13	17.5	23.6	29	33.5	43.4	54.1	65.5
		HD		0.6	1.1	1.9	3	4.6	6.9	9.1	13	17.5	23.6	29	33.5	43.4	54.1
	Overload capacity ④	SLD		110 % of rated motor capacity for 60 s; 120 % for 3 s (max. ambient temperature 40 °C) – inverse time characteristics													
		LD		120 % of rated motor capacity for 60 s; 150 % for 3 s (max. ambient temperature 50 °C) – inverse time characteristics													
		ND		150 % of rated motor capacity for 60 s; 200 % for 3 s (max. ambient temperature 50 °C) – inverse time characteristics													
		HD		200 % of rated motor capacity for 60 s; 250 % for 3 s (max. ambient temperature 50 °C) – inverse time characteristics													
	Voltage ⑤			3-phase AC, 0 V to power supply voltage													
	Frequency range		Hz	0.2– 400													
	Regenerative braking torque			100 % torque/2 % ED							20 % torque/continuous ⑥				20 % torque/continuous		
	Carrier frequency		kHz	0.7 –14.5													
Input	Power supply voltage			3-phase, 380–480 V AC, -15 %/+10 %													
	Voltage range			323–528 V AC at 50/60 Hz													
	Power supply frequency			50/60 Hz ±5 %													
	Rated input capacity [kVA] ⑦	SLD		2.5	4.5	5.5	9	12	17	20	28	34	41	52	66	80	100
		LD		2.1	4	4.8	8	11.5	16	20	27	32	37	47	60	73	91
		ND		1.5	2.5	4.5	5.5	9	12	17	20	28	34	41	52	66	80
		HD		0.8	1.5	2.5	4.5	5.5	9	12	17	20	28	34	41	52	66
Others	Cooling			Self cooling			Fan cooling										
	Protective structure ⑨			IP20 ⑧											IP00		
	Power loss [kW]	SLD		0.06	0.082	0.98	0.15	0.21	0.28	0.39	0.4	0.55	0.69	0.97	1.18	1.36	1.78
		LD		0.05	0.08	0.09	0.14	0.18	0.22	0.31	0.35	0.44	0.52	0.71	0.93	1.03	1.32
		ND		0.05	0.065	0.075	0.1	0.15	0.2	0.25	0.29	0.4	0.54	0.65	0.81	1.02	1.3
		HD		0.043	0.05	0.06	0.075	0.1	0.146	0.18	0.21	0.29	0.4	0.54	0.65	0.74	1.02
	Frequency inverter weight [kg]			3.8	3.8	3.8	3.8	3.8	7.1	7.1	7.5	7.5	13	13	23	35	35
	Dimensions (WxHxD) [mm]			150x260x140					220x260x170		220x300x190				325x550 x195	435x550x250	

Order information															
	Frequency inverters	169826	169797	169798	169799	169800	169801	169802	169803	169804	169805	169806			
	Input power frame												169827	169828	169829
	Control card FR-CA70-EC												169877	169877	169877

Remarks:

Explanation for ① to ⑨ see next page.

Product line				FR-A740 EC													
				01800	02160	02600	03250	03610	04320	04810	05470	06100	06830	07700	08660	09620	10940	12120
Output	Rated motor capacity [kW] ①	120 % overload capacity (SLD)		90	110	132	160	185	220	250	280	315	355	400	450	500	550	630
		150 % overload capacity (LD)		75	90	110	132	160	185	220	250	280	315	355	400	450	500	560
		200 % overload capacity (ND) ①		55	75	90	110	132	160	185	220	250	280	315	355	400	450	500
		250 % overload capacity (HD)		45	55	75	90	110	132	160	185	220	250	280	315	355	400	450
	Rated current [A] ③	120 % overload capacity (SLD)	I rated	180	216	260	325	361	432	481	547	610	683	770	866	962	1094	1212
			I max. 60 s	198	238	286	358	397	475	529	602	671	751	847	953	1058	1203	1333
			I max. 3 s	216	259	312	390	433	518	577	656	732	820	924	1039	1154	1313	1454
		150 % overload capacity (LD)	I rated	144	180	216	260	325	361	432	481	547	610	683	770	866	962	1094
			I max. 60 s	173	216	259	312	390	433	518	577	656	732	820	924	1039	1154	1313
			I max. 3 s	216	270	324	390	488	542	648	722	821	915	1025	1155	1299	1443	1641
		200 % overload capacity (ND)	I rated	110	144	180	216	260	325	361	432	481	547	610	683	770	866	962
			I max. 60 s	165	216	270	324	390	488	542	648	722	821	915	1025	1155	1299	1443
			I max. 3 s	220	288	360	432	520	650	722	864	962	1094	1220	1366	1540	1732	1924
		250 % overload capacity (HD)	I rated	86	110	144	180	216	260	325	361	432	481	547	610	683	770	866
			I max. 60 s	172	220	288	360	432	520	650	722	864	962	1094	1220	1366	1540	1732
			I max. 3 s	215	275	360	450	540	650	813	903	1080	1203	1368	1525	1708	1925	2165
	Rated output capacity [kVA] ②	SLD		137	165	198	248	275	329	367	417	465	521	587	660	733	834	924
		LD		110	137	165	198	248	275	329	367	417	465	521	587	660	733	834
		ND		84	110	137	165	198	248	275	329	367	417	465	521	587	660	733
		HD		80	84	110	137	165	198	248	275	329	367	417	465	521	587	660
	Overload capacity ④	SLD		110 % of rated motor capacity for 60 s; 120 % for 3 s (max. ambient temperature 40 °C) – inverse time characteristics														
		LD		120 % of rated motor capacity for 60 s; 150 % for 3 s (max. ambient temperature 50 °C) – inverse time characteristics														
		ND		150 % of rated motor capacity for 60 s; 200 % for 3 s (max. ambient temperature 50 °C) – inverse time characteristics														
		HD		200 % of rated motor capacity for 60 s; 250 % for 3 s (max. ambient temperature 50 °C) – inverse time characteristics														
	Voltage ⑤			3-phase AC, 0 V to power supply voltage														
	Frequency range		Hz	0.2– 400														
	Regenerative braking torque (max. value/permissible duty)			20 % torque/ continuous	10 % torque/continuous													
	Carrier frequency		kHz	0.7–14.5	0.7–6													
Input	Power supply voltage			3-phase, 380–500 V AC, -15 %/+10 %														
	Voltage range			323–550 V AC at 50/60 Hz														
	Power supply frequency			50/60 Hz ±5 %														
	Rated input capacity [kVA] ⑦	SLD		137	165	198	247	275	329	366	416	464	520	586	660	733	833	924
		LD		110	137	165	198	247	275	329	366	416	464	520	586	659	733	833
		ND		100	110	137	165	198	248	275	329	367	417	465	521	587	660	733
		HD		80	84	110	137	165	198	248	275	329	367	417	465	521	587	660
Others	Cooling			Fan cooling														
	Protective structure ⑨			IP00														
	Power loss [kW]	SLD		2.65	2.9	3.57	3.8	4.2	5.02	5.5	6.4	7.2	8.19	8.6	10.37	11.5	13.2	14.94
		LD		2	2.4	2.9	3	3.8	4.2	5.1	5.5	6.4	7.2	8	8.6	10.2	11.5	13.20
		ND		1.54	1.9	2.4	2.5	3	4	4.2	5	5.5	6.5	7	7.3	8.1	9.3	10.5
		HD		1.14	1.44	1.9	1.97	2.5	2.57	4	4.2	5	5.5	6.5	7	6.91	8.1	9.3
	Frequency inverter weight [kg]			37	50	57	72	72	110	110	175	175	175	260	260	370	370	370
	Reactor weight [kg]			20	22	26	28	29	30	35	38	42	46	50	57	67	85	95
	Dimensions (W x H x D) [mm]			435x550 x250	465x620x300		465x740x360		498x1010x380		680x1010x380			790x1330x440		995x1580x440		

Order information																	
	Frequency inverters																
	Input power frame	169830	169831	169832	169833	169834	169835	169836	169837	169838	169839	169840	169841	169842	169843	169844	
	Control card FR-CA70-ECT	169877	190051	190051	190051	190051	190051	190051	190051	190051	190051	190051	190051	190051	190051	190051	

Remarks:

① The rated motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi Electric 4-pole standard motor. The 200 % overload capacity (ND) is the factory default setting.

② The rated output capacity indicated assumes that the output voltage is 440 V.

③ When operating the inverter of 75K (type 02160) or more with a value larger than 2 kHz set in Pr. 72 PWM frequency selection, the rated output current is max. 85 %.

④ The % value of the overload capacity indicates the ratio of the overload current to the inverter's rated output current.
For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100 % load.

⑤ The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range.
However, the pulse voltage value of the inverter output side voltage remains unchanged at about √2 that of the power supply.

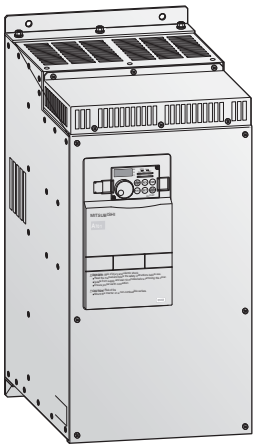
⑥ For the 11K to 22K capacities (type 00023 to 00250 and 00310 to 00620), using the dedicated external brake resistor (FR-ABR-H) will achieve the performance of 100 % torque/6 % ED.

⑦ The rated input capacity varies depending on the impedance values on the power supply side of the inverter (including the cables and input reactor).

⑧ When the cable bushing for the optional expansion cards is broken out the unit has an IP00 protection rating.

⑨ FR-DU07: IP40 (except for the PU connector)

FR-A741 High End Inverters with Integrated Power Regeneration Function



The FR-A741 is the latest addition to the high-performance FR-A700 series. It sets new standards with an integrated power regeneration function that also improves braking performance.

Featuring a large number of innovative technologies, this compact frequency inverter delivers exceptional performance and is ideal for hoist drives and high-powered machines with torque that can be used for regenerative braking.

The advantages over conventional frequency inverter technology are very significant:

- 100 % braking energy infeed
- No braking resistor required
- No external brake transistor required
- Up to 40 % less space for installation needed, depending on the output capacity
- Integrated AC reactor

Der FR-A741 is available in the output power range from 5,5 to 55 kW.

All the inverters in the series are designed for connection to three-phase 380 to 480 V (50/60 Hz) power supplies.

The output frequency ranges from 0.2 to 400 Hz.

Product line			FR-A741 EC									
			5.5k	7.5k	11k	15k	18.5k	22k	30k	37k	45k	55k
Output	Rated current [A] ③	200 % overload capacity (ND)	12	17	23	31	38	44	57	71	86	110
	Rated motor capacity [kW] ①	200 % overload capacity (ND)	5.5	7.5	11	15	18.5	22	30	37	45	55
	Rated output capacity [kVA] ②		9.1	13	17.5	23.6	29	32.8	43.4	54	65	84
	Overload capacity ③		150 % of rated motor capacity for 60 s; 200 % for 3 s (max. ambient temperature 50 °C)									
	Voltage ④		3-phase AC, 0 V to power supply voltage									
	Frequency range	Hz	0.2– 400									
	Regenerative braking torque		100 % continuous/150 % for 60 s									
	Carrier frequency	kHz	0.7 –14.5									
Input	Power supply voltage		3-phase, 380–480 V AC, -15 %/+10 %									
	Voltage range		323–528 V AC at 50/60 Hz									
	Power supply frequency		50/60 Hz ±5 %									
	Rated input capacity [kVA] ⑤		12	17	20	28	34	41	52	66	80	100
Others	Cooling		Fan cooling									
	Protective structure		IP00									
	Power loss [kW]		0.33	0.44	0.66	0.86	1.1	1.29	1.45	1.95	2.36	2.7
	Frequency inverter weight [kg]		25	26	37	40	48	49	65	80	83	115
	Dimensions (WxHxD) [mm]		250x470x270		300x600x294		360x600x320		450x700x340	470x700x368		600x900x405
Order information		Art. no.	216905	216906	216907	216908	216909	217397	216910	216911	216912	216913

Remarks:

① The rated motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi Electric 4-pole standard motor.

② The rated output capacity indicated assumes that the output voltage is 440 V.

③ The % value of the overload capacity indicates the ratio of the overload current to the inverter's rated output current.
For repeated duty, allow time for the inverter and motor to return to or below the temperatures under 100 % load.

④ The maximum output voltage does not exceed the power supply voltage. The maximum output voltage can be changed within the setting range.
However, the pulse voltage value of the inverter output side voltage remains unchanged at about $\sqrt{2}$ that of the power supply.

⑤ The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).

Common Specifications FR-A700

FR-A740/FR-A741 EC			Description
Control specifications	Control method		V/F control, advanced magnetic flux vector control and real sensorless vector control)/vector control (when used with option FR-A7AP) ①
	Modulation control		Sine evaluated PWM, Soft PWM
	Frequency setting resolution	Analog input	0.015 Hz/0–50 Hz (terminal 2, 4: 0–10 V/12 bit) 0.03 Hz/0–50 Hz (terminal 2, 4: 0–5 V/11 bit, 0–20 mA/11 bit, terminal 1: -10–+10 V/12 bit) 0.06 Hz/0–50 Hz (terminal 1: 0–±5 V/11 bit)
		Digital input	0.01 Hz
	Frequency accuracy		±0.2 % of the maximum output frequency (temperature range 25° ± 10 °C) via analog input; ±0.01 % of the set output frequency (via digital input)
	Voltage/frequency characteristics		Base frequency adjustable from 0 to 400 Hz; selection between constant torque, variable torque or optional flexible 5-point V/f characteristics
	Starting torque		200 %, 0.3 Hz (0.4 K to 3.7 K), 150 %, 0.3 Hz (5.5 K or more) (under real sensorless vector control or vector control)
	Torque boost		Manual torque boost
	Acceleration/deceleration time		0; 0.1–3600 s (can be set individually),linear or S-pattern acceleration/deceleration mode, backlash measures acceleration/deceleration can be selected.
	Acceleration/deceleration characteristics		Linear or S-form course, user selectable
	DC injection brake		Operating frequency (0–120 Hz), operating time (0–10 s) and operating voltage (0–30 %) can be set individually. The DC brake can also be activated via the digital input.
	Stall prevention operation level		Operation current level can be set (0–220 % adjustable), whether to use the function or not can be selected
	Motor protection		Electronic motor protection relay (rated current user adjustable)
	Torque limit level		Torque limit value can be set (0 to 400 % variable)
Control signals for operation	Frequency setting values	Analog input	Terminal 2, 4: 0–5 V DC, 0–10 V DC, 0/4–20 mA Terminal 1: 0–±5 V DC, 0–±10 V DC
		Digital input	Input using the setting dial of the operation panel or parameter unit Four-digit BCD or 16 bit binary (when used with option FR-A7AX)
	Start signal		Available individually for forward rotation and reverse rotation. Start signal automatic self-holding input (3-wire input) can be selected.
	Input signals	Common	Any of 12 signals can be selected using parameters 178 to 189 (input terminal function selection) from among: multi speed selection, remote setting, stop-on-contact, second function selection, third function selection, terminal 4 input selection, JOG operation selection, selection of automatic restart after instantaneous power failure, flying start, external thermal relay input, inverter operation enable signal (FR-HC/FR-CV connection) ⑤, FR-HC connection (instantaneous power failure detection) ⑤, PU operation/external inter lock signal , external DC injection brake operation start, PID control enable terminal, brake opening completion signal, PU operation/external operation switchover, load pattern selection forward rotation reverse rotation boost, V/F switching, load torque high-speed frequency, S-pattern acceleration/deceleration C switchover, pre-excitation, output stop, start self-holding selection, control mode changing, torque limit selection, start-time tuning start external input, torque bias selection 1, 2 ①, P/PI control switchover, forward rotation command, reverse rotation command, inverter reset, PTC thermistor input, PID forward reverse operation switchover, PU-NET operation switchover, NET-external operation switchover, command source switchover, conditional position pulse train sign ①, conditional position droop pulse clear ①, magnetic flux decay output shutoff ⑥
		Pulse train input	100 kpps
	Output signals	Operating status	Any of 7 signals can be selected using parameter 190 to 196 (output terminal function selection) from among: inverter running, up-to-frequency, instantaneous power failure/undervoltage, overload warning, output frequency (speed) detection, second output frequency (speed) detection, third output frequency (speed) detection, regenerative brake prealarm ⑤, electronic thermal relay function pre-alarm, PU operation mode, inverter operation ready, output current detection, zero current detection, PID lower limit, PID upper limit, PID forward rotation reverse rotation output, commercial power supply-inverter switchover MC1, commercial power supply-inverter switchover MC2, commercial power supply-inverter switchover MC3, orientation completion ①, orientation error ①⑥, brake opening request, fan fault output, heatsink overheat pre-alarm , inverter running/start command on ⑤, deceleration at an instantaneous power failure, PID control activated, during retry, PID output interruption, position control preparation ready ⑥, life alarm, alarm output 1, 2, 3 (power-off signal), power savings average value update timing, current average monitor, maintenance timer alarm, remote output, forward rotation output ①, reverse rotation output ①, low speed output, torque detection, regenerative status output ①, start-time tuning completion, in-position completion ①, minor fault output and alarm output. Open collector output (5 points), relay output (2 points) and alarm code of the inverter can be output (4 bit) from the open collector
		When using the FR-A7AY, FR-A7AR option	In addition to the above operating modes parameters 313 to 319 (function selection for the additional 7 output terminals) can also be used to assign the following four signals: control circuit capacitor life, main circuit capacitor life, cooling fan life, inrush current limit circuit life (Only positive logic can be set for extension terminals of the FR-A7AR)
		Pulse train output	50 kpps
		Analog output	You can select any signals using Pr. 54 FM terminal function selection (pulse train output) and Pr. 158 AM terminal function selection (analog output) from among output frequency, motor current (steady or peak value), output voltage, frequency setting, operation speed, motor torque, converter output voltage (steady or peak value), electronic thermal relay function load factor, input power, output power, load meter, motor excitation current, reference voltage output, motor load factor, power saving effect, regenerative brake duty ⑤, PID set point, PID measured value, PLC function output ⑥, motor output, torque command, torque current command and torque monitor.
Display	Parameter unit display (FR-PU07/ FR-DU07)	Operating status	Output frequency, motor current (steady or peak value), output voltage, frequency setting, running speed,motor torque, overload, converter output voltage (steady or peak value), electronic thermal relay function load factor, input power, output power, load meter, motor excitation current, cumlative energization time, actual operation time, motor load factor, cumulative power, energy saving effect, cumulative saving power, regenerative brake duty ⑤, PID set point, PID measured value, PID deviation, inverter I/O terminal monitor, input terminal option monitor ②, output terminal option monitor ②, option fitting status ③, terminal assignment status ③, torque command, torque current command, feed back pulse ①, motor output
		Alarm definition	Alarm definition is displayed when the protective function is activated, the output voltage/current/frequency/cumulative energization time right before the protection function was activated and the past 8 alarm definitions are stored.
		Interactive guidance	Operation guide/trouble shooting with a help function (FR-PU07 only)
Protection	Protective functions		Overcurrent during acceleration, overcurrent during constant speed, overcurrent during deceleration, overvoltage during acceleration, overvoltage during constant speed, overvoltage during deceleration, inverter protection thermal operation, motor protection thermal operation, heatsink overheat, instantaneous power failure occurrence, undervoltage, input phase failure, motor overload, output side earth (ground) fault overcurrent, output short circuit, main circuit element overheat, output phase failure, external thermal relay operation ④, PTC thermistor operation ④, option alarm, parameter error, PU disconnection, retry count excess ④, CPU alarm, operation panel power supply short circuit, 24 V DC power output short circuit, output current detection value excess ④, inrush current limit circuit alarm, communication alarm (inverter), USB error ⑤, opposite rotation deceleration error ④, analog input error, fan fault, overcurrent stall prevention, overvoltage stall prevention, regenerative brake prealarm ⑤, electronic thermal relay function prealarm, PU stop, maintenance timer alarm ②④, brake transistor alarm ⑤, parameter write error, copy operation error, operation panel lock, parameter copy alarm, speed limit indication, encoder no-signal ①④, speed deviation large ①④, overspeed ①④, position error large ①④, encoder phase error ①④, regeneration converter overcurrent ⑥, regeneration converter circuit fault ⑥, regeneration converter transistor protection thermal ⑥, brake sequence error ④⑥

Remarks:

① Only when the option (FR-A7AP) is mounted
② Can be displayed only on the parameter unit (FR-DU07).
③ Can be displayed only on the parameter unit (FR-PU07).
④ This protective function does not function in the initial status.
⑤ FR-A740 only
⑥ FR-A741 only

General Operating Conditions for All Inverters

Specifications	FR-D700	FR-E700	FR-F700	FR-A700
Ambient temperature in operation	-10 °C to +50 °C (non-freezing)	-10 °C to +50 °C (non-freezing)	FR-F740: -10 °C to +50 °C; FR-F746: -10 °C to +40 °C (non-freezing) ①	-10 °C to +50 °C (non-freezing)
Storage temperature ②	-20 to +65 °C	-20 to +65 °C	-20 to +65 °C	-20 to +65 °C
Ambient humidity	Max. 90 % (non-condensing)	Max. 90 % (non-condensing)	Max. 90 % (non-condensing)	Max. 90 % (non-condensing)
Altitude	Max. 1000 m above sea level	Max. 1000 m above sea level	Max. 1000 m above sea level ③	Max. 1000 m above sea level
Protective structure	Enclosed type IP20	Enclosed type IP20	FR-F740: IP00/IP20 ④ FR-F746: IP54	FR-A740: IP00/IP20 FR-A741: IP00
Shock resistance	10 g (3 times each in 3 directions)	10 g (3 times each in 3 directions)	10 g (3 times each in 3 directions)	10 g (3 times each in 3 directions)
Vibration resistance	Max. 5.9 m/s^2	Max. 5.9 m/s^2	Max. 5.9 m/s^2 ($2.9\ m/s^2$ or less for the 04320 or above)	Max. 5.9 m/s^2 ($2.9\ m/s^2$ or less for the FR-A740-04320 or above)
Ambient conditions	For indoor use only, avoid environments containing corrosive gases, install in a dust-free location.	For indoor use only, avoid environments containing corrosive gases, install in a dust-free location.	For indoor use only (F740), avoid environments containing corrosive gases, install in a dust-free location.	For indoor use only, avoid environments containing corrosive gases, install in a dust-free location.
Approvals	UL/CSA/CE/EN/GOST/CCC	UL/CSA/CE/EN/GOST/CCC	FR-F740: CE/UL/cUL/DNV/GOST FR-F746: CE/GOST/CCC	FR-A740: CE/UL/cUL/DNV/GOST/CCC FR-A741: CE/UL/cUL/GOST

Remarks:

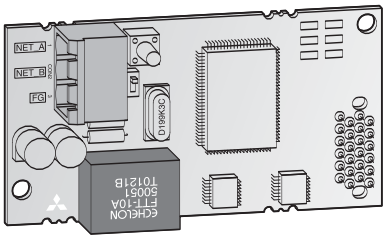
① For selection of the load characteristics with a 120 % overload rating the max. temperature is 40 °C (F740) and 30 °C (F746).

② The product may only be exposed to the full extremes of this temperature range for short periods (e.g. during transportation).

③ After that derate by 3 % for every extra 500 m up to 2500 m.

④ When the cable bushing for the optional expansion cards is broken out the unit has an IP00 protection rating.

Internal and External Options



A large number of options allows an individual adoption of the inverter to the according task. The options can be installed quickly and easily. Detailed information on installation and functions is included in the manual of the options.

The options can be divided into two major categories:

- Internal options
- External options

Internal options

The internal options comprise input and output extensions as well as communications options supporting the operation of the inverter within a network or connected to a personal computer or PLC.

External Options

In addition to the FR-PU07 parameter unit that enables interactive operation of the frequency inverter the available external options also include additional EMC noise filters, reactors for improving efficiency and brake units with brake resistors.

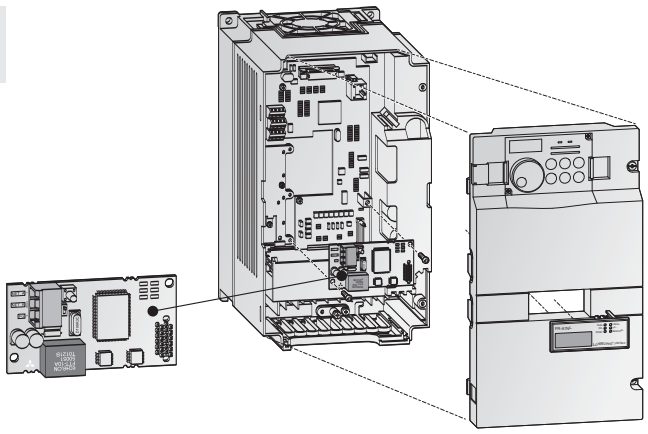
Option			Description	FR-D700	FR-E700	FR-F700	FR-A700
Internal options	Digital input		Input of the frequency setting via BCD or binary code	—	●	●	●
	Digital output		Selectable standard output signals of the inverter can be output at the open collector.	—	●	●	●
	Expansion analog output		Selectable additional signals can be output and indicated at the analog output.	—	●	●	●
	Relay output		Selectable standard output signals of the inverter can be output through relay terminals.	—	●	●	●
	Orientation control, encoder feedback control (PLG), vector and master slave control		These options are used for position control, precise speed control and master/slave control.	—	—	—	●
	Communications	SSCNET	Integration of a frequency inverter into a SSCNET.	—	—	—	●
		Profibus/DP	Integration of a frequency inverter into a Profibus/DP network.	—	●	●	●
		DeviceNet™	Integration of a frequency inverter into a DeviceNet.	—	●	●	●
		CC-Link	Integration of a frequency inverter into a CC-Link network.	—	●	●	●
		LonWorks	Integration of a frequency inverter into a LonWorks network.	—	●	●	●
		CANopen	Integration of a frequency inverter into a CANopen network.	—	●	—	●
		Ethernet multi-protocol	Ethernet multi-protocol interface card	—	—	●	●

Option			Description	FR-D700	FR-E700	FR-F700	FR-A700
External options	Parameter unit (8 languages)		Interactive parameter unit with LCD display.	●	●	●	●
	FR-Configurator software		Parameterization and setup software for the Mitsubishi Electric inverter series.	●	●	●	●
	EMC noise filter		Noise filter for compliance with EMC directives.	●	●	●	●
	Brake unit		To improve the brake capacity of the inverter. For high inertia loads and active loads. Used in combination with a resistor unit.	●	●	●	●
	External high-duty brake resistor		To improve the brake capacity; used in combination with the internal brake transistor.	●	●	—	●
	DC reactor AC chokes		For increased efficiency, reduction of mains feedback and compensation of voltage fluctuations.	●	●	●	●
	Floor standing unit FSU		IP20 physical contact protection in a freely-locatable floor-standing unit. Detailed information on request.	—	—	●	●
	Communications	Profibus/DP	High speed converter for Profibus/DP to RS485 inverter protocol	●	●	●	●
		Profinet	High speed converter for Profinet to RS485 inverter protocol	●	●	●	●

Overview Internal Options

Internal options		Description	Remarks/Specifications	Type	Applicable inverter	Art. no.
16-bit digital input		Interface for the input of the frequency setting via 4-digit BCD or 16-bit binary code, setting of gain and bias supported.	Input: 24 V DC; 5 mA; open collector or switching signal, sink or source logic	FR-A7AX	FR-F700, FR-A700	156775
				FR-A7AX E kit	FR-E700	210668
Digital output with Expansion analog output		Selectable of 43 standard output signals of the inverter can be output at the open collector. The outputs are isolated with optocouplers.	Output: max. 0–10 V DC; 0–20 mA; Resolution: 3 mV at voltage output, 10 mA at current output accuracy: ±10 %	FR-A7AY	FR-F700, FR-A700	156776
		Selectable 2 of 18 additional signals (e.g. output frequency, output voltage, output current) can be output and indicated at the analog output. Display on measuring gauge: 20 mA DC or 5 V (10 V) DC		FR-A7AY E kit	FR-E700	210669
Relay output		Selectable 3 of 43 standard output signals of the inverter can be output through relay terminals.	Switching load: 230 V AC/0.3 A, 30 V DC/0.3 A	FR-A7AR	FR-F700, FR-A700	156777
				FR-A7AR E kit	FR-E700	210670
Bipolar analog output 16 bit analog input Motor thermistor input		Selectable among 24 analog output signals Analog input of torque and speed related data Motor thermistor input for torque stability improvement	Bipolar analog output max. 0–(±)10 V DC Bipolar analog input (16 bit) 0–(±)10 V DC	FR-A7AZ	FR-A700	191401
Encoder power supply		Control terminal block with integrated power supply	12 V DC	FR-A7PS	FR-A700	191399
I/O port		RS485 port, I/O card with twin terminal block	Data rate 4,800–38,400 bps	FR-E7TR	FR-E700	214299
Vector control with encoder feedback		Closed loop vector control with encoder can be performed. Encoder feedback enables high-precision speed, torque and position control.	5 V TTL differential 1024–4096 pulse 11–30 V HTL complimentary	FR-A7AP	FR-A700	166133
Master slave control		Closed loop vector control with encoder can be performed. Master slave position and speed synchronisation are possible with command pulse scaling and position control.		FR-A7AL	FR-A700	191402
Communications	CC-Link	Option board for the integration of a frequency inverter into a CC-Link network. The operation, display functions, and parameter settings can be controlled by a PLC.	Maximum transfer distance: 1200 m (at 156 kBaud)	FR-A7NC	FR-F700, FR-A700	156778
				FR-A7NC E kit	FR-E700	210671
	CAN Open	Option board for integration of a frequency inverter in a CAN Open network. Operation, display functions and parameter settings can be controlled by a computer (PC etc.) or a PLC.	Maximum transfer rate: 1 MBaud	FR-A7NCA	FR-A740	191424
				FR-A7NCA E kit	FR-E700	210705
	Ethernet multi-protocol	Ethernet multi-protocol interface card, Modbus TCP, Ethernet/IP, Profinet, BACNet with Modbus RTU		FR-A7N-ETH	FR-F700, FR-A700	212369
	LonWorks	Option board for integration of a frequency inverter in a LonWorks network. Operation, display functions and parameter settings can be controlled by a computer (PC etc.) or a PLC.	Connection of up to 64 inverters supported. Maximum transfer rate: 78 kBaud	FR-A7NL	FR-F700, FR-A700	156779
				FR-A7NL E kit	FR-E700	210672
	Profibus/DP	Option board for the integration of a frequency inverter into a Profibus/DP network. The operation, display functions, and parameter settings can be controlled by a computer (PC etc.) or a PLC.	Connection of up to 126 inverters supported. Maximum transfer rate: 12 MBaud	FR-A7NP	FR-F700, FR-A700	158524
				FR-A7NP E kit	FR-E700	210673
			D-Sub9 connection adapter for FR-A7NP	FR-D-Sub9	FR-F700, FR-A700	191751
	DeviceNet™	Option board for the integration of a frequency inverter into a DeviceNet. The operation, display functions, and parameter settings can be controlled by a computer (PC etc.) or a PLC.	Maximum transfer rate: 10 MBaud	FR-A7ND	FR-F700, FR-A700	158525
				FR-A7ND E kit	FR-E700	210704
	SSCNET III	Option board for the integration of a frequency inverter into the Mitsubishi Electric servo system network SSCNET III. The operation and display functions can be controlled by Motion Controller (Q172H CPU, Q173H CPU).	Maximum transfer rate: 50 MBaud	FR-A7NS	FR-A700	191403

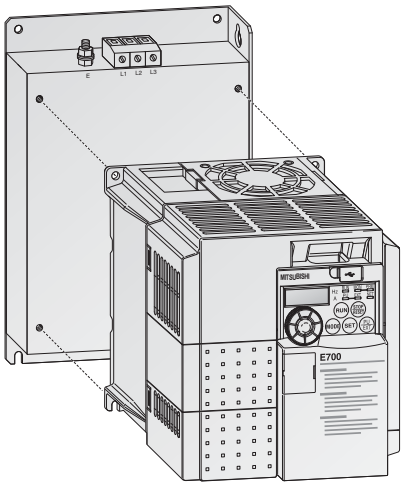
Mounting example of an internal option



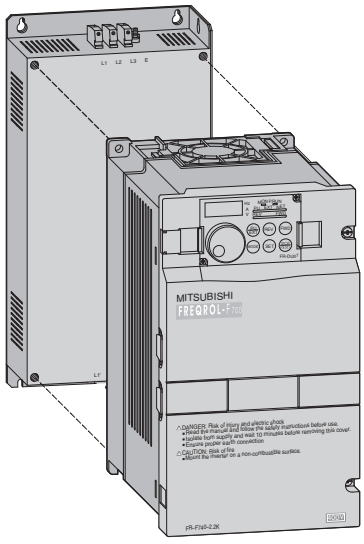
Overview External Options

External options	Description	Remarks/Specifications	Type	Applicable inverter	Art. no.
Parameter unit	Interactive parameter unit with LC display (8 languages) with copy function	Further details are provided by your Mitsubishi Sales office or in the technical catalogue for frequency inverters.	FR-PU07	All	166134
	Interactive standard parameter unit with copy function		FR-DU07	All	157514
	For mounting on the switchgear cabinet door (for instance)		FR-PA07	FR-D700, FR-E700	214795
	Interactive parameter unit with LC display and battery pack		FR-PU07BB	FR-E700, FR-A700	209052
Adapter	Connection adapter for FR-DU07	Required for remote connection of the FR-DU07 with FR-A5CBL	FR-ADP	FR-A700, FR-F700	157515
Connection cable for remote parameter unit	Cable for a remote connection of a parameter unit	Available length: 1; 2.5 and 5 m	FR-A5 CBL	All	1 m: 70727 2.5 m: 70728 5 m: 70729
Installation kit for external air cooling	For installation of the heatsink on the switchgear cabinet door	Reduces temperature in switchgear cabinet	FR-A7CN	FR-A700, FR-F700	—
Distributor module for RJ45 connections	Distributor for connection of multiple inverters in a serial network	2 connections	FR-RJ45-HUB4	FR-A700	167612
		8 connections	FR-RJ45-HUB10		167613
	Terminating resistor for RJ45	120 Ω	FR-RJ45-TR	All	167614
Interface cable	Communications cable for RS232 or RS485 interface to connect an external personal computer	Length 3 m	SC-FR PC	All	88426
USB-RS232 converter	Port converter adapter cable from RS-232 to USB	USB specification 1.1, 0.35 m long	USB-RS232	FR-D700, FR-F700	155606
FR-Configurator	Parameterization and setup software for Mitsubishi Electric inverter.	Further details are provided by your Mitsubishi Sales office or in the technical catalogue for frequency inverters.	—	All	215701
EMC noise filter	Noise filter for compliance with EMC directives.		FFR -□□, FR-, FN -□□	All	—
du/dt filter	Output filter for du/dt reduction		FFR-DT-□□A-SS1	All	—
Sinusoidal filter	Output filter for sine wave output voltage		FFR-SI-□□A-SS1	All	—
AC chokes	For increased efficiency, reduction of mains feedback and compensation of voltage fluctuations.		FR-BAL-B	FR-D700, FR-E700, FR-F700, FR-A740	—
DC reactor	DC reactor for compensation of voltage fluctuations.		FR-HEL	FR-D700, FR-E700, FR-F700, FR-A740	—
Brake units	For an improvement of the brake capacity. For high inertia loads and active loads. Used in combination with a resistor unit.		FR-BU2, BU-UFS+RUFC	FR-D700, FR-E700, FR-F700, FR-A740	—
External high-duty brake resistor	To improve the brake capacity; used in combination with the internal brake transistor.		FR-ABR(H)	FR-D700, FR-E700, FR-A740	—
Communications Profibus/DP	High speed converter for Profibus/DP to RS485 inverter protocol	Base unit with 8 ports	PBDP-GW-G8	All	224915
		Extension unit with 8 ports	PBDP-GW-E8	All	224916
Profinet	High speed converter for Profinet to RS485 inverter protocol	Base unit with 8 ports	PN-GW-G8	All	224917
		Extension unit with 8 ports	PN-GW-E8	All	224918

Installing an EMC noise filter on an FR-E700



Installing an EMC noise filter on an FR-F700



Overview of All Inverters and Applicable Noise Filters

Power supply 1~230 V ①	Power supply 3~400 V ②	Rated output current [A]	Rated motor capacity [kW] ④	Rated output current [A] ⑥	Rated motor capacity [kW] ④	Rated output current [A] ③	Rated motor capacity [kW] ④	Frequency inverter type	Art. no.	Applicable noise filter ⑤
		Overload capacity 120 % *		Overload capacity 150 % *		Overload capacity 200 % *				
●		—	—	—	—	0.8	0.1	FR-D720S-008 EC	214189	D1
●		—	—	—	—	1.4	0.2	FR-D720S-014 EC	214190	D1
●		—	—	—	—	2,5	0.4	FR-D720S-025 EC	214191	D1
●		—	—	—	—	4.2	0.75	FR-D720S-042 EC	214192	D1
●		—	—	—	—	7	1.5	FR-D720S-070 EC	214193	D2
●		—	—	—	—	10	2.2	FR-D720S-100 EC	214194	D3
	●	—	—	—	—	1.2 (1.4)	0.4 (0.55)	FR-D740-012 EC	212414	D4
	●	—	—	—	—	2.2 (2.6)	0.75 (1.1)	FR-D740-022 EC	212415	D4
	●	—	—	—	—	3.6 (4.3)	1.5 (2.2)	FR-D740-036 EC	212416	D4
	●	—	—	—	—	5 (6)	2.2 (3)	FR-D740-050 EC	212417	D5
	●	—	—	—	—	8 (9.6)	3.7 (4)	FR-D740-080 EC	212418	D5
	●	—	—	—	—	12 (14.4)	5.5 (7.5)	FR-D740-120 EC	212419	D6
	●	—	—	—	—	16 (19.2)	7.5 (11)	FR-D740-160 EC	212420	D6
●		—	—	—	—	0.8 (0.8)	0.1	FR-E720S-0 08 EC	219221	E1
●		—	—	—	—	1.5 (1.4)	0.2	FR-E720S-015 EC	219222	E1
●		—	—	—	—	3 (2.5)	0.4	FR-E720S-030 EC	217895	E1
●		—	—	—	—	5 (4.1)	0.75	FR-E720S-050 EC	217896	E2
●		—	—	—	—	8 (7)	1.5	FR-E720S-080 EC	217897	E2
●		—	—	—	—	11 (10)	2.2	FR-E720S-110 EC	217898	E3
	●	—	—	—	—	1.6 (1.4)	0.4	FR-E740-016 EC	211955	E4
	●	—	—	—	—	2.6 (2.2)	0.75	FR-E740-026 EC	211956	E4
	●	—	—	—	—	4.0 (3.8)	1.5	FR-E740-040 EC	211957	E4
	●	—	—	—	—	6.0 (5.4)	2.2	FR-E740-060 EC	211958	E5
	●	—	—	—	—	9.5 (8.7)	3.7	FR-E740-095 EC	211959	E5
	●	—	—	—	—	12	5.5	FR-E740-120 EC	211960	E6
	●	—	—	—	—	17	7.5	FR-E740-170 EC	211961	E6
	●	—	—	—	—	23	11	FR-E740-230 EC	211962	E7
	●	—	—	—	—	30	15	FR-E740-300 EC	211963	E7
	●	2.3	0.75	2.1	0.75	—	—	FR-F740-00023 EC	156569	AF1
	●	3.8	1.5	3.5	1.5	—	—	FR-F740-00038 EC	156570	AF1
	●	5.2	2.2	4.8	2.2	—	—	FR-F740-00052 EC	156571	AF1
	●	8.3	3.7	7.6	3.7	—	—	FR-F740-00083 EC	156572	AF1
	●	12.6	5.5	11.5	5.5	—	—	FR-F740-00126 EC	156573	AF1
	●	17	7.5	16	7.5	—	—	FR-F740-00170 EC	156594	AF2
	●	25	11	23	11	—	—	FR-F740-00250 EC	156595	AF2
	●	31	15	29	15	—	—	FR-F740-00310 EC	156596	AF3
	●	38	18.5	35	18.5	—	—	FR-F740-00380 EC	156597	AF3
	●	47	22	43	22	—	—	FR-F740-00470 EC	156598	AF4
	●	62	30	57	30	—	—	FR-F740-00620 EC	156599	AF4
	●	77)	37	70	37	—	—	FR-F740-00770 EC	156600	AF5
	●	93	45	85	45	—	—	FR-F740-00930 EC	156601	AF6
	●	116	55	106	55	—	—	FR-F740-01160 EC	156602	AF7
	●	180	90	144	75	—	—	FR-F740-01800 EC	156603	AF7
	●	216	110	180	90	—	—	FR-F740-02160 EC	156604	AF8
	●	260	132	216	110	—	—	FR-F740-02600 EC	156605	AF8
	●	325	160	260	132	—	—	FR-F740-03250 EC	156606	AF9
	●	361	185	325	160	—	—	FR-F740-03610 EC	156607	AF9
	●	432	220	361	185	—	—	FR-F740-04320 EC	156608	AF9
	●	481	250	432	220	—	—	FR-F740-04810 EC	156609	AF10
	●	547	280	481	250	—	—	FR-F740-05470 EC	156610	AF10
	●	610	315	547	280	—	—	FR-F740-06100 EC	156611	AF10
	●	683	355	610	315	—	—	FR-F740-06830 EC	156612	AF11
	●	770	400	683	355	—	—	FR-F740-07700 EC	156613	AF11
	●	866	450	770	400	—	—	FR-F740-08660 EC	156614	AF11
	●	962	500	866	450	—	—	FR-F740-09620 EC	156615	AF11
	●	1094	560	962	500	—	—	FR-F740-10940 EC	156616	AF12
	●	1212	630	1094	560	—	—	FR-F740-12120 EC	156617	AF12

Remark:

Explanation for ① to ⑥ see next page.

Power supply 3~400 V ②	Rated output current [A] ⑥	Rated motor capacity [kW] ④	Rated output current [A] ⑥	Rated motor capacity [kW] ④	Rated output current [A]	Rated motor capacity [kW] ④	Rated output current [A]	Rated motor capacity [kW] ④	Frequency inverter type	Art. no.	Applicable noise filter ⑤
	Overload capacity 120 %*		Overload capacity 150 %*		Overload capacity 200 %*		Overload capacity 250 %*				
●	2.3	0.75	2.1	0.75	—	—	—	—	FR-F746-00023 EC	163796	F1
●	3.8	1.5	3.5	1.5	—	—	—	—	FR-F746-00038 EC	163797	F1
●	5.2	2.2	4.8	2.2	—	—	—	—	FR-F746-00052 EC	163798	F1
●	8.3	3.7	7.6	3.7	—	—	—	—	FR-F746-00083 EC	163799	F1
●	12.6	5.5	11.5	5.5	—	—	—	—	FR-F746-00126 EC	163800	F1
●	17	7.5	16	7.5	—	—	—	—	FR-F746-00170 EC	163801	F2
●	25	11	23	11	—	—	—	—	FR-F746-00250 EC	163802	F2
●	31	15	29	15	—	—	—	—	FR-F746-00310 EC	163803	F3
●	38	18.5	35	18.5	—	—	—	—	FR-F746-00380 EC	163804	F3
●	47	22	43	22	—	—	—	—	FR-F746-00470 EC	163805	F4
●	62	30	57	30	—	—	—	—	FR-F746-00620 EC	163806	F4
●	77	37	70	37	—	—	—	—	FR-F746-00770 EC	163807	F5
●	93	45	85	45	—	—	—	—	FR-F746-00930 EC	163808	F6
●	116	55	106	55	—	—	—	—	FR-F746-01160 EC	163809	F6
●	2.3	0.75	2.1	0.75	1.5	0.4	0.8	0.25	FR-A740-00023 EC	169826	AF1
●	3.8	1.5	3.5	1.5	2.5	0.75	1.5	0.4	FR-A740-00038 EC	169797	AF1
●	5.2	2.2	4.8	2.2	4	1.5	2.5	0.75	FR-A740-00052 EC	169798	AF1
●	8.3	3.7	7.6	3.7	6	2.2	4	1.5	FR-A740-00083 EC	169799	AF1
●	12.6	5.5	11.5	5.5	9	3.7	6	2.2	FR-A740-00126 EC	169800	AF1
●	17	7.5	16	7.5	12	5.5	9	3.7	FR-A740-00170 EC	169801	AF2
●	25	11	23	11	17	7.5	12	5.5	FR-A740-00250 EC	169802	AF2
●	31	15	29	15	23	11	17	7.5	FR-A740-00310 EC	169803	AF3
●	38	18.5	35	18.5	31	15	23	11	FR-A740-00380 EC	169804	AF3
●	47	22	43	22	38	18.5	31	15	FR-A740-00470 EC	169805	AF4
●	62	30	57	30	44	22	38	18.5	FR-A740-00620 EC	169806	AF4
●	77	37	70	37	57	30	44	22	FR-A740-00770 EC	169807	AF5
●	93	45	85	45	71	37	57	30	FR-A740-00930 EC	169808	AF6
●	116	55	106	55	86	45	71	37	FR-A740-01160 EC	169809	AF7
●	180	90	144	75	110	55	86	45	FR-A740-01800 EC	169810	AF7
●	216	110	180	90	144	75	110	55	FR-A740-02160 EC	169811	AF8
●	260	132	216	110	180	90	144	75	FR-A740-02600 EC	169812	AF8
●	325	160	260	132	216	110	180	90	FR-A740-03250 EC	169813	AF9
●	361	185	325	160	260	132	216	110	FR-A740-03610 EC	169814	AF9
●	432	220	361	185	325	160	260	132	FR-A740-04320 EC	169815	AF9
●	481	150	432	220	361	185	325	160	FR-A740-04810 EC	169816	AF10
●	547	280	481	250	432	220	361	185	FR-A740-05470 EC	169817	AF10
●	610	315	547	280	481	250	432	220	FR-A740-06100 EC	169818	AF10
●	683	355	610	315	547	280	481	250	FR-A740-06830 EC	169819	AF11
●	770	400	683	355	610	315	547	280	FR-A740-07700 EC	169820	AF11
●	866	450	770	400	683	355	610	315	FR-A740-08660 EC	169821	AF11
●	962	500	866	450	770	400	683	355	FR-A740-09620 EC	169822	AF11
●	1094	560	962	500	866	450	770	400	FR-A740-10940 EC	169823	AF12
●	1212	630	1094	560	962	500	866	450	FR-A740-12120 EC	169824	AF12
●	—	—	—	—	12	5.5	—	—	FR-A741-5.5k	216905	AF13
●	—	—	—	—	17	7.5	—	—	FR-A741-7.5k	216906	AF13
●	—	—	—	—	23	11	—	—	FR-A741-11K	216907	AF14
●	—	—	—	—	31	15	—	—	FR-A741-15K	216908	AF14
●	—	—	—	—	38	18.5	—	—	FR-A741-18.5K	216909	AF15
●	—	—	—	—	44	22	—	—	FR-A741-22K	217397	AF15
●	—	—	—	—	57	30	—	—	FR-A741-30K	216910	AF16
●	—	—	—	—	71	37	—	—	FR-A741-37K	216911	AF16
●	—	—	—	—	86	45	—	—	FR-A741-45K	216912	AF16
●	—	—	—	—	110	55	—	—	FR-A741-55K	216913	AF17

The values for 120 % overload capacity are valid at 110 % I_{rated} for 60 s, 120 % for 0.5 s (3 s for FR-F740 and FR-F746) at 40 °C ** max. (30 °C for FR-F746)
The values for 150 % overload capacity are valid at 120 % I_{rated} for 60 s, 150 % for 0.5 s (3 s for FR-F740 and FR-F746) at 40 °C ** max.
The values for 200 % overload capacity are valid at 150 % I_{rated} for 60 s, 200 % for 0.5 s at 50 °C max. (3 s for FR-A740/FR-A741) at 50 °C max.
The values for für 250 % overload capacity are valid at 200 % I_{rated} for 60 s, 250 % for 3 s at 50 °C max.
** (FR-A540L-G and FR-F740 do not have this limitation, the validity is 50 °C max. at 150 % overload capacity)

Remarks:

① Permissible power supply voltage range for 1-phase connection: 170–264 V.

② Permissible power supply voltage range for 3-phase connection: 323–528 V (323–550 V for FR-F740-01800–12120)

③ The values in brackets are valid without a restriction to the PWM frequency (up to 40 °C).

④ At higher power supply voltages higher capacities can be output. The motor capacity ratings in brackets are for ambient temperatures up to 40 °C.

⑤ Combination see next page.

⑥ If the carrier of the FR-F 740 is set to 3 kHz or more, the carrier frequency is automatically reduced when the inverter output current exceeds the parenthesized rated output current (= 85 % load).

Filters and Conditioners

Filters and conditioners - a necessary part of today's environment

The need for various filters and conditioning elements, to be added to power circuits, has been driven by legislation and regulation from Europe, the Government and Electricity suppliers.

Mitsubishi Electric offers a range of solutions to help installations meet requirements such as EMC directives through to G5/4 regulations.

Registration with the UK ECA scheme

Many of Mitsubishi Electric's inverters are registered with the UK Governments ECA scheme.

More information about the scheme can be found at www.eca.gov.uk . Mitsubishi Electric's company registration number in the scheme is 107, and was first registered 1/4/2003.

EMC information

Ensuring compliance with the EN 61800-3 product standard.

Inverters must be fitted with an appropriate **EMC filter** (see Accessories) to guarantee compliance with the EMC requirements of the EN 61800-3 product standard.

These **EMC filters** are available as optional accessories and are normally installed in the direct vicinity of the inverter. The guidelines for using and installing Mitsubishi inverters must be observed at all times.

See the applicable technical documentation for your Mitsubishi inverter for more information. All the applicable guidelines and regulations for using and installing the equipment must also be observed at all times.

Please contact your Mitsubishi partner if you require further information.

Definition of terms in EN 61800-3 & A11:

First environment:

An environment including buildings and domestic residential areas that are connected directly to a low-voltage power supply network without an interstage transformer.

Second environment:

Environments containing facilities that are not directly connected to a low-voltage power supply network for buildings in domestic and residential areas.

No.	Frequency inverter	EMC Filter conf. 55011A	Art. no.	EMC Filter conf. 55022B	Art. no.
D1	FR-D720S-008–042 EC	FFR-CS-050-14A-RF1	216227	FFR-CS-050-14A-RF1	216227
		FFR-CS-050-14A-RF1-LL	229801	FFR-CS-050-14A-RF1-LL	229801
D2	FR-D720S-070 EC	FFR-CS-080-20A-RF1	216228	FFR-CS-080-20A-RF1	216228
		FFR-CS-080-20A-RF1-LL	229802	FFR-CS-080-20A-RF1-LL	229802
D3	FR-D720S-100 EC	FFR-CS-110-26A-RF1	216229	FFR-CS-110-26A-RF1	216229
		FFR-CS-110-26A-RF1-LL	229803	FFR-CS-110-26A-RF1-LL	229803
D4	FR-D740-012–036 EC	FFR-CSH-036-8A-RF1	215007	FFR-CSH-036-8A-RF1	215007
		FFR-CSH-036-8A-RF1-LL	226836	FFR-CSH-036-8A-RF1-LL	226836
D5	FR-D740-050/080 EC	FFR-CSH-080-16A-RF1	215008	FFR-CSH-080-16A-RF1	215008
		FFR-CSH-080-16A-RF1-LL	226837	FFR-CSH-080-16A-RF1-LL	226837
D6	FR-D740-120/160 EC	FFR-MSH-170-30A-RF1	215005	FFR-MSH-170-30A-RF1	215005
		FFR-MSH-170-30A-RF1-LL	226838	FFR-MSH-170-30A-RF1-LL	226838
E1	FR-E720S-008–030 EC	FFR-CS-050-14A-RF1	216227	FFR-CS-050-14A-RF1	216227
E2	FR-E720S-050/080 EC	FFR-CS-080-20A-RF1	216228	FFR-CS-080-20A-RF1	216228
E3	FR-E720S-110 EC	FFR-CS-110-26A-RF1	216229	FFR-CS-110-26A-RF1	216229
E4	FR-E740-016-040 EC	FFR-MSH-040-8A-RF1	214953	FFR-MSH-040-8A-RF1	214953
E5	FR-E740-060/095 EC	FFR-MSH-095-16A-RF1	215004	FFR-MSH-095-16A-RF1	215004
E6	FR-E740-120/170 EC	FFR-MSH-170-30A-RF1	215005	FFR-MSH-170-30A-RF1	215005
E7	FR-E740-230/300	FFR-MSH-300-50A-RF1	215006	FFR-MSH-300-50A-RF1	215006
AF1	FR-A/F740-00023–00126 EC	FFR-BS-00126-18A-SF100	193677	FFR-BS-00126-18A-SF100	193677
AF2	FR-A/F740-00170– 00250 EC	FFR-BS-00250-30A-SF100	193678	FFR-BS-00250-30A-SF100	193678
AF3	FR-A/F740-00310–00380 EC	FFR-BS-00380-55A-SF100	193679	FFR-BS-00380-55A-SF100	193679
AF4	FR-A/F740-00470–00620 EC	FFR-BS-00620-75A-SF100	193680	FFR-BS-00620-75A-SF100	193680
AF5	FR-A/F740-00770 EC	FFR-BS-00770-95A-SF100	193681	FFR-BS-00770-95A-SF100	193681
AF6	FR-A/F740-00930 EC	FFR-BS-00930-120A-SF100	193682	FFR-BS-00930-120A-SF100	193682
AF7	FR-A/F740-01160– 01800 EC	FFR-BS-01800-180A-SF100	193683	FFR-BS-01800-180A-SF100	193683
AF8	FR-A/F740-02160–02600 EC	FN3359-250-28	104663		
AF9	FR-A/F740-03250–04320 EC	FN3359-400-99	104664		
AF10	FR-A/F740-04810–06100 EC	FN3359-600-99	104665		
AF11	FR-A/F740-06830–09620 EC	FN3359-1000-99	104666		
AF12	FR-A/F740-10940–12120 EC	FN3359-1600-99	130229		
F1	FR-F746-00023–00126 EC	FFR-AF-IP54-21A-SM2	201551	FFR-AF-IP54-21A-SM2	201551
F2	FR-F746-00170–00250 EC	FFR-AF-IP54-44A-SM2	201552	FFR-AF-IP54-44A-SM2	201552
F3	FR-F746-00310–00380 EC	FFR-AF-IP54-62A-SM2	201553	FFR-AF-IP54-62A-SM2	201553
F4	FR-F746-00470–00620 EC	FFR-AF-IP54-98A-SM2	201704	FFR-AF-IP54-98A-SM2	201704
F5	FR-F 746-00770 EC	FFR-AF-IP54-117A-SM2	201705	FFR-AF-IP54-117A-SM2	201705
F6	FR-F746-00930–01160 EC	FFR-AF-IP54-172A-SM2	201706	FFR-AF-IP54-172A-SM2	201706
AF13	FR-A741-5.5k/7.5k	FFR-RS-7.5k-27A-EF100	227840	FFR-RS-7.5k-27A-EF100	227840
AF14	FR-A741-11k/15k	FFR-RS-15k-45A-EF100	227841	FFR-RS-15k-45A-EF100	227841
AF15	FR-A741-18.5k/22k	FFR-RS-22k-65A-EF100	227842	FFR-RS-22k-65A-EF100	227842
AF16	FR-A741-30k/37k/45k	FFR-RS-45k-127A-EF100	227843	FFR-RS-45k-127A-EF100	227843
AF17	FR-A741-55K	FFR-RS-55k-159A-EF100	227844	FFR-RS-55k-159A-EF100	227844

Remark:

The frequency inverters of the FR-F740/FR-F746/FR-A740 series are equipped with a built-in EMC filter for industrial environment (2nd environment). The filters shown in the table above are required for special cases only.

SERVO AND MOTION SYSTEMS

Mitsubishi Electric offers a variety of Servo and Motion system products providing solutions for applications covering point-to-point and synchronised systems. Systems can be built using a single axis or multi axes, for example when using a System Q Motion CPU solution up to 96 axes can be controlled.

With both standard pulse type output modules and SSCNET bus modules specific application needs are easy to meet.

The Servo motors and amplifiers takes Mitsubishi Motion Control to new levels of precision with a wide range of motors (all MR-ES series motors are fitted with 131072 pulse-per-revolution encoders, and all MR-J3 series motors are fitted with 262144 pulse-per-revolution encoders) and wide amplifier range (up to 110 kW).

All Mitsubishi Servo and Motion system hardware is complimented by a range of software packages allowing easy programming and set-up of the units.

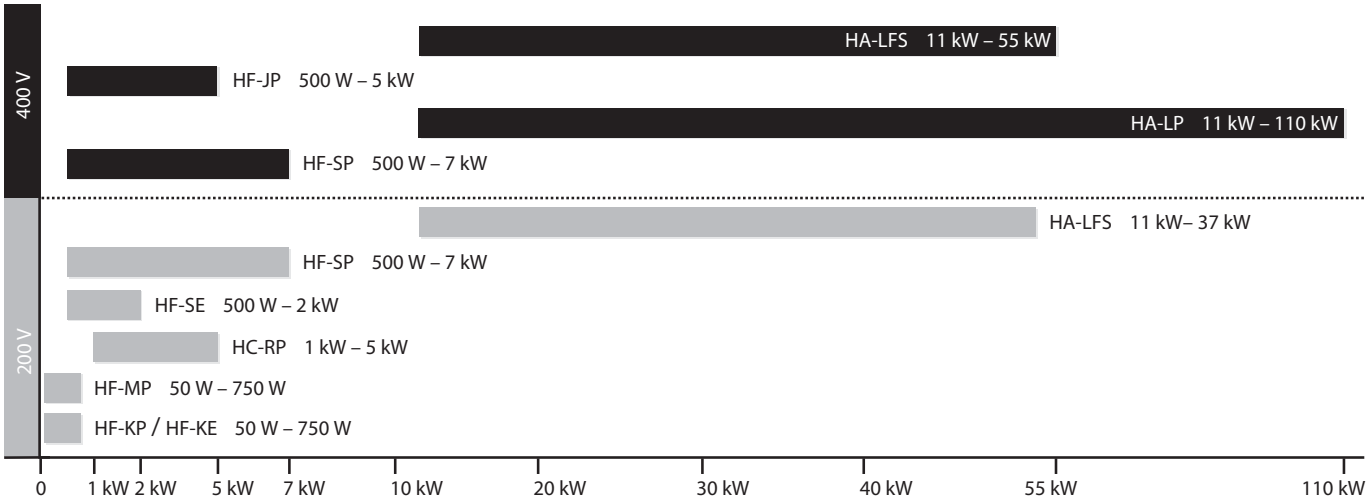
What are the Components of a Servo System?

Servo motors

Utilising the most advanced concentrated winding techniques and latest technology, these brushless servo motors are among the most compact on the market.

Mitsubishi Servo Motors are made to high standards and offer a wide range of power, speed and inertia ratings providing a motor for all applications. With a range from 50 W to 110 kW and with specialist motor types (flat "pancake" motors) a complete line-up of products can be offered by Mitsubishi Electric.

Also, all motors in the MR-J3 Series are fitted with absolute encoders as standard. Therefore, an absolute system can be created by simply providing power to Servo amplifier via a battery. Once this has been done the super capacitor inside the motor and back-up battery allow the Servomotor position to be constantly monitored.

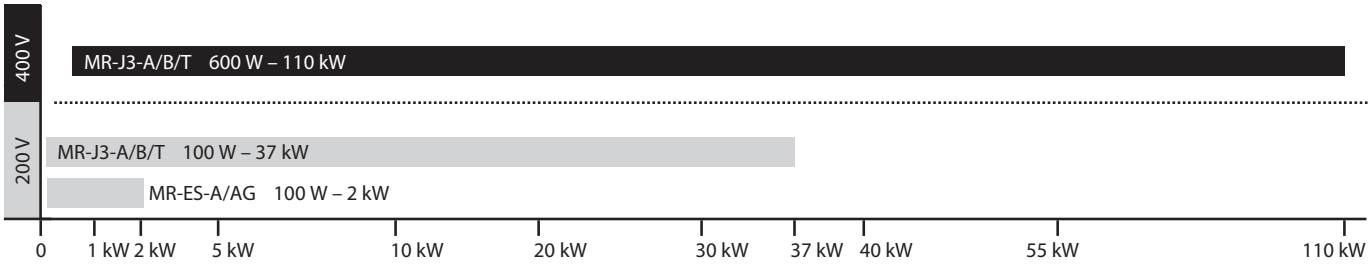


Servo amplifiers

Mitsubishi offer a wide range of Servo amplifiers to meet the demands of all types of applications. From standard digital pulse and analogue controlled amplifiers through to dedicated SSCNET bus type amplifiers, there is a product for all circumstances.

Real Time Adaptive Tuning (RTAT) is a unique Mitsubishi technology, enabling the servo to deliver maximum dynamic performance, even if the load keeps changing, by automatically tuning online (during operation) to the application.

The digital pulse-train and analogue units of the MR-ES and MR-J3 series range from 100 W units through to 110 kW. The SSCNET bus type amplifiers (type B) offer the user ease of connectivity, via SSCNET.



Positioning controllers

For the compact, cost effective, FX range of PLCs, the FX2N-10PG unit provides single-axis control with in-built positioning tables, fast external start and an output pulse rate of up to 1 MHz. The module FX3U-20SSC-H is a positioning module for the MR-J3-B series. This modules provide a quick and easy, but efficient positoning control system for simpler applications.

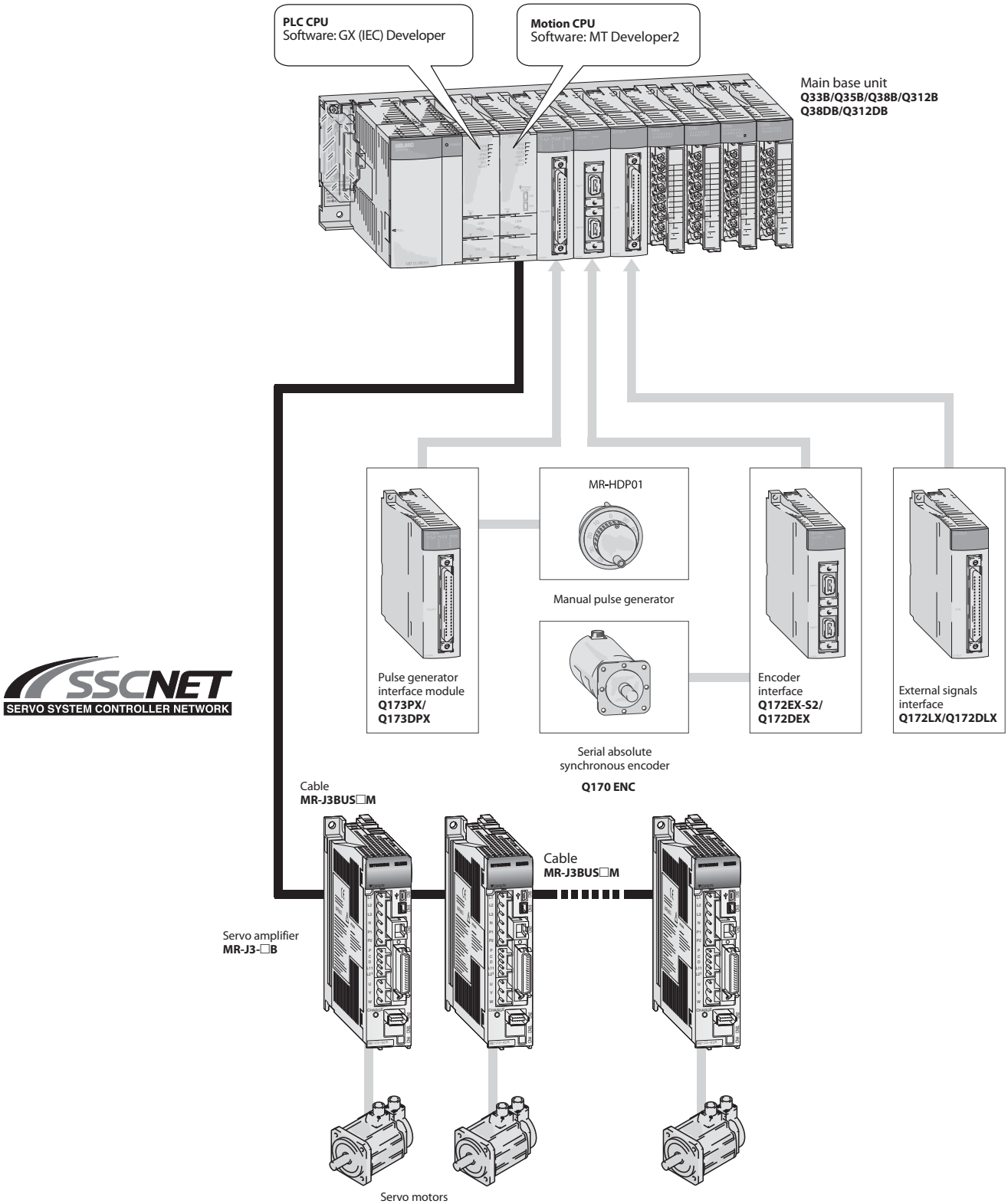
For larger, more complex applications the new powerful Qn PLC range offers three QD75 Series modules (one, two and four axes).

These are: open-collector output type (QD75P series), Differential output type (QD75D series) and SSCNET III bus type (QD75MH series). Using the SSCNET system can provide much improved, easier to use positioning system, with reduced wiring and better noise immunity. All QD75 series controllers can provide functionality such as interpolation and speed-position operation etc.

Motion Controllers

For specialist applications requiring the highest level of control and precision, the dynamic servo technology provided by the Q-Motion CPU is combined with the powerful processing power of the Q series PLC CPU, creating a completely new generation of motion controller products.This fully integrated and flexible system has the capability to control up to 96 axes using SSCNET, which is more than capable for handling any motion application.

System Configuration



Notes:

1. The first CPU on the main base unit must always be a PLC CPU (e.g. Q00, Q01, Q02/Q02H/Q06H/Q12H/Q25H/QnUD(H) Serie).

X-Y Table System Configurations

An X-Y table is a typical two axes servo application, commonly used in industry for pick and place systems such as PCB component insertion machines through to welding machines.

The following information provides two examples of possible X-Y table system configurations, using Mitsubishi automation equipment.

The first is a FX3G-24MT/ESS based system and the second is a more complex interpolating QD75MH (SSCNET III) based system.

System 1: FX3G PLC based system

Products	Function
FX3G-24MT/ESS	PLC with integrated positioning control
MR-E-10A-QW003	Servo Amplifier
HF-KE13W1-S100	Motor
MR-E-70A-QW003	Servo Amplifier
HF-SE52KW1-S100	Motor

The FX3G is a compact PLC for comprehensive machine control. It combines the functions of a PLC with positioning functions. In this configuration the FX3G-24MT/ESS is used to control the X and Y axes. Via the transistor open collector outputs the PLC provides the Servo amplifiers of the MR-ES-A Series with pulse train signals for controlling the two axes. The setting of the system can be done with the GX-Developer. GX Developer has a special section for the general positioning parameter setup and for the setup of each positioning command in a easy to use table. This table for each axis can contain 100 instructions with the Frequency and number of pulses stored in the user data area and can be manipulated and uploaded for setting into operation of the machine.

For expanding the system, the FX3G is also connectable to the majority of existing FX2N and FX3U Special Function Blocs.

- User friendly positioning
- Easy setting in GX Developer
- Cost effective
- Simple functionality

System 2: QD75MH based system

Products	Function
Q00J	Q PLC
QD75MH2	Positioning Controller
MR-J3-10B	Servo Amplifier
HF-KP13	Motor
MR-J3-60B	Servo Amplifier
HF-SP52	Motor
MR-J3BAT	Servo Amplifier Battery

The QD75MH based system uses the powerful modular Qn PLC Series, providing greater functionality and expandability options. The QD75MH system is connected using SSCNET III (Servo System Controller Network), which is Mitsubishi's dedicated motion control network. SSCNET III simplifies the set-up of the system and reduces the wiring required. SSCNET III systems are created by simply plugging an amplifier into the main controller (QD75MH) and then "daisy-chaining" each additional axis that is added. SSCNET III connectivity requires MR-J3-B type amplifiers to be used.

Furthermore, as the Servo amplifiers are connected by a bus system, all Servo data, such as current position, torque etc. can all be monitored back at the main controller (Q00J PLC) as the data is automatically updated on the QD75MH module.

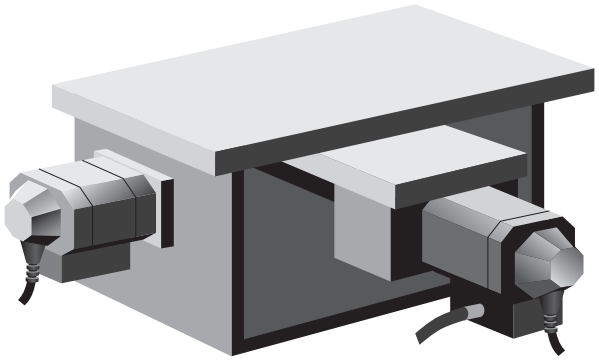
Also, all of the internal Servo parameters can be set from the PLC, again due to the bus system used.

The bus system also means that position data is sent serially, therefore reducing any possible interference due to noise.

Finally, as both axes are controlled from one high function module (QD75MH), interpolation between the two axes is possible.

- SSCNET III capability
- Easy of set-up
- High functionality
- Expandability
- Module Options
- Reduced Wiring

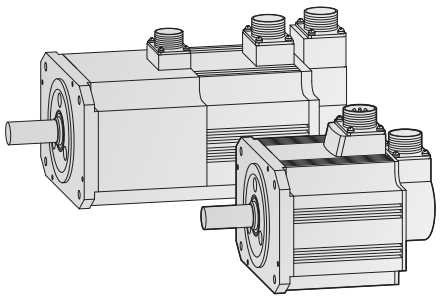
X-Y table control

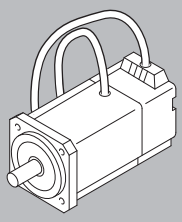
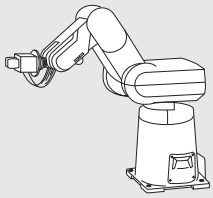
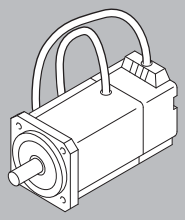
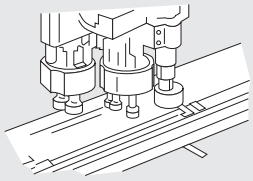
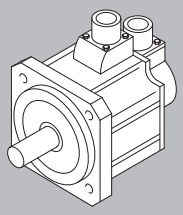
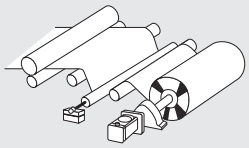
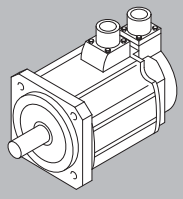
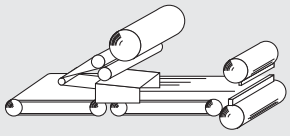
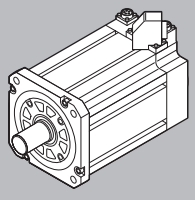


Servo Motor Features and Typical Applications

The recommended combinations of servo amplifiers and servo motors are listed in the tables below.

All servo motors are fitted with an absolute encoder and optionally avalable with an electromagnetic brake.



Model designation	Features	Application example	
K 	**Low inertia** Larger motor inertia moment makes this unit well suited for machines with fluctuating load inertia moment or machines with low rigidity such as conveyors.	● Conveyors ● Food preparation machinery ● Printers ● Small loaders and unloaders ● Small robots and component assembly devices ● Small X-Y tables ● Small press feeders	 Small robots
M 	**Ultra low inertia** Small motor inertia moment makes this unit well suited for high-dynamic positioning operations with extra small cycle times.	● Inserters, mounters, bonders ● Printed board hole openers ● In-circuit testers ● Label printers ● Knitting and embroidery machinery ● Ultra-small robots and robot tips	 Inserters, mounters, bonders
S 	**Medium inertia** Stable control is performed from low to high speeds, enabling this unit to handle a wide range of applications (e.g. direct connection to ball screw components).	● Conveyor machinery ● Specialised machinery ● Robots ● Loaders and unloaders ● Winders and tension devices ● Turrets ● X-Y tables ● Test devices	 Winders and tension devices
R 	**Low inertia** A compact sized low-inertia moment model with medium capacity. Well suited for high-frequency operation.	● Roll feeders ● Loaders and unloaders ● High-frequency conveyor machinery	 Wrapping machinery
J 	**Low Inertia (400 V)** A 400 V Servo Motor for the MELSERVO-J3 Series for a power range up to 5 kW with low inertia and high speed. It has a compact size, is equipped with high resolution encoder and is compatible to gloabal standards.	● Food and Packaging ● Printing machine ● Pick up robot for Injection molding machine ● Palletizing machine ● General machine which require High speed and High frequency	

Note: Other types of motors are available on request.

Servo Motors Overview

Motors for MR-ES series servo amplifiers

Motor series	Rated speed [r/min]	Rated output capacity [kW]	Servo motor model	Servo motor type: Voltage	Servo motor type: Protective structure	Amplifier pairing MR-E: 10A 10AG	20A 20AG	40A 40AG	70A 70AG	100A 100AG	200A 200AG	Art. no.
HF-KE K	3000	0.1	HF-KE13W1-S100	200 V AC	IP55	●						210940
		0.2	HF-KE23KW1-S100				●					213081
		0.4	HF-KE43KW1-S100					●				213082
		0.75	HF-KE73KW1-S100						●			213083
HF-SE S	2000	0.5	HF-SE52KW1-S100	200 V AC	IP65				●			213084
		1.0	HF-SE102KW1-S100							●		213085
		1.5	HF-SE152KW1-S100								●	213086
		2.0	HF-SE202KW1-S100								●	213087

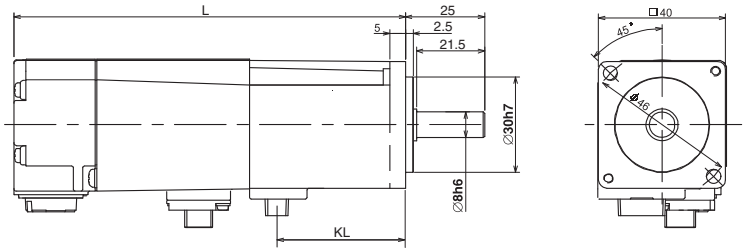
Motors for MR-J3 series servo amplifiers

Motor series 200 V	Rated speed [r/min]	Rated output capacity [kW]	Servo motor model	Servo motor type: Voltage	Servo motor type: Protective structure	Amplifier pairing MR-J3: 10A 10B	20A 20B	40A 40B	60A 60B	70A 70B	100A 100B	200A 200B	350A 350B	500A 500B	700A 700B	Art. no.
HF-KP K	3000	0.05	HF-KP053	200 V AC	IP65	●										161507
		0.1	HF-KP13			●										160211
		0.2	HF-KP23				●									161508
		0.4	HF-KP43					●								161509
		0.75	HF-KP73							●						161510
HF-MP M	3000	0.05	HF-MP053	200 V AC	IP65	●										161515
		0.1	HF-MP13			●										161516
		0.2	HF-MP23				●									161517
		0.4	HF-MP43					●								161518
		0.75	HF-MP73							●						161519
HF-SP S	2000	0.5	HF-SP52	200 V AC	IP67				●							161525
		1.0	HF-SP102								●					161526
		1.5	HF-SP152									●				161527
		2.0	HF-SP202									●				161528
		3.5	HF-SP352										●			161529
		5.0	HF-SP502											●		161530
		7.0	HF-SP702												●	161531
HC-RP R	3000	2.0	HC-RP103	200 V AC	IP65							●				168667
		2.0	HC-RP153									●				168668
		3.5	HC-RP203										●			168669
		5.0	HC-RP353											●		168670
		5.0	HC-RP503											●		168671
Motor series 400 V						—	—	—	**60A4 60B4**	—	**100A4 100B4**	**200A4 200B4**	**350A4 350B4**	**500A4 500B4**	**700A4 700B4**	**Art. no.**
HF-SP S	2000	0.5	HF-SP524	400 V AC	IP67				●							192042
		1.0	HF-SP1024								●					192043
		1.5	HF-SP1524									●				192054
		2.0	HF-SP2024									●				192055
		3.5	HF-SP3524										●			192056
		5.0	HF-SP5024											●		192057
		7.0	HF-SP7024												●	192058
Motor series 400 V						—	—	—	**60A4 60B4 60T4**	—	**100A4 100B4 100T4**	**200A4 200B4 200T4**	**350A4 350B4 350T4**	**500A4 500B4 500T4**	**700A4 700B4 700T4**	**Art. no.**
HF-JP J	3000	0.5	HF-JP534	400 V AC	IP67				●							227015
		0.75	HF-JP734								●					227016
		1.0	HF-JP1034								●					227017
		1.5	HF-JP1534									●				227018
		2.0	HF-JP2034									●				227019
		3.3<3.5>	HF-JP3534										●			227020
		5.0	HF-JP5034											●		227021

Note: Other types of motors are available on request.

Dimensions of Motors for MR-J3, MR-ES Series Servo Amplifiers

HF-MP13 (B), HF-KP13 (B), HF-KE13(B)W1-S100

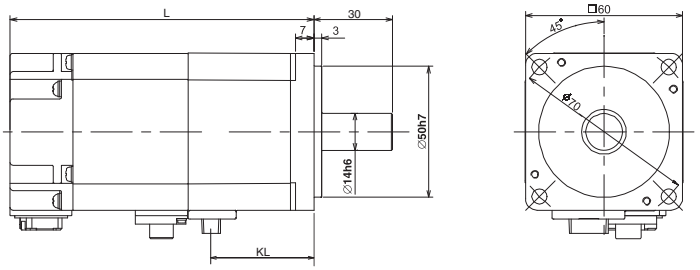


Type	L [mm]	KL [mm]
HF-MP13 (B)	82.4 (123.5)	40.5
HF-KP13 (B)	82.4 (123.5)	40.5
HF-KE13(B)W1-S100	82.4 (123.5)	40.5

Dimensions inside ( ) are for the models with an electromagnetic brake.
Keyway shaft as standard (HF-KE motors come with key)

Unit: mm

HF-MP23 (B), HF-MP43 (B), HF-KP23 (B), HF-KP43 (B), HF-KE23(B)KW1-S100, HF-KE43(B)KW1-S100

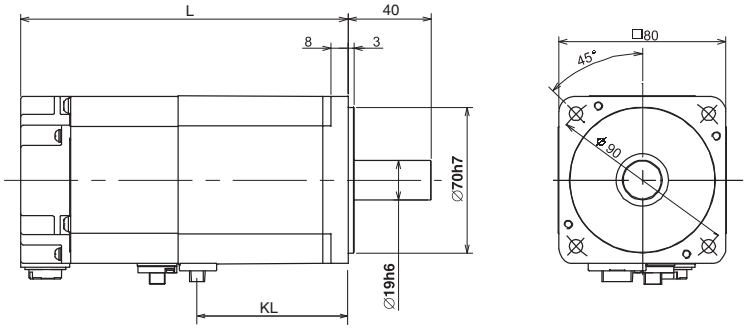


Type	L [mm]	KL [mm]
HF-MP23 (B)	76.6 (116.1)	39.3
HF-MP43 (B)	98.5 (138.0)	61.2
HF-KP23 (B)	76.6 (116.1)	39.3
HF-KP43 (B)	98.5 (138.0)	61.2
HF-KE23(B)KW1-S100	76.6 (116.1)	39.3
HF-KE43(B)KW1-S100	98.5 (138.0)	61.2

Dimensions inside ( ) are for the models with an electromagnetic brake.
Keyway shaft as standard (HF-KE motors come with key)

Unit: mm

HF-MP73 (B), HF-KP73 (B), HF-KE73(B)KW1-S100

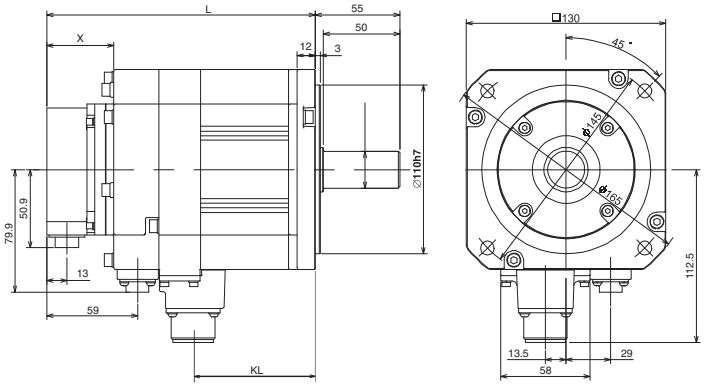


Type	L [mm]	KL [mm]
HF-MP73 (B)	113.8 (157.0)	72.3
HF-KP73 (B)	113.8 (157.0)	72.3
HF-KE73(B)KW1-S100	113.8 (157.0)	72.3

Dimensions inside ( ) are for the models with an electromagnetic brake.
Keyway shaft as standard (HF-KE motors come with key)

Unit: mm

HF-SP52 (B), HF-SP102 (B), HF-SP152 (B), HF-SE52(B)KW1-S100, HF-SE102(B)KW1-S100, HF-SE152(B)KW1-S100

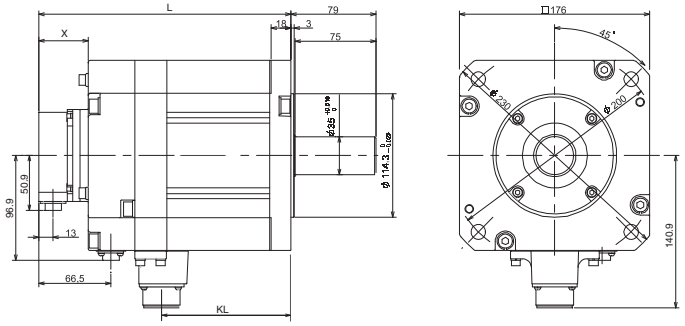


Type	L [mm]	KL [mm]	X [mm]
HF-SP52 (B)	118.5 (153.0)	57.8	38.2 (43.5)
HF-SP102 (B)	140.5 (175.0)	79.8	38.2 (43.5)
HF-SP152 (B)	162.5 (197.0)	101.8	38.2 (43.5)
HF-SE52(B)KW1-S100	120 (154.5)	57.8	39.7 (45.0)
HF-SE102(B)KW1-S100	142 (176.5)	79.8	39.7 (45.0)
HF-SE152(B)KW1-S100	164 (198.5)	101.8	39.7 (45.0)

Dimensions inside ( ) are for the models with an electromagnetic brake.
Keyway shaft as standard (HF-SE motors come without key)

Unit: mm

HF-SP202 (B), HF-SP352 (B), HF-SP502 (B), HF-SP702 (B), HF-SE202(B)KW1-S100

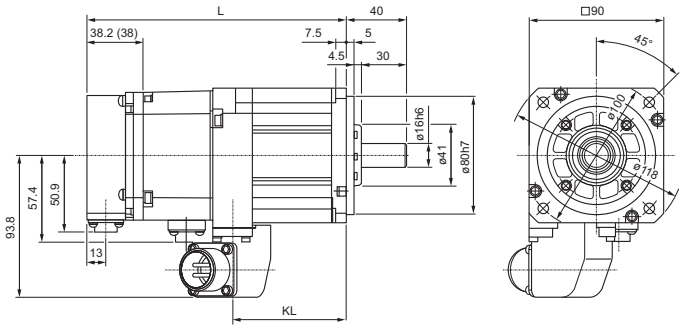


Type	L [mm]	KL [mm]	X [mm]
HF-SP202 (B)	143.5 (193.0)	79.8	38.5 (45.5)
HF-SP352 (B)	183.5 (233.0)	119.8	38.5 (45.5)
HF-SP502 (B)	203.5 (253.0)	139.8	38.5 (45.5)
HF-SP702 (B)	263.5 (313.0)	191.8	38.5 (45.5)
HF-SE202(B)KW1-S100	145 (194.5)	79.8	40.0 (47.0)

Dimensions inside ( ) are for the models with an electromagnetic brake.
Keyway shaft as standard (HF-SE motors come without key)

Unit: mm

HF-JP534 (B), HF-JP734 (B), HF-JP1034 (B), HF-JP1534 (B), HF-JP2034(B)

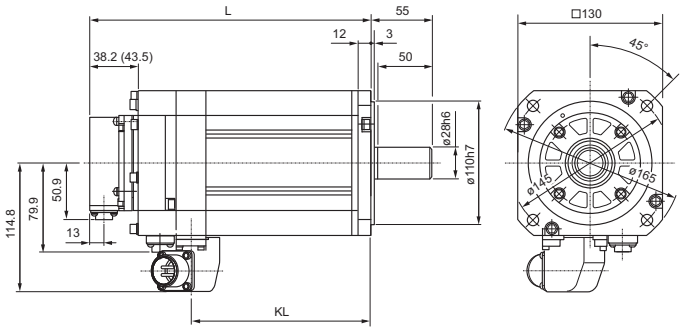


Type	L [mm]	KL [mm]
HF-JP534 (B)	127.5 (173)	76
HF-JP734 (B)	145.5 (191)	94
HF-JP1034 (B)	163.5 (209)	112
HF-JP1534 (B)	199.5 (245)	148
HF-JP2034 (B)	235.5 (281)	184

Dimensions inside ( ) are for the models with an electromagnetic brake.

Unit: mm

HF-JP3534(B), HF-JP5034(B)

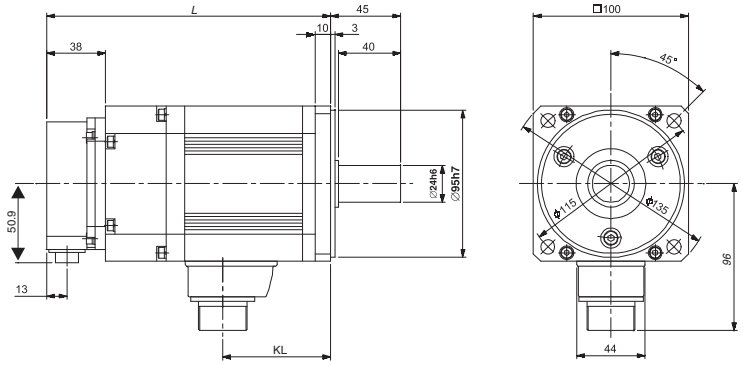


Type	L [mm]	KL [mm]
HF-JP3534 (B)	213 (251.5)	161
HF-JP5034 (B)	267 (305.5)	215

Dimensions inside ( ) are for the models with an electromagnetic brake.

Unit: mm

HC-RP103 (B), HC-RP153 (B), HC-RP203 (B)

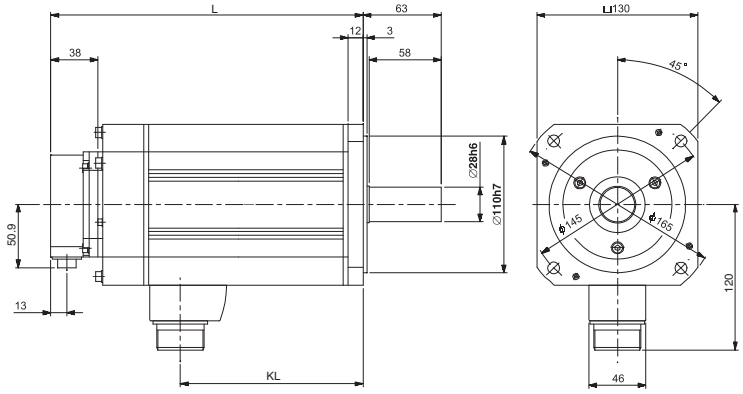


Type	L [mm]	KL [mm]
HC-RP103 (B)	145.5 (183.5)	69.5
HC-RP153 (B)	170.5 (208.5)	94.5
HC-RP203 (B)	195.5 (233.5)	119.5

Dimensions inside ( ) are for the models with an electromagnetic brake.

Unit: mm

HC-RP353 (B), HC-RP503 (B)

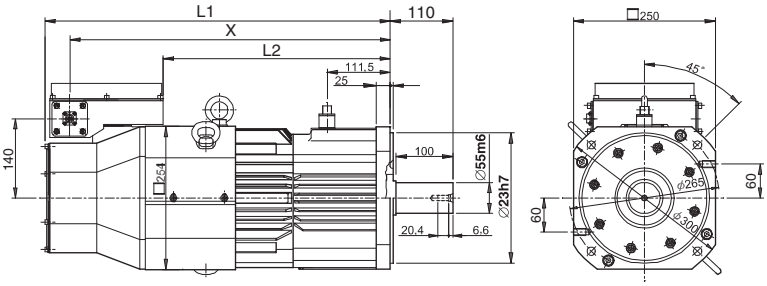


Type	L [mm]	KL [mm]
HC-RP353 (B)	215.5 (252.5)	148
HC-RP503 (B)	272.5 (309.5)	205

Dimensions inside ( ) are for the models with an electromagnetic brake.

Unit: mm

HA-LP11K2[4] (B), HA-LP15K2[4] (B), HA-LP22K2[4] (B)

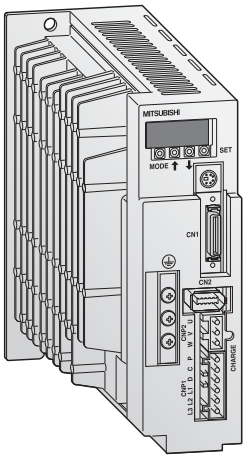


Type	L1 [mm]	L2 [mm]	X
HA-LP11K2[4] (B)	480 (550)	262 (334)	426 (498)
HA-LP15K2[4] (B)	495 (610)	289 (400)	454 (565)
HA-LP22K2[4] (B)	555 (670)	346 (457)	511 (622)

Dimensions inside ( ) are for the models with an electromagnetic brake.

Unit: mm

MR-ES Servo Amplifier Specifications



The servo ampflifier of the series ME-E Super combines unique functions with very compact dimensions. With its high positioning accuracy and high responsivness the MR-E Super is suitable for applications from 100 W to 2 kW. Availible functions of the drive are e.g. position/internal speed control mode, speed/torque control mode and Mitsubishis well known real-time auto-tuning. The compact size helps designers, to fit all control components needed for an automation system into the smallest space.

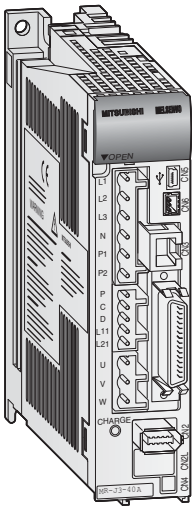
For a fast, easy and secure wiring all connectors are located on the front of the servo amplifier. The powerful software package SETUP154E makes set up and diagnostics of the system quick and comfortable.

Servo amplifier MR-E-A/AG ①		10A 10AG 0.1 kW	20A 20AG 0.2 kW	40A 40AG 0.4 kW	70A 70AG 0.75 kW	100A 100AG 1 kW	200A 200AG 2 kW
Power supply		3phase 200–230 V AC, 50/60 Hz; 1phase 200–230 V AC, 50/60 Hz				3phase 200–230 V AC, 50/60 Hz	
Control system		Sinusoidal PWM control/current control system					
Dynamic brake		Built-in					
Protective functions		Overcurrent shutdown, regeneration overvoltage shutdown, overload shutdown (electronic thermal), encoder fault protection, regeneration fault protection, undervoltage/sudden power outage protection, overspeed protection, excess error protection					
Structure/protection		Self-cooling, open (IP00); 200A/AG fan-cooling, open (IP00)					
Environment	Ambient temperature	Operation: 0–55 °C (no freezing); Storage: -20–65 °C (no freezing)					
	Ambient humidity	Operation: 90 % RH max. (no condensation); Storage: 90 % RH max. (no condensation)					
	Others	Elevation: 1000 m or less above sea level; Oscillation: 5.9 m/s^2 (0.6 G) max.					
Weight	kg	0.7	0.7	1.1	1.7	1.7	2.0
Dimensions (WxHxD)	mm	50x168x135	50x168x135	70x168x135	70x168x190	70x168x190	70x168x195
Order information							
A type	Art. no.	213069	213070	213071	213072	213073	213074
AG type	Art. no.	213075	213076	213077	213078	213079	213080

① Typ A: Impulsketteneingang, Typ AG: Analoger Eingang

Servo amplifier		MR-E-A	MR-E-AG
Position control mode	Max. input pulse frequency	1 Mpps (differential receiver), 200 kpps (open collector)	—
	Positioning feedback pulse	131072 pulses per servo motor rotation	—
	Torque limit	Set by parameters	—
Speed control mode	Control range	Internal speed command 1:5000	Analog speed command 1:2000, internal speed command 1:5000
	Fluctuation rate	±0.01 % max. (load fluctuation 0–100 %)	±0.01 % max. (load fluctuation 0–100 %)
	Torque limit	Set by parameters	Set by parameters or external analog input (0 to ±10 V DC/max. torque)
Torque control mode	Command input	—	0 to ±8 V DC/max. torque
	Speed limit	—	Set by parametersor external analog input (0 to ±10 V DC/rated speed)

MR-J3 Servo Amplifier Specifications (200 V Type)



The MR-J3-A are general purpose servo amplifiers with analog inputs and pulse train interface as a standard. The range covers 100 W units (MR-J3-10A) through to 7 kW (MR-J3-700A).

The MR-J3-B (SSCNET III bus type) servo amplifiers are designed for use with the Mitsubishi motion controllers of the MELSEC System Q series. The motion controllers and servo amplifiers can be linked via the high speed SSCNET III network.

Connecting the amplifiers to SSCNET guarantees reliable operation and eliminates the need for complex wiring. The range also covers 100 W units (MR-J3-10B) through to 7 kW (MR-J3-700B).

A servo amplifier with built-in positioning (MR-J3-T) is also available.

Positioning via position tables (target position, motor speed, acceleration/deceleration ramp). The MR-J3-T can store 256 position tables, accessed via external inputs or CC-Link.

Common specifications MR-J3-A/B/T		10A 10B 10T	20A 20B 20T	40A 40B 40T	60A 60B 60T	70A 70B 70T	100A 100B 100T	200A 200B 200T	350A 350B 350T	500A 500B 500T	700A 700B 700T
Power supply	voltage/frequency ①	3-phase 200–230 V AC, 50/60 Hz; 1-phase 230 V AC, 50/60 Hz					3-phase 200–230 V AC, 50/60 Hz				
	permissible voltage fluctuation	3-phase 200–230 V AC: 170–253 V AC, 1-phase 230 V AC: 207–253 V AC					3-phase 170–253 V AC				
	permissible frequency fluctuation	± 5 %									
Control system		Sinusoidal PWM control/current control system									
Dynamic brake		Built-in									
Speed frequency response		900Hz									
Protective functions		Overcurrent shutdown, regeneration overvoltage shutdown, overload shutdown (electronic thermal), servomotor overheat protection, encoder fault protection, regeneration fault protection, undervoltage/sudden power outage protection, overspeed protection, excess error protection.									
Structure		Self-cooling, open (IP00)			Fan-cooling, open (IP00)						
Environment	ambient temperature	Operation: 0–55 °C (no freezing), storage: -20–65 °C (no freezing)									
	ambient humidity	Operation: 90 % RH max. (no condensation), storage: 90 % RH max. (no condensation)									
	atmosphere	Inside control panel; no corrossive gas, no flammable gas, no oil mist, no dust									
	elevation	1000 m or less above sea level									
	oscillation	5.9 m/s² (0.6 G) max.									
Weight [kg]		0.8	0.8	1.0	1.0	1.4	1.4	2.3	2.3	4.6	6.2
Dimensions (WxHxD)	mm	40x168x135	40x168x135	40x168x170	40x168x170	60x168x185	60x168x185	90x168x195	90x168x195	130x250x200	172x300x200
Order information											
A type	Art. no.	16020	161485	161486	161487	161488	161489	161490	161491	161492	161493
B type	Art. no.	161497	161498	161499	161500	161501	161502	161503	161504	161505	161506
T type	Art. no.	190647	190648	190649	190650	190651	190652	190653	190654	190655	190656

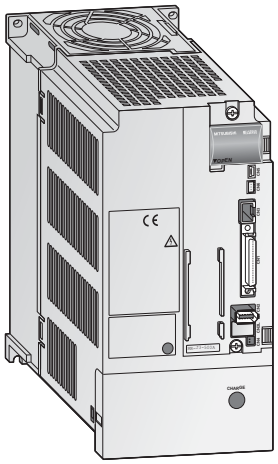
① Rated output capacity and rated rotation speed of the servo motor used in combination with the servo amplifier are as indicated when using the power voltage and frequency listed. Output and speed cannot be guaranteed when the power supply voltage is less than specified.

Control specifications MR-J3-A		10A	20A	40A	60A	70A	100A	200A	350A	500A	700A
Position control mode	maximum input pulse frequency	1000 kpps (when using differential receiver), 200 kpps (when using open collector)									
	positioning feedback pulse	Resolution per encoder/servo motor rotation (262144 pulses/revolution)									
	command pulse multiple	Electronic gear A/B multiple; A: 1–1048576, B: 1–1048576, 1/10 < A/B < 2000									
	positioning complete width setting	0–±10000 pulses (command pulse unit)									
	excess error	±3 rotations									
	torque limit input	Set by parameters or external analog input (0–+ 10 V DC/maximum torque)									
Speed control mode	speed control range	Analog speed command 1:2000, internal speed command 1:5000									
	analog speed command input	0–± 10 V DC/rated speed									
	speed fluctuation rate	±0.01 % max. (load fluctuation 0–100 %); 0 % (power fluctuation ±10 %) ±0.2 % max. (ambient temperature 25 °C ±10 °C), when using external analog speed command									
	torque limit	Set by parameters or external analog input (0–+10 V DC/maximum torque)									
Torque control specifications	torque command input	0–±8 V DC/maximum torque (input impedance 10 to 12 kΩ)									
	speed limit	Set by parameters or external analog input (0–± 10 V DC, rated speed)									

Control specifications MR-J3-B (SSCNET III)	10B	20B	40B	60B	70B	100B	200B	350B	500B	700B
Position and speed control	Possible using SSCNET III control									
Comunication speed	50 Mbps									

Control specifications MR-J3-T	10T	20T	40T	60T	70T	100T	200T	350T	500T	700T
Command interface	CC-Link communication (Ver. 1.10), DIO command (extension IO unit MR-J3-D01 is required), or RS-422 communication									

MR-J3 Servo Amplifier Specifications (400 V Type)



Mitsubishi's 400 V range of servo amplifiers provides the same industry leading functionality as the 200 V range.
The 400 V servo amplifiers are available over a wide range from 600 W rating to the very powerful 22 kW rating. Suitable for all types of automation solutions, the 400 V servo amplifiers also provide sink/source logic selectability.

For amplifiers larger than 22 kW please contact your nearest Mitsubishi office.

Common specifications MR-J3-A4/B4/T4		60A4 60B4 60T4	100A4 100B4 100T4	200A4 200B4 200T4	350A4 350B4 350T4	500A4 500B4 500T4	700A4 700B4 700T4	11KA4 11KB4 11KT4	15KA4 15KB4 15KT4	22KA4 22KB4 22KT4
Power supply	voltage /frequency ①	3-phase 380–480 V AC, 50/60 Hz								
	permissible voltage fluctuation	3-phase 323–528 V AC, 50/60 Hz								
	permissible frequency fluctuation	± 5 % max.								
Control system		Sinusoidal PWM control/current control system								
Dynamic brake		Built-in						External option		
Speed frequency response		900 Hz								
Protective functions		Overcurrent shutdown, regeneration overvoltage shutdown, overload shutdown (electronic thermal), servomotor overheat protection, encoder fault protection, regeneration fault protection, undervoltage/sudden power outage protection, overspeed protection, excess error protection.								
Structure		Self-cooling, open (IP00)		Fan cooling						
Environment	ambient temperature	Operation: 0–55 °C (no freezing), storage: -20–65 °C (no freezing)								
	ambient humidity	Operation: 90 % RH max. (no condensation), storage: 90 % RH max. (no condensation)								
	atmosphere	Inside control panel; no corrossive gas, no flammable gas, no oil mist, no dust								
	elevation	1000 m or less above sea level								
	oscillation	5.9 m/s² (0.6 G) max.								
Weight [kg]		1.7	1.7	2.1	4.6	4.6	6.2	18	18	19
Dimensions (WxHxD)	mm	90x168x195	90x168x195	90x168x195	130x250x200	130x250x200	180x350x200	260x400x260	260x400x260	260x400x260
Order information										
A type	Art. no.	205081	205082	205083	205084	205085	205086	on request	on request	on request
B type	Art. no.	192036	192037	192038	192039	192040	192041	on request	on request	on request
T type	Art. no.	212524	212525	212526	212527	212528	212529	on request	on request	on request

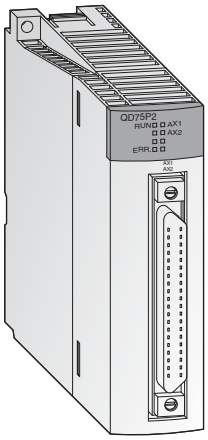
① Rated output capacity and rated rotation speed of the servo motor used in combination with the servo amplifier are as indicated when using the power voltage and frequency listed.
Output and speed cannot be guaranteed when the power supply voltage is less than specified.

Control specifications MR-J3-A4		60A4	100A4	200A4	350A4	500A4	700A4	11KA4	15KA4	22KA4
Position control mode	maximum input pulse frequency	1 Mpps (when using differential receiver), 200 kpps (when using open collector)								
	positioning feedback pulse	Resolution per encoder/servo motor rotation (262144 pulses/revolution)								
	command pulse multiple	Electronic gear A/B multiple; A: 1–1048576 or 131072, B: 1–1048576, 1/10 < A/B < 2000								
	positioning complete width setting	0–±10000 pulses (command pulse unit)								
	excess error	±3 rotations								
	torque limit input	Set by parameters or external analog input (0–± 10 V DC/maximum torque)								
Speed control mode	speed control range	Analog speed command 1:2000, internal speed command 1:5000								
	analog speed command input	0–± 10 V DC/rated speed								
	speed fluctuation rate	±0.01 % max. (load fluctuation 0–100 %); 0 % (power fluctuation ±10 %) ±0.2 % max. (ambient temperature 25 °C ±10 °C), when using external analog speed command								
	torque limit	Set by parameters or external analog input (0–± 10 V DC/maximum torque)								
Torque control specifications	torque command input	0–±8 V DC/maximum torque (input impedance 10 to 12 kΩ)								
	speed limit	Set by parameters or external analog input (0–± 10 V DC, rated speed)								

Control specifications MR-J3-B4 (SSCNET)	60B4	100B4	200B4	350B4	500B4	700B4	11KB4	15KB4	22KB4
Position and speed control	Possible using SSCNET III control								
Comunication speed	50 Mbps								

Control specifications MR-J3-T	60T4	100T4	200T4	350T4	500T4	700T4	11KT4	15KT4	22KT4
Command interface	CC-Link communication (Ver. 1.10), DIO command (extension IO unit MR-J3-D01 is required), or RS-422 communication								

Positioning Modules



The MELSEC System Q offers three different positioning module series for control of up to four axes

- Open-collector output type (QD75P series)
- Differential output type (QD75D series)
- SSCNET III bus type (QD75MH series)

The open-collector and differential output controllers can be used with standard type servo amplifiers (MR-ES-A/MR-J3-A), whilst the QD75MH series controllers should be used with the MR-J3-B (SSCNET III bus type) Servo amplifiers. Using the SSCNET III system can provide much improved, easier to use positioning system, with reduced wiring and better noise immunity.

All QD75 series positioning modules can provide functionality such as interpolation and speed-position operation etc.

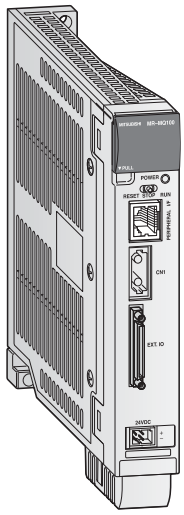
The open-collector output type modules provide positioning with open loop control. The modules generate the travel command via the pulse chain. The speed is proportional to the pulse frequency and the distance travelled is proportional to the pulse length.

The differential output type modules are suitable for bridging long distances between the module and the drive system due to the fact that the output allows large motor cable lengths.

Specifications		QD75D1	QD75P1	QD75D2	QD75P2	QD75D4	QD75P4
Number of control axes		1	1	2	2	4	4
Interpolation		—	—	2 axis linear and circular interpolation		2, 3, or 4 axis linear and 2 axis circular interpolation	
Positioning data itmes		600 per axis					
Output type		Differential driver	Open collector	Differential driver	Open collector	Differential driver	Open collector
Output signal		Pulse chain	Pulse chain	Pulse chain	Pulse chain	Pulse chain	Pulse chain
Positioning	method	PTP control: absolute data and/or incremental; speed/position swiching control: incremental; locus/speed control: incremental; path control: absolute data and/or incremental					
	units	Absolute data: -2 147 483 648 – 2 147 483 647 pulse -21 4748 364.8 – 214 748 364.7 µm -21 474.83648 – 21 474.83647 inch 0 – 359.99999 degree Incremental method: -2 147 483 648 – 2 147 483 647 pulse -214 748 364.8 – 214 748 364.7 µm -21 474.83648 – 21 474.83647 inch -21 474.83648 – 21 474.83647 degree Speed/position switching control : 0 – 2 147 483 647 pulse 0 – 21 4748 364.7 µm 0 – 21 474.83647 inch 0 – 21 474.83647 degree				
	speed	1 – 1 000 000 pulse/s 0.01 – 20 000 000.00 mm/min 0.001 – 200 000.000 degree/min 0.001 – 200 000.000 inch/min					
	acceleration/deceleration processing	Automatic trapezoidal or S-pattern acceleration and deceleration or automatic S-pattern acceleration and deceleration					
	acceleration and deceleration time	1–8388608 ms (4 patterns, each can be set)					
	rapid stop decceleration time	1–8388608 ms					
I/O points		32	32	32	32	32	32
Dimensions (WxHxD)	mm	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90	27.4x98x90
Order information	Art.no.	129675	132581	129676	132582	129677	132583
Accessories		40-pin connector and ready to use connection cables and system terminals; Programming software: GX Configurator QP, art. no.: 132219					

Specifications		QD75MH1	QD75MH2	QD75MH4
Number of control axes		1	2	4
Interpolation		—	2 axis linear and circular interpolation	2, 3, or 4 axis linear and 2 axis circular interpolation
Positioning data itmes		600 per axis		
Output type		SSCNET III	SSCNET III	SSCNET III
Output signal		BUS	BUS	BUS
Positioning	method	PTP control: absolute data and/or incremental; speed/position swiching control: incremental; locus/speed control: incremental; path control: absolute data and/or incremental		
	units	Absolute data: -2 147 483 648 – 2 147 483 647 pulse -21 4748 364.8 – 214 748 364.7 µm -21 474.83648 – 21 474.83647 inch 0 – 359.99999 degree Incremental method: -2 147 483 648 – 2 147 483 647 pulse -214 748 364.8 – 214 748 364.7 µm -21 474.83648 – 21 474.83647 inch -21 474.83648 – 21 474.83647 degree Speed/position switching control : 0 – 2 147 483 647 pulse 0 – 21 4748 364.7 µm 0 – 21 474.83647 inch 0 – 21 474.83647 degree		
	speed	1 – 50 000 000 pulse/s 0.01 – 20 000 000.00 mm/min 0.001 – 2 000 000.000 degree/min 0.001 – 2 000 000.000 inch/min		
	acceleration/deceleration processing	Automatic trapezoidal or S-pattern acceleration and deceleration or automatic S-pattern acceleration and deceleration		
	acceleration and deceleration time	1–8388608 ms (4 patterns, each can be set)		
	rapid stop decceleration time	1–8388608 ms		
I/O points		32	32	32
Dimensions (WxHxD)	mm	27.4x98x90	27.4x98x90	27.4x98x90
Order information	Art.no.	165761	165762	165763
Accessories		40-pin connector and ready to use connection cables and system terminals; Programming software: GX Configurator QP, art. no.: 132219		

Single Axis Motion Controller MR-MQ100



The MR-MQ100 allows a single axis to be completely controlled and synchronised to a separate encoder or virtual axis with no additional controller hardware like a PLC. Applications such as rotary cutters, flying saws and labelling can be realized cost-effectively.A complete range of essential functions are available, including encoder and virtual axis synchronization, registration, point to point positioning and user defined cam profiles. In addition, the hardware complements these powerful software features with built-in I/O and SSCNET III motion networking capability as well as an Ethernet port.
The MR-MQ100 uses Mitsubishi's simple but rugged optical fiber motion network SSCNET III. A single fiber connection is all that's needed to provide full communication and control over all functions of the MR-J3B servo amplifier regardless of capacity. A standard Ethernet connection is also provided to link the MR-MQ100 to the MT Developer 2 software and to the control system.

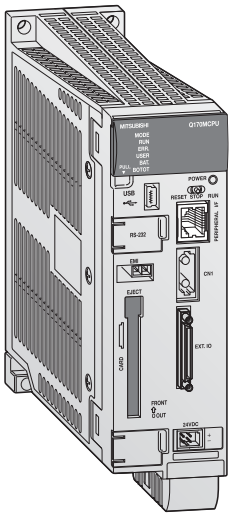
- Stand-alone Motion Control Systen only with servo amplifier without additional hardware
- Optical high-speed SSCNET III network
- Ethernet interface 100/10 Mbps
- High speed inputs for mark sensors
- External encoder input for axis sychronisation
- MC protocol Ethernet communication
- DI/DO expansion unit(Soon available)

Items		MR-MQ100
Power supply		24 V DC ±10 % (required current capacity: 400 mA)
Digital inputs (mark sensors)		4 inputs (24 V DC)
Digital outputs		2 outputs (24 V DC)
Synchronous encoder	signal type	A/B phase pulse train input
	voltage input/open-collector type (5 V DC)	Up to 800 kpps (after magnification by 4), up to 10 m
	differential input type	Up to 4 Mpps (after magnification by 4), up to 30 m
Peripheral interface		100 Mbps/10 Mbps Ethernet (for programming and additional options) SSCNET III (for connection to servo amplifier with optical cable)
Positioning	method	(PTP(Point to Point) control, Speed control/Speed-position control, Fixed-pitch feed, Constant speed control, Position follow-up control, Speed control with fixed position stop, Speed switching control, High-speed oscillation control, Synchronous control (SV22))
	acceleration/deceleration control	Automatic trapezoidal acceleration/deceleration,S-curve acceleration/deceleration
	compensation	Backlash compensation, Electronic gear, Phase compensation
Servo program capacity		16 k steps
Number of positioning points		3200
Number of contral axis		1 axis
Operation cycle		0.44 ms
Servo amplifier		MR-J3B servo amplifier (over SSCNET III)
Programming language		Motion SFC, dedicated instruction, mechanical support language (SV22)
Memory back up (included)		Q6BAT
Cam function	number of cams	Up to 256 cam profiles may be stored internally.
	resolution per cycle	256, 512, 1024, 2048
	stroke resolution	32767
	control mode	Two-way cam, feed cam
Weight [kg]		0.7
Dimensions (WxHxD)	mm	30x168x135 ①

Order information	Art. no.	217705

① H without battery (Height with battery = 178 mm)

Stand-Alone Motion-Controller Q170MCPU



The Q170MCPU combines a PLC CPU, a Motion CPU and a power supply module into one compact unit. No base unit is required, although an extension base unit with standard PLC modules can be connected if required. An encoder interface is included as standard, enabling multiple axis synchronization with an external encoder.

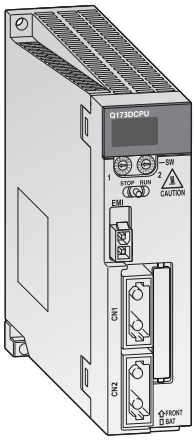
The well-reputed mechanical support language (SV13, SV22) from the System Q Motion Controller is incorporated.

- Small size
- Controls up to 16 axes
- Communication with servo amplifier via high-speed network SSCNET III and a communication speed up to 50 Mbps.
- Programming and configuration is performed using the familiar software GX (IEC) Developer und MT Developer2.
- Expandable with an extension base unit (up to 5 slots) and I/O modules, intelligent modules, and network-related modules.
- MC protocol Ethernet communication

Specificatons		Q170MCPU
Motion-CPU	number of controllable axes	16
	operation cycle (using SV13)	0.44 ms (1st to 6th axis), 0.88 ms (7th to 16th axis)
	acceleration/deceleration system	Trapezoidal, S-curve
	programming languages	Motion SFC, dedicated instruction, mechanical support language (SV22)
	servo program capacity	16 k steps
	interfaces	Ethernet 100 Mbps/10Mbps (for programming and additional options) SSCNET III (for connection to servo amplifier with optical cable) USB, RS232
Interpolation functions		Linear interpolation for up to 4 axes, circular interpolation for 2 axes, helical interpolation for 3 axes
PLC CPU	number of I/O points	512 (Maximum of 320 points is available with modules on extension base unit)
	programming languages	Ladder, instruction list, SFC, structured text
	program capacity	20 k steps
	processing speed	0.02 µs (LD-Anweisung); 0.04 µs (MOV-Anweisung)
	total number of instructions	764 (including real number operation instruction)
Positioning	method	(PTP(Point to Point) control, Speed control/Speed-position control, Fixed-pitch feed, Constant speed control, Position follow-up control, Speed control with fixed position stop, Speed switching control, High-speed oscillation control, Synchronous control (SV22))
	acceleration/deceleration control	Automatic trapezoidal acceleration/deceleration,S-curve acceleration/deceleration
	compensation	Backlash compensation, Electronic gear, Phase compensation
Memory card interface		1 slot for memory card for MELSEC System Q
Cam function	number of cams	Up to 256 cam profiles may be stored internally.
	resolution per cycle	256, 512, 1024, 2048
	stroke resolution	32767
	control mode	Two-way cam, feed cam
Dimensions (WxHxD)	mm	52x178x135

Order information	Art. no.	221835

Q-Motion CPU



The Q-Motion controller CPU controls and synchronises the connected servo amplifiers and servo motors. A motion system besides the controller CPU, also includes a PLC CPU. Only after combining a highly dynamic positioning control CPU and a PLC, an innovative motion control system is created.

While the Motion CPU controls large-scale servo movements the PLC CPU is responsible for the machine control and the communication.

- Using multiple CPUs to distribute the load improves the overall performance of the whole system
- Use of up to 3 motion CPUs within one system
- Large scale control system for up to 96 axes per system
- Interpolation of 4 axes simultaneously
- Electronic cam control
- Virtual and real master axes
- Integration in the high-speed SSCNET network for communication with high-performanceservo amplifiers at up to 50 Mbps

Specifications		Q172HCPU	Q173HCPU	Q172DCPU	Q173DCPU
Type		Motion CPU	Motion CPU	Motion-CPU	Motion-CPU
I/O points		8192	8192	8192	8192
No. of control axes		8	32	8	32
Interpolation functions		Linear interpolation for up to 4 axes, circular interpolation for 2 axes, helical interpolation for 3 axes			
Positioning	method	PTP (point to point), speed control/speed-position control, fixed pitch feed, constant speed control, position follow-up control, speed switching control, high-speed oscillation control, synchronous control (SV22)			
	acceleration/ deceleration control	Automatic trapezoidal acceleration/deceleration, S-curve acceleration/deceleration			
	compensation	Backlash compensation, electronic gear			
Programming language		Motion SFC, dedicated instructions, software for conveyor assembly (SV13), virtual mechanical support language (SV22)			
Servo program capacity		16 k steps			
No. of positioning points		3200			
Interfaces		USB, RS232C, SSCNET III		SSCNET III (USB, RS232C via PLC-CPU)	SSCNET III (USB, RS232C via PLC-CPU)
Real I/O points (PX/PY)		256 (these I/Os can be allocated directly to the motion CPU)			
Dimensions (WxHxD)	mm	27.4x98x114.3	27.4x98x114.3	27.4x98x119.3	27.4x98x119.3
Order information	Art. no.	162417	162416	209788	209787

Q-Motion System Modules

Servo external signals interface module Q172LX/Q172DLX

The Q172LX/Q172DLX input module is used inconjunction with a Q Motion CPU to capture external servo signals.

Up to 8 axes can be evaluated per module. In this way, proximity dog sensor, upper/lower limit switch, stop signal input and operating mode switching input can be easily incorporated into the system.

- 32 address points for 8 axes for each 4 inputs
- Bipolar inputs for positive and negative logic
- Galvanic isolation of the inputs by means of photocoupler
- Shortest response time of < 0.4 ms
- Modular extension possible

Serial absolute synchronous encoder interface module Q172EX/Q172DEX and Q172EX-S2

The serial absolute synchronous encoder interface module Q172EX/Q172DEX is a Motion systemmodule for receiving and evaluating up to two serial absolute-value encoders. (Incremental encoders cannot be connected.) Via an external encoder (MR-HENC/Q170ENC) it is possible to feed a setpoint source to the Motion system, which inturn is programmed as a master axis.

In addition to the interfaces for the signals of two absolute value encoders, the Q172EX/ Q172DEX has two digital inputs with ultra-rapid responsetimes.

- Transfer rate of 2.5 Mbit per second
- Resolution of 14 Bit MR-HENC/ 18 Bit Q170ENC
- Voltage-failure security of the absolute values by means of built-in buffer battery
- Shortest response times of < 0.4 ms
- Modular extension possible

Manual pulse generator interface module Q173PX/Q173DPX

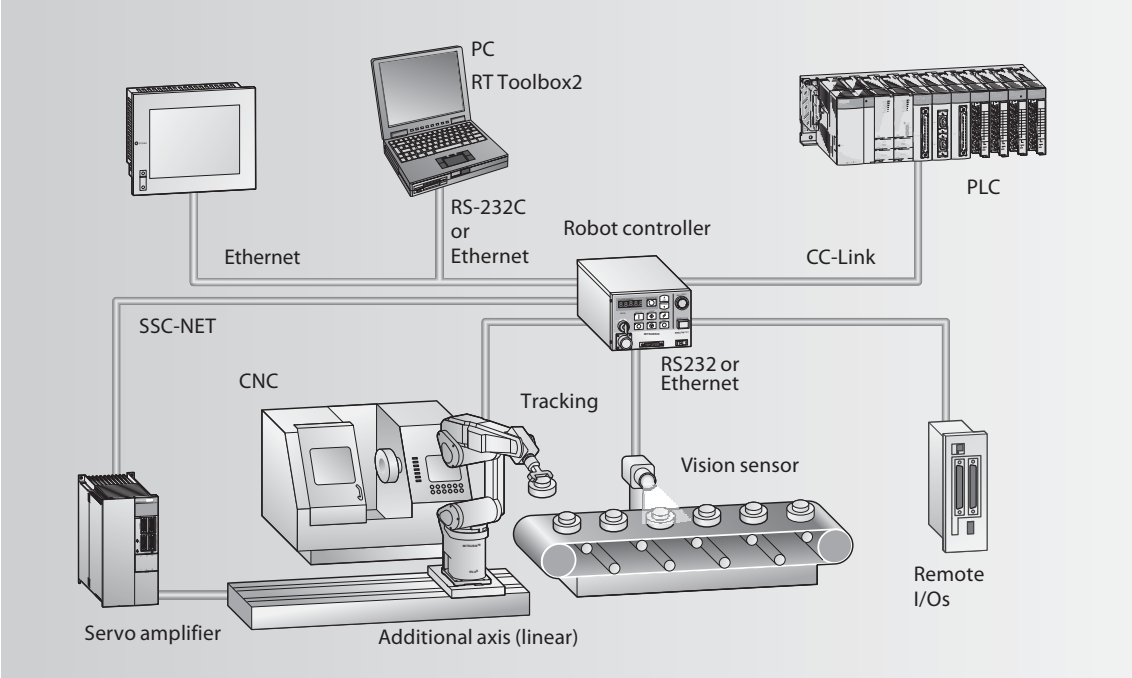
The Manual pulse generator interface module Q173PX is used in a Motion system to receive the signals of up to 3 external incremental encoders or manual impulse generators (hand wheels).

In addition to the inputs for the encoders, the Q173PX/Q173DPX has three digital inputs with which the encoder signal counting procedure can bestarted (Encoder start signal).

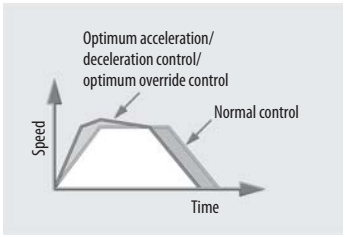
- Bipolar inputs for positive and negative logic
- Galvanic isolation of the inputs by means of photo coupler
- Shortest response times of < 0.4 ms
- Modular extension possible

MELFA ROBOT SYSTEMS

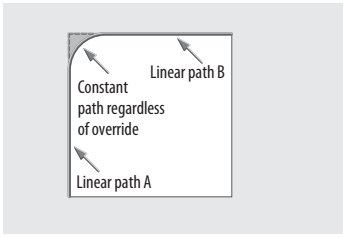
Example of a Robot system configuration



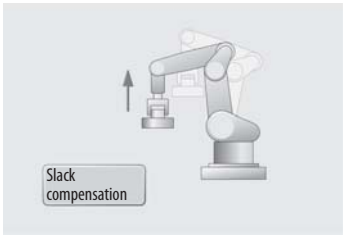
Practical Functions for All Applications



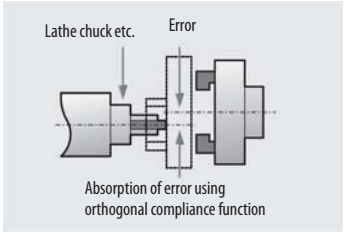
Automatic acceleration and braking ramp optimisation for faster cycle times



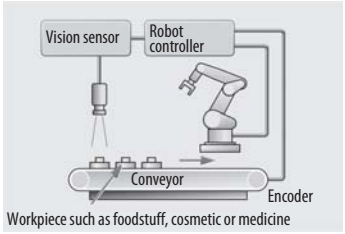
Continuous path function for faster cycle times



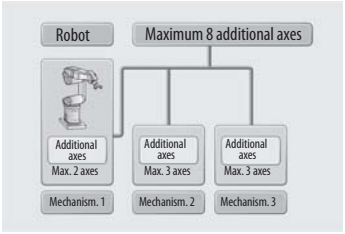
Gravity compensation for greater positioning and palletising precision



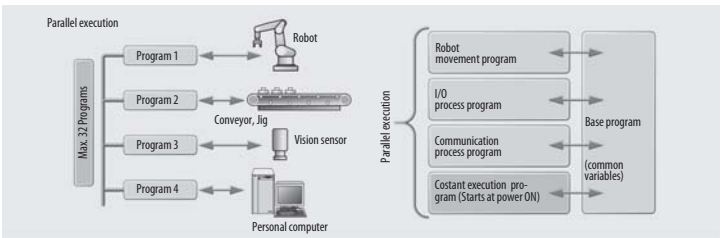
Orthogonal "compliance control" function for interactive response to opposing forces



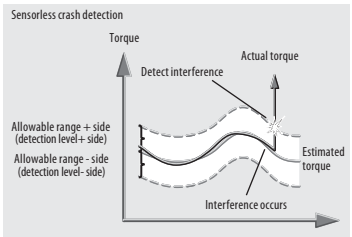
Object tracking function for faster cycle times



Control functions for up to 8 additional axes



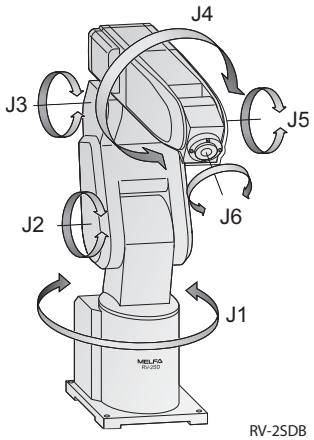
Multitasking function for parallel execution of multiple tasks



RV-2SDB Articulated-arm Robots – The Powerful Compact Class

This robot is an all round talent in its class, thanks to its compactness and wide range of motion for each axis. Even critical applications with limited space are no problem due to 6 DOF and floor or ceiling mounting capability. The new generation controller has special features and functions to reduce cycle times. High speed communication, control of up to 8 additional axes and conveyor tracking are standard features. To expand workspace, the robot can be easily installed on a carriage for traversing an interpolated linear axis.

Model		RV-2SDB
Degrees of freedom		6
Maximum payload		3.0 kg
Gripper flange reach		504 mm
Repeatability		±0.02 mm
Max. speed		4,400 mm/s
Controller type		CR1D
Operating range	J1	480 (-240 to +240)
	J2	240 (-120 to +120)
	J3	160 (0 to +160)
	J4	400 (-200 to +200)
	J5	240 (-120to +120)
	J6	720 (-360 to +360)
Robot weight		19 kg
Protection		IP20
Order information	Art. no.	231174



RV-2SDB

RV-3SDJB/RV-3SDB Articulated-arm Robots – The Reliable Mid-range Solution

The RV-3SD series of robots have been designed to be very simple to integrate into an existing automation cell. Features such as the direct control over 32 local I/Os allows the robot to interact directly with sensors and actuators, speeding up and simplifying system building.

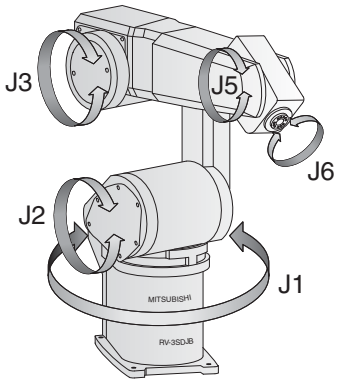
Communicating with other automation plant is an important area of any automation cell.

The RV-3SD series has been optimised with a choice of three major networking technologies: Ethernet, Profibus/DP and CC-Link.

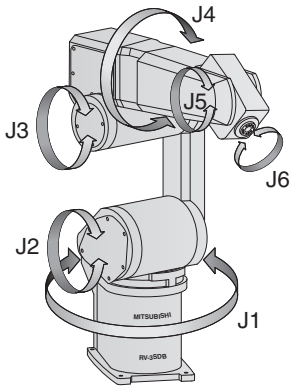
For complex automation cells where movement is restricted, or there is a large distance between working points, the RV-3SD robots can control up to eight additional axes to its standard robot arm configuration.

Two of these axis can be interpolated allowing easy and efficient movement around obstructions. The other six axes can be used to control elements such as linear slides to move the robot between work stations.

Model		RV-3SDJB	RV-3SDB
Degrees of freedom		5	6
Maximum payload		3.5 kg	3.5 kg
Gripper flange reach		641 mm	642 mm
Repeatability		±0.02 mm	±0.02 mm
Max. speed		5,300 mm/s	5,500 mm/s
Controller type		CR1D	CR1D
Operating range	J1	340 (-170 to +170)	340 (-170 to +170)
	J2	225 (-90 to +135)	225 (-90 to +135)
	J3	237 (-100 to +137)	191 (-20 to +171)
	J4	—	320 (-160 to +160)
	J5	240 (-120 to +120)	240 (-120 to +120)
	J6	720 (-360 to +360)	720 (-360 to +360)
Robot weight		33 kg	37 kg
Protection		IP65 rating for full arm	
Order information	Art. no.	235684	235683



RV-3SDJB



RV-3SDB

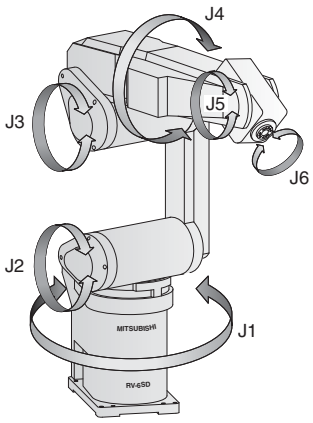
RV-6SD/RV-6SDL/RV-12SDL/RV-12SD Articulated-arm Robots – Exceptional Power and Reach

With handling payloads of up to 12 kg, a truly impressive maximum workspace radius of 1,385 mm and exceptional precision (repeatability: ±0.05 mm) the new RV-SD series is predestined for handling parts in industrial production and for chaining plant stations. An IP65 protection rating provides the capabilities needed for heavy-duty applications, like those in the motor industry suppliers sector. The state-of-the-art technology used in this series drastically reduces work cycle times. All the new robots complete the 12-inch test in less than a second!

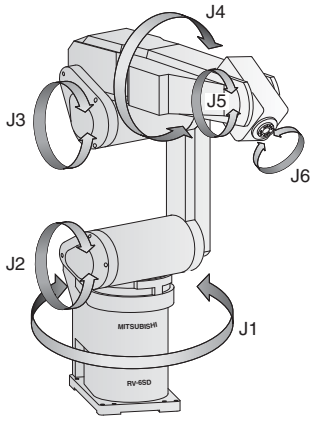
Multifunctional robot controllers

The robots are controlled by the multitasking controllers CR2D or CR3D. Connection of any image processing system, control of up to 8 additional axes and high-speed communication via an Ethernet link are just a few of the impressive highlights of these high-performance robot controllers. Other features include automatic conveyor belt tracking, crash detection without sensors and a wide range of powerful functions for work cycle optimisation.

Model		RV-6SD	RV-6SDL	RV-12SD	RV-12SDL
Degrees of freedom		6	6	6	6
Maximum payload		6 kg	6 kg	12 kg	12 kg
Gripper flange reach		696 mm	902 mm	1086	1385 mm
Repeatability		±0.02 mm	±0.02 mm	±0.05 mm	±0.05 mm
Max. speed		9,300 mm/s	8,500 mm/s	9,600 mm/s	9,500 mm/s
Controller type		CR2D	CR2D	CR3D	CR3D
Operating range	J1	340 (-170 to +170)			
	J2	227 (-92 to +135)			
	J3	285 (-107 to +166)	295 (-129 to+166)	290 (-130 to +160)	
	J4	320 (-160 to +160)			
	J5	240 (-120 to +120)			
	J6	720 (-360 to +360) (expandable)			
Robot weight		58 kg	60 kg	93 kg	98 kg
Protection		IP54 (J1 to J3), IP65 (J4 to J6)			
Order information	Art. no.	235685	235686	235687	235688



RV-6SD

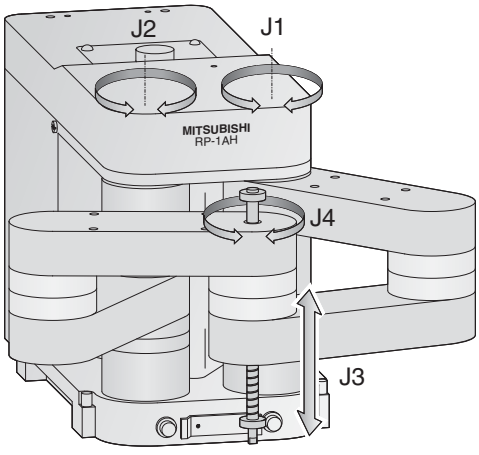


RV-6SDL

RP-AH SCARA Robots – Outstanding Speed Plus High Precision

The RP-1AH is in its element in all applications where parts have to be processed quickly and precisely in cramped quarters. It has an installation footprint of just 200 x 160 mm and a reach of 236 mm, and it can place components with a precision of ±0.005 mm. This combination of compact dimensions and great precision predestine the RP robots for micro-handling tasks like micro-assembly and the population and soldering of SMD circuit boards for mobile phones. The robots of this series are incomparably more flexible than traditional automated machines, and this pays off in greatly enhanced efficiency and higher productivity.

Model		RP-1AH	RP-3AH	RP-5AH
Degrees of freedom		4	4	4
Maximum payload		1 kg	3 kg	5 kg
Controller type		CR1	CR1	CR1
Operating limits	W x D (mm)	150 x 105 (A6 size)	210 x 148 (A5 size)	297 x 210 (A4 size)
	J3 vertical motion (mm)	30	50	50
	J4 (deg.)	±200	±200	±200
Repet position accuracy	X-Y surface (mm)	±0.005	±0.008	±0.01
	J3 vertical motion (mm)	±0.01	±0.01	±0.01
	J4 (deg.)	±0.02	±0.03	±0.03
J3-axes travel (in mm)		30	50	50
Robot weight		12 kg	24 kg	25 kg
Order information	Art. no.	134183	131626	131628



RH-SDH SCARA Robots – Specialists for Palletising

No reference point travel

Travel and position are measured with absolute encoders, so that the robot can start work as soon as it is powered up without wasting time with reference point traverses. In fact, the robot can even resume at the point where it left off after power failures and emergency shutdowns in the middle of a movement sequence. In most cases, this eliminates the need to reset the entire system.

Optimum gripper connections

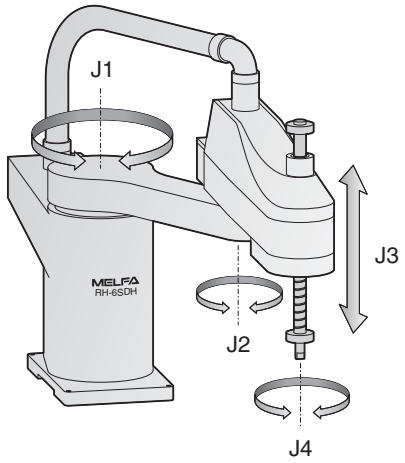
Pneumatic hoses and signal connection lines are routed inside the robot, making it easy to connect grippers and sensors.

Unpack, calibrate, start work

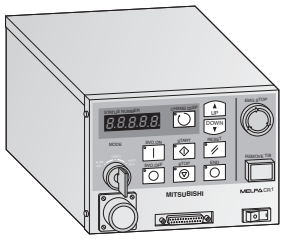
You can start work almost as soon as you have unpacked the robot and installed the arm assembly. You only have to enter the reference point data recorded at the factory, then the robot is ready to execute the first movements.

SCARA robots are ideal for sorting, palletising and component installation. They have a short cycle period of less than 0.5 seconds for a movement sequence of 25 mm vertical lift, 300 mm horizontal traverse and 25 mm vertical lower and return (the 12" test).

Model		RH-6SDH	RH-12SDH	RH-20SDH
Degrees of freedom		4	4	4
Maximum payload		6 kg	12 kg	20 kg
Controller type		CR1D	CR2D	CR2D
Gripper flange reach		550 mm	850 mm	850 mm
Operating range	J1 (deg.)	254 (±127)	280 (±140)	280 (±140)
	J2 (deg.)	290 (±145)	306 (±153)	306 (±153)
	J3 (Z) (mm)	200 (97–297)	350 (-10–340)	350 (-10–340)
	J4 (0 Axes) (deg.)	720 (±360)	720 (±360)	720 (±360)
Repeatability X-Y direction		±0.02 mm	±0.025 mm	±0.025 mm
Z-axes travel in mm		200	350	350
Max. speed (mm/s)		7782 (J1, J2, J4) 6003 (J1, J2)	11221 (J1, J2, J4) 6612 (J1, J2)	11221 (J1, J2, J4) 6612 (J1, J2)
Robot weight		21 kg	45 kg	45 kg
Protection		IP20		
Order information	Art. no.	235691	236938	236455



Powerful Controllers CR1, CR1D, CR2D and CR3D

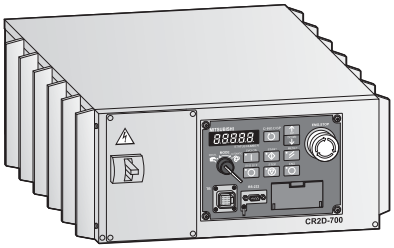


Which controller is used depends on the specific robot model. But the CR1, CR1D, CR2D or CR3D are all programmed with exactly the same language, no matter which robot is connected to them. You can add special application functions by inserting expansion option cards in the slots in the controllers. For example, there are option cards for connecting the controllers to different networks and for controlling additional robot axes.

The D-Controller has already implemented some functions like Ethernet- and USB-Connection, Additional Axes Control over SSCNET3 and Tracking Encoder interface as a standard.

A teaching box for defining the robots' working positions can be connected to the controller's RS-422 port. The teaching box can also be used for testing the entire program sequence.

There is also an RS-232C port beside the USB- and Ethernet-Port in the D-Controller for connecting a personal computer. This makes it possible to develop programs with a powerful PC software package with a user-friendly interface, and to perform 3D simulations of complete work cells.



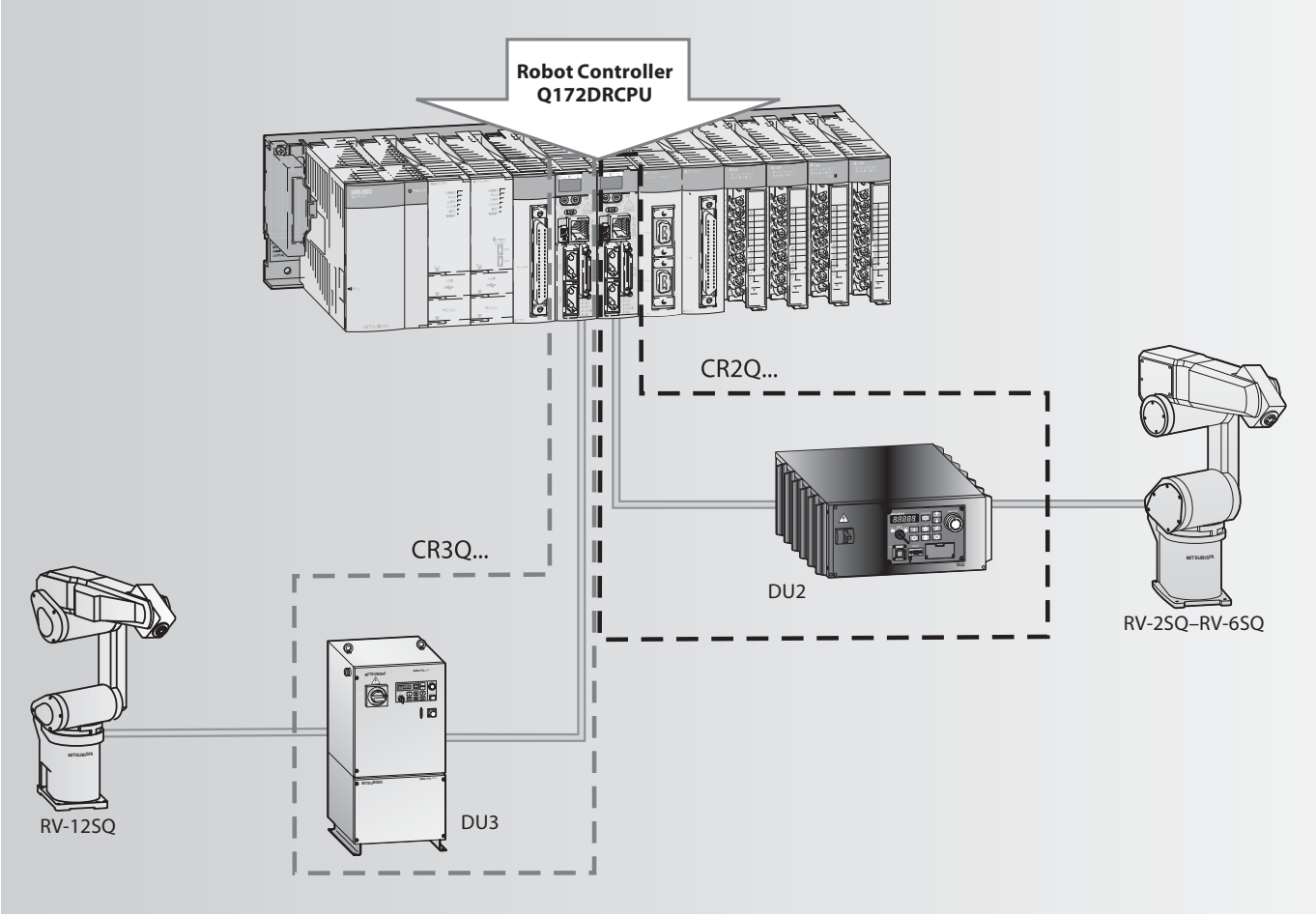
Characteristics/Functions		CR1	CR1D	CR2D	CR3D
Shipped with robot		RP-1AH/3AH/5AH	RV-2SDB, RV-3SDB/SDJB, RH-6SDH	RV-6SD/6SDL, RH12SDH/18SDH	RV-12SD/12SDL
Number of controllable axes		Optional	6 robot axes + 2 interpolation axes + 6 independent axes		
Interfaces		Ethernet (optional), RS232 (integrated)	USB, Ethernet, RS232 (all integrated)		
Memory capacity	no. of teaching points	Max. 2500	Max. 13000		
	no. program steps	Max. 5000	Max. 26000		
	no. of programs	88	256		
External inputs/outputs	general purpose I/Os	16 inputs and 16 outputs	0 inputs and 0 outputs	32 inputs and 32 outputs	
	hand open/close	8 (4 for RV2SDB)			
	emergency stop I/Os	1	2 (redundant) in accordance with DIN EN ISO 10218		
	door switch input	1	2 (redundant)		
Power supply		1~ 90–132 V AC; 50/60 Hz 1~ 180–253 V AC; 50/60 Hz			3~ 400 V AC; 50/60 Hz
Dimensions (WxHxD)	mm	212x166x290	240x200x290	470x200x400	450x975x380

SQ Series

High flexibility and full production line integration can easily be realised with SQ-robot systems. This is an iQ-Platform based robot controller which directly communicates with the iQ PLC CPU and all its modules. This makes the complete range of iQ system modules (I/O, networking, special function, etc.) available to an SQ system.

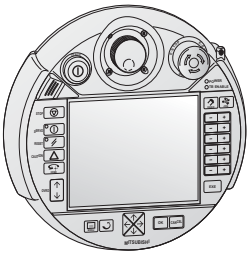
SD-system robots are also available as SQ-robot systems. Powerful features like fully integrated HMI terminal application monitoring, communication on most of the widely used networks and high performance MES functionality for 100 % data logging are just some of the features of this new system.

The SQ-system provides cost reduction during installation and through to production by reducing the cycle time for every single product.



Robots Teach Panel for Operation and programming

R28TB



R46TB

The R46TB teach panel is a multifunctional control and programming terminal for all Mitsubishi A and SD series robots. Its intuitive user interface makes it easy to control robot movements and perform extensive diagnostics and monitoring functions for users of all levels. All safety-critical functions such as robot movements are assigned to keys. Programming and monitoring functions are accessed and adjusted quickly and easily via the bright 6.5" touchscreen display.

In addition to controlling robot movements the terminal has many other functions: For example, writing programs with a virtual on-screen keyboard and monitoring all system status parameters, inputs and outputs, including those accessed via the network.

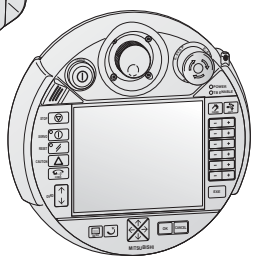
The R46TB's flexible monitoring function enables the display of all important system parameters. Access to production data like the number of work cycles, the average cycle time and many other parameters make it easy to get a quick overview of the production situation.

Extensive analysis functions for checking robot workload also make it easy to optimise your robot applications and minimise cycle times.

Screen input templates make it easy to enter the parameters for grippers and workpieces for quick system optimisation. Entering the reference points data when you install the system just takes a few minutes, then the robot is ready for programming.

Specifications		R46TB	R28TB
Compatibility		All Mitsubishi A and SD series robots	
Functions		Operation, programming and monitoring of all robot functions	Position teaching, JOG feed, program control and editing
Programming and monitoring		Read out information, also during operation; program editing with virtual keyboard; display up to 14 lines of program code; I/O monitoring for up to 256 inputs and 256 outputs; service display with information on maintenance intervals; error display with details of the last 128 alarms	Program and parameter editing. Maintenance functions and monitoring.
Software		Integrated operating system software with menu-based user interface	Integrated system OS
Menu navigation (language)		German, English, French, Italian	Japanese, English
Display	type/dimensions	6.5" TFT display (640 x 480 pixels)	LCD with 4 lines x 16 characters (with backlight illumination)
	technology	Touchscreen with backlight	
Interfaces		USB, RS-422 for connection to the robot controller	RS422
Connection		Direct connection to the robot controller, cable length 7m	7 m
Protection rating		IP54	IP65
Weight [kg]		1.25	Approx. 0.5 kg (without cable)
Order information	Art. no.	193409	124656

R32TB



R56TB

The R56TB teach panel is a multifunctional control and programming terminal for all Mitsubishi SD series robots. Its intuitive user interface makes it easy to control robot movements and perform extensive diagnostics and monitoring functions for users of all levels. All safety-critical functions such as robot movements are assigned to keys. Programming and monitoring functions are accessed and adjusted quickly and easily via the bright 6.5" touchscreen display.
In addition to controlling robot movements the terminal has many other functions:
For example, writing programs with a virtual on-screen keyboard and monitoring all system status parameters, inputs and outputs, including those accessed via the network.

Specifications		R56TB	R32TB
Compatibility		All Mitsubishi SD series robots	
Functions		Operation, programming and monitoring of all robot functions	
Programming and monitoring		Read out information, also during operation; program editing with virtual keyboard; display up to 14 lines of program code; I/O monitoring for up to 256 inputs and 256 outputs; service display with information on maintenance intervals; error display with details of the last 128 alarms	Read out information, also during operation, program editing with T9-Key standard, supervising of I/Os, display of error alarms, Right-/Left-Hand usage, 36 keys for operation selection
Software		Integrated operating system software with menu-based user interface	
Menu navigation (language)		German, English, French, Italian	English, Japanese
Display	type/dimensions	6.5" TFT display (640 x 480 pixels)	Monochrome LCD graphic display (24 characters x 8 lines
	technology	Touchscreen with backlight	LCD with backlight
Interfaces		USB, Ethernet for connection to the robot controller	RS-422 for connection to the robot controller
Connection		Direct connection to the robot controller, cable length 7m	
Protection rating		IP54	IP65
Weight [kg]		1.25	0.9
Order information	Art. no.	218854	214968

Options Overview for All Robots

Option	Marking	RV-2SDB	RV-3SDJB/3SDB	RV-6SD/6SDL	RV-12SD/12SDL	RH-6SDH	RH-12SDH/RH-18SDH	RP-1/3/5AH	Art. no.
Robot model name in catalogue	—	SD	SD	SD	SD	SDH	SDH	AH	—
Teaching Box	R28TB							●	124656
Teaching Box	R46TB							●	193409
Teaching Box	R32TB	●	●	●	●	●	●		214968
Teaching Box	R56TB	●	●	●	●	●	●		218854
Electrical hand set	4A-HM01								129874
Pneumatic hand set	4A-HP01E								129873
Single valve set	1A-VD01E-RP							●	129780
Double valve set	1A-VD02E-RP							●	129781
Triple valve set	1A-VD03E-RP							●	129792
Quadruple valve set	1A-VD04E-RP							●	129793
Single valve set	RV-E-1E-VD01E	●							47397
Double valve set	RV-E-1E-VD02E	●							47398
Single valve set	1S-VD01E-01				●				153057
Double valve set	1S-VD02E-01				●				153058
Triple valve set	1S-VD03E-01				●				153059
Quadruple valve set	1S-VD04E-01				●				153062
Single valve set	1S-VD01E-02		●	●					153074
Double valve set	1S-VD02E-02		●	●					153075
Triple valve set	1S-VD03E-02		●	●					153076
Quadruple valve set	1S-VD04E-02		●	●					153077
Single valve set	1S-VD01ME-03						●		166278
Double valve set	1S-VD02ME-03						●		166279
Triple valve set	1S-VD03ME-03						●		166280
Quadruple valve set	1S-VD04ME-03						●		166281
Single valve set	1S-VD01ME-04					●			166274
Double valve set	1S-VD02ME-04					●			166275
Triple valve set	1S-VD03ME-04					●			166276
Quadruple valve set	1S-VD04ME-04					●			166277
Ethernet interface	2A-HR533E							●	129809
CC-Link interface	2A-HR575E							●	129808
CC-Link interface	2D-TZ576	●	●	●	●	●	●		219063
PROFIBUS interface	2A-RZ577A							●	155317
PROFIBUS interface	2D-TZ577	●	●	●	●	●	●		218861
Serial expansion	2A-RZ581E							●	129807
I/O interface	2A-RZ371							●	124658
I/O interface	2D-TZ378	●	●	●	●	●	●		218862
Additional axis interface	2A-RZ541E							●	129801
Pneumatic hand interface	2A-RZ375	●	●	●	●	●	●	●	124657
Electric hand interface	2A-RZ364								129875
Curled connection cable	1A-GHCD								132101
Hand signal output cable	1A-GR200-RP							●	129778
	1S-GR35S-01		●	●	●				153078
	1S-GR35S-02					●	●		166272
Hand signal input cable	1A-HC20								129877
	1A-HC200-RP							●	129779
	1S-HC35C-02		●	●	●	●	●		166273
	1S-HC25C-01		●	●	●	●	●		153079
Gripper output connector	R-SMR-09V-B							●	132112
Gripper input connector	R-SMR-10V-N							●	132113

Option	Marking	RV-2SDB	RV-3SDJB/3SDB	RV-6SD/6SDL	RV-12SD/12SDL	RH-6SDH	RH-12SDH/RH-18SDH	RP-1/3/5AH	Art. no.
Robot model name in catalogue	—	SD	SD	SD	SD	SDH	SDH	AH	—
Valve input connect	R-SMR-02V-B								143798
Hand signal output connector	S-series Hand OUTPUT		●	●	●	●	●		164814
Hand signal input connector	S-series Hand INPUT		●	●	●	●	●		164815
Valve connection cable	RV-E-1E-GR35S								47391
Hand curl tube	RV-E-1E-ST0402C	●	●	●				●	47390
	RV-E-1E-ST0404C	●	●	●				●	47389
Flexible drag chain cable	Cable Flex 5 m							●	149006
	Cable Flex 15 m							●	149010
Extension cable for fixed installation in a drag chain	1S-05CBL-01			●	●		●		155827
	1S-10CBL-01			●	●		●		155830
	1S-15CBL-01			●	●		●		155665
	1S-05CBL-03	●	●			●			165967
	1S-10CBL-03	●	●			●			165968
	1S-15CBL-03	●	●			●			165969
Extension cable for flexible installation in a drag chain	1S-05LCBL-01			●	●		●		157582
	1S-10LCBL-01			●	●		●		157583
	1S-15LCBL-01			●	●		●		157594
	1S-05LCBL-03	●	●			●			165970
	1S-10LCBL-03	●	●			●			165971
	1S-15LCBL-03	●	●			●			165972
PC connection cable	RV-CAB4							●	55653
Connection cable for I/O interface	2A-CBL05							●	47387
	2A-CBL15							●	59947
	2D-CBL05	●	●	●	●	●	●		218857
	2D-CBL15	●	●	●	●	●	●		218858
Extension box	CR1-EB3							●	129878
Calibration device	RV-E-1E-INST								47388
Adapter cable	TB-2D-28CON05M	●	●	●	●	●	●		218863
Calibration pin	6 mm Tool	●	●	●	●	●	●		155831
Calibration pin	8 mm Tool			●	●				155832

The Complete Solution for Line and Load Side

Mitsubishi offers the whole line from Air Circuit Breakers over Low Voltage Switchgear to Magnetic Contactors and Thermal Overload Relays.

A complete breaker program for complete, all-round protection.

SUPER AE series air circuit breakers

The SUPER AE air circuit breaker family consists of models from 1000 to 6300 A with a broad range of adjustable breaking capacities.

At the lower end of the scale the smallest current setting Ir is 125 A, with the AE1000 model. With the AE6300, the maximum possible setting is a full 6300 A.

Features include:

- Complete breaker program
- Frame size from 1000 A to 6300 A
- Wide performance range
- Breaking capacity up to 130 kA
- Growing power demands
- Optimum overload tripping system
- Additional disconnectors available

WSS series moulded case circuit breakers

The MCCBs of the Mitsubishi breaker series are amongst the smallest compact circuit breakers in the world with electronic overload indication. The system is based, among other things, on the well-known and proven microprocessor technology. The WSS breaker series meets national and international protection ratings according to VDE, EN, and IEC standards for industrial applications as well as for extended shipping demands. The innovative tripping technology guarantees a high reliability and highest protection.

The highlights are

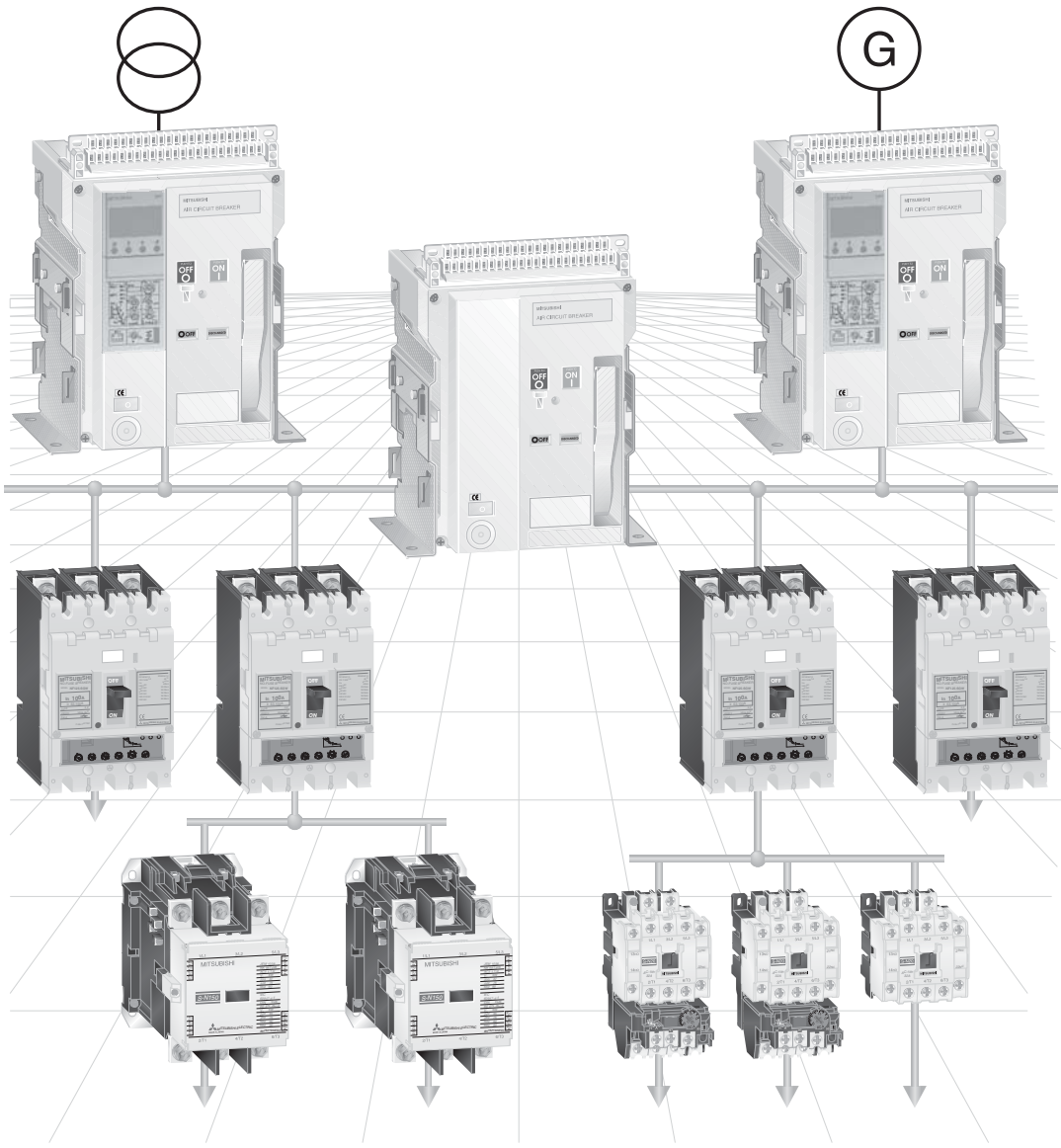
- 3 A to 1600 A rated capacity (3- and 4-pole)
- Interchangeable relay unit (thermal type or electronic type)
- Available in fixed and slot-in versions
- Breaking capacity up to 200 kA
- Additional disconnectors available

MS-N series magnetic contactors and thermal overload relays

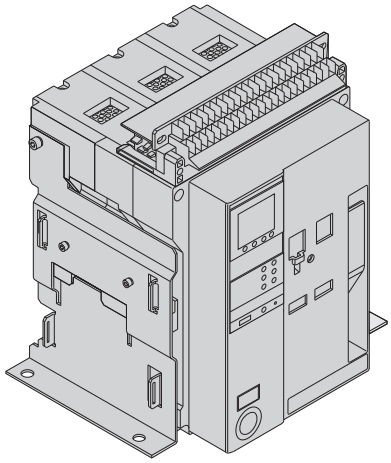
Compact, modular extensions and an energy-saving design – these are the main requirements set by users of contactors and auxiliary contactors.

MS-N meets these requirement plus:

- Easy mounting and wiring
- Easy inspection
- Built-in surge absorber (from S-N50)
- Safety terminal functions
- Improvement of electromagnet
- International standard models



SUPER AE Series Air Circuit Breakers (AE-SW series)



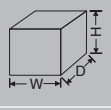
Built for the global demands of the 21st century

Mitsubishi Electric offers a really complete range of circuit breakers.

The World Super AE-SW air circuit family consist of models from 1000 to 6300 A and are available in both 3 and 4 pole versions with fixed or drawout configurations to suit your individual requirements. There are only 3 standard sizes, making planning much easier.

The development target was based on the features:

- Simple operation for maximum user-friendliness
- Flexible installation and customised protection for your systems
- Class leading performance range and extended service life
- Enhanced network support for comprehensive monitoring and control

Type		AE1000-SW		AE1250-SW		AE1600-SW		AE2000-SWA		AE2000-SW		AE2500-SW		AE3200-SW		AE4000-SWA		AE4000-SW		AE5000-SW		AE6300-SW	
Frame type		1								2								3					
Rated current Iu (A) 40 °C		1000		1250		1600		2000		2000		2500		3200		4000		4000		5000		6000	
Max. rated operational voltage Ue (V)		690								690								690					
Rated insulation voltage Ui (V)		1000								1000								1000					
Rated impulse withstand voltage Uimp (kV)		12								12								12					
Suitable for isolation		●								●								●					
Category		B								B								B					
Pollution degree		3								3								3					
Number of poles		3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4	3	4
Rated current Ir (A) adjustment range at 40 °C		500–1000		625–1250		800–1600		1000–2000		625–2000		1250–2500		1600–3200		2000–4000		2000–4000		2500–5000		3150-6300	
Rated current of neutral pole (A)		1000		1250		1600		2000		2000		2500		3200		4000		2000		2500		3150	
Rated service short-circuit breaking capacity ① Icu (kA, rms) Ics = Icu = 100 %	690 V AC	65								75								85					
	400 V AC	65								85								130					
Rated short-time withstand current (kA rms) Icw	1 s	65								75								100					
Operating cycles ② (ON/OFF)	without rated current	25000								20000								10000 (3P)/5000 (4P)					
Connecting terminal	horizontal	●						—		●						—				—			
	vertical	● ③						●		● ③						●				●			
	frontal	● ③						—		● ③						—				—			
Outline dimensions (mm) HxWxD 	fixed type	3-pole: 410x340x290 4-pole: 410x425x290								3-pole: 410x475x290 4-pole: 410x605x290								3 pole: 414x873x290 4 pole: 414x1003x290					
	draw-out type	3-pole: 430x300x368 4-pole: 430x385x368								3-pole: 430x435x368 4-pole: 430x565x368						3-pole: 430x 439x368 4-pole: 430x 569x368		3 pole: 480x875x368 4 pole: 480x1005x368					
Weight (kg)	fixed type	41	51	41	51	42	52	47	57	60	72	61	73	63	75	81	99	160	180	160	180	160	180
	draw-out type	64	78	64	78	65	79	70	84	92	113	93	114	95	116	108	136	233	256	233	256	240	263
	cradle only	26	30	26	30	26	30	31	35	35	43	35	43	36	44	49	61	118	133	118	133	125	140

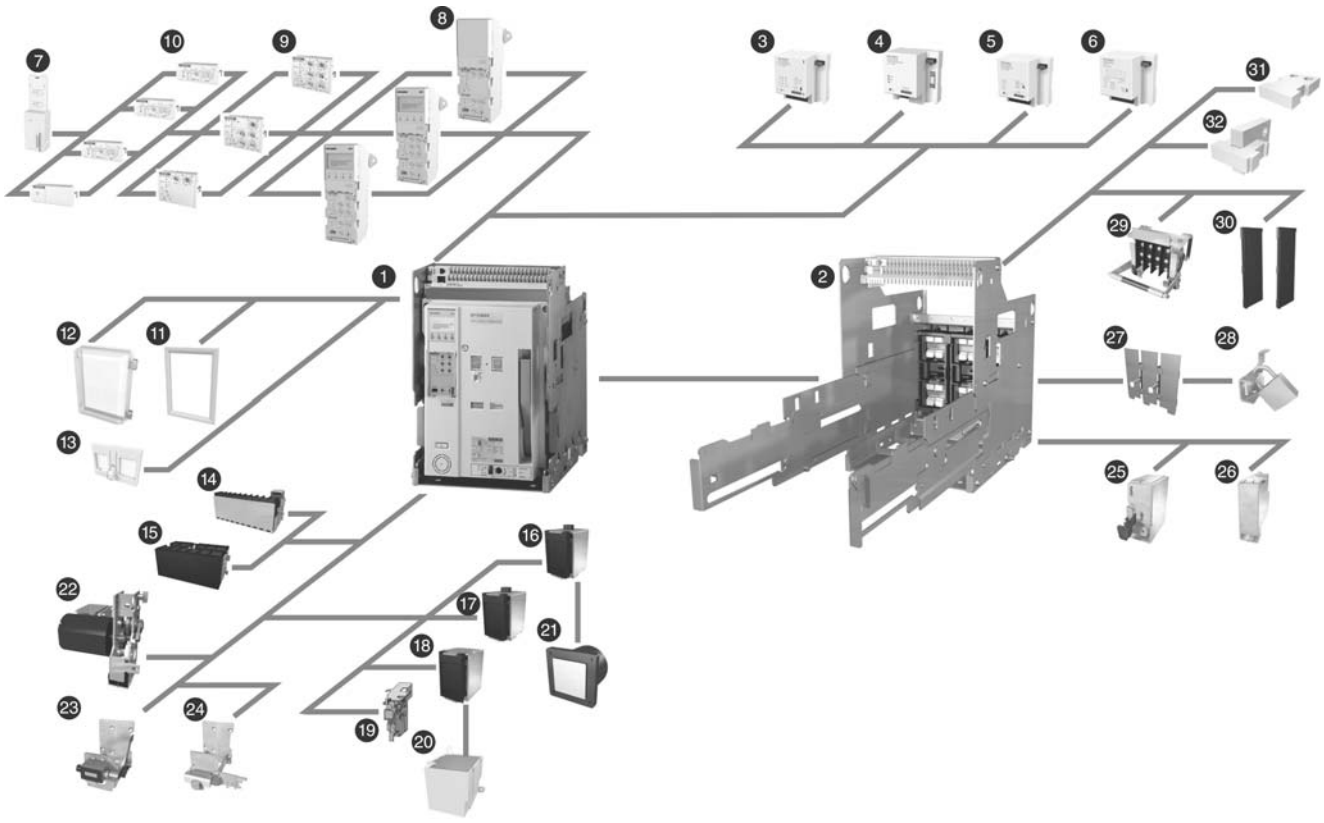
① Conforms to IEC60947-2, EN60947-2

② Number of mechanical operating cycles (on/off).

③ Optional

Product Skeleton of Accessories for SUPER AE Series Air Circuit Breakers

Mitsubishi Electric offers a wide range of accessories for the Air Circuit Breakers to serve almost all variations of applications.



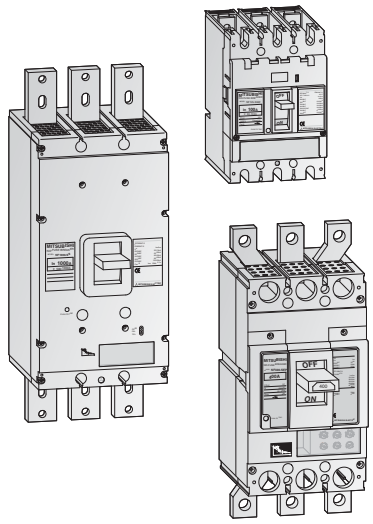
Position	Name
1	Air circuit breaker
2	Cradle
3	CC-Link® Interface unit
4	PROFIBUS-DP Interface unit
5	MODBUS® Interface unit
6	I/O unit
7	Extension module
8	ETR unit
9	Main setting module
10	Optional setting module
11	Door frame (DF)

Position	Name
12	Dust cover (DUC)
13	Push button cover (BC-L)
14	Auxiliary switch standard (AX)
15	Auxiliary switch high capacity type (HAX)
16	Shunt trip device (SHT)
17	Closing coil (CC)
18	Under voltage trip device (UVT)
19	Trip coil
20	UVT-controller (U-CON)
21	Condenser trip device (COT)
22	Motor charging device (MD)

Position	Name
23	Counter (CNT)
24	Cylinder lock (CYL)
25	Door interlock (DI)
26	Mechanical interlock (MI)
27	Safety shutters (SST)
28	Safety shutter lock (SST-LOCK)
29	Cell switch (CL)
30	Interphase Barrier (BA)
31	Horizontal terminal
32	Vertical terminal

For details on our full range including accessories contact your local distributor

WS Series Moulded-Case Circuit Breakers



The moulded-case circuit breakers of the Mitsubishi breaker series are amongst the smallest compact circuit breakers in the world with electronic overload indication of this kind. The system is based, among other things, on the well-known and proven microprocessor technology.

WSS – World Super Series

The new WSS breaker series meets national and international protection ratings according to VDE, EN, and IEC standards for industrial applications as well as for extended shipping demands.

The new tripping technology guarantees a high reliability and highest protection.

Highlights are:

- 16 A to 250 A in one model size (3- and 4-pole)
- Overcurrent tripping relay unit (thermal type or electronic type)
- Available in fixed and plug-in versions
- Breaking capacity up to 200 kA

Specifications

Specifications				NF32-SW	NF63-SW	NF63-HW
Rated current $I_{n\ max.}$ [A]				32	63	125
Rated insulation voltage U_i [V]			AC	600	600	690
Number of poles				3	3/4	3/4
Rated breaking capacity [kA] (I_{cu}/I_{cs})	IEC 947-2 EN 60 947-2 VDE 0660	AC (50/60 Hz)	690 V	—	—	2.5/1
			440 V	2.5/1	7.5/4	10/5
			400 V	5/2	7.5/4	10/5
Dimensions WxHxD			[mm]	75x130x86	75/100x130x68	75/100x130x68

Specifications				NF125-SGW RT	NF125-SGW RE	NF125-HGW RT	NF125-HGW RE	NF125-RGW RT	NF160-SGW RT	NF160-SGW RE
Rated current $I_{n\ max.}$ [A]				125	125	125	125	100	160	160
Rated insulation voltage U_i [V]			AC	690	690	690	690	690	690	690
Number of poles				3/4	3/4	3/4	3/4	3	3/4	3/4
Rated breaking capacity [kA] (I_{cu}/I_{cs})	IEC 947-2 EN 60 947-2 VDE 0660	AC (50/60 Hz)	690 V	8/8	8/8	20/20	20/20	25/25	8/8	8/8
			440 V	36/36	36/36	65/65	65/65	125/125	36/36	36/36
			400 V	36/36	36/36	75/75	75/75	125/125	36/36	36/36
Dimensions WxHxD			[mm]	105/140x165x86	105/140x165x86	105/140x165x86	105/140x165x86	105x240x86	105/140x165x86	105/140x165x86

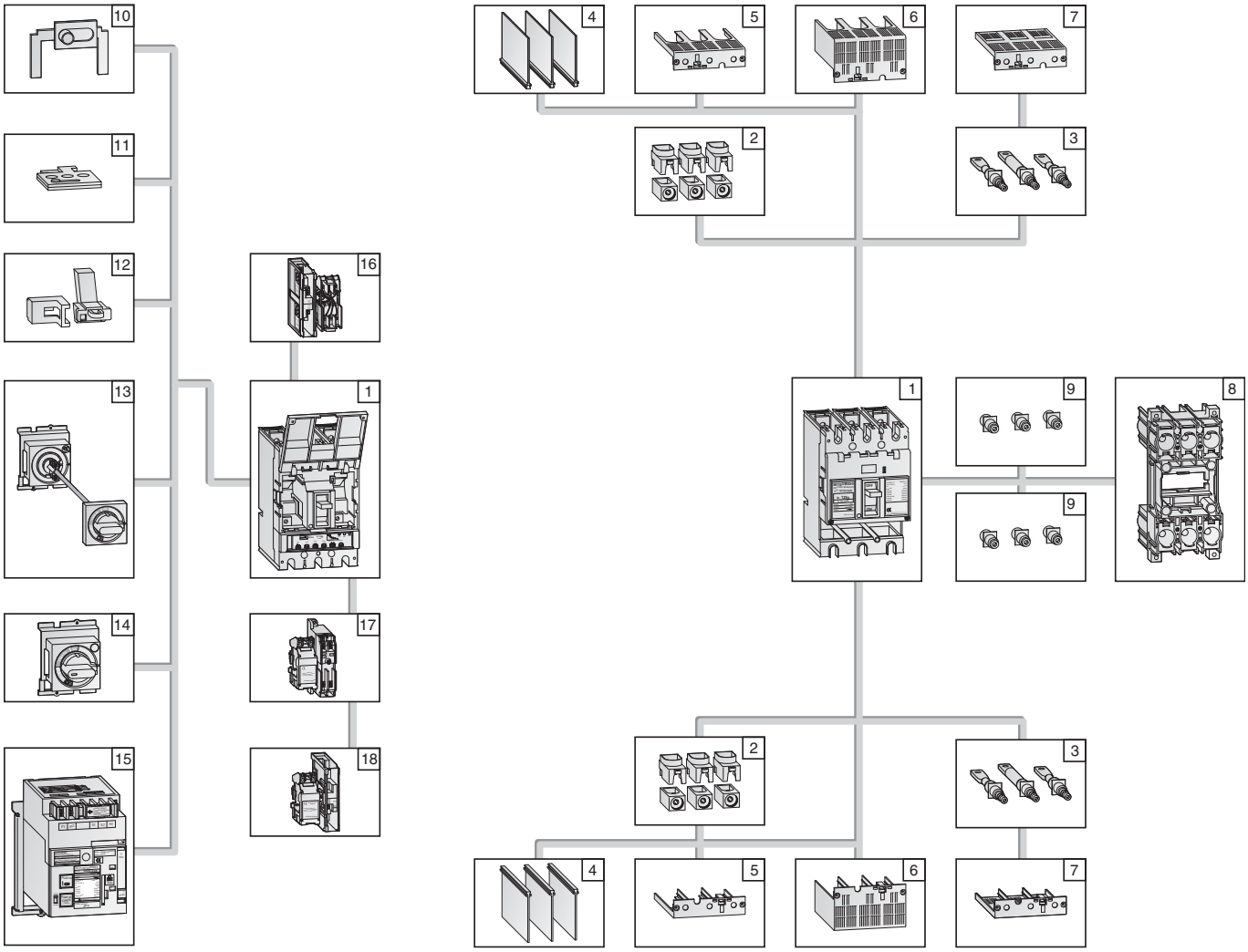
Specifications				NF160-HGW RT	NF160-HGW RE	NF250-SGW RT	NF250-SGW RE	NF250-HGW RT	NF250-HGW RE	NF250-RGW RT
Rated current $I_{n\ max.}$ [A]				160	160	250	250	250	250	225
Rated insulation voltage U_i [V]			AC	690	690	690	690	690	690	690
Number of poles				3/4	3/4	3/4	3/4	3/4	3/4	3
Rated breaking capacity [kA] (I_{cu}/I_{cs})	IEC 947-2 EN 60 947-2 VDE 0660	AC (50/60 Hz)	690 V	20/20	20/20	8/8	8/8	20/20	20/20	25/25
			440 V	65/65	65/65	36/36	36/36	65/65	65/65	125/125
			400 V	75/75	75/75	36/36	36/36	75/75	75/75	125/125
Dimensions WxHxD			[mm]	105/140x165x86	105/140x165x86	105/140x165x86	105/140x165x86	105/140x165x86	105/140x165x86	105x240x86

Specifications				NF400-SEW	NF400-HEW	NF400-REW	NF630-SEW	NF630-HEW	NF630-REW	NF800-SEW	NF800-HEW	NF800-REW
Rated current $I_{n\ max.}$ [A]				400	400	400	630	630	630	800	800	800
Rated insulation voltage U_i [V]			AC	690	690	690	690	690	690	690	690	690
Number of poles				3/4	3/4	3	3/4	3/4	3	3/4	3/4	3
Rated breaking capacity [kA] (I_{cu}/I_{cs})	IEC 947-2 EN 60 947-2 VDE 0660	AC (50/60 Hz)	690 V	10/10	35/18	—	10/10	15/15	—	10/10	15/15	—
			440 V	42/42	65/65	125/63	42/42	65/65	125/63	42/42	65/65	125/63
			400 V	50/50	70/70	125/63	50/50	70/70	125/63	50/50	70/70	125/63
Dimensions WxHxD			[mm]	140/185x257x103	140/185x257x103	140x257x103	140/185x257x103	140/185x257x103	140x257x103	210/280x275x103	210/280x275x103	210x275x103

Specifications				NF1000-SEW	NF1250-SEW	NF1600-SEW
Rated current $I_{n\ max.}$ [A]				1000*	1250*	1600*
Rated insulation voltage U_i [V]			AC	690	690	690
Number of poles				3/4	3/4	3/4
Rated breaking capacity [kA] (I_{cu}/I_{cs})	IEC 947-2 EN 60 947-2 VDE 0660	AC (50/60 Hz)	690 V	25/13	25/13	25/13
			440 V	85/43	85/43	85/43
			400 V	85/43	85/43	85/43
Dimensions WxHxD			[mm]	210/280x406x140	210/280x406x140	210/280x406x140

Product Skeleton of Accessories for Moulded Case Circuit Breakers

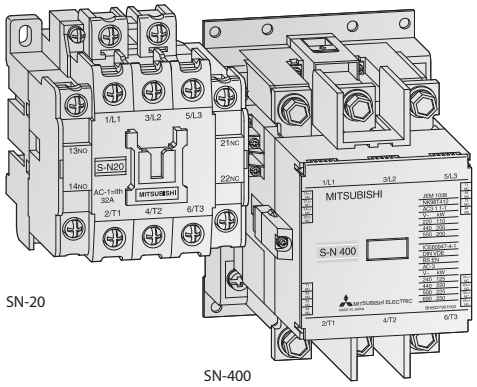
Mitsubishi Electric offers a wide range of accessories for the Moulded Case Circuit Breakers and disconnectors to serve almost all variations of applications.



Position	Name	Description
1	Circuit Breaker	Main breaker unit.
2	Solderless (box) terminals	Connection accessories, only available for frame sizes 125/160/250 A.
3	Rear connection studs	Used for rear connection.
4	Insulating barriers (BA-F)	Used to avoid short-circuits between the terminals, every breaker is equipped with insulating barriers as standard.
5	Small terminal covers (TC-S)	Used to avoid exposure of charged parts, small type.
6	Large terminal covers (TC-L)	Used to avoid exposure of charged parts, large type.
7	Rear terminal covers (BTC)	Used to avoid exposure of charged parts, for rear connection.
8	Plug-in base (PM)	Used for easy connection and exchange.
9	Connections for Plug-in	Special connection accessories for Plug-in base.
10	Mechanical interlock (MI)	With two breakers, use a panel-mounted mechanical interlock for one-way only input. It is usable for front, rear, and plug-in types.
11	OFF Lock with 3 padlocks (HL)	Can be used to lock the handle of the breaker against switching OFF by not-allowed persons. Up to three padlock can be used.
12	Handle lock device (LC, HLF, HLN, HLS)	Can be used to lock the handle of the breaker against switching by not-allowed persons. Up to three padlock can be used.
13	Variable-depth operating handle, V type	The V-type operating handle is used to operate the breaker which is installed in a cabinet.
14	Rotary operating handle, R type	The R-type operating handle is to be mounted directly on the breaker.
15	Electrical operating device (MDS)	Used to switch the breaker ON and OFF electrically by remote.
16	Alarm and Auxiliary switches (AL, AX)	Indicators for status signals (ON, OFF, Tripped).
17	Under voltage trip device (UVT)	Trips the breaker when voltage drops.
18	Shunt trip device (SHT)	Trips the breaker by remote.

For details on our full range including accessories contact your local distributor

General Purpose Contactors



SN-20

SN-400

Compact, modular extensions and an energy-saving design – these are the main requirements set by users of contactors and auxiliary contactors.

Requirements that the MS-N series from Mitsubishi Electric fulfill.

Special features:

- Easy mounting and wiring
- Easy inspection
- Built-in surge absorber (from S-N50)
- Safety and speedy terminal functions
- Thermo-plastic improves the barrier strength
- Coil boasts lower coil consumption
- Improvement of Electromagnet (DC electromagnet with AC operation)
- Less noise nor surge from coil
- Conform to IEC947-4-1, EN-Standards
- Wide range for rated continuous current I from 20 A to 1000 A

Handling of the contactors

S-N10CX to S-N65CX units can all be mounted on DIN rail (35 mm wide).

A variety of auxiliary blocks and optional features are available including:

- Standard front clip-on auxiliary contact blocks (4-pole-type and 2-pole-type)
- Low-level signal front-clip-on auxiliary contact blocks
- Side clip-on auxiliary contact blocks
- Surge absorbers (varistor and CR models)
- Surge absorbers with LED operating indicators
- Mechanical interlocks

Compact arc quenching and magnet layout greatly reduces installation space.

The coil rating is displayed in a location readily visible even after the unit is installed onto the panel.

Contacts are visible when the cover is removed, allowing them to be checked easily.

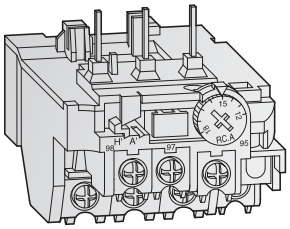
Three-phase motor ratings IEC category AC3 for Contactors											
Contactor	AC-operated	S-N10CX	S-N11CX	S-N12CX	S-N18CX	S-N20CX	S-N21CX	S-N25CX	S-N35CX	S-N50CX	S-N65CX
	DC-operated	—	SD-N11CX	SD-N12CX	—	—	SD-N21CX	—	SD-N35CX	SD-N50	SD-N65
AC 380–440 V	kW	4	5.5	5.5	7.5	11	11	15	18.5	22	30
Rated continuous current I_{th}	A	20	20	20	25	32	32	50	60	80	100
Auxiliary contacts (standard)		1 NO or 1 NC	1 NO or 1 NC	1 NO + 1 NC	—	1 NO + 1 NC	2 NO + 2 NC	2 NO + 2 NC	2 NO + 2 NC	2 NO + 2 NC	2 NO + 2 NC

Thermal Overload Relays						
Type	TH-N12KPCX		TH-N18KPCX	TH-N20KPCX	TH-N20TAKPCX	TH-N60KPCX
Setting range	0.1–13 A		1–18 A	0.2–22 A	18–40 A	12–65 A

Three-phase motor ratings IEC category AC3 for Contactors											
Contactor	AC-operated	S-N80	S-N95	S-N125	S-N150	S-N180	S-N220	S-N300	S-N400	S-N600	S-N800
	DC-operated	SD-N80	SD-N95	SD-N125	SD-N150	—	SD-N220	SD-N300	SD-N400	SD-N600	SD-N800
AC 380–440 V	kW	45	55	60	75	90	132	160	220	330	440
Rated continuous current I_{th}	A	135	150	150	200	260	260	350	450	800	1000
Auxiliary contacts (standard)		2 NO + 2 NC	2 NO + 2 NC	2 NO + 2 NC	2 NO + 2 NC	2 NO + 2 NC	2 NO + 2 NC	2 NO + 2 NC	2 NO + 2 NC	2 NO + 2 NC	2 NO + 2 NC

Thermal Overload Relays						
Type	TH-N60TAKP	TH-N120KP	TH-N120TAKP	TH-N220RHKP	TH-N400RHKP	TH-N600KP
Setting range	54–105 A	34–100 A	85–150 A	65–250 A	85–400 A	200–800 A

Thermal Overload Relays



TH-N18KPCX

A selection of relays for optimum motor protection characteristics

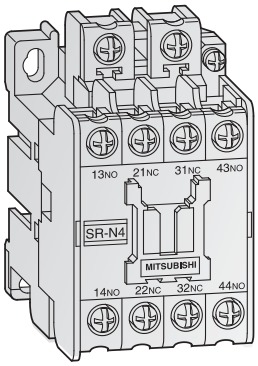
The thermal relay line-up includes the phase failure protection type models (three-element relays).

This array of protection characteristics allows you to choose the units suited to your motor protection needs.

Special features:

- An operation indicator makes maintenance and inspection easy.
- 1 NO and 1 NC contact
- Rated current can be set easily
- Finger protection up to TH-N60KPCX
- Trip-free reset bar
- Convenient reset release (optional)

Contactor Relays



SR-N4

Contactor relays

Contactor relays are designed for use in low voltage control circuit applications.

Our standard contactor relay version is with 4 auxiliary contacts.

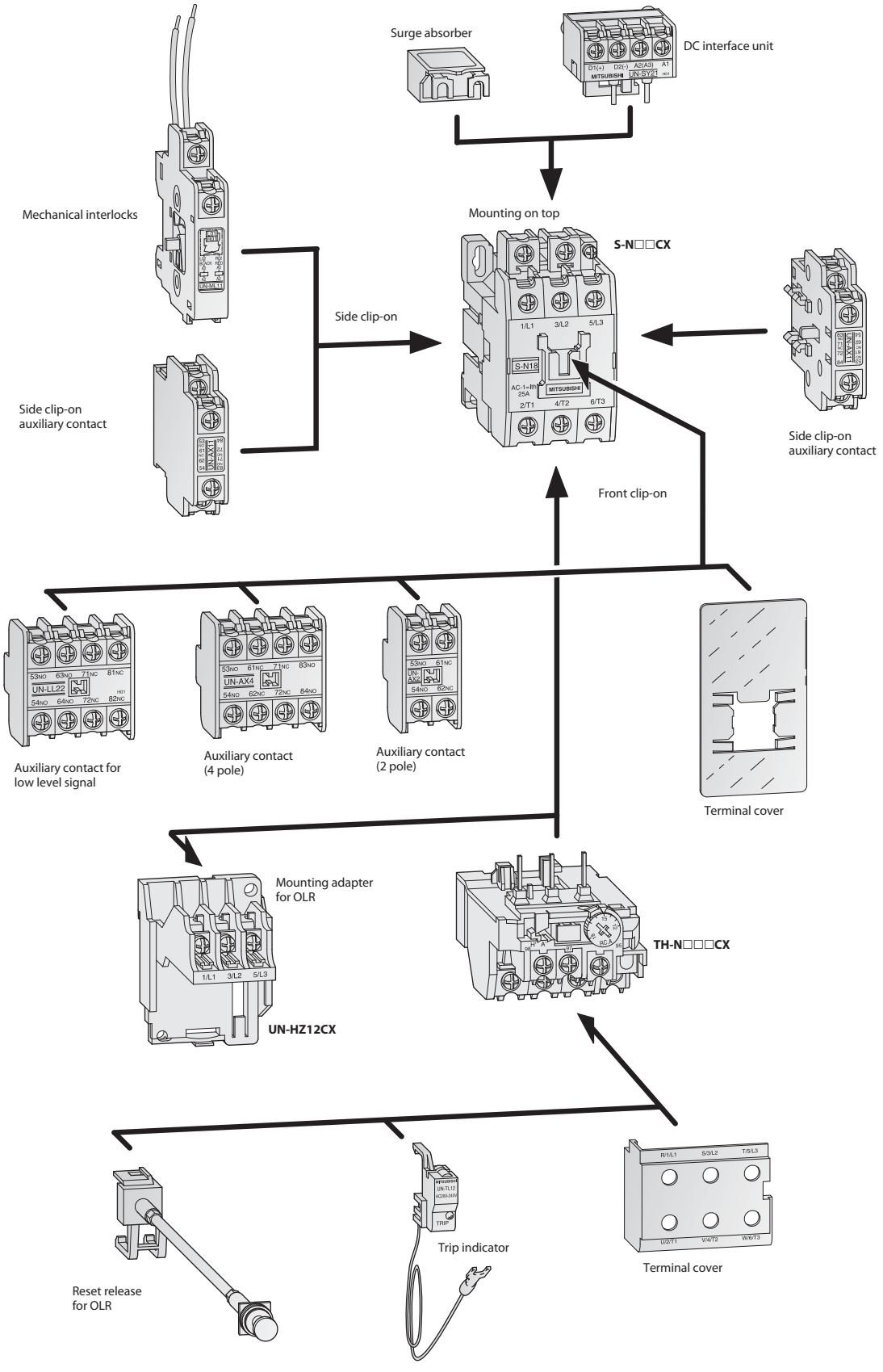
With side clip-on and front clip-on configurations available, a maximum of 8 auxiliary contacts are possible.

Special features:

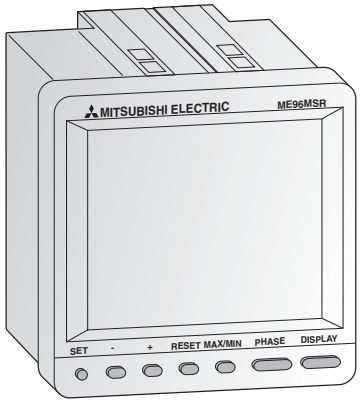
- High reliability: By adopting bifurcated moving contacts and by improving the shape of the contacts, contact performance has been made more reliable than ever.
- Different types: Standard, large capacity, overlap contact
- Various contact arrangement and long life
- Mountable on 35 mm DIN rails
- Dust-proof construction
- Easily visible coil ratings
- Easy wiring (self-rising terminal screws)
- Various accessories common with the series S-N contactors (front and side clip-on type additional auxiliary contact blocks, surge absorbers)
- Finger protected types are available (DIN 57106/VDE 0106 Part 100) (Suffix "CX")

Contactor Relays			
AC-operated type	**SR-N4CX 4A**	**SR-N4CX 3A1B**	**SR-N4CX 2A2B**
DC-operated type	**SRD-N4CX 4A**	**SRD-N4CX 3A1B**	**SRD-N4CX 2A2B**
Auxiliary contacts	4 NO	3 NO, 1 NC	2 NO, 2 NC

Product Skeleton of Accessories for Magnetic Contactors, Thermal Overload Relays & Contactor Relays



Electronic Multi-Measuring Instruments

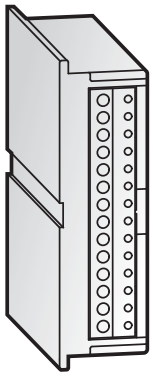


ME96NSR

The ME96NSR measures and displays all important values of a low voltage/medium voltage power distribution system. By optional plug-in modules, remote I/O's and open network communication can be added. The remote I/O will be used for monitoring the MCCB or ACB status or can be used for energy counters. It provides full integration in a CC-Link or MODBUS network and allows therefore energy reduction and optimization controlled by a PLC.

- Compact sizes according to DIN
- Easy to read display and simple to learn operation
- Flexible to use and modular expandable
- Conforms to CE standard

Specifications		ME96NSR	ME96NSR-MB
Display		LCD, monochrome	LCD, monochrome
Function keys		7	7
Memory for		Measurements and settings	
Network connection		—	RS485/MODBUS
Expandability		CC-Link, digital or analog I/Os via plug-in module	
External power supply		100 to 240 V AC (+10 %, -15 %), 50/60 Hz; 75 to 140 V DC	
Operating conditions		-5–50 °C (average temperature; ≤35 °C per day), 30–85 % humidity (no condensation)	
Storage conditions		-20–60 °C	
Dimensions (BxHxT)	mm	96x96x86	96x96x86
Weight	kg	0.5	0.5
Standards		EMC: EN61326-1:2006 safety standard: EN61010-1:2001	
Order information	Art. No.	221596	221597



Plug-in modules

Using an optional plug-in module the multi-measuring instrument can be connected in open CC-Link networks. They offer different I/Os to display measured data from the electric distribution system or similar.

The plug-in module can be simply plugged into the designated space on the back side of the measuring module.

Specifications		ME-4201-NS96	ME-0040C-NS96	ME-0052-NS96
Analog outputs		4	—	—
Pulse outputs		2	—	—
Potential free inputs		—	4	5
Potential free outputs		1	—	2
Network connection		—	CC-Link	—
Suitable measuring instrument		ME96NSR	ME96NSR	ME96NSR-MB
Order information	Art. No.	221598	221599	221600

Measured and displayed can be:

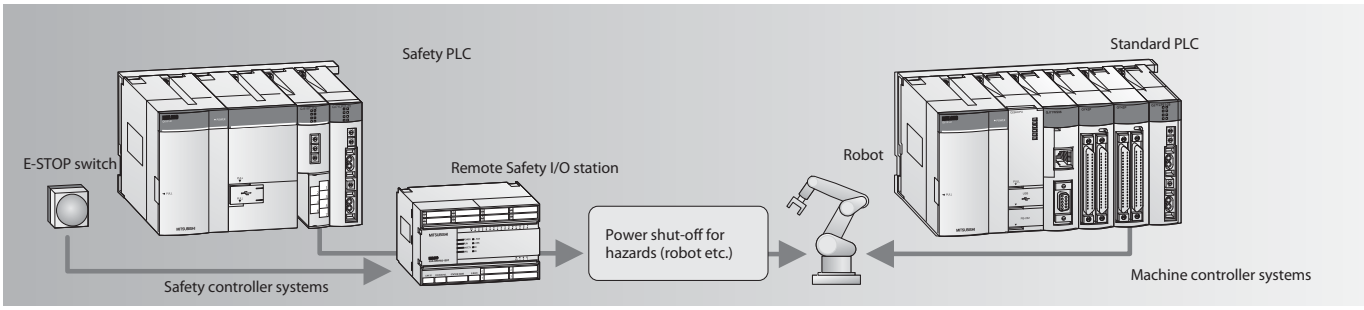
- Measuring of voltage, current, active power, reactive power, apparent power, power factor, and frequency.
- In addition, total of six types of energy (incoming energy, outgoing energy, incoming lag reactive energy, incoming lead reactive energy, outgoing lag reactive energy, and outgoing lead reactive energy) can be measured.
- Using the RS485 interface monitoring of contact input (5 circuits) and power monitoring of output control (2 circuits) can be operated at the same time.
- Status of the breaker (e. g. ON, OFF, tripped, alarm; only useable with AE-SW)
- Measuring of imported and exported energy
- Measuring ranges: IT and TN, 60 V to 750 kV, 5 A to 30 kA, 50 to 60 Hz

MELSEC Safety PLC

Even with increasing productivity, the safety of humans operating machinery and manufacturing facilities must still always have top priority. The MELSEC System QS PLC is specially designed for managing safety systems.

It is connected to safety devices like Emergency Stop switches and light curtains and has extensive diagnostics functions that enable it to reliably switch safety-critical outputs at the right time to turn machines off in the event of danger.

The actual machinery (conveyor belts, robots etc.) is still controlled by a conventional PLC.

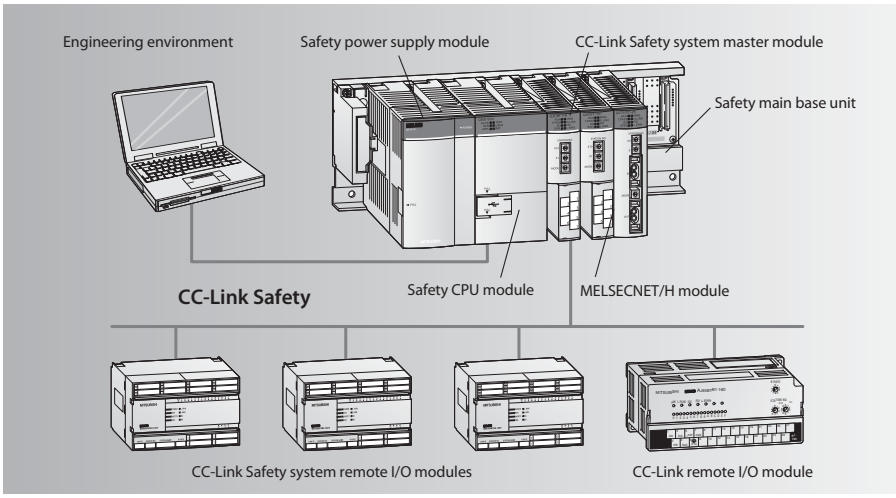


CC-Link Safety

The CC-Link Safety network eliminates the complex wiring needed in conventional safety controller systems. The remote Safety I/O stations are connected to the CC-Link master module in the Safety PLC using standard CC-Link cables. In the event of communications errors powerful and effective error identification routines automatically switch off the outputs of both the Safety PLC and the remote Safety I/O stations.

CC-Link Safety is also compatible with CC-Link. This means you can also use standard CC-Link I/O modules in a CC-Link Safety network for those inputs and outputs that are not critical for safety.

- Conforms to the safety requirements of EN 954-1, Category 4 (2010: ISO13849-1 PLe)
- Automatic checking of safety inputs and outputs and external devices (cable breaks, short circuits, fused contactor contacts etc.)
- Program and configure with the familiar GX Developer or GX IEC Developer programming software packages. No new skills or software are required.
- Reduced wiring requirements cuts costs



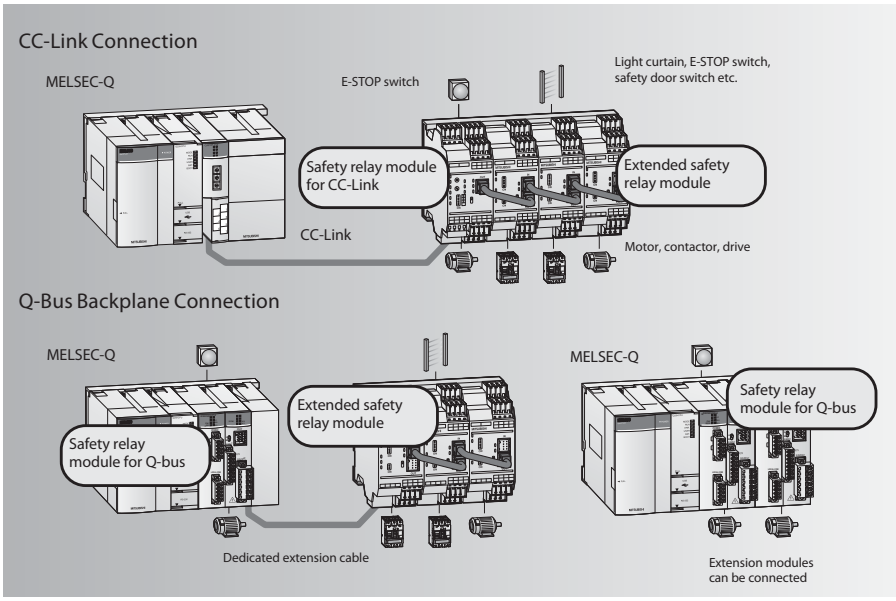
- Comprehensive diagnostics functions
- Versatile: A single Safety CPU can control up to 84 remote safety stations
- The CC-Link standard enables connection of third-party products compatible with the safety concept

Type	Safety Controller Components	Art. no.
QS001CPU	Safety PLC, 14 K steps program capacity	203205
QS034B-E	Safety base unit, accommodates power supply unit, CPU and up to 4 modules	203206
QS061P-A1	Safety power supply unit, 100-120 V AC	203207
QS061P-A2	Safety power supply unit, 200-240 V AC	203208
QSQJ61BT12	CC-Link Safety master module	203209
QSQJ65BTB2-12DT	Safety remote I/O module, 8 dual safety inputs + 4 dual safety outputs	203210
QSQJ65BTS2-8D	CC-Link Safety remote I/O module, 8 dual safety inputs	217625
QSQJ65BTS2-4T	CC-Link Safety remote I/O module, 4 dual safety outputs	217626

Safety Relais

Safety relay modules are the ideal solution for applications where you don't need a separate Safety PLC. These modules are installed together with the standard MELSEC System Q components on the same base unit, or in a CC-Link network. This enables a normal PLC used as a controller to also perform safety functions, without the added cost of a separate safety controller and without additional programming and configuration.

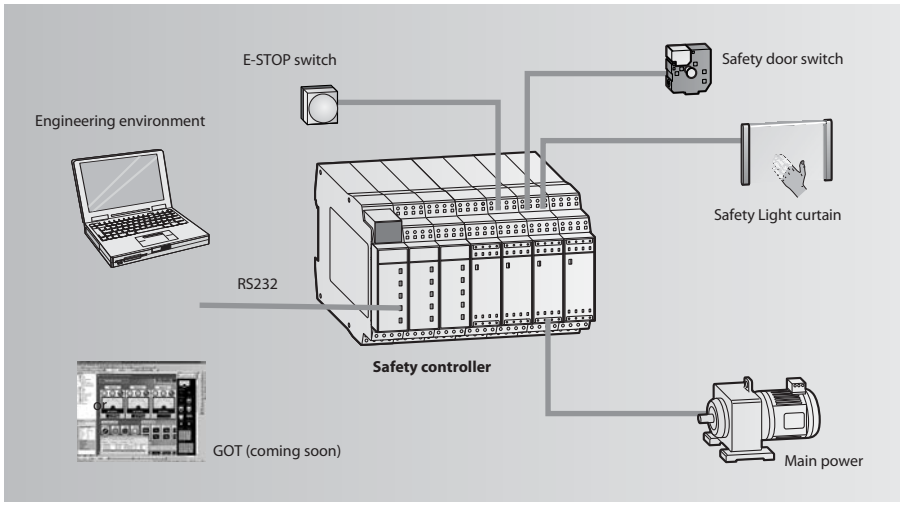
- The safety modules conform to the safety requirements of EN 954-1, Category 4 (2010: ISO13849-1 PLe)
- Simple configuration without programming
- Easy retrofitting on existing systems
- The PLC monitors your safety functions, enabling fast diagnostics
- Extension modules allow easy modification



Specifications		Module	Type	Art. no.
Safety relay modules	For installation in a CC-Link station	QS90SR2SP-CC	P-Type, 1 safety input, 1 safety output	215801
		QS90SR2SN-CC	N-Type, 1 safety input, 1 safety output	215803
	For installation on a MELSEC System Q base unit	QS90SR2SP-Q	P-Type, 1 safety input, 1 safety output	215799
		QS90SR2SN-Q	N-Type, 1 safety input, 1 safety output	215800
Extension modules	Can be connected to safety relay modules	QS90SR2SP-EX	P-Type, 1 safety input, 1 safety output	215804
		QS90SR2SN-EX	N-Type, 1 safety input, 1 safety output	215805

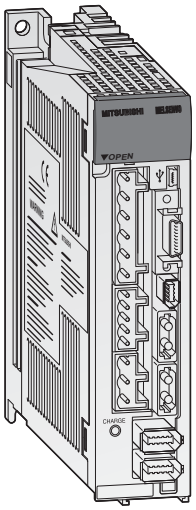
MELSEC WS Safety Controller

The MELSEC WS Safety Controller provides a cost effective way to add a safety controller capability to individual machines, or smaller scale systems. Mitsubishi Electric is proud to announce that the WS is a joint development with SICK AG of Germany, an acknowledged leader in the global machine safety industry. Its compact size insures easy placement in most control cabinets, without adding extra cost. Configuration saves engineering time by using a graphical icon based method, and program development and certification is simplified by the use of safety function blocks. For more complex needs, the WS is also scalable by simply adding additional I/O modules. Finally, integration with conventional control systems is easily achieved with the CC-Link open network connection or Ethernet.



Function	Module	Description	Art. no.
CPU	WS0-CPU000200	Program memory: 255 function blocks	230057
	WS0-CPU130202	Program memory: 255 function blocks; EFI (direct communication with SICK safety devices)	230058
Input module	WS0-XTDI80202	8 safety inputs	230059
Input/output modul	WS0-XTIO84202	8 safety inputs; 4 safety outputs	230060
Output module	WS0-4RO4002	4 safety relay outputs	230064
Communication module	WS0-GETH00200	Module for Ethernet communication	230063
Memory	WS0-MPL000201	Memory plug	230061
Programming cable	WS0-C20R2	Serial programming cable	230062

MR-J3-BSafety (200 V Type)



The MR-J3-BSafety servo amplifiers offer among the standard functions of the MR-J3-B, additional safety functions for a comprehensive protection of machinery and workers. In combination with the Safety Option Card MR-J3-D05, these devices represent a perfect safety solution. MR-J3-BSafety and MR-J3-D05 are certified according IEC/EN 61508 SIL 2, EN 62061 SIL CL2 and EN ISO 13849-1 PL d (Category 3).

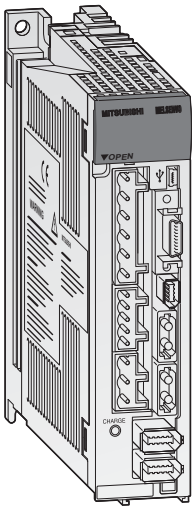
The servo amplifier MR-J3-BSafety itself offers the Safety function "Safe Torque Off" (STO) according EN 61800-5-2.

This "Safe Torque Off" function disconnects the power from the motor and prevents an unexpected re-start. Thereupon the motor coasts to a halt. Compared to the traditional technology with contactors, this integrated Safety function reduces the effort in hardware, wiring and maintenance and offers higher performance and lifetime.

Common specifications MR-J3-BSafety		10BS	20BS	40BS	60BS	70BS	100BS	200BS	350BS	500BS	700BS
Power supply	voltage/frequency	3-phase 200–230 V AC, 50/60 Hz; 1-phase 230 V AC, 50/60 Hz					3-phase 200–230 V AC, 50/60 Hz				
	permissible voltage fluctuation	3-phase 200–230 V AC: 170–253 V AC, 1-phase 230 V AC: 207–253 V AC					3-phase 170–253 V AC				
	permissible frequency fluctuation	± 5 %									
Control system		Sinusoidal PWM control/current control system									
Dynamic brake		Built-in									
Speed frequency response		900 Hz									
Protective functions		Overcurrent shutdown, regeneration overvoltage shutdown, overload shutdown (electronic thermal), servomotor overheat protection, encoder fault protection, regeneration fault protection, undervoltage/sudden power outage protection, overspeed protection, excess error protection.									
Structure		Self-cooling, open (IP00)			Fan-cooling, open (IP00)						
Environment	ambient temperature	Operation: 0–55 °C (no freezing) ①, storage: -20–65 °C (no freezing)									
	ambient humidity	Operation: 90 % RH max. (no condensation), storage: 90 % RH max. (no condensation)									
	atmosphere	Inside control panel; no corrossive gas, no flammable gas, no oil mist, no dust									
	elevation	1000 m or less above sea level									
	oscillation	5.9 m/s^2 (0.6 G) max.									
Position and speed control		Possible using SSCNET III control									
Comunication speed		50 Mbps									
Standards		CE (LVD: EN50178, EMC: EN61800-3), UL: UL508C									
Weight [kg]		0.8	0.8	1.0	1.0	1.4	1.4	2.1	2.3	4.6	6.2
Dimensions (WxHxD)	mm	40x168x135	40x168x135	40x168x170	40x168x170	60x168x185	60x168x185	90x168x195	90x168x195	130x250x200	172x300x200
Order information	Art. no.	229316	229317	229318	229319	227373	227374	227485	229320	229321	229322

① Rated output capacity and rated rotation speed of the servo motor used in combination with the servo amplifier are as indicated when using the power voltage and frequency listed. Output and speed cannot be guaranteed when the power supply voltage is less than specified.

MR-J3-BSafety (400 V Type)

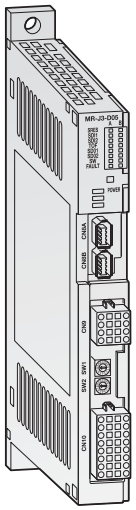


Mitsubishi's 400 V range of safety servo amplifiers provides the same industry leading functionality as the 200 V range. The 400 V safety servo amplifiers are available over a wide range from 600 W rating tothe powerful 7 kW rating. Suitable for all types of automation solutions, the 400 V safety servo amplifiers also provide sink/source logic selectability, safety functions and can be connected to the Safety Option Card MR-J3-D05. For amplifiers larger than 7 kW please contact your nearest Mitsubishi office.

Common specifications MR-J3-BSafety		60BS4	100BS4	200BS4	350BS4	500BS4	700BS4
Power supply	voltage /frequency	3-phase 380–480 V AC, 50/60 Hz					
	permissible voltage fluctuation	3-phase 323–528 V AC, 50/60 Hz					
	permissible frequency fluctuation	± 5 % max.					
Control system		Sinusoidal PWM control/current control system					
Dynamic brake		Built-in					
Speed frequency response		900 Hz					
Protective functions		Overcurrent shutdown, regeneration overvoltage shutdown, overload shutdown (electronic thermal), servomotor overheat protection, encoder fault protection, regeneration fault protection, undervoltage/sudden power outage protection, overspeed protection, excess error protection.					
Structure		Self-cooling, open (IP00)		Fan cooling (IP00)			
Environment	ambient temperature	Operation: 0–55 °C (no freezing), storage: -20–65 °C (no freezing)					
	ambient humidity	Operation: 90 % RH max. (no condensation), storage: 90 % RH max. (no condensation)					
	atmosphere	Inside control panel; no corrossive gas, no flammable gas, no oil mist, no dust					
	elevation	1000 m or less above sea level					
	oscillation	5.9 m/s^2 (0.6 G) max.					
Position and speed control		Possible using SSCNET III control					
Comunication speed		50 Mbps					
Standards		CE (LVD: EN50178, EMC: EN61800-3) UL: UL508C					
Weight [kg]		1.7	1.7	2.1	4.6	4.6	6.2
Dimensions (WxHxD)	mm	60x168x195	60x168x195	90x168x195	130x250x200	130x250x200	172x300x200
Order information	Art. no.	229328	229329	229330	229331	229332	229333

① Rated output capacity and rated rotation speed of the servo motor used in combination with the servo amplifier are as indicated when using the power voltage and frequency listed. Output and speed cannot be guaranteed when the power supply voltage is less than specified.

MR-J3-D05 Safety Logic Unit



The function of the Safety Option Card MR-J3-D05 can be compared with a programmable Safety relay. In combination with MR-J3-BSafety additional Safety functions according EN 61800-5-2 and additional Emergency Stop functions according EN IEC 60204-1 are availible. Among "Safe Torque Off" (STO) also "Safe Stop" (SS1) is possible.

With SS1 the connected motor will be stopped "by control" in a fixed time. When the minimum speed is reached, the Safety function STO will be activated preventing the re-start of the motor by disconnecting the motor power supply. Emergency Stop functions like EMG OFF (Emergency Off) and EMG STOP (Emergency Stopp) according EN IEC 60204-1 can be realised with an appropriate wiring. One unit of MR-J3-D05 supports save operation of 2 axes.

Common specifications MR-J3-BSafety		MR-J3-D05
Control power supply	voltage /frequency	24 V DC
	permissible voltage fluctuation	24 V DC 10 %
	power supply capacity	500 mA ①②
Connectable Axis		2 axes, indepently controlled
Shut-off input (Safety devices)		4 points (2 points x 2 axis), source/sink logic compatible
Shut-off release input (restart devices)		2 points (1 points x 2 axis), source/sink logic compatible
Response time		20 ms or less for Safe Torque Off (STO)
Delay time setting		0 s, 1.4 s, 2.8 s, 9.8 s, 30.8 s, w2 % (additional for axis A: 5.6 s)
Environment	ambient temperature	Operation: 0–55 °C (no freezing), storage: -20–65 °C (no freezing)
	ambient humidity	Operation: 90 % RH or less (no condensation), storage: 90 % RH or less (no condensation)
	atmosphere	Inside control panel; no corrossive gas, no flammable gas, no oil mist, no dust
	elevation	1000 m or less above sea level
	oscillation	5.9 m/s2 or less at 10 to 55Hz (directions of X, Y and Z axes)
Weight [kg]		0.15
Dimensions (WxHxD)	mm	22.5x192x86
Order information	Art. no.	227486

① Inrush current of approximately 1.5mA flow instantaneously when turning the control power supply on. Select an appropriate power supply considering the inrush current.

② Number of turning the power on is 100000.

Safety specifications

	QS001	WS0-CPU0	WS0-CPU1	QS90SRx	MR-J3-BSafety/-D05	FR-D700 ①
Category	cat. 4 (EN 954-1)	cat. 4 (EN 954-1)	cat. 4 ((EN 954-1)	cat. 4 (EN 954-1)	cat. 3 (EN 954-1)	cat. 3 (EN 954-1)
Safety Integrity Level	SIL3 (IEC 61508)	SIL3 (IEC 61508)	SIL3 (IEC 61508)	—	SIL2 (IEC 61508)	SIL2 (IEC 61508)
	SILCL3 (EN 62061)	SILCL3 (EN 62061)	SILCL3 (EN 62061)	—	SILCL2 (EN 62061)	SILCL2 (EN 62061)
Performance Level	PL e (EN ISO 13849-1)	PL e (EN ISO 13849-1)	PL e (EN ISO 13849-1)	PL e (EN ISO 13849-1)	PL d (EN ISO 13849-1)	PL d (EN ISO 13849-1)
Safety function	—	—	—	—	STO/SS1 (EN 61800-5-2)	STO (EN 61800-5-2)
	—	—	—	—	cat. 0/1 (EN 60204-1)	cat. 0 (EN 60204-1)
MTTFd Expectation of the average time for a dangerous failure to occur	71 years	100 years	100 years	100 years	100 years	725 years
DC Diagnostic Coverage (DC) is the effectiveness of fault monitoring of a system or subsystem	99 %	99 %	99 %	99 %	90 %	60 %
PFH Average probability of dangerous failure taking place during one (1) hour	4.95E-09 1/h	1.07E-09 1/h	1.69E-09 1/h	—	1.01E-07 1/h	2.35E-09 1/h

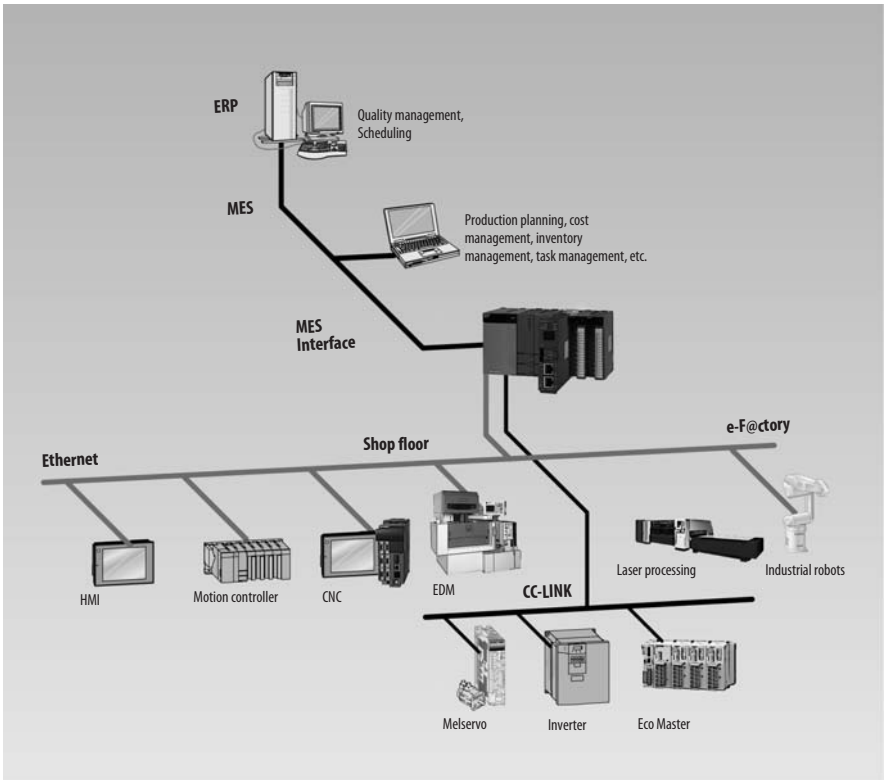
① You will find the specifications of FR-D700 on page 80.

Effectively Optimizing Production by Directly Connecting Enterprise Systems with the Shop Floor.

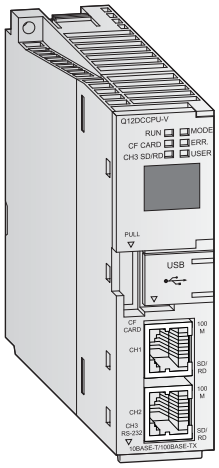
MES Soutions The MES interface product group enables direct connection between the MES (Manufacturing Execution System) database and shop floor equipment, without a communication gateway such as a PC.

The MES benefits are:

- accurate information in real-time through direct utilization of internal device information
- simple system implementation by direct connecting to database(s)
- no need for PCs and programs, which greatly reduces costs
- improved reliability by changing the gateway PC to a PLC
- no specialists and expensive interfacing software needed
- reduced installation costs
- reduced network load because of trigger executed database communication and not polling data



MELSEC System Q MES Interface IT Module

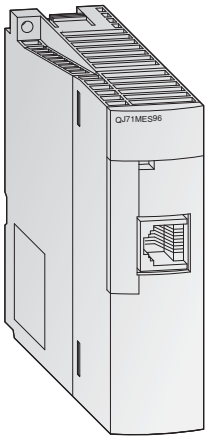


The MES Interface IT module provides a direct link from the iQ Platform to enterprise IT systems. Hence any shop floor system using the iQ Platform can communicate directly with high level IT systems. This allows the removal of the usual intermediate layer of PC infrastructure required to process shop floor data. This saves cost, increases security and reduces maintenance requirements.

Specifications			MESiT
Module type			MES interface IT modul
Communications method			ETHERNET
Interface		type	10BASE-T/100BASE-TX
DB interface function	general		Interacts with databases via user-defined jobs (Windows, Linux, Unix ect)
	databases		Oracle®/SAP, Microsoft® SQL, DB2, DB2/400
	SQL commands		Insert, batch insert, update, select, select with delete, select with update, stored procedure and count rows delete
	messaging		Http, E-mail, TCP, IBM WebSphere MQ, MQTT, JBOSS
	trigger buffering function		The MES module buffers the data and trigger time to internal memory.
	arithmetic processing		Formulas can be applied to data before sending from the MES interface module.
	program execution function		Executes programs in the application server computer
Memory capacity			1 Compact Flash™ Card can be installed
Internal power consumption (5 V DC)		mA	0.93
Dimensions (WxHxD)		mm	27.4x98x115

Order information	Art. no.
MES-IT module Hardware:	134930
Core Software incl. Mitsubishi driver and 5 connections to PLC	227387
Database Connection for SQL	227390
Database Connection for Oracle	227391
Database Connection for DB2	227392
Additional 5 PLC connections	227388
Siemens driver for S7-200, 300, 400, 12000	229481
Mitsubishi MC Protocoll driver	231543
MODBUS driver	231544
Rockwell driver	227395
Omron driver	227397

MELSEC System Q MES Interface Module

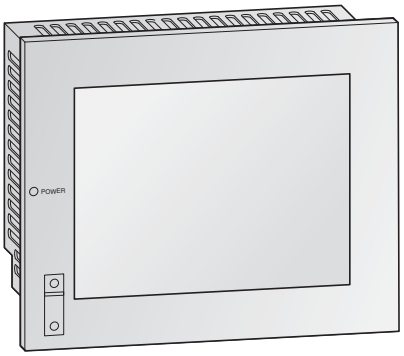


QJ71MES96

The Q series MES module allows users to interface their production control systems directly to a MES database based on Windows technology.

Specifications			QJ71MES96
Module type			MES interface module
Communications method			ETHERNET
Interface		type	10BASE-T/100BASE-TX
DB interface function	general		Interacts with databases via user-defined jobs
	tag function		Collects device data of the PLCs CPU on the network in units of tags.
	trigger monitor function		Monitors the status of conditions (time, tag values, etc.)
	trigger buffering function		The MES module buffers the data and trigger time to internal memory.
	SQL text transmission		Automatically generates the correct SQL message according to requirements.
	arithmetic processing		Formulas can be applied to data before sending from the MES interface module.
	program execution function		Executes programs in the application server computer
Memory capacity			1 Compact Flash™ Card can be installed
I/O points			32
Internal power consumption (5 V DC)		mA	650
Dimensions (WxHxD)		mm	27.5x98x90
Order information		Art. no.	200698

MES Option Board for GOT (GT15 and GT16 Series)



GT15-MESB-48M and GT16M-MESB

By using an MES option card the GT15 and GT16 are able to communicate directly with Windows databases without needing a Gateway-PC.

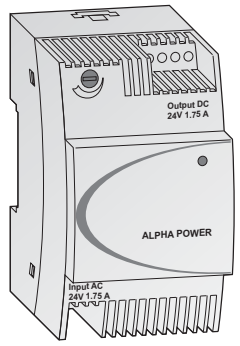
Specifications			GT15-MESB48M	GT16M-MESB
Module type			GT15 option card with 48 MB expansion memory and MES functionalityt (for direct database connection)	GT15 option card with MES functionality (for direct database connection)
DB interface function	general		Interacts with databases via user-defined jobs	
	tag function		Collects device data of the PLCs CPU on the network in units of tags.	
	trigger monitor function		Monitors the status of conditions (time, tag values, etc.)	
	trigger buffering function		The MES module buffers the data and trigger time to internal memory.	
	SQL text transmission		Automatically generates the correct SQL message according to requirements.	
	arithmetic processing		Formulas can be applied to data before sending from the MES interface module.	
	program execution function		Executes programs in the application server computer	
Order information		Art. no.	203473	221369

For GT15 the additional Ethernet communication module GT15-J71E71-100 is required.
For GT15 and GT16 a standard CF card up to 2GB is required

The information collected on the MELSEC-Q PLC is linked by the PLC MES interface module, and the information from existing equipment and 3rd party controllers is linked by the GOT1000 MES interface function.

The MES interface product series links shop floor equipment and MES information simply, with minimum cost.

Power Supply Modules

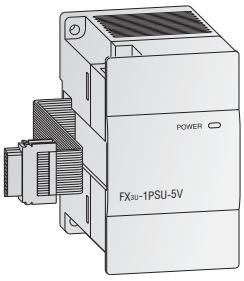


The ALPHA POWERs are convenient power supplies for the 24 V units and other external devices. They are applicable for wall or DIN rail mounting and their dimensions are matched to those of the Alpha family.

Up to 5 Alpha Power units can be installed together for redundant mode operation or connected in parallel for more power.

The units have an integrated thermal overload protection circuit and a POWER LED. The output voltage is adjustable.

Specifications		ALPHA POWER 24-0.75	ALPHA POWER 24-1.75	ALPHA POWER 24-2.5
Application		Power supply for the 24 V ALPHA base units and external devices		
Nominal input voltage		100–240 V AC (45–65 Hz)		
Output voltage		24 V DC (+/-1 %)		
Max. output current		0.75 A	1.75 A	2.5 A
Protection		IP20		
Dimensions (WxHxD)	mm	36x90x61	54x90x61	72x90x61
Order information	Art. no.	209029	209030	209031



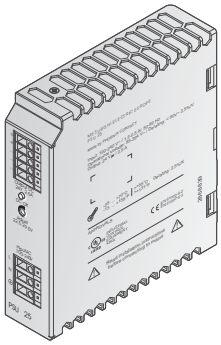
The power supply modules FX3U-1PSU-5V and FX3UC-1PS-5V are used to reinforce the build-in 5 V DC and 24 V DC power supply of a FX3U/FX3UC main unit. They do not occupy any I/O points and deliver up to 1 A more current for the 5 V system bus (for special function modules).

Two FX3U-1PSU-5V units can be installed in parallel for more power.

Note: The FX3U-1PSU-5V can't be used with a 24 V base unit!

When connecting an input extension module (e.g. FX2N-8ER-ES/UL, FX2N-8ER) to the FX3U-1PSU-5V, supply the power for it from the 24 V DC service power supply of the connected main unit or powered extension unit on the upstream side.

Specifications		FX3U-1PSU-5V	FX3UC-1PS-5V
Application		Power supply for the FX3U system bus	Power supply for the FX3UC system bus
Nominal input voltage		100–240 V AC (50/60 Hz)	24 V DC (+20 %/-15 %)
Output voltage		5 V DC/24 V DC	5 V DC
Max. output current	5 V DC	1 A at 40 °C; 0.8 A at 55 °C	1 A
	24 V DC	0.3 A at 40 °C; 0.2 A at 55 °C	—
Dimensions (WxHxD)	mm	55x90x87	24x90x74
Order information	Art. no.	169507	210086



The primary switched-mode power supply units PSU are especially applicable for universal usage in batch mechanical engineering. The wide range input and the UL, cUL certifications allow a worldwide application. The 3-phase units supply the full permanent output power at breakdown of one phase

The power supply units can be installed in parallel for more power or for redundant mode operation.

The units dispose of an adjustable output voltage, a thermal overload protection circuit and a POWER LED.

Specifications		PSU 25	PSU 50	PSU 100	PSU 200	PSU 200-3	PSU 400-3
Application		Power supply for all peripheral devices					
Nominal input voltage		100–240 V AC (45–65 Hz)				380–400 V AC	
Output voltage		24 V DC					
Max. output current		2.5 A	5 A	10 A	20 A	20 A	40 A
Protection		IP20					
Dimensions (WxHxD)	mm	32x130x115	40x130x115	60x130x152.5	115x130x152.5	115x130x152.5	139x130x190
Order information	Art. no.	206147	206148	206149	208850	208851	208852
Accessories (PSU 100 or larger)		Wall mounting apter PSU-UWA, art. no.: 208853					

The Mitsubishi Industrial Automation Internet Portal

The Mitsubishi Automation website

Our website provides a simple and fast way of accessing further technical data and up to the minute details on our products and services. Manuals and catalogues are available in several different languages and can be downloaded for free. The main page is availbalbe under ***www.mitsubishi-automation.com***. The web site is available in more than 10 different languages and the number of languages is still growing. Follow the drop down menu in the upper right corner of the web site to see if your language is already available.

The European Automation portal

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Are you interested in news about products and technologies from Mitsubishi Electric for factory and process automation applications? Do you need an address in your area for a local Mitsubishi distributor? Or are you already a customer and need quick access to the latest technical information? You can already find all this and more on our website, but with MyMitsubishi you can find the information you need even faster and more easily and you also get some valuable additional services. Take advantage of MyMitsubishi – it's your direct channel to Mitsubishi automation technology.

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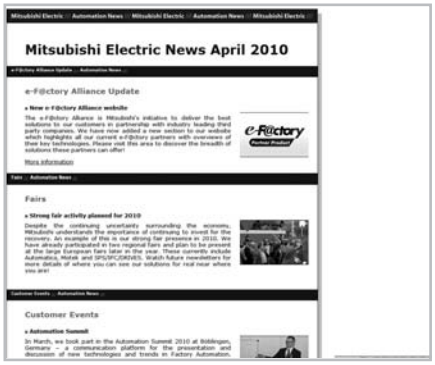

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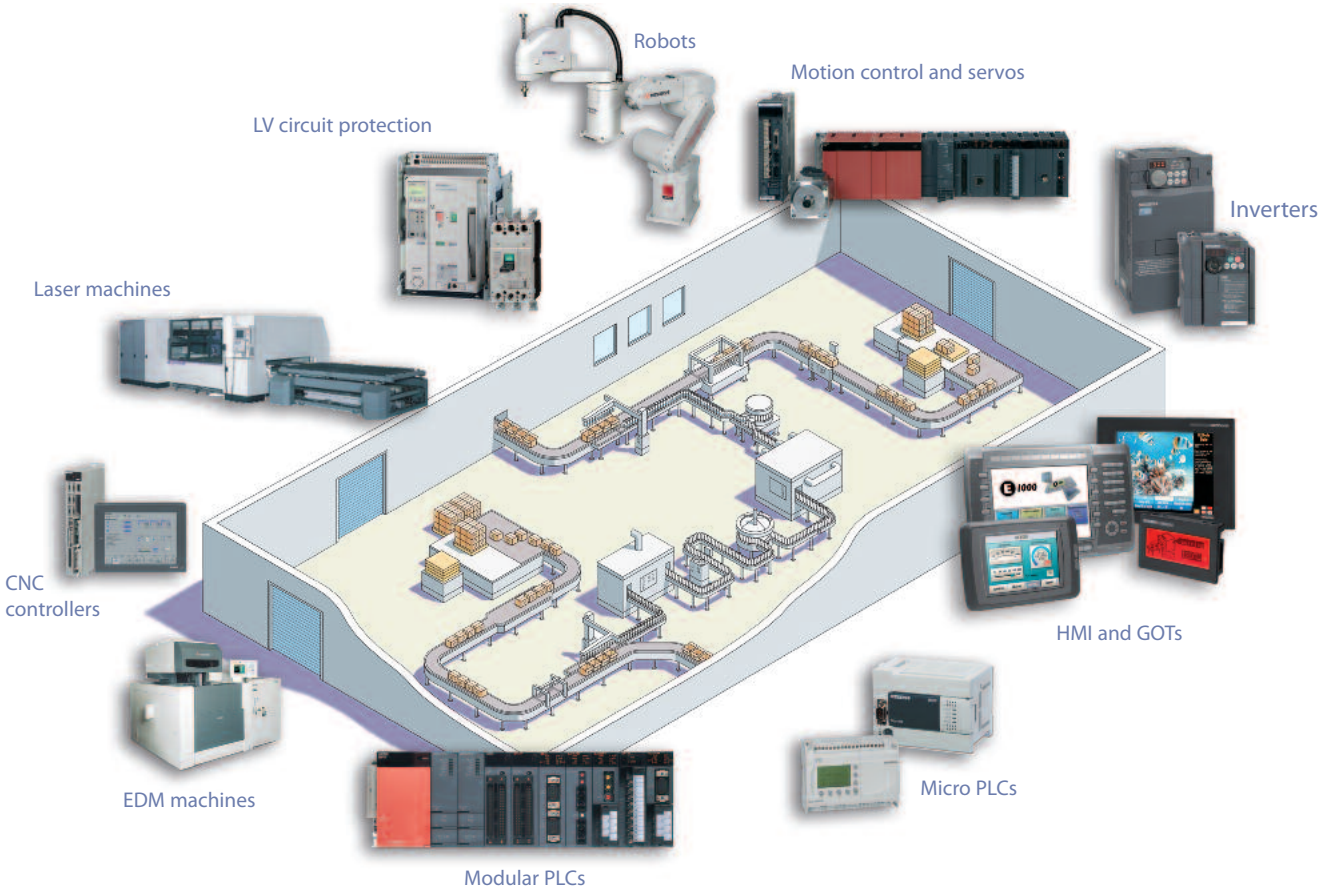
A world of automation solutions



Mitsubishi offers a wide range of automation equipment from PLCs and HMIs to CNC and EDM machines.

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Since its beginnings in 1870, some 45 companies use the Mitsubishi name, covering a spectrum of finance, commerce and industry.

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