MITSUBISHI ELECTRIC
*Changes for the Better*

# The Automation Book

## A world of solutions

**Global service & support /** Innovative solutions /

Standards driven / **Improving financial performance**

# Global impact of Mitsubishi Electric

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

*Changes for the Better*

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.

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.

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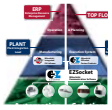

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# Present right through Europe

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 80 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.

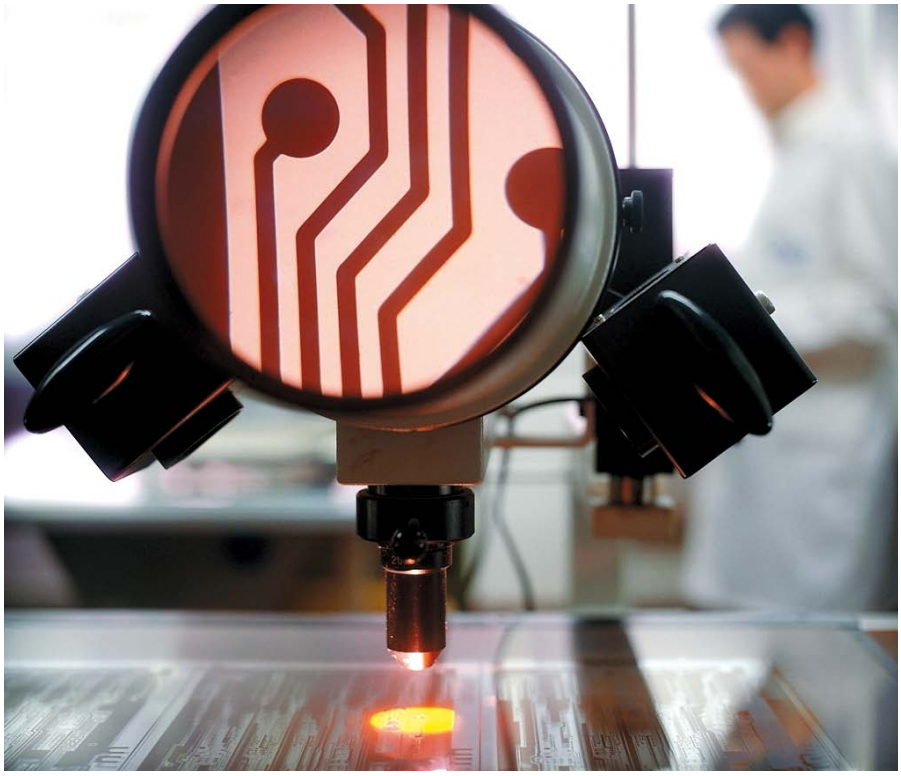
We coordinate and organise our local support throughout Europe to ensure the highest possible standards. Additional support services are available from our European Development Centre (EDC) and EMC Competence Centre.

# Trust and loyalty is as important as products

Collaboration with capable partners in the automation industry is one of the key elements in Mitsubishi Electric'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.



Attention to detail leaves little to chance.

## Setting the standards

Mitsubishi Electric 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 Electric name.

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 Electric'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 Electric's automation products as leading the market.

# Water

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.

### Application in action

**Company**: Klinting Vandvaerk
**Location**: Denmark
**Automation specialist**: PRO/AUTOMATIC
**Application**: Water pumping station
**Products**: Mitsubishi Electric 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

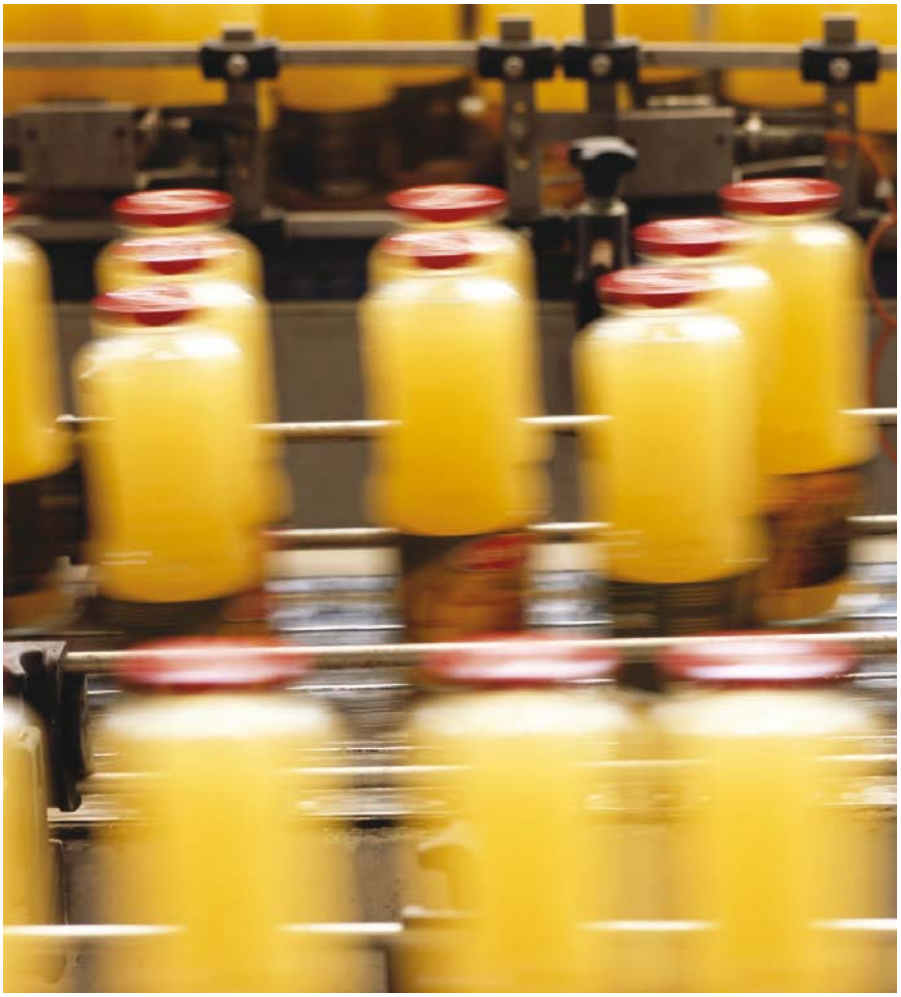
# Food

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 Electric 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 Electric 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 Electric … because of their reputation for reliability and worldwide support particularly in the food and beverage industry."
Rod Golightly, Charles Wait

# Manufacturing

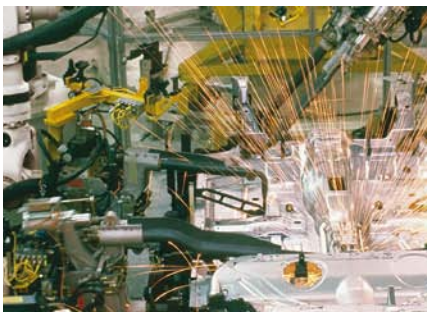


## Application in action

**Company**: Kaba Group
**Location**: Austria
**Application**: Manufacture of keys
**Products**: Mitsubishi Electric 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 finish 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 twelve million Mitsubishi Electric FX family PLCs since their introduction over 30 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 Electric 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 Electric 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.

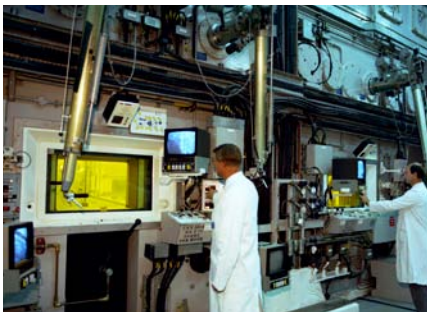
# Chemical

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.

## Application in action

**Company**: Follmann & Co.
**Location**: Germany
**Application**: Adhesive manufacture
**Products**: Mitsubishi Electric compact PLCs, HMI control units, frequency inverter drives
**Networks**: Ethernet + Fieldbus
**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

# Process

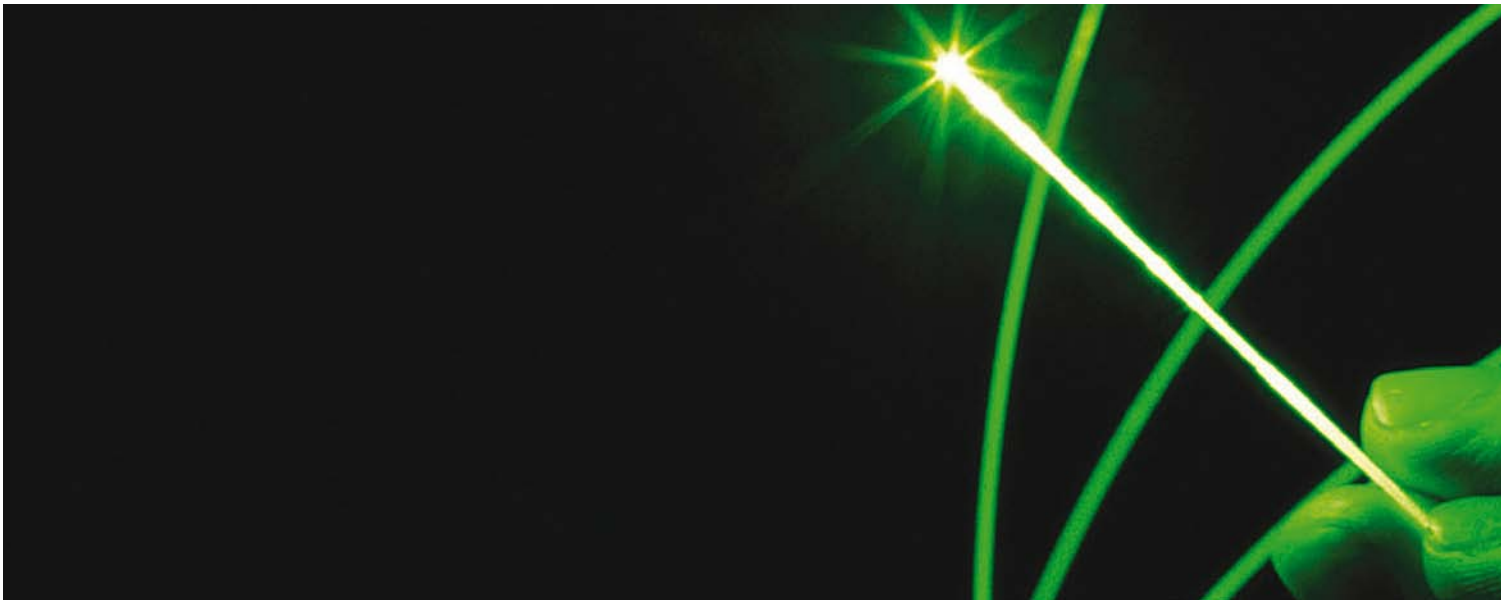


Many automated applications are a continuous process. They vary widely, ranging from power stations to waste incineration. However, all share a need for highly reliable systems. Moreover, control and management of operational waste is an issue undergoing greater regulation through directives such as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



Tomorrow's technology requires investment today

## for a greener tomorrow

## Eco Changes – for a greener future

Eco Changes is an expression of Mitsubishi Electric's commitment to environmental management. The programme is directed towards a greener future, achieved with innovative environmental technologies and manufacturing expertise. Mitsubishi Electric's goal is to help create an ecological society by means of a broad spectrum of technologies and solutions for private households, offices, businesses, infrastructure and even space exploration. As a global company, we intend to make a key contribution to achieving the goal of a world with low carbon dioxide emissions and high recycling rates.

# ... today's goals

No matter what the application, the industry or a company's size, Mitsubishi Electric 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.

## 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.

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.

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

Working for a sustainable future.

# 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.

## Service in Europe

Networks, technology centres and partners spanning Europe ensure outstanding local support services.

# The human element

Reliable technical support is only a call away

Our customer hotline supports both current and older product lines. Local engineers then provide telephone support in native languages.

This local service can also provide in-depth technical support when necessary. 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.

All repairs are carried out by qualified and experienced engineers.

## 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.

Our comprehensive services will help you to get your plant up and running again fast, keeping expensive downtime to a minimum.

Comprehensive training programs

## Training for performance

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

# Automation solutions ...

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

**Modular PLCs**
The MELSEC L Series and MELSEC System Q are high-performance modular controllers. With a wealth of integrated functions, they enable configuration of optimum solutions for all automation tasks.

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

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

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

# Automation solutions ...

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.

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

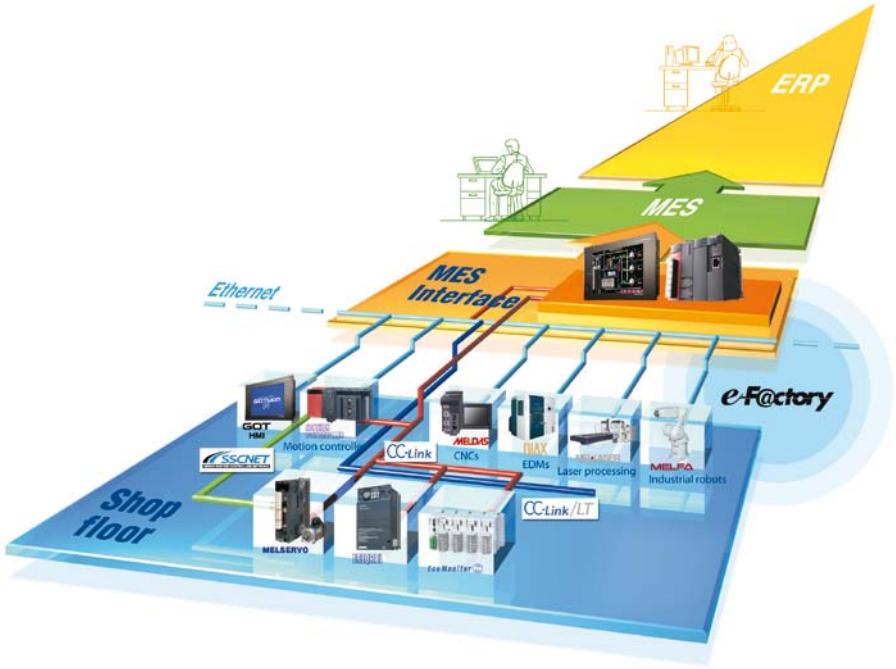
**Robots**
MELFA robots offer class leading technology for both SCARA and articulated arm systems.

**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 Electric EDM - voted as the "Global Market Leader 2005" by Frost and Sullivan.

# 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

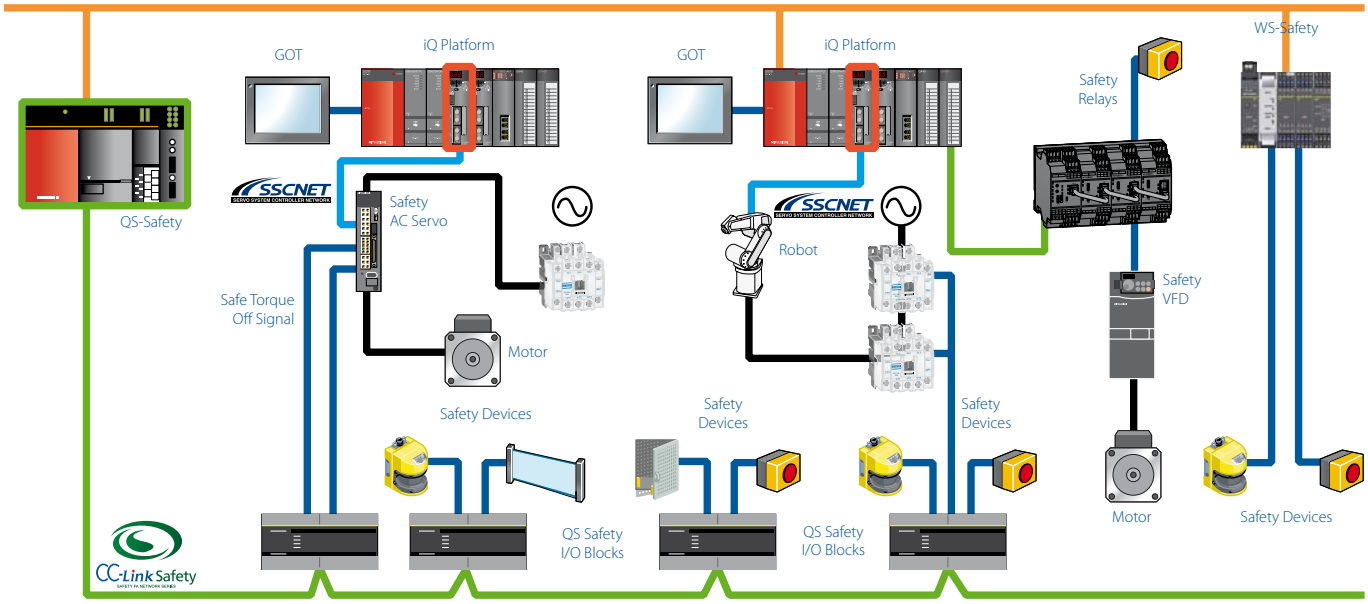
The MES Interface IT products provide the vital link between the shop floor controllers such as the iQ Platform, and the enterprise IT systems. The connection is direct, with no intermediate PC hardware introducing maintenance or security issues.

For more information about Mitsubishi Electric 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. The e-F@ctory Alliance currently has over 28 partners and their number is growing. Current partners include Adroit, Atos Origin, Control Microsystems, CODESYS, Cognex, Copa Data, DP Technology, Emulate3D, eWON, FAG, Felten, HMS, IBHsoftec, ILS Technology, INEA, KH Automation Projects, LEM, mpdv, DATALOGIC, ProLeiT, Raima, RITTAL, RT Leaders, SCHAD, Schaffner, ubigrate, Visual Components, AUVESY, RealTimeLogic.

# Safety solutions




Safety control is fully integrated into the Mitsubishi Electric automation solution

## 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 information and ask for our separatly available safety brochure.

# Simple, easy, reliable

Proven reliability from standalone to complete installations

One system, one tool

## Simple

Mitsubishi Electric 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 and GX Works2 programming packages, specially designed for users who wish to use a structured programming standard such as IEC61131-3.

All three packages 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.

## 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 Electric quality is the widespread use of our components in the global auto industry, where zero tolerance of product failure is fast becoming the norm.

## A unified tool – iQ Works

The iQ Automation Platform is a leading solution for simplified management of complex and heterogeneous industrial production systems. The concept unites PLC, motion, robot and CNC technologies in a single compact hardware platform, enabling seamless interaction between the different control systems. One of the key benefits is the ability to use a single unified tool for development and maintenance of the component systems. iQ Works is that tool: A unified development environment that encompasses all aspects of development and maintenance and can be controlled entirely from a single central location.

| PLC Programming | | | | | | | |
|---|---|---|---|---|---|---|---|
| Package | GX Works 2 | | GX IEC Developer | | GX Developer | | AL-PCS/ WIN |
| | All MELSEC PLC's | FX PLC's | 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 | ● | ● | ● | ● | | | |

* except L Series

# Control to fit

## A wide range of solutions

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

### Logic controllers

These Mitsubishi Electric 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).

### Micro PLCs

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

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 Electric's MELSEC L Series and MELSEC 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. Their modular architecture makes it easy to configure these controllers for any task. Modular PLCs comprise a power supply, one or more CPU modules and I/O and/or special function modules. There Special function modules include analogue, communications and network modules and a special MES interface. A Web server module is also available for Internet access.

The CPU comes with an integrated Ethernet port for easy access to this standard network.

Mitsubishi Electric's MELSEC 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.

There is a solution to match your needs

### iQ Platform

Mitsubishi Electric'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 Electric 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.

| | Logic controller | Compact PLC | Modular PLC | |
|---|---|---|---|---|
| | ALPHA2 | FX Family | MELSEC L Series | MELSEC System Q |
| I/O | 10–28 | 10–384 | 24–4096 | 32–8192 |
| Memory | 200 function blocks | 2–64 k steps | 20–260 k steps | 10–1000 k steps |
| Cycle period/log. instruction | 20 µs | 0.065–0.55 µs (65–550 ns) | 0.0095–0.040 µs (9.5–40 ns) | 0.0095–0.2 µs (1.5–200 ns) |

# Seeing is believing

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

A wide range of open HMI solutions

Mitsubishi Electric'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.

### 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 Electric 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.

### Industrial PC (IPC) solutions

Mitsubishi Electric'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 Electric 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.

# 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 Electric Industrial Modems.

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

### Ease of use

Programming and using Mitsubishi Electric 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.

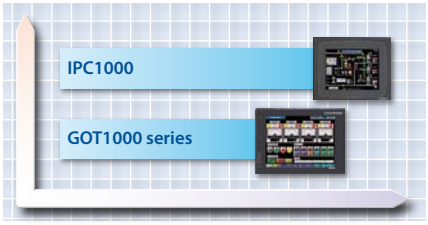
## MELSOFT

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.

## MAPS (Mitsubishi Adroit Process Suite)

MAPS is an engineering tool that encompasses the entire product life cycle of automation solutions. The benefits of MAPS are already available in the development and integration phases. MAPS also makes it easier to integrate your data and enables customers to install extensions and perform maintenance themselves. The program uses predefined, user-configurable PLC function blocks and SCADA graphics based on the international S88 and S95 standards. This standardisation means that in addition to saving time, MAPS also reduces the development, testing and commissioning overheads of your automation projects. A range of import functions facilitate fast and easy configuration of the user interfaces for both SCADA and PLC projects. MAPS uses a central database for exchanging global variables, making accidental duplication of data records impossible.

Solutions for every visualisation and programming application.




There is a solution to match your needs

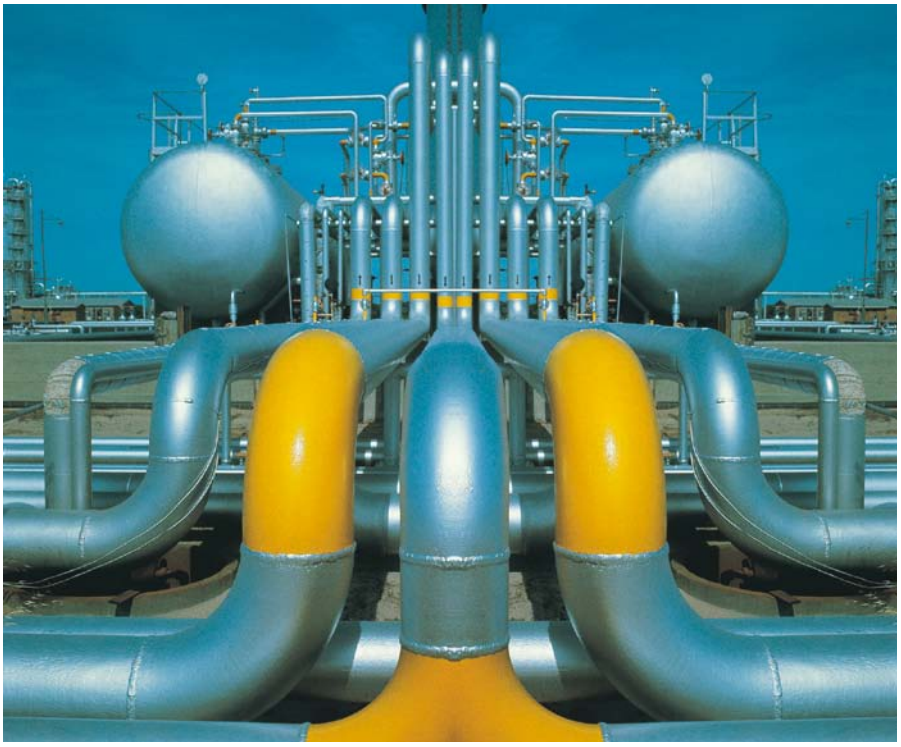
**HMI Programming/Simulation**

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

**PC based visualisation**

| Feature \ Package | Soft HMI | PC Control | | |
|---|---|---|---|---|
| | SoftGOT1000 | 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

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

The FR-D700 SC and FR-E700 SC inverter drive series come with the two-channel STO (Safe Torque Off) safety system integrated as standard equipment. This makes it possible to operate multiple inverter drives inexpensively with a single safety relay.

## 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.

## Intelligent solutions for every task

Mitsubishi Electric 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 Electric inverters can support the following networks: RS485, ModbusRTU, BacNet, Profibus DP, CC-Link IE Fieldbus, DeviceNet, LONWorks, SSCNET and Ethernet based networks. This extensive communication ability makes it easier to integrate inverter control into larger automation systems.

# Powering the future

## FR-D700 SC

### ■ Micro

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, eve n at low speeds. An integrated brake transistor enables direct connection of a brake resistor for better braking performance. The FR-D700 SC is the ideal choice for driving fans, agitators and conveyor belt systems.

## FR-E700 SC

### ■ Compact

Improved functions and capabilities make the FR-E700 SC 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, safe stop inputs for safety stop function, improved power delivery in the low-speed range, options for controlled shut down and a slot in which you can install one of the many available option cards for the 700 series.

## 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.

## 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.

Comprehensive range from ultra compact to ultra powerful

Among the highlights of this series are the FR-A741 models, which have an integrated regenerative braking system. Up to 100 % of the braking energy can be fed back into the power circuits. No external brake resistor or brake chopper is needed.

| Inverter range | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | FR-D700 SC | | FR-E700 SC | | FR-F700 | | FR-A700 | |
| | D720S SC | D740 SC | E720S SC | E740 SC | F740 | F746 | A740 | 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 380–500 V | 3-phase 380–500 V AC | 3-phase 380–500 V | 3-phase 380–500 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 % | | 200 %, 150 % | | 120 %, 150 %, 200 %, 250 % | 150 % |
| Rating | 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 Electric 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-J4 series have an encoder with a resolution of 4,194,304 pulses per second. This permits greater machine speed and accuracy.

## Plug and Play

Mitsubishi Electric 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

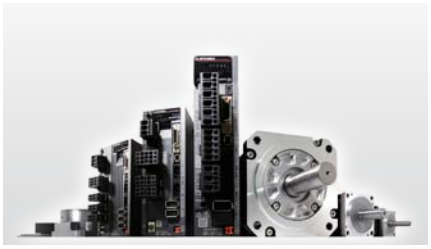
When a Mitsubishi Electric servomotor is connected to an amplifier it is automatically recognized. The correct parameters are then automatically loaded, ready for operation. This reduces the set-up time and the chance of errors.

### Simple networking

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

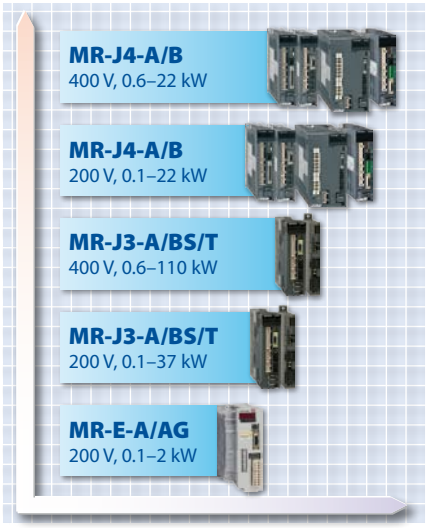
*) The MR-J4 series products use SSCNETIII/H, a fibre based version of the network giving complete noise immunity.

# Power and precision



Plug and play technology

HG motor series – IP65/IP67 standard protection




A wide range of powerful amplifiers

## Powerful Amplifiers

A wide spectrum of Mitsubishi Electric MR-J4 series amplifiers is available, ranging in power from 100 W to 22 kW for 200 V operation, and 600 W to 22 kW for 400 V systems. With such a wide choice of types and series users are sure to find the solution they need.

### Performance

With a speed frequency response of up to 2500 Hz Mitsubishi Electric servo systems offer world class performance.

### Vibration suppression

Machine performance is often limited by mechanical constraints. The built-in vibration suppression of Mitsubishi Electric'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. This function suppresses not only residual vibrations of the machine but also at the end of an arm.

### „One-Touch-Tuning"

The new one-touch tuning function minimises time consuming system adjustments between machine and electronics by touching one button. Control parameters are optimised and resonance frequencies of the machine and the mechanics are detected and filtered. An individual adjustment of single applications is not needed. The result is a vibration free, high precise und high speed positioning process – only by one click.

## Motor solutions for all

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

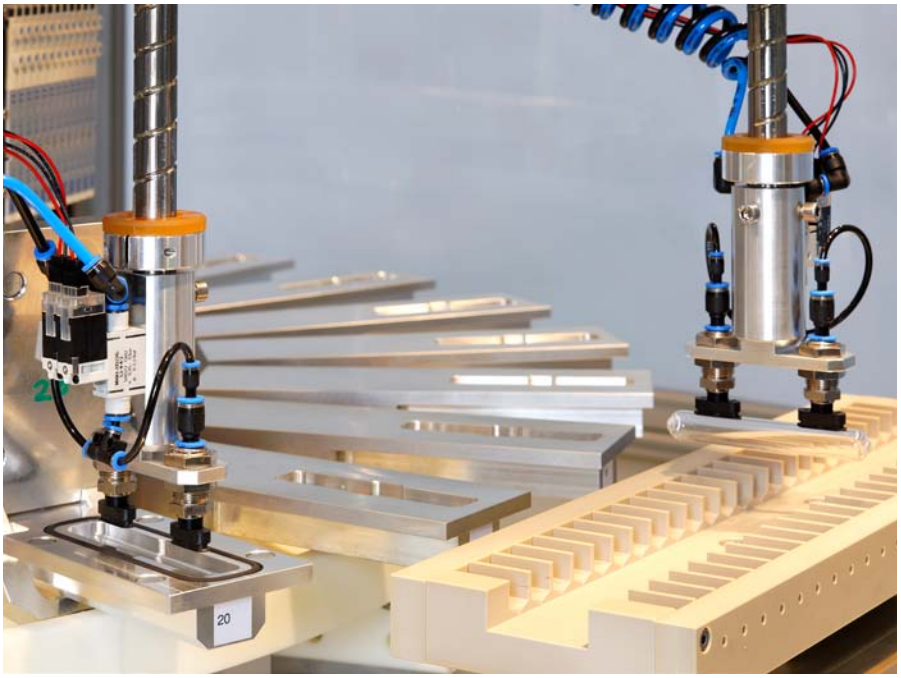
Motors are available in a range of options from 50 W to 110 kW in different designs, including specialised motors such as hollow shaft and pancake designs that suit most application needs.

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

## Motion controllers

Mitsubishi Electric offers a comprehensive range of solutions for positioning tasks and high-end motion control. Options include simple pulse train positioning controllers and dedicated motion cards. And for the most complex applications there are dedicated MELSEC 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.

# Innovation in movement



High speed, high accuracy pick and place applications

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

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 Electric 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 Electric robots are programmed using the same language, reducing the user's learning curve.

## Making life easy

With the software RT ToolBox2 all robot models are programmable in a quick and easy way. Imported 3D CAD data, program variables and robot simulations can easily be displayed on the graphical surface of the programming software RT Toolbox2.

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 Electric 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

Due to the new motors developed by Mitsubishi Electric, the high arm rigidity and the unique controller technology the robots of the F series achieve the highest speed in their class.

### Ease of connection

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

## Articulated arm robots

The range of the articulated-arm robots of the RV series starts with the powerful compact class with a payload from 2 kg up to the power pack with a payload of 12 kg. These robots are also available as a long arm version.

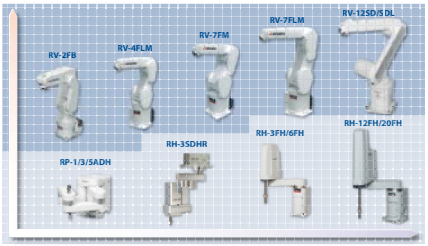
Higher handling weights and a larger movement area can be realised by the compact and slim construction of the robot arm. The standard protection class of IP67 allows the operation of the robots in industries like food, beverage and packaging.

## SCARA robots

Mitsubishi Electric's range of SCARA robots divides into two categories. The small RP-ADH 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.

The robots of the RH-FH series are suitable ex factory for a multitude of industrial applications and can be adopted intersectoral. A cycle time of only 0.29 s for the 12" cycle ensures high precise and powerful operation for increasing productivity on-site. By protection class IP54 and utilisation of lubrication grease suitable for use in food the robots are capable of being fully integrated. The wiring routed inside the robot and led through at the ball screw end offers protection and safety.

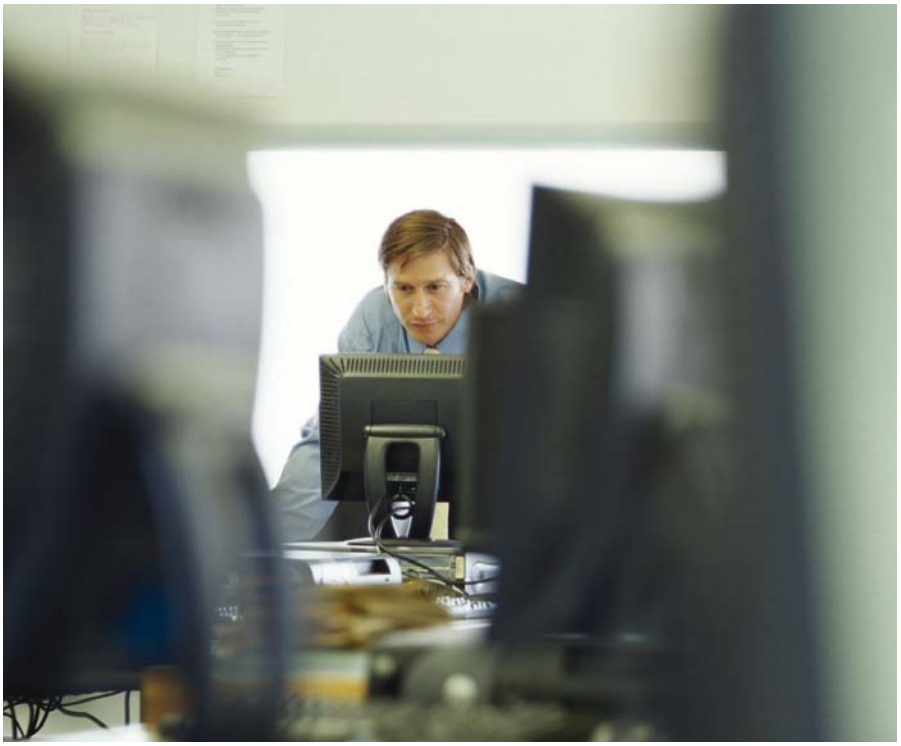
Articulated-arm robots have pneumatic hoses and signal connection lines which are routed inside the robot. SCARA robots are particularly suitable for fast palletising also on the fly.




The ideal robots for all applications with payloads of up to 12 kg/20 kg

| Robot range | | | |
|---|---|---|---|
| Range | RP | RH | RV |
| Type | SCARA | SCARA | Articulated arm |
| Weight class [kg] | 1–5 | 3–20 | 2–12 |
| Reach [mm] | 236–453 | 350–1000 | 504–1385 |

# Breakthrough technology



Groundbreaking research and design

Standards are at the centre of our product development.

Mitsubishi Electric has been active in the low voltage (LV) switchgear market since 1933. Ever since Mitsubishi Electric 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 Electric's LV products leading edge.

## Global products

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

# A complete solution

Mitsubishi Electric 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.

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

### Moulded Case Circuit Breakers (MCCBs)

Mitsubishi Electric'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.

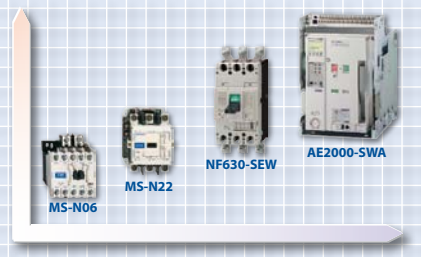
### Magnetic Contactors, Thermal Overload Relays, Contactor Relays

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

Virtually maintenance free low voltage switchgears




Advanced low voltage technology

# Where have Mitsubishi Electric products been used?

Automotive control solutions

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

Customer applications with Mitsubishi Electric 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
  - Pollution measurement systems
  - Cryogenic freezing
  - Gas chromatography
  - Packaging
- Plastics
  - Plastic welding systems
  - Energy management systems for injection molding machines
  - Loading/unloading machines
  - Blow molding test machines
  - Injection molding machines
- Automotive
- Printing
- Textiles
- Transportation
  - Sanitation on passenger ships
  - Sanitation on rail rolling stock
  - Fire tender pump management
  - Waste disposal truck management
- Utilities
  - Waste water disposal
  - Fresh water pumping
  - Clarification plants

# 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 Electric partners and distributors are only too happy to help answer your technical questions or help with configuration building. For a list of Mitsubishi Electric 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.

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**The products of Mitsubishi Electric Europe B.V., that are listed and described in this document, are neither subject to approval for export nor subject to the Dual-Use List.**

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# 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.
- **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 Electric hardware, combined with the familiarity of software packages/tools such as Microsoft Excel, ActiveX and OPC.

## Unified Engineering Environment: 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

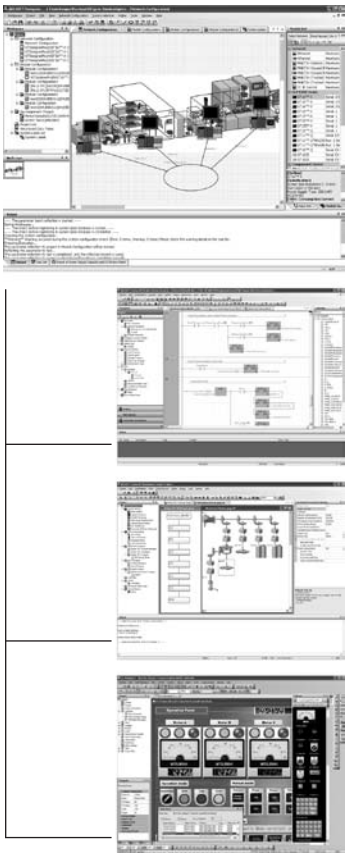
Use system labels to seamlessly share device data between GOTs, PLCs and motion controllers. Save the time and hassle of changing device values in each program by using the update system labels feature.

### 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 Works2**

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

**MELSOFT MT Works2**

is a comprehensive motion CPU maintenance and program design tool. Its many useful functions, such as intuitive settings, graphical programming and digital oscilloscope, simulator, different Motion OS support, assistance help, to reduce the MT Works2 associated with motion systems.

**MELSOFT GT Works3**

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).

# Visualisation Software

## Soft HMI

### GT Works3 (GT SoftGOT1000)

GT Works is a wide-ranging visualisation control tool from Mitsubishi Electric. 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 SoftGOT1000 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.

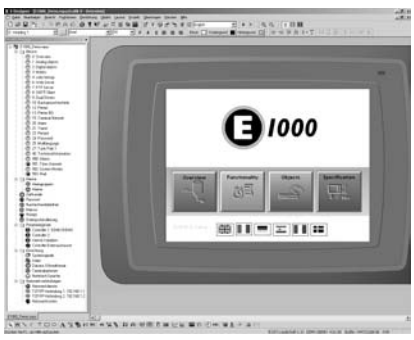
## HMI Programming

### GT Works3

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.

# PLC Programming

### GX Works2/GX Works2 FX

GX Works2 is the PLC programming environment of the next generation. It supports all PLC of the MELSEC System Q, L and FX series and offers numerous functions to faciliate programming work and support the user. GX Works2 FX has the same functionality as GX Works2 but just for FX PLC´s.

The following programming languages are available:

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

The main features of GX Works2 are:

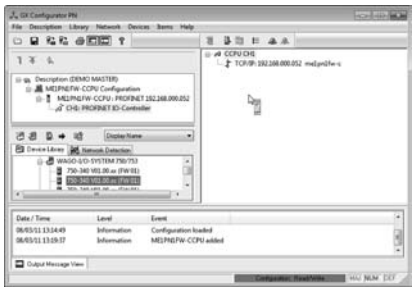
- Integrated parameterization of special function modules (analog, temperature, positioning, counter, network)
- Use of program and function block libraries save time for programming and minimizes errors.
- Integrated simulation allows offline testing of the software and the configuration.
- Comprehensive diagnostics and debugging functions support the user in troubleshooting and fault clearance.
- Revision verification and restoration makes it possible to restore old program versions or to compare with programs from the PLC.
- GX Works2 is compatible with GX Developer and GX IEC Developer projects (as far as the editors are supported)

### GX Configurator DP

GX Configurator DP is a setup and configuration software for Profibus DP networks. It can be used to configure Mitsubishi Electric 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

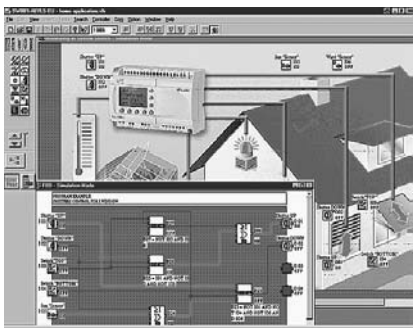
### GX Configurator PN



GX Configurator PN is the configuration tool for Profinet I/O modules. This software offers functions for the configuration of the Profinet I/O network, testing the configuration and transfer of the settings to the Profinet module.

- Various capabilities for the transfer of parameter data: Direct connection to the local Profinet module or via a network.
- Easy configuration of Profinet I/O slaves using GSD files provided by the device manufacturer.
- Available as 32 bit version for MS Windows® XP, Vista and MS Windows® 7.

### 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

## Robots programming

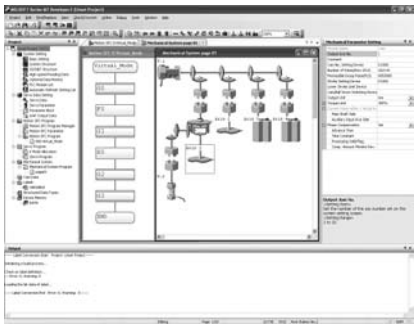
### RT ToolBox2

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

## Servo/Motion programming

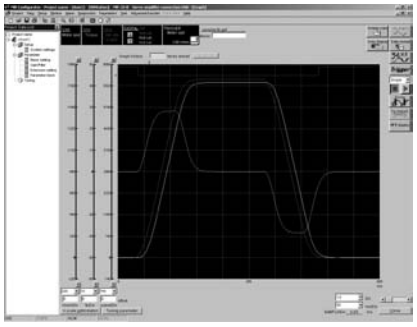
### MT Works2



MT Works2 is an integral start-up software used to structure and configure a system for MELSEC System Q 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 the 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.

### MR Configurator2



MR Configurator2 is a user-friendly software for easy setup, tuning and operation. Tuning, monitor display, diagnosis, reading/writing parameters, and test operations are easily performed on a personal computer. This start-up support tool achieves a stable machine system, optimum control, and short setup time.

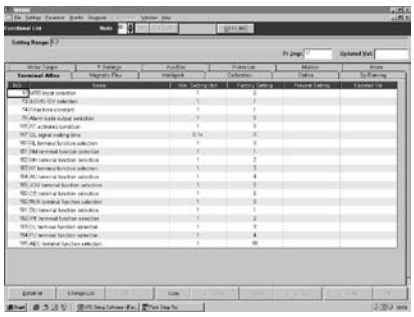
- Graph display function allows the servo motor state to be easily monitored.
- Machine analyser function, gain search function and machine simulation function for high performance adjustments.
- Optimum Control, allows the response setting value to be set making use of the servo's "high level real-time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

### FX Configurator FP

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

## Special applications

### FR Configurator



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

## PC Data Management

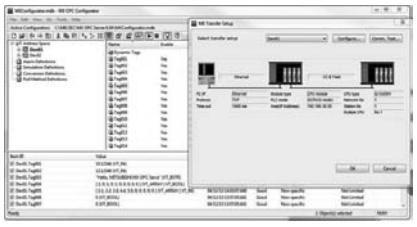
### MX Sheet

The device data in the PLC can be monitored in real-time with Excel, and recipe data in Excel can be transferred 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.

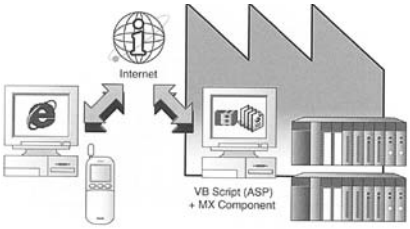
### MX OPC Server



The MX OPC Server is a Mitsubishi Electric 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 Electric hardware and your process control software. Mitsubishi Electric drivers incorporate OLE Automation technology and OPC compliance to provide flexibility and ease-of-use.

Mitsubishi Electric'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.

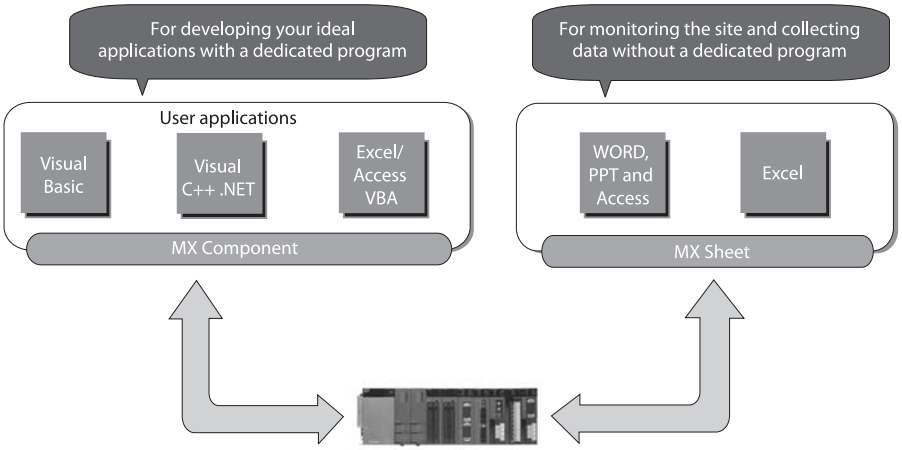
### MX Component




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.




## Life Cycle Engineering Software

### MAPS – Mitsubishi Electric Adroit Process Suite

The Mitsubishi Electric Adroit Process Suite (MAPS) is a life-cycle software tool that offers value along the entire value chain. It addresses the shortcomings of most PLC SCADA integration tools in that it offers value to the engineering and integration phases. MAPS offers customers the ability to handle the normal extensions and maintenance of any automation solution.

This single integrated package takes users through all the phases of process design, engineering design, control system design, installation, commissioning, acceptance testing and ongoing maintenance; helping to maintain consistency and integrity within an automation system, improving quality and reducing costs.

- Pre-defined and user configurable PLC Function blocks and associated SCADA graphics based on S88/S95 standards to reduce engineering time and effort significantly
- The MAPS solution is a structured single point of configuration. Using the MAPS Enterprise Manager, allows for bulk engineering and reduced effort which enables rapid configuration of your engineering design, SCADA and PLC project and on-going life-cycle management of the automation solution.
- Cost reductions of between 30 % and 50 % can be achieved when using the wizard approach to projects inside MAPS, allowing the user to benefit from the reduced time spent on design and configuration.
- In MAPS reports can be created, covering I/O schedules, PLC and SCADA tag configuration. As these reports are generated from a database that is constantly updated, reports always show the current status of the configuration. That ensures that the project on handover reflects the as-built up to date configuration of the automation project.
- The MAPS solution offers customers the capability of on-going management of their PLC/SCADA projects and the plant´s as-built electrical documentation. Whether tags are changed in the design, PLC, SCADA or the MAPS management environment, the project ensures that databases and documentation are synchronised.

# 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 Electric has the answers. Here is an overview of some of the networks Mitsubishi Electric 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.

### CC-Link (Process Solution/Fieldbus)

CC-Link covers all Mitsubishi Electric 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 Association (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.

### 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.

### Profibus DP (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.

### Profinet

Profinet is an open Industrial Ethernet standard for automation. It uses TCP/IP and IT standards, is capable of real time Ethernet and allows the integration of fieldbus systems.

### 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

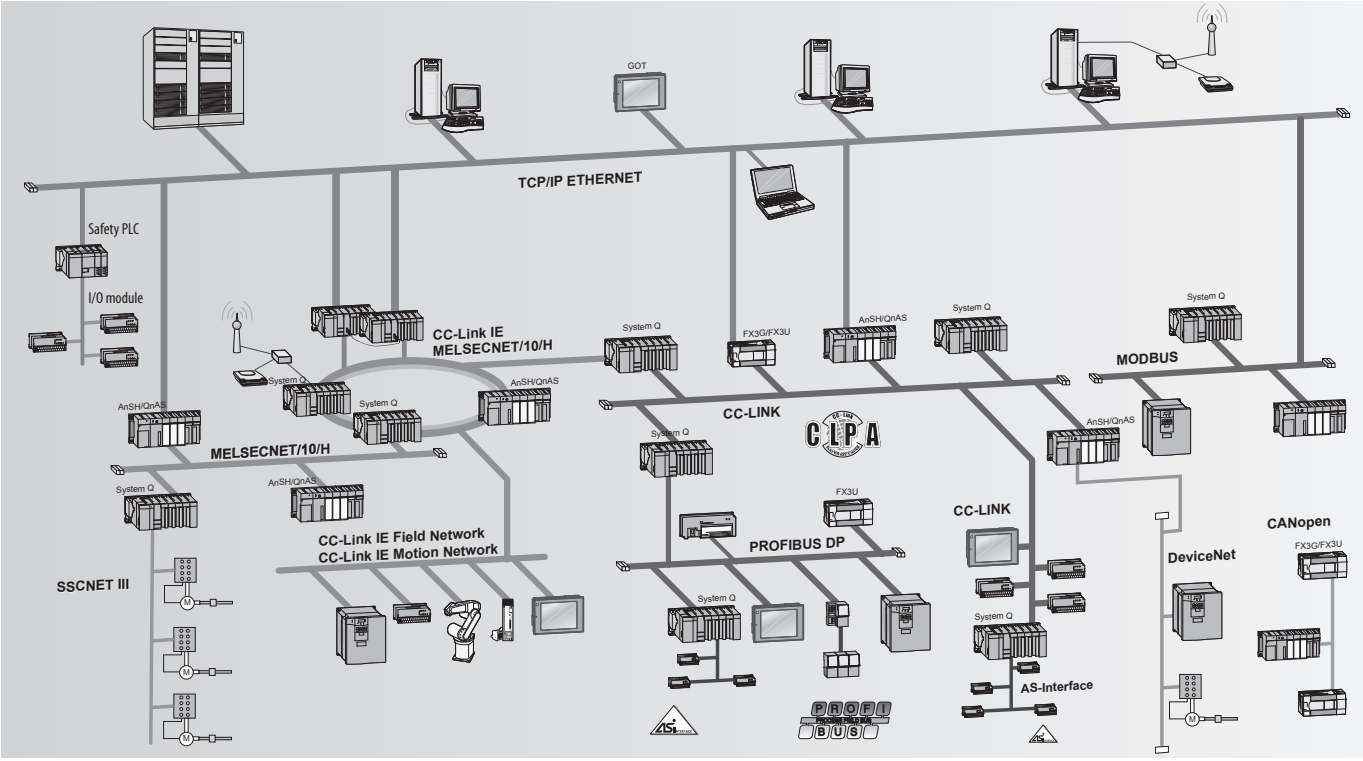
This is Mitsubishi Electric's own high-performance network. MELSECNET/H can be configured as a coaxial bus or twisted pair bus system or with double ring topology. This offers high network availability, as cable breaks are automatically detected and the active communication channel is automatically re-routed 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 Electric's optical fibre based Servo System Controller Network (SSCNETIII) offers noise resistance communication for high-speed servo and motion applications.

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

## Typical Distributed Control Structure

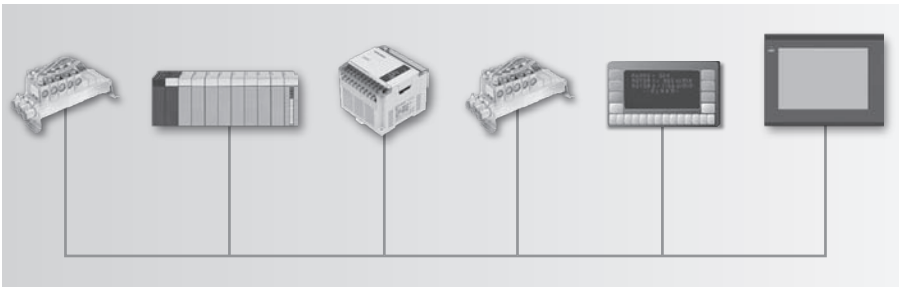



## Ethernet

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 to be 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 *
- MELSEC System Q 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 | MELSEC System Q | QJ71E71-100 | Ethernet interface module,100 Mbps,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 |
| | | NZ2EHG-T8 | Compact-sized industrial switching HUB equipped with 8 ports capable of 1000BASE-T | 259221 |
| | | NZ2EHF-T8 | Compact-sized industrial switching HUB equipped with 8 ports capable of 100BASE-T | 259222 |
| | AnS | A1SJ71E71N3-T | Ethernet interface module,10 Base-T | 163755 |
| | FX series | FX3U-ENET-ADP | Ethernet interface module,10 Base-T | 157447 |
| | | FX3U-ENET | Ethernet interface module,100BASETX/10BASE-T | 166086 |
| | | FX3U-ENET-P502 | Ethernet modul, 100BASETX/10BASE-T, Modbus/TCP ready | 225142 |
| | E series | IFC-ETTP | 10-Base-T Twisted Pair Ethernet interface for E300/600/610/615/700/710/900/910 HMI's | 104727 |
| | | IFC-ETCX | Coaxial 10-Base-T Ethernet interface for E300/600/610/615/700/710/900/910 HMI's | 104726 |
| | GOT series | A9GT-J71E71-T | 10-Base-T Ethernet interface module for GOT HMIs | 139395 |

## CC-Link, CC-Link IE, CC-Link IE Field and CC-Link Safety

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

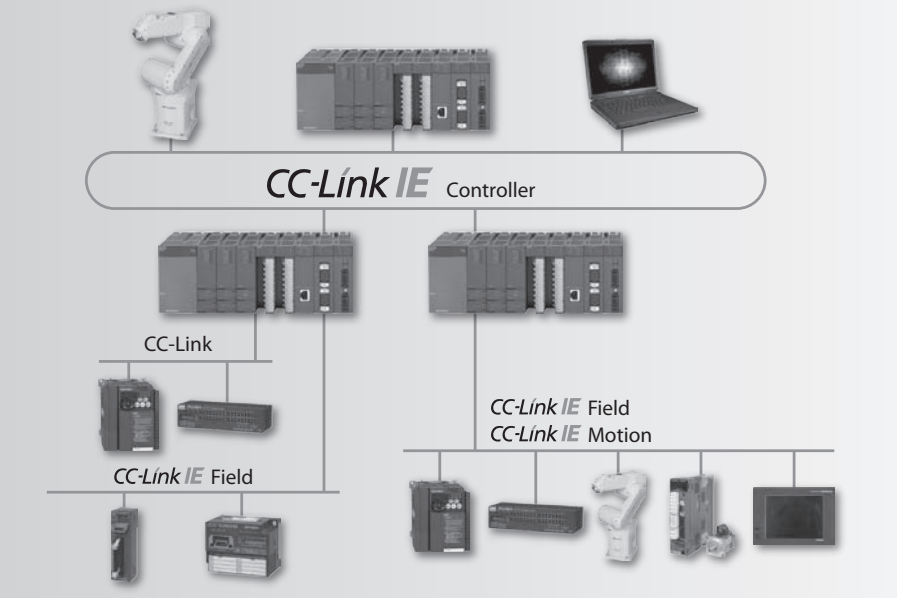
This open fieldbus and control network provides fast data communications with different devices. As with all manufacturer specific networks, CC-Link is quickly implemented and is guaranteed to work. CC-Link is also an open network and therefore allows many third-party products now appearing on the market 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.

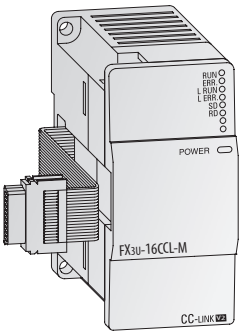
The new CC-Link IE open standard offers maximum performance at maximum availability. CC-Link IE Control serves firstly as a network for the control level and furthermore implements the manufacturing level, the motion level and the safety level. In future, the network structure will be uniform at all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

CC-Link IE Field is a high-speed and high-capacity network able to cope with a mixture of device control data and management data. In addition, distributed control, I/O control, motion control and safety functions can all be seamlessly set.

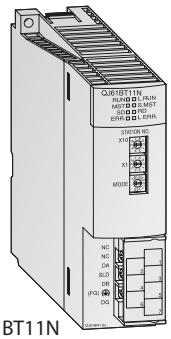
Other interesting information on the CC-Link IE is provided in a separate brochure which is also available for download.




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




Master module FX3U-16CCL-M



Master/local module QJ61BT11N

**Standard CC-Link modules**

| PLC | Master Modules | Description | Art. no. |
|---|---|---|---|
| MELSEC System Q | QJ61BT11N | CC-Link master/local module | 154748 |
| | QS0J61BT12 | Master modules for CC-Link Safety | 203209 |
| FX series | FX3U-16CCL-M | CC-Link master | 248224 |
| L series | L26CPU-BT | CPU with integrated CC-Link master/local module | 238056 |
| | LJ61BT11 | CC-Link master/local module | 238099 |
| 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-64CCL | Local module for CC-Link on FX3 | 217915 |
| Frequency inverters | FR-A7NC | CC-Link interface for frequency inverters of the FR-A700/FR-F700 series | 156778 |
| | FR-A7NC-Ekit-SC-E | CC-Link interface for frequency inverters of the FR-E700 SC series | 239644 |
| 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 121 |
| Robots | 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. |
|---|---|---|---|
| MELSEC System Q | QJ71GF11-T2 | CC-Link IE field master/slave modul, 1Gbps, Cat5e | 236484 |
| | QS0J71GF11-T2 | CC-Link IE field master/local module | 245177 |
| | 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 |
| | Q81BD-J71GF11-T2 | PCI PC card, master/local module | 253008 |
| | NZ2GF-ETB | CC-Link IE field network Ethernet adapter | 253007 |
| | LJ71GF11-T2 | CC-Link IE field master/local module | 246346 |
| | LJ72GF15-T2 | CC-Link IE field head module | 238100 |



### CC-Link Cable

This cable is designed for connecting together CC-Link network devices to create peer-to-peer systems (e.g.Mitsubishi Electric MELSEC System Q), master/slave systems (e.g. Mitsubishi Electric MELSEC System Q and Mitsubishi Electric 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**

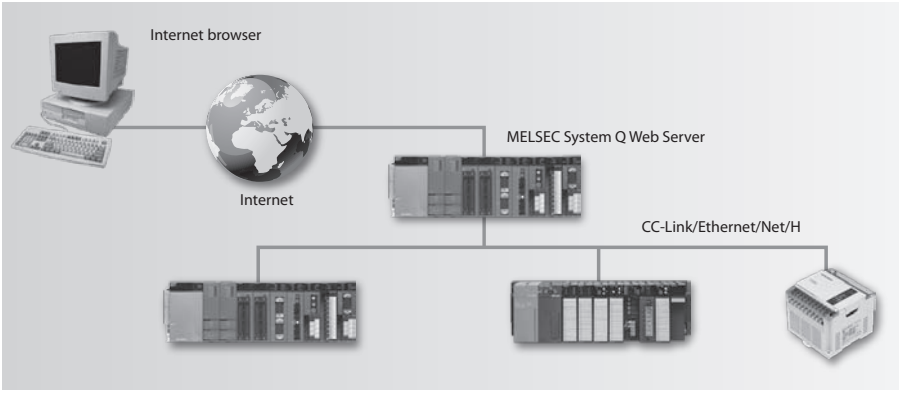
| | |
|---|---|
| Max. operating voltage | 300 V RMS |
| Nom. capacitance between conductors @1 kHz | 60 pF/m |
| Nom. impedance @ 1 MHz | 110 Ω |
| Nom. conductor DC resistance @ 20°C | 36 Ω/1000 m |
| Nom. attenuation @ 1 MHz | 1.6 dB/100 m |
| Nom. attenuation @ 5 MHz | 3.51 dB/100 m |
| Insulation resistance | ≥10,000 MΩ/km |

## Web Server

This unit allows direct access from Internet/ Intranet to MELSEC System Q. With ample built-in memory, flexible communications and compact design, it is the perfect tool to give you visualisation of MELSEC System Q PLC control processes. MELSEC System 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 MELSEC System 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 Electric, this unit is designed for harsh environments and has the same robust design as the rest of the MELSEC System Q.




- 5 Mbyte of built in memory, option to expand up to 512 Mbyte (CompactFlash)
- 100 BaseTX Ethernet port
- Serial RS232 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.

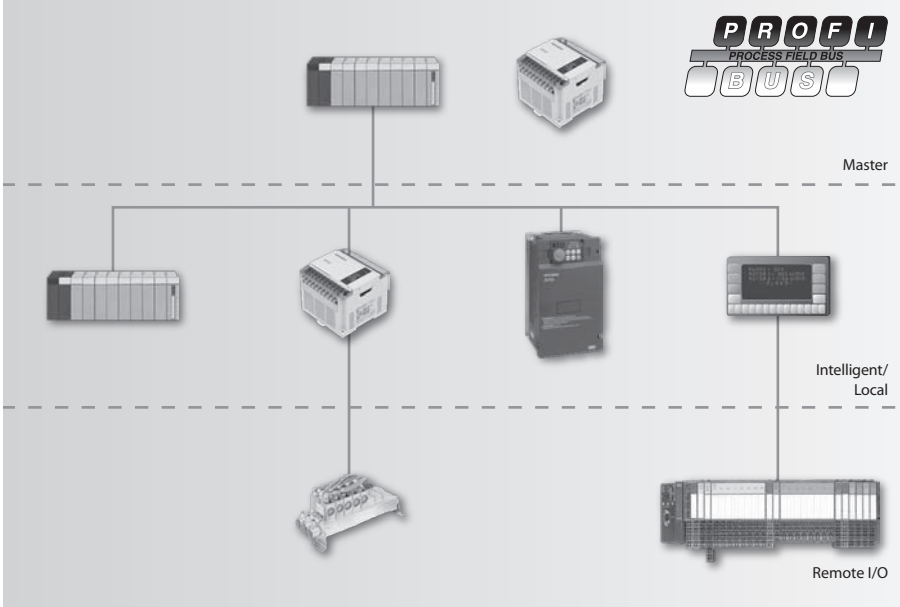
| Model type | Series | Module | Description | Art. no. |
|---|---|---|---|---|
| Web Server | MELSEC System Q | QJ71WS96 | Q Web Server module | 147115 |

## 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 Electric 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 Electric Profibus products
- Master and slave available with MELSEC System Q and FX Series




**MASTER**

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

**INTELLIGENT SLAVE**

| Series | Module | Description | Art. no. |
|---|---|---|---|
| MELSEC System Q | QJ71PB93D | Profibus slave | 143545 |
| FX series | FX0N-32NT-DP | Profibus DP slave module for FX1N/FX2N and FX3U PLC's | 62125 |
| | FX3U-32DP | Profibus DP slave module for FX3U PLCs | 194214 |
| Inverter | FR-A7NP | Profibus interface for frequency inverters of the FR-A700 and FR-F700 series | 158524 |
| | FR-A7NP-Ekit-SC-E | Profibus interface for frequency inverters of the FR-E700 SC series | 239646 |
| | FR-A7NP-Ekit-SC-E-01 | | 239647 |
| 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/STlite series | Modular input/output system for connection to Profibus DP | refer to page 20 and following |

**I/O BRIDGE MODULE**

| Series | Module | Description | Art. no. |
|---|---|---|---|
| FX series | FX2N-32DP-IF | Profibus remote I/O using FX2N I/O and special function modules; 240 V AC power supply | 145401 |
| | FX2N-32DP-IF-D | Profibus remote I/O using FX2N I/O and special function modules; 24 V DC power supply | 142763 |

### Profinet

Open industrial Ethernet standard for automation. Profinet uses TCP/IP and IT standards, is capable of real-time Ethernet and allows the integration of field bus systems.

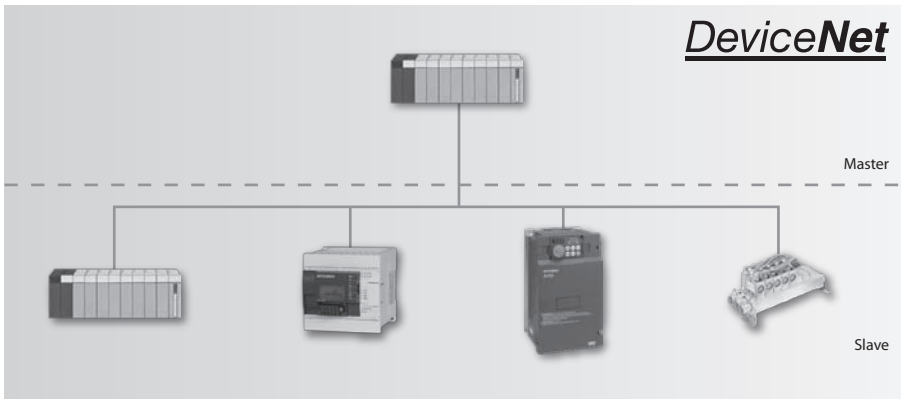
| Series | Module | Description | Art. no. |
|---|---|---|---|
| MELSEC System Q | ME1PN1FW-CCPU | Profinet master module | 252935 |

## 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 configurations 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 MELSEC System Q
- Wide range of Mitsubishi Electric DeviceNet products
- Master and slave available with MELSEC System Q and AnS Series

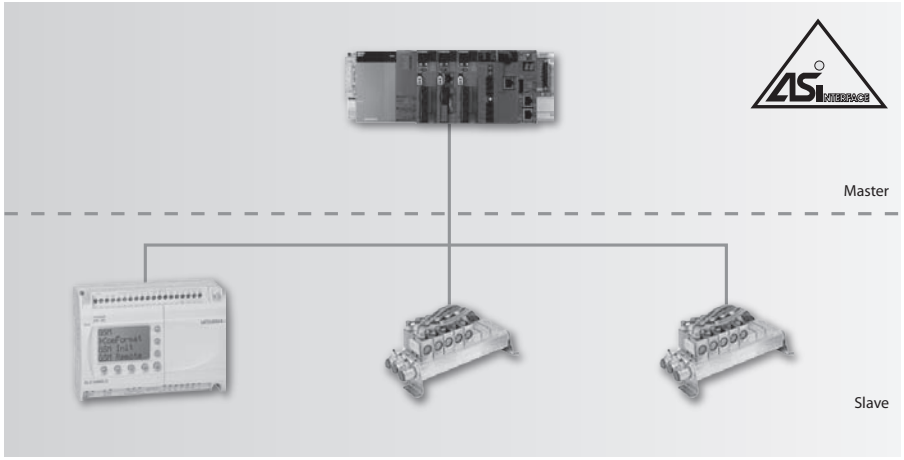



| Model type | Series | Module | Description | Art. no. |
|---|---|---|---|---|
| Master | MELSEC System Q | QJ71DN91 | DeviceNet interface master/slave module | 136390 |
| | AnS/QnAS series | A1SJ71DN91 | DeviceNet master/slave module, for Ans and QnAS PLC's | 124373 |
| Intelligent Slave | FX series | FX2N-64DNET | DeviceNet interface (slave) | 131708 |
| | Inverter | FR-A7ND | DeviceNet interface for frequency inverters of the FR-A700 and FR-F700 series | 158525 |
| | | FR-A7ND-Ekit-SC-E | DeviceNet interface for frequency inverters of the FR-E700 SC series | 239648 |

## 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.

- MELSEC System 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



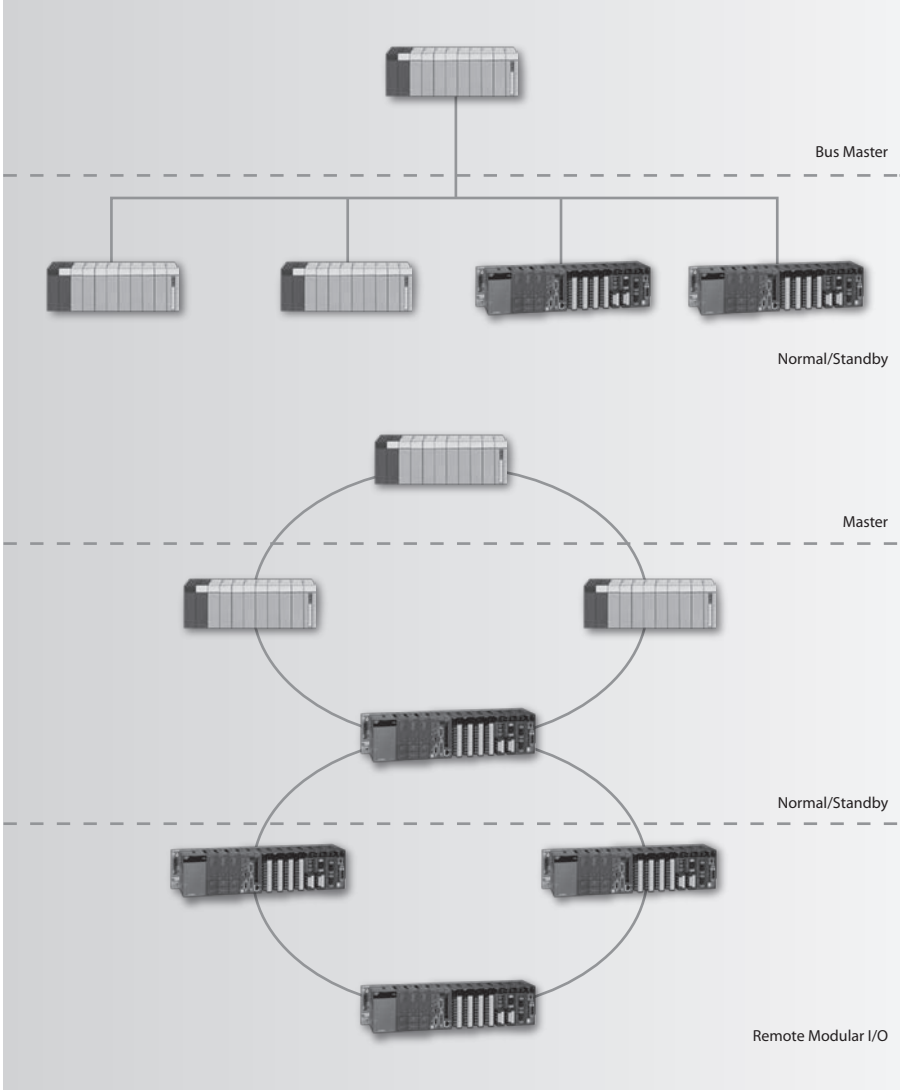

| Model type | Series | Module | Description | Art. no. |
|---|---|---|---|---|
| Master | MELSEC System Q | QJ71AS92 | AS-Interface module, version 2.11, dual network master | 143531 |
| | AnS series | A1SJ71AS92 | AS-Interface master module for AnS (Double network master) | 129936 |
| Intelligent Slave | Alpha | AL2-ASI-BD | AS-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 Electric'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 q 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 | MELSEC System Q | 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 | MELSEC System Q | 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 |

### SSCNETIII

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.

SSCNETIII achieves speeds of up to 50 Mbps ensuring both high speed and high accuracy.

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.

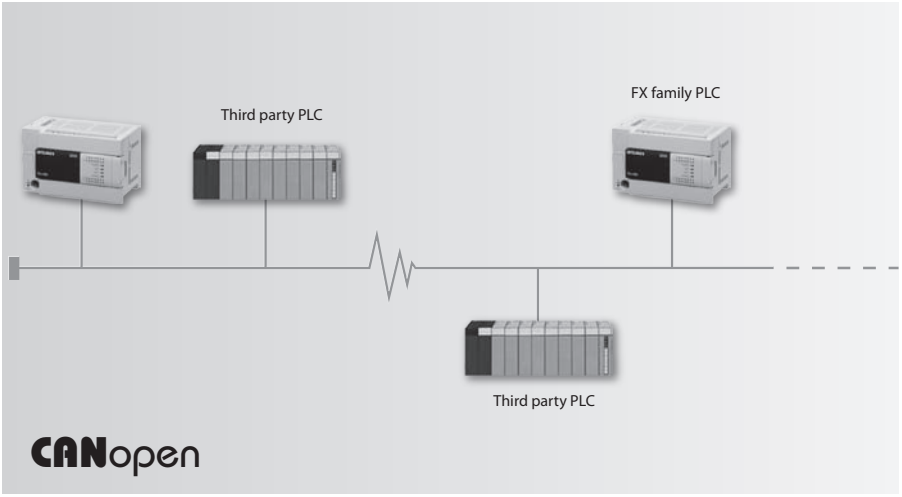
- "Plug and Play" for ease of connectivity, instant communication and reduced wiring faults.
- Greater flexibility for system integration.
- High speed networking with fast cycle time.
- Direct bus operation with fast access
- Fibre-optic connection cables for noise immunity.

## 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 Mbps. Lowering the data rate makes it possible to increase the length of the bus. For example, a transfer rate of 125 kbps 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 kbps).



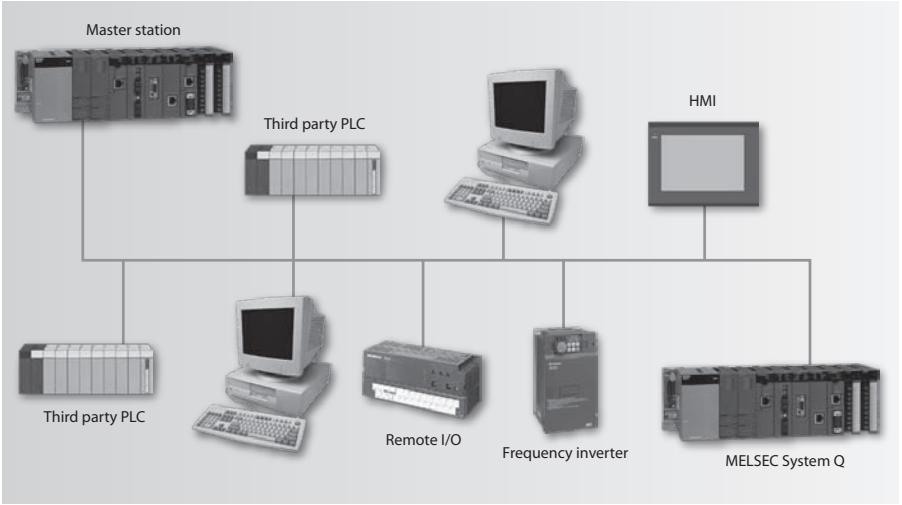

| Model type | Series | Module | Description | Art. no. |
|---|---|---|---|---|
| Local | FX series | FX3U-CAN | Communications module for CANopen | 252845 |

## 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.

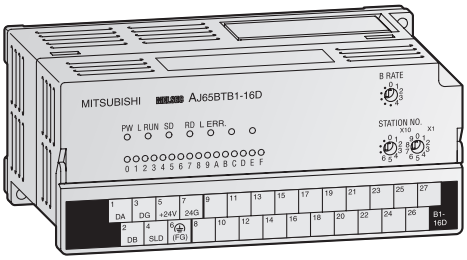
Modbus allows communication between many devices connected to the same network, for example a system that measures temperature and humidity and communicates the results to a PC. Modbus is often used to connect a supervisory computer with a remote terminal unit (RTU) in supervisory control and data acquisition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

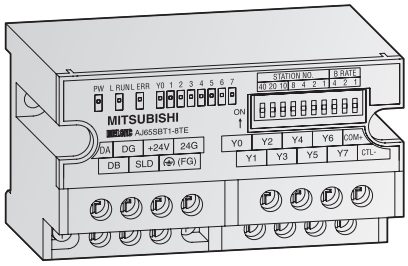
Modbus RTU is a compact, binary representation of the data.




| Model type | Series | Module | Description | Art. no. |
|---|---|---|---|---|
| Master/Slave | MELSEC System Q | QJ71MB91 | Serial Modbus interface master/slave module | 167757 |
| | | QJ71MT91 | Modbus/TCP interface master/slave module for Ethernet | 155603 |
| | FX series | FX3U-232ADP-MB | Serial Modbus RS232C interface master/slave module | 165276 |
| | | FX3U-485ADP-MB | Serial Modbus RS485 interface master/slave module | 165277 |
| | | FX3U-ENET-P502 | Ethernet modul, 100BASETX/10BASE-T, Modbus/TCP ready | 225142 |
| Slave | AnS series | 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 |

# CC-Link/CC-Link IE Field remote modules



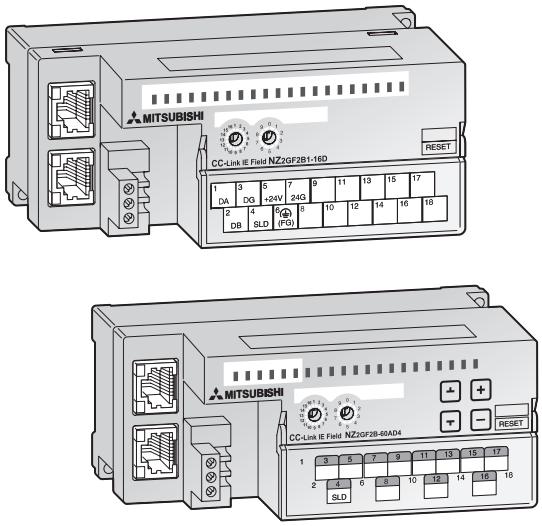




These remote modules are intended to be installed near the control target. The advantages are reduced cabling and the capability of acquiring data and operation results of individual machine modules autonomously.

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 | Type | 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 | | 16 | — | 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),DC input (sink type) | 137589 |
| | AJ65FBTA42-16DTE | | 8 | 8 | Protection IP67, DC output (source type), DC input (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–+10 V, -20–+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–+10 V, 0 A–+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–+10 V | 75446 |
| | AJ65BT-64DAI | | — | 4 | 4-channel current output, 4–20 mA | 75445 |
| | AJ65SBT-62DA | Compact remote module | — | 2 | 2-channel voltage output, -10–+10 V, 0 A–20 mA | 140147 |
| | AJ65SBT2B-64DA | | — | 4 | 4-channel voltage output, -10–+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 RS422 connection, up to 400 kHz (low current consumption) | 88029 |
| | AJ65BT-D62D-S1 | | 2 high-speed counter inputs, EIA standard RS422 connection, up to 400 kHz | 88030 |
| Interface | AJ65BT-R2N | Remote module | Serial interface, RS232C (D-Sub, 9 pole), 1 channel | 216545 |
| Positioning | AJ65BT-D75P2-S3 | Remote module | 2 axes positioning module, pulse output, linear and circular interpolation | 88002 |
| I/O modules | NZ2GF2B1-16D | CC-Link IE Field Network remote I/O module | 16 points input, 24 V DC (positive/negative common shared) 1-wire, terminal block type, response time 0–70 ms | 260472 |
| | NZ2GF2B1-16T | | 16 points output, 12 to 24 V DC, 0.5 A/point, 4 A/common, transistor output (sink type) 1-wire, terminal block type | 260473 |
| | NZ2GF2B1-16TE | | 16 points output, 12 to 24 V DC, 0.5 A/point, 4 A/common, transistor output (source type) 1-wire, terminal block type | 260474 |
| | NZ2EX2B1-16D | CC-Link IE Field Network extension I/O module | 16 points input, 24 V DC (positive/negative common shared) 1-wire, terminal block type, response time 0–70ms | 260507 |
| | NZ2EX2B1-16T | | 16 points output, 12 to 24 V DC, 0.5 A/point, 4 A/common, transistor output (sink type) 1-wire, terminal block type | 260508 |
| | NZ2EX2B1-16TE | | 16 points output, 12 to 24 V DC, 0.5 A/point, 4 A/common, transistor output (source type) 1-wire, terminal block type | 260509 |
| | NZ2GFCF-D62PD2 | CC-Link IE Field Network remote I/O module | 2 high-speed counter inputs, 5/24 V DC/Differential inputs, up to 8 MHz | 266159 |
| | NZ2GF-CCB | CC-Link IE Field to CC-Link bridge module | Allows the connection of a CC-Link network to a CC-Link IE network. | 266160 |
| Analog modules | NZ2GF2B-60AD4 | CC-Link IE Field Network analog-digital converter module | 4 channels voltage/current analog-digital converter module (analog input type) | 260505 |
| | NZ2GF2B-60DA4 | CC-Link IE Field Network digital-analog converter module | 4 channels voltage/current digital-analog converter module (analog output type) | 260506 |

See also CC-Link Safety Remote I/O Modules, page 162
See also CC-Link Safety Relays, page 163

The CC-Link Partner Association set-up a European headquarters at the beginning of January 2001 at Mitsubishi Electric'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."

John Browett, 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**
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e-mail: partners@clpa-europe.com
www.clpa-europe.com

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

# The MELSEC STlite series scalable I/O solutions for CC-Link, Profibus and Ethernet

Approved for a very wide range of applications, the STlite series features excellent module granularity and fieldbus-agnostic design, making it ideally suited for the requirements of today's distributed fieldbus systems. The devices are optimised for efficient processlevel communication, with scalable performance and high integration density.

- The range of potential applications is virtually unlimited.
- Reduces hardware and system overheads to a minimum.
- Simplifies handling and maximises efficiency.

The uncompromisingly modular architecture of the system also extends to its support for a wide range of fieldbus systems. You can install different head stations for different protocols, depending on the needs of your applications.

### Optimised for real-life requirements

- Module granularity:
- 2, 4 or 8 channels in a single I/O module

### Fieldbus-agnostic:

- Head stations available for the leading fieldbus protocols CC-Link, Profibus DP and Ethernet

### Safe investment:

- Fieldbus node design enables easy switching to new bus standards without changing the bus modules.

### Clear labelling:

- Colour-coded group identification plate brackets and terminal tags

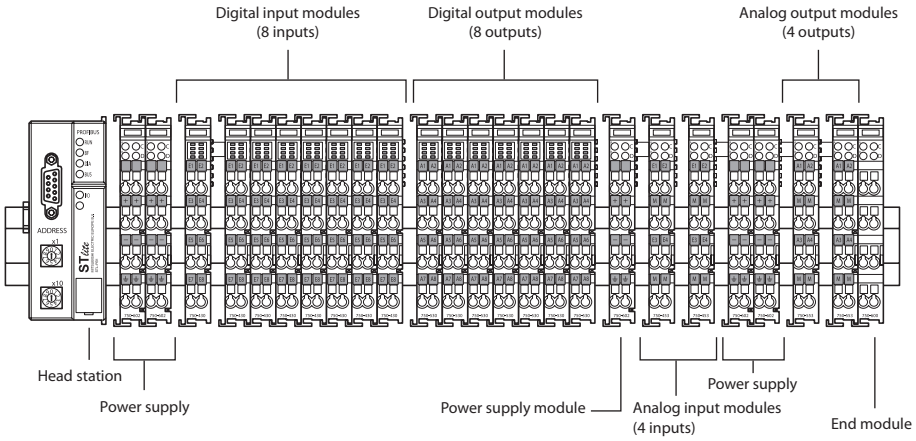
### Versatile:

- Configuration options for digital/analog inputs/outputs and special functions with different voltages, powers and signals on a single fieldbus node.

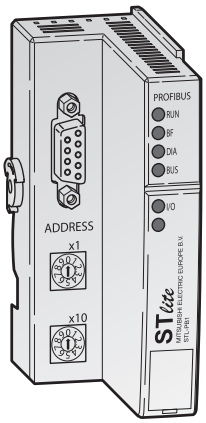
### Reliable:

- Approvals for industrial and marine automation applications ensure a wide range of deployment options – even in heavy-duty environments.
- Automatic contacting for power and data contacts
- Pluggable connections with bus plug connector
- CAGE CLAMP® spring terminals for input/output point connections

### Product range




| Electronic modules | Description |
|---|---|
| **Head station** | |
| STL-BT1 | Head station CC-Link, 156 kBaud–10 MBaud; digital and analog signals |
| STL-PB1 | Head station Profibus DP/V1, 12 MBaud; digital and analog signals |
| STL-ETH1 | Head station Ethernet TCP/IP ECO, 10/100 Mbps; digital and analog signals |
| **Power supply** | |
| STL-PS | Power supply module 24 V DC, passive |
| STL-BPS | Power supply module 24 V DC, with bus power supply |
| **Digital input modules** | |
| STL-DI8-V1 | Digital input module, 8 inputs, 24 V DC, 0.5 A, 0.2 ms, source type, 1-conductor connection |
| STL-DI8-V2 | Digital input module, 8 inputs, 24 V DC, 0.5 A, source type |
| **Digital output modules** | |
| STL-DO4 | Digital output module, 4 outputs, 24 V DC, 0.5 A, source type |
| STL-DO8 | Digital output module, 8 outputs, 24 V DC, 0.5 A, source type |
| **Relay output module** | |
| STL-RO2 | Relay output module, 2 N/O contacts, 230 V AC/30 V DC, 2A, potential-free |
| **Analog input modules** | |
| STL-AD2-V | Analog input module, 2 voltage inputs, 0–10 V DC, single-ended |
| STL-AD2-I | Analog input module, 2 current inputs, 4–20 mA, single-ended |
| STL-AD4-V1 | Analog input module, 4 voltage inputs, 0–10 V DC, single-ended |
| STL-AD4-V2 | Analog input module, 4 voltage inputs, ±10 V DC, single-ended |
| STL-AD4-I | Analog input module, 4 current inputs, 4–20 mA, single-ended |
| STL-TI2 | Analog temperature input module, 2 temperature inputs, Pt100 and resistor measurement (selectable) |
| **Analog output modules** | |
| STL-DA2-V | Analog output module, 2 voltage outputs, 0–10 V DC |
| STL-DA2-I | Analog output module, 2 current outputs, 4–20 mA |
| STL-DA4-V1 | Analog output module, 4 voltage outputs, 0–10 V DC |
| STL-DA4-V2 | Analog output module, 4 voltage outputs, ±10 V DC |
| STL-DA4-I | Analog output module, 4 current outputs, 4–20 mA |
| **Encoder module** | |
| STL-ENC | Input module for incremental encoder |
| **Counter module** | |
| STL-C100 | Input module with forward/reverse counter, 24 V DC,100 kHz |
| **Interface module** | |
| STL-SSI | Input module with SSI encoder interface, 24 bit, 125 kHz |
| **System module** | |
| STL-ET | Bus end module |
| **Accessory** | |
| STL-CClink con | CC-Link fieldbus connector for CC-Link head station, D-Sub plug, 9-pole |

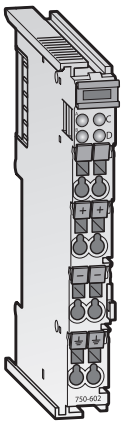



### STlite series head stations

The head stations connect the STlite I/O systems with the Profibus DP, CC-Link or Ethernet fieldbus systems. Each head station recognises all inserted I/O and special function modules and generates a local process image from the configuration.

Mixed configurations of analog (word-wise communication) and digital (bit-wise communication) modules are supported. The stations have a large range of application protocols. The Ethernet head station also has an integrated server for web-based applications.

| Specifications | | STL-BT1 | STL-PB1 | STL-ETH1 |
|---|---|---|---|---|
| Number of I/O modules | | 64 | 64 | 64 |
| Communication | protocol | CC-Link-Standard | Profibus DP | Ethernet TCP/IP ECO, Modbus TCP |
| | medium | Shielded Cu cable 2/3x0.5 mm² | Cu cable acc. to EN 50170 | Twisted Pair S-UTP 100 Ω Cat 5 |
| Interface connector | | D-Sub 9-pole | D-Sub 9-pole | RJ45 |
| Max. transmission distance | m | 1200 (depends on baud rate/cable) | 1200 (depends on baud rate/cable) | 100 between HUB and head station, max. network length limited by Ethernet specification |
| Fieldbus | input process image | 256 bytes | 244 bytes | 14 bytes digital, 2 bytes system, 32 bytes analog |
| | output process image | 256 bytes | 244 bytes | 14 bytes digital, 2 bytes system, 32 bytes analog |
| Number of addressable modules | | 64 | 96 with repeater | Limited by Ethernet specification |
| Station addresses | | 1/1–4 | — | — |
| Internal current consumption (5 V DC) | mA | 300 | 200 | 300 |
| Max. input current (24 V DC) | mA | 500 | 500 | 500 |
| External power supply (24 V DC) | | Via power supply module | Via power supply module | Via power supply module |
| Wire connection | | CAGE CLAMP® | CAGE CLAMP® | CAGE CLAMP® |
| Dimensions (WxHxD) | mm | 51x65x100 | 51x65x100 | 51x65x100 |
| **Order information** | Art. no. | 242280 | 242279 | 242281 |
| **Accessories** | | STL-CCLink con: Art. no. 242314<br>The fieldbus connector connects a CC-Link device to a CC-Link line. | | |



### Power supply module

The power supply modules deliver power to the bus terminals at the required voltages. When configuring the system it is important that the total current does not exceed the maximum current flowing through the power input terminals. If this is the case an additional power supply module needs to be installed.

The power supply module with bus power supply increases the capacity of the system power supply for field bus nodes with high power requirements (sum of the internal power consumption values of the bus terminals). Additional power supply modules with bus power supply can be installed as required.

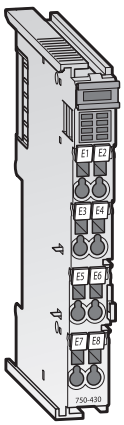
| Specifications | | STL-PS | STL-BPS |
|---|---|---|---|
| Voltage supply | | 24 V DC (-25 %–+30 %) | 24 V DC (-25 %–+30 %) |
| Input current | max. | — | 500 |
| Total current for I/O modules | mA | — | 2000 |
| Voltage via power contacts | max. | 24 V DC | 24 V DC (-25 %–+30 %) |
| Current via power contacts | max. | 10 A DC | 10 A DC |
| Wire connection | mA | CAGE CLAMP® | CAGE CLAMP® |
| Module width | | 1 unit (12 mm) | 1 unit (12 mm) |
| Dimensions (WxHxD) | mm | 12x65x100 | 12x65x100 |
| **Order information** | Art. no. | 242311 | 242312 |

### Bus end module

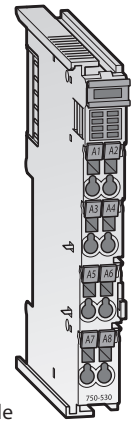
One of these end modules must be installed at the end of each fieldbus node. The end module terminates the internal terminals bus and ensures reliable data communications.

| Specifications | | STL-ET |
|---|---|---|
| Module width | | 1 unit (12 mm) |
| Dimensions (WxHxD) | mm | 12x65x100 |
| **Order information** | Art. no. | 242313 |

## Digital I/O modules




Digital
input module




Digital
output module

### Digital input modules

The digital input modules have 8 channels. They are used for inputting control signals from the field, for example from sensors. Every input has an interference suppression filter, using a variety of time constants.

### Digital output modules

Digital output modules are available with 4 or 8 outputs. They are used to send control signals from the automation controller to the connected actuators. All the outputs are short-circuit proofed.

The field and system levels are electrically isolated from one another in all digital input and output modules.

### Digital relay output module

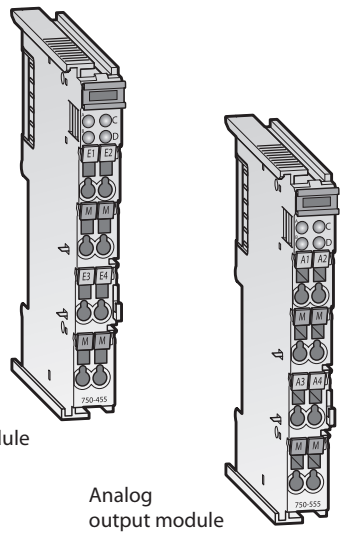
The relay output modules have two make contacts. The relays have floating contacts and are actuated with the internal system voltage. The control status of each relay is indicated by an LED.

Actuators with PE connections can be wired directly.

| Specifications | | STL-DI8-V1 | STL-DI8-V2 |
|---|---|---|---|
| Module type | | Digital input module | Digital input module |
| Integrated inputs | | 8, source type, 1-conductor connection | 8, source type, 1-conductor connection |
| Module width | | 1 unit (12 mm) | 1 unit (12 mm) |
| Isolation method | | Photo coupler | Photo coupler |
| Rated input voltage | | (0): -3–+5 V DC/(1): 15–30 V DC | (0): -3–+5 V DC/(1): 15–30 V DC |
| Rated input current | mA | 2.8 | 2.8 |
| Response time | ms | 0.2 | 3 |
| Internal current consumption | mA | 17 | 17 |
| Dimensions (WxHxD) | mm | 12x65x100 | 12x65x100 |
| Wire connection | | CAGE CLAMP® | CAGE CLAMP® |
| **Order information** | Art. no. | 242282 | 242283 |

| Specifications | | | STL-DO4 | STL-DO8 | STL-RO2 |
|---|---|---|---|---|---|
| Module type | | | Digital output module | Digital output module | Digital relay output module |
| Integrated outputs | | | 4, source type | 8, source type | 2 contacts (normally open) |
| Module width | | | 1 unit (12 mm) | 1 unit (12 mm) | 1 unit (12 mm) |
| Isolation method | | | Photo coupler | Photo coupler | Relay |
| Rated load voltage | | | 24 V DC | 24 V DC | — |
| Max. switching load | | | — | — | 250 V AC/30 V DC |
| Max. load current | | A | 0.5/point | 0.5/point | 2.0/point |
| Max. switching frequency | | | 1 kHz | 2 kHz | 30/min (at rated load) |
| Response time | OFF → ON | ms | — | — | max. 10 |
| | ON → OFF | ms | — | — | max. 10 |
| Protection functions | | | Output short-circuit protected | Output short-circuit protected | — |
| Bounce time | | | — | — | type. 1.2 ms |
| Internal current consumption | | mA | 7 | 25 | 100 |
| Dimensions (WxHxD) | | mm | 12x65x100 | 12x65x100 | 12x65x100 |
| Wire connection | | | CAGE CLAMP® | CAGE CLAMP® | CAGE CLAMP® |
| **Order information** | | Art. no. | 242284 | 242295 | 242296 |

## Analog I/O modules




### Analog input modules

The analog input modules with current input process standard 4–20 mA signals. The modules with voltage inputs can handle standard ±10 V or 0–10 V signals.

The input signal is electrically isolated and is transferred to the system level with a resolution of 12 bits.

The modules are powered by the internal system power supply. The input channels of the modules have a common ground.

### Analog output modules

The analog output modules with current outputs generate standard 4–20 mA signals. The modules with voltage outputs generate standard ±10 V or 0–10 V signals.

The output signal is electrically isolated and is transferred to the system level with a resolution of 12 bits.

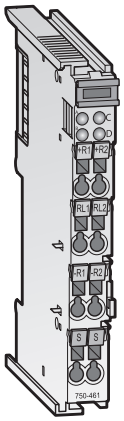
The power for the current output modules comes from the field power supply. The outputs of the voltage output modules are short-circuit proofed, have a common reference potential and are powered by the internal system power supply.



| Specifications | | STL-AD2-V | STL-AD2-I | STL-AD4-V1 | STL-AD4-V2 | STL-AD4-I |
|---|---|---|---|---|---|---|
| Module type | | Analog input module | Analog input module | Analog input module | Analog input module | Analog input module |
| Module width | | 1 unit (12 mm) | 1 unit (12 mm) | 1 unit (12 mm) | 1 unit (12 mm) | 1 unit (12 mm) |
| Number of input channels | | 2 | 2 | 4 | 4 | 4 |
| Signal input | | 0–10 V | 4–20 mA | ±10 V | 0–10 V | 4–20 mA |
| Resolution | | 12 bit | 12 bit | 12 bit | 12 bit | 12 bit |
| Conversion time | | 2 ms | 2 ms | 10 ms | 10 ms | 10 ms |
| Maximum input voltage | | 35 V | 10 V | ±40 V | ±40 V | 32 V |
| Accuracy at 25 °C | | <±0.2 % of full scale value | <±0.1 % of full scale value | <±0.1 % of full scale value | <±0.1 % of full scale value | <±0.2 % of full scale value |
| Input resistance (per input) | | 130 Ω | <220 Ω/20 mA | >100 Ω | >100 Ω | >100 Ω/20 mA |
| Isolation method | | Electrical isolation of the input channels | | | | |
| Internal current consumption | mA | 60 | 75 | 65 | 65 | 65 |
| Dimensions (WxHxD) | mm | 12x65x100 | 12x65x100 | 12x65x100 | 12x65x100 | 12x65x100 |
| Wire connection | | CAGE CLAMP® | CAGE CLAMP® | CAGE CLAMP® | CAGE CLAMP® | CAGE CLAMP® |
| **Order information** | Art. no. | 242297 | 242298 | 242299 | 242300 | 242301 |

| Specifications | | STL-DA2-I | STL-DA2-V | STL-DA4-V1 | STL-DA4-V2 | STL-DA4-I |
|---|---|---|---|---|---|---|
| Module type | | Analog output module | Analog output module | Analog output module | Analog output module | Analog output module |
| Module width | | 1 unit (12 mm) | 1 unit (12 mm) | 1 unit (12 mm) | 1 unit (12 mm) | 1 unit (12 mm) |
| Number of output channels | | 2 | 2 | 4 | 4 | 4 |
| Signal output | | 4–20 mA | 0–10 V | 0–10 V | ±10 V | 4–20 mA |
| Resolution | | 12 bit | 12 bit | 12 bit | 12 bit | 12 bit |
| Conversion time | | 2 ms | 2 ms | 10 ms | 10 ms | 10 ms |
| Accuracy at 25 °C | | <±0.1 % of full scale value | | | | |
| Data length | | 2x16 bit | 2x16 bit | 4x16 bit | 4x16 bit | 4x16 bit |
| External load resistance value | | <600 Ω | 5 kΩ | 5 kΩ | 5 kΩ | 0–300 Ω/300–600 Ω |
| Isolation method | | Electrical isolation of the output channels | | | | |
| Internal current consumption | mA | 70 | 65 | 125 | 125 | 60 |
| Dimensions (WxHxD) | mm | 12x65x100 | 12x65x100 | 12x65x100 | 12x65x100 | 12x65x100 |
| Wire connection | | CAGE CLAMP® | CAGE CLAMP® | CAGE CLAMP® | CAGE CLAMP® | CAGE CLAMP® |
| **Order information** | Art. no. | 242302 | 242303 | 242304 | 242305 | 242306 |

## Special function modules



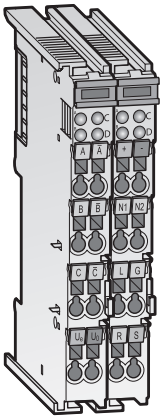
### Temperature input module

The analog temperature input module enables direct connection of Pt100 resistance temperature sensors, with either a 2-wire or 3-wire cable. The module linearises the data across the entire supported temperature range.

Short circuits, sensor cable breaks and out-of-range values are signalled by a red error LED.

| Specifications | | STL-TI2 |
|---|---|---|
| Module type | | Analog temperature input module |
| Number of input channels | | 2 |
| Internal current consumption | mA | 80 |
| Sensor types | | Pt100 and resistance measurement |
| Sensor connection | | 3-wire connection (factory preset) or 2-wire |
| Temperature measuring range | | -200–+850 °C (Pt100) |
| Resolution | | 0.1 °C |
| Conversion time | | 320 ms (per channel) |
| Accuracy at 25 °C | | <±0.2 % of full scale value |
| Isolation method | | Electrical isolation of the input channels |
| Rated measuring current | | 0.5 mA |
| Data length | | 2x16 bit |
| Wire connection | | CAGE CLAMP® |
| Module width | | 1 unit (12 mm) |
| Dimensions (WxHxD) | mm | 12x65x100 |

| Order information | Art. no. | 242307 |
|---|---|---|



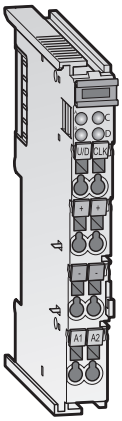
### Incremental encoder input module

This module provides an interface for incremental encoders with an RS422 port. A counter with a quadrature decoder and a null point signal latch can be read and activated by the controller. The controller can also set the counter. In the corresponding operating mode, a rising edge signal at the input then loads the counter value into the latch register and initialises the counter.

The speed (increments/ms) is logged automatically and can be transmitted to the controller instead of the latch value. The gate input can be used to lock the counter. The ref input can be used to activate the null point function. The module uses cam outputs to signal whether the counter value is within the predefined windows. The module provides the power supply for the encoder.

| Specifications | | | STL-ENC |
|---|---|---|---|
| Module type | | | Incremental Encoder Interface |
| Encoder connection | | | 3 input channels |
| Internal current consumption | | mA | 110 |
| Counting range | | | 32 bits binary |
| Max. counting frequency | | | 250 kHz |
| Decoder | | | Quadrature decoder with 4-fold report |
| Resolution zero impulse | | | 32 bit |
| Commands | | | read, set, enable |
| Current consumption (typ.) | | | 35 mA without load |
| Output voltage | | | 5 V DC for sensor supply |
| Max. output current | | | 300 mA for sensor supply |
| Data length | | | 1x32 bit |
| Digital outputs | output voltage | | 24 V DC |
| | max. output current | | 0.5 A |
| Protection functions | | | Output short-circuit protected |
| Digital inputs | input voltage | | (0): -3–+5 V DC/(1): 15–30 V DC |
| | input current | | 5–7 mA |
| Wire connection | | | CAGE CLAMP® |
| Module width | | | 2 units (24 mm) |
| Dimensions (WxHxD) | | mm | 24x65x100 |

| Order information | Art. no. | 242308 |
|---|---|---|



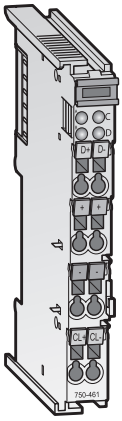
### Up/Down counter module

This counter inputs binary 24V signals and transmits the counter value to the installed bus system. An input is used to switch between Up and Down counting.

The control byte can be used to switch two digital outputs and to set and reset the counter. It is also possible to lock the counter.

| Specifications | | STL-C100 |
|---|---|---|
| Module type | | Up/Down counter |
| Switching outputs | | 2 |
| Counter inputs | | 1 |
| Internal current consumption | mA | 70 |
| Max. output current | | 0.5 A |
| Rated input voltage | | (0): -3–+5 V DC/(1): 15–30 V DC |
| Rated input current | mA | 5 |
| Max. counting frequency | | 100 kHz |
| Counting range | | 32 bit |
| Isolation method | | Electrical isolation of the inputs and outputs |
| Data length | | 32 bit |
| Protection functions | | Output short-circuit protected |
| Wire connection | | CAGE CLAMP® |
| Module width | | 1 unit (12 mm) |
| Dimensions (WxHxD) | mm | 24x65x100 |

| Order information | Art. no. | 242309 |
|---|---|---|



### Interface modules

The SSI transmitter interface module enables direct connection of an SSI transmitter. To read out the transmitter the module emits a clock signal and represents the data flow as a data word in the process image. Control registers can be used to set different operating modes, transmission frequencies and bit widths.

The transmitter can be powered directly by the power output from the module.

The serial interface module enables connection of devices with an RS232C port. The connected device can then communicate directly with the controller via the fieldbus head station. The active communications channel has a data rate of 19,200 baud in full duplex mode, irrespective of the host bus system deployed.

| Specifications | | STL-SSI |
|---|---|---|
| Module type | | Transmitter interface |
| Interface | | SSI |
| Sensor connection | | 1 input/1 output channel |
| Internal current consumption | mA | 85 |
| Output voltage | | 24 V DC (-15–+20 % for sensor supply) |
| Transmission frequency/-rate | | 125 kHz (max. 1 MHz) |
| Data length serial input | | 32 bit |
| Signal output | | Differential signal (RS422) |
| Signal input | | Differential signal (RS422) |
| Signal coding | | Gray-Code |
| Isolation method | | Electrical isolation of the inputs and outputs |
| Data length | | 1x32 bit |
| Wire connection | | CAGE CLAMP® |
| Module width | | 1 unit (12 mm) |
| Dimensions (WxHxD) | mm | 24x65x100 |

| Order information | Art. no. | 242310 |
|---|---|---|

# The MELSEC ST series – premium product for process industry



### System description

The ST series is designed as a modular input/ output system for connection to CC-Link and Profibus DP. It comprises of:

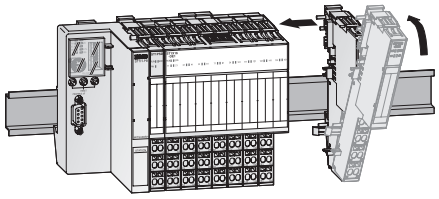
- basic module (head station and bus node for CC-Link and Profibus DP)
- power supply modules
- digital and analog I/O modules

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.

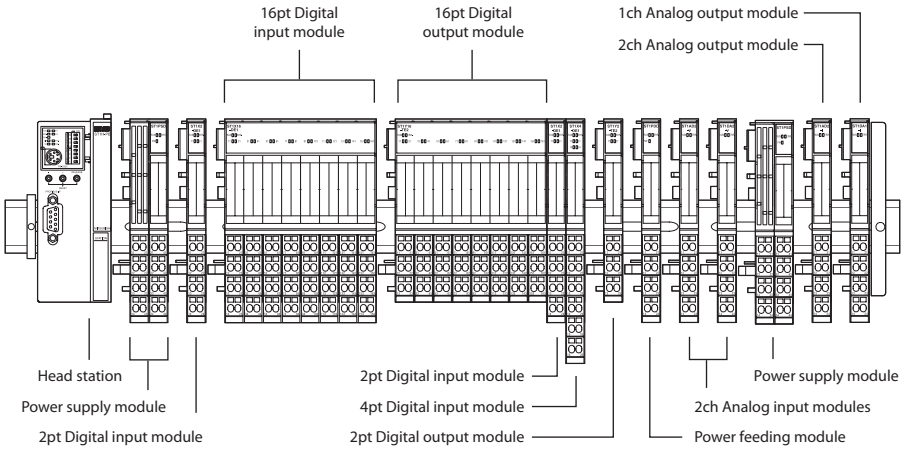


Every electronic module provides LEDs for quick and easy diagnostics and also additional information. Error and status messages are also shown on the basic module.

### 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

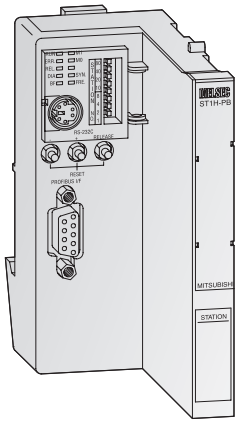
### Product range




### 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-BT (CC-Link) | — | — |
| ST1H-PB | no need | no need |
| **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/-F01 | ST1B-S4IR2 | ST1B-E4IR2 |
| ST1DA1-I/-F01 | ST1B-S4IR2 | ST1B-E4IR2 |
| **Temperature modules** | | |
| ST1TD2 | ST1B-S4TD2 | ST1B-E4TD2 |
| ST1RD2 | ST1B-S4IR2 | ST1B-E4IR2 |
| **Encoder module** | | |
| ST1SS1 | ST1B-S4IR2 | ST1B-E4IR2 |

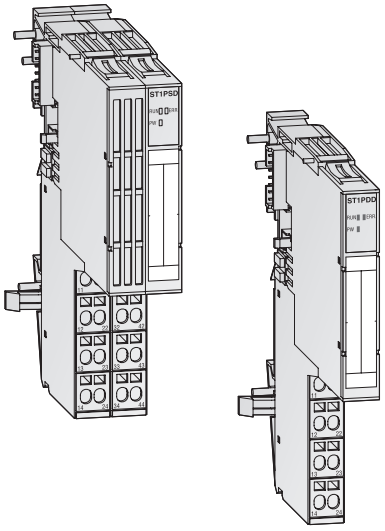



### Basic module (head station) of the MELSEC ST series

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




### 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.

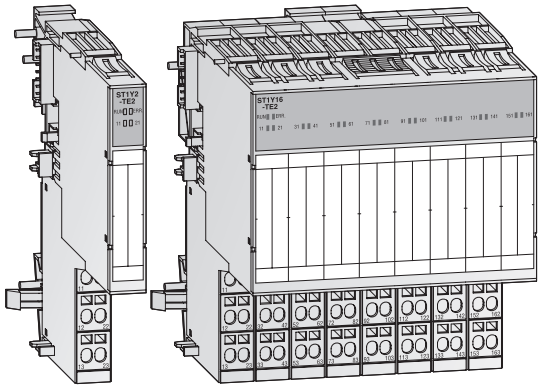
| Specifications | | | ST1PSD | ST1PDD |
|---|---|---|---|---|
| Module type | | | Power supply for head station, internal 5 V DC backplane bus and 24 V DC for I/Os (double function) | Power feeding module |
| Occupied I/O points | | | 2/2 | 2/2 |
| Occupied slice number | | | 2 | 1 |
| Nominal voltage | | 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/Os, 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 consumption 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.

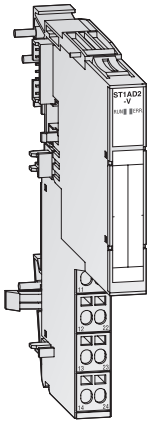
The electronic modules are fitted in a base module, which can be installed on a standard DIN rail. Each module can be replaced without having to turn OFF the power („Hot Swap"), without rewiring and without using any tool.

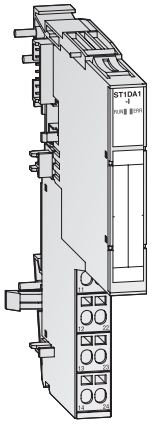
- DIN rail mounting
- LEDs for RUN and ERROR on the modules and also on the basic module
- Connection to the basic module (head station) via integrated backplane bus in the base modules
- Two selectable types of connecting terminals base modules:
  - spring clamp type terminals
  - screw clamp type terminals



| 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 | | k Ω | 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 | ST1Y2-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 |
| Max. switching 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 |





### 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.

- 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/-F01 | ST1DA1-I/-F01 | 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 | | | ±12 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 kW–1.0 MW | 0–500 W | — |
| 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. | 152975/217631 | 152976/217632 | 193660 |

# Modular PLCs MELSEC System Q

MELSEC System Q has been designed to be at the heart of your manufacturing process, as it is at the heart of Mitsubishi Electric'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**

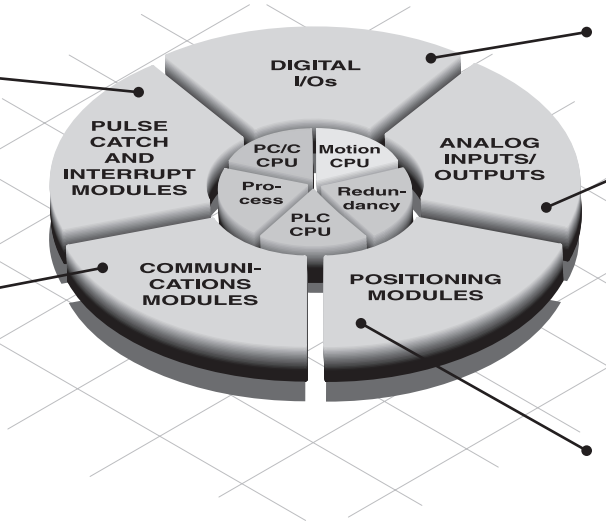
Digital input modules for pulse storage and for processing subroutines.

**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 DP/Profinet, 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**

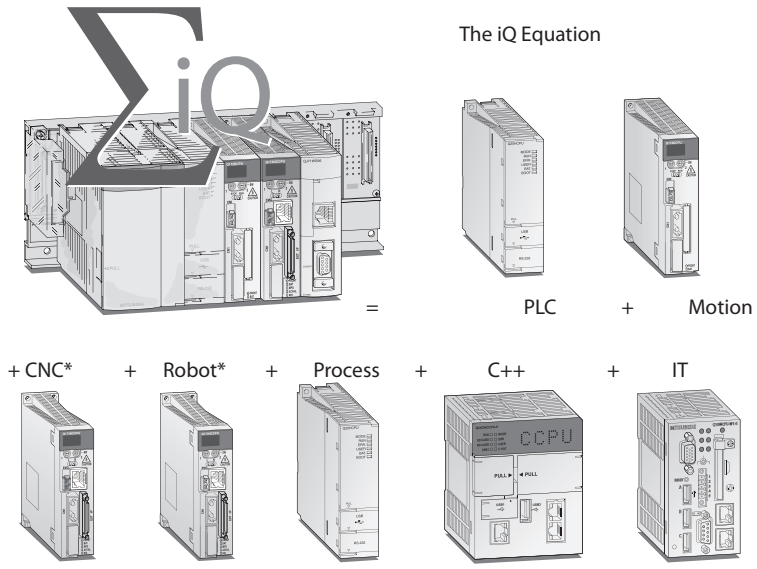
High-speed counter modules with possibility for connection of incremental shaft encoder or multiaxial positioning modules for servo and step drives with up to 8 axes per module.

## iQ Platform

**The universal automation solution for maximising ROI**

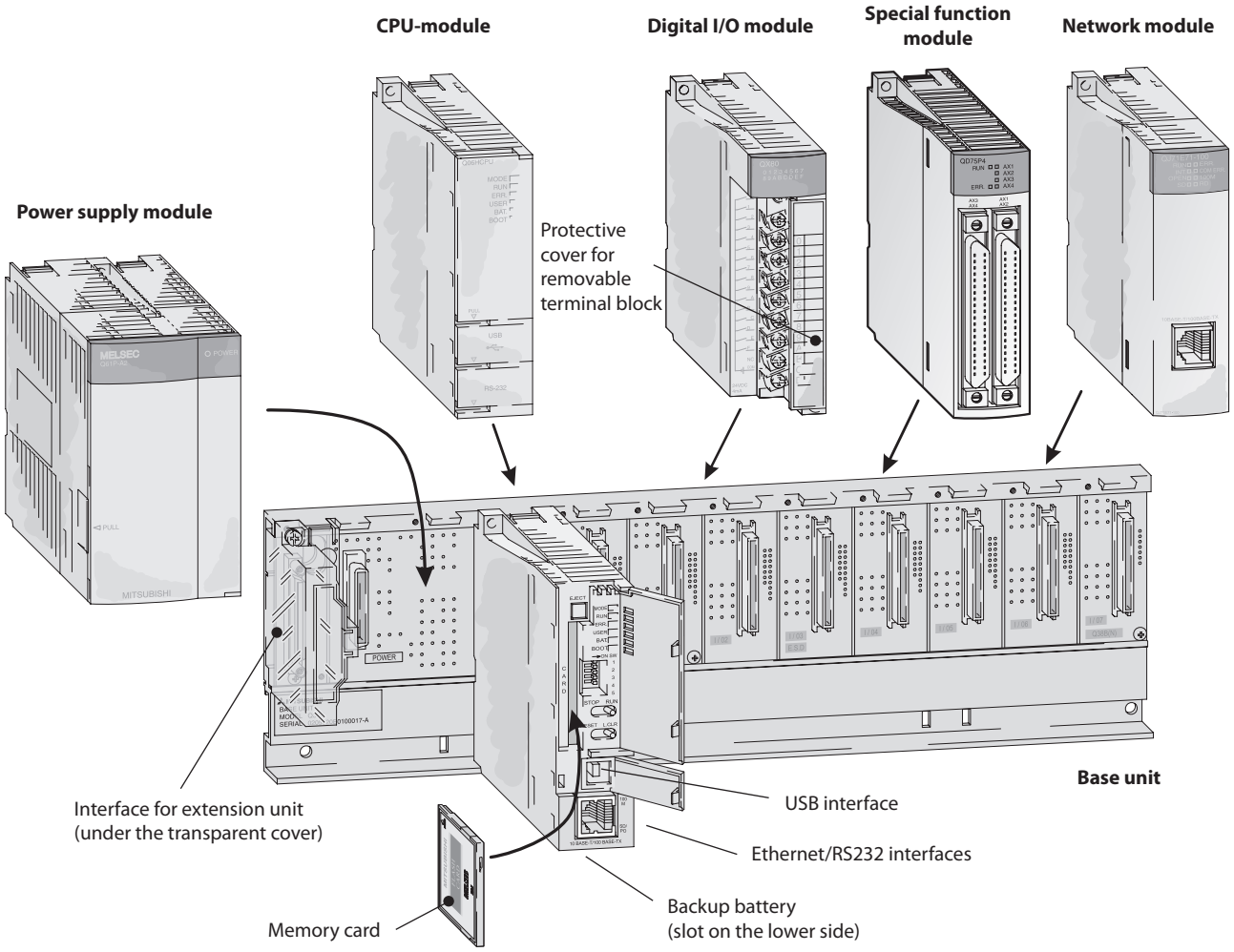
Mitsubishi Electric's iQ Platform is the hardware foundation for our e-F@ctory concept – an advanced, integrated automation strategy based on our long experience and expertise as a global manufacturing company. The main features of iQ Platform include:

- 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 dependent on each individual modules power consumption and available supply voltage. You can only use one power supply per backplane.

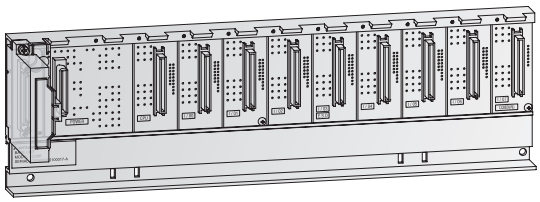
### CPU

There are three main CPU types: Basic models (Q00JCPU through Q01CPU), advanced models (Q02CPU through Q25HCPU) and universal models (Q00UJ through Q100UDEHCPU).
Up to 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



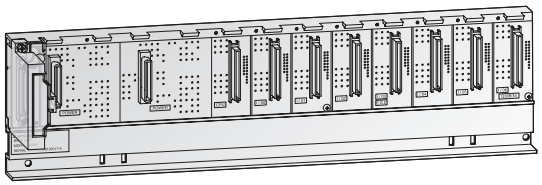
### Main base units

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 | Q33SB | Q35B | Q35SB | Q35DB | Q38B | Q38DB* | Q38RB | Q312B | Q312DB* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Slots for I/O modules | | 2 | 3 | 3 | 5 | 5 | 5 | 8 | 8 | 8 | 12 | 12 |
| Slots for power supply modules | | 1 | 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 | 245x98x44.1 | 328x98x44.1 | 328x98x44.1 | 439x98x44.1 | 439x98x44.1 | 439x98x44.1 |
| **Order information** | Art. no. | 147273 | 136369 | 147284 | 127586 | 147285 | 249091 | 127624 | 207608 | 157067 | 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.

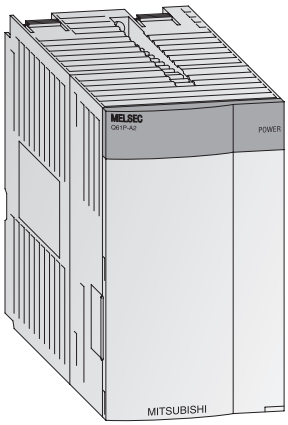
- Q6*B extension units provide a slot for their own power supply module
- A total of max. 7 extension units can be connected to a main base unit with up to 64 I/O modules for a single system
- The maximum distance from the first to the last base unit is 13.2 m

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 | QA1S51B |
|---|---|---|---|---|---|---|---|---|---|---|
| Slots for power supply modules | | — | — | 1 | 1 | 1 | 2 | 1 | 1 | — |
| Slots for I/O modules | | 2 | 5 | 3 | 5 | 8 | 8 | 12 | 5 | 1 |
| 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 | 100x130x50.7 |
| **Order information** | Art. no. | 140376 | 140377 | 136370 | 129572 | 129578 | 157066 | 129579 | 210163 | 249092 |
| **Accessories** | | Connection cables adapter for DIN rail mounting | | | | | | | | |

## Power supply modules



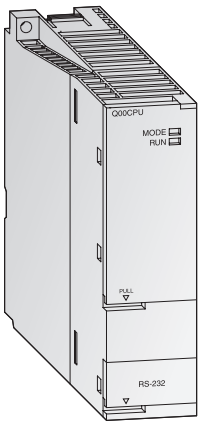

These units power all the modules on the backplane. The choice is dependent on the power consumption of the individual modules (this is especially important when using multiple CPUs).

- 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).

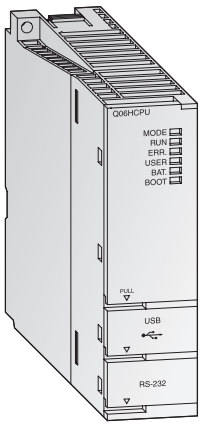
### Basic PLC CPUs

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 | 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. | 138322 | 138323 | 138324 |
| The CPU can be replaced by: | | Q00UJCPU | Q00UCPU | Q01UCPU |



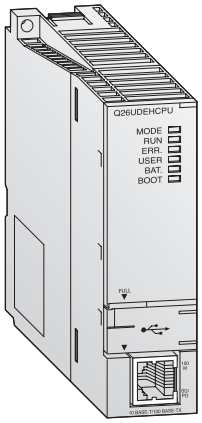

### High-performance PLC CPUs

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 |
| The CPU can be replaced by: | | Q03UD/UDECPU | Q03UD/UDECPU | Q06UDH/UDEHCPU | Q13UDH/UDEHCPU | Q26UDH/UDEHCPU |




### 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 Q□UDEH modules
- Extremely fast bit processing, 9.5 ns
- High-speed data access
- Q□UDVCPUs enable high speed program processing
- SD memory card and SRAM cassette installable in Q□UDVCPUS



| 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 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 |

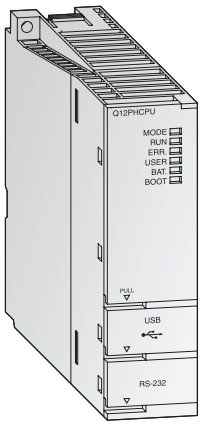
| Specifications | | Q04UDHCPU, Q04UDEHCPU | Q06UDHCPU, Q06UDEHCPU | Q10UDHCPU, Q10UDEHCPU | Q13UDHCPU, Q13UDEHCPU | Q20UDHCPU, Q20UDEHCPU | Q26UDHCPU, Q26UDEHCPU | Q50UDEHCPU * | Q100UDEHCPU * |
|---|---|---|---|---|---|---|---|---|---|
| Type | | Multi processor CPU module | | | | | | | |
| I/O points | | 4096/8192 | 4096/8192 | 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 | RAM, ROM, FLASH | RAM, ROM, FLASH |
| Memory capacity 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) | 500 k steps (2000 kByte) | 1000 k steps (4000 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 | 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 | 27.4x98x115 | 27.4x98x115 |
| **Order information** | Art. no. | 207606, 217900 | 207607, 215808 | 221578, 221579 | 217619, 217901 | 221580, 221581 | 217620, 217902 | 242368 | 242369 |

* is supported by GXWorks2 only

| Specifications | | Q03UDVCPU | Q04UDVCPU | Q06UDVCPU | Q13UDVCPU | Q26UDVCPU |
|---|---|---|---|---|---|---|
| Type | | Multi processor CPU module | | | | |
| I/O points | | 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, SD-Card, extended SRAM cassette | | | | |
| Memory capacity for PLC program | | 30 k steps (120 kByte) | 40 k steps (160 kByte) | 60 k steps (240 kByte) | 130 k steps (520 kByte) | 260 k steps (1040 kByte) |
| Program cycle period | | 1.9 ns/log. instruction | 1.9 ns/log. instruction | 1.9 ns/log. instruction | 1.9 ns/log. instruction | 1.9 ns/log. instruction |
| Dimensions (WxHxD) | mm | 27.4x98x115 | 27.4x98x115 | 27.4x98x115 | 27.4x98x115 | 27.4x98x115 |
| **Order information** | Art. no. | 266161 | 266162 | 266163 | 266164 | 266165 |

| | | |
|---|---|---|
| **Accessories** | Q4MCA-1MBS; 1 MB memory cassette for Q□UDVCPU | Art. no. 266134; |
| | Q4MCA-2MBS; 2 MB memory cassette for Q□UDVCPU | Art. no. 266155; |
| | Q4MCA-4MBS; 3 MB memory cassette for Q□UDVCPU | Art. no. 266156 |
| | Q4MCA-8MBS; 4 MB memory cassette for Q□UDVCPU | Art. no. 266157 |

## Process CPU modules

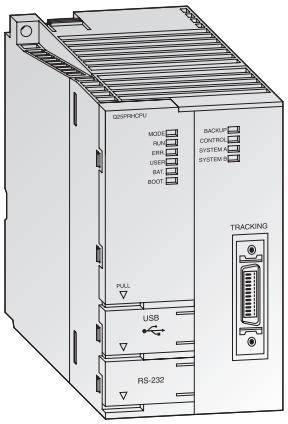



The MELSEC System Q process CPU allows flexible system design based on off-the-shelf components, which reduces both initial and implementation costs. Using either PX Developer/GX Developer or GX IEC Developer, process applications can be designed, debugged, monitored and maintained. The MELSEC Process 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.

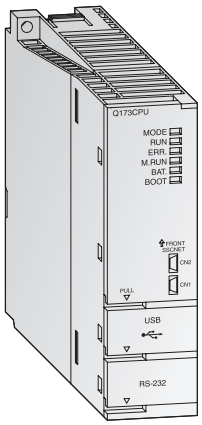
If the control system fails, the standby system takes over without interruption of the process.

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**

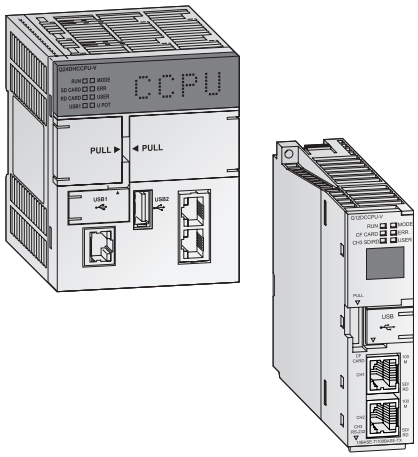
The motion controller CPU controls and synchronises the connected servo amplifiers and servo motors. A motion system requires a motion controller CPU, and a PLC CPU.

In this configuration the Motion CPU controls large-scale servo movements and a PLC CPU or C Controller CPU is simultaneously 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 50 Mbps

| Specifications | | Q172DCPU | Q172HCPU | Q173DCPU | Q173HCPU |
|---|---|---|---|---|---|
| Type | | Motion CPU | | | |
| I/O points | | 8192; 8 | 8192; 8 | 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 | | SSCNETIII (USB, RS232C via PLC CPU) | USB, RS232C, SSCNETIII | SSCNETIII (USB, RS232C via PLC CPU) | USB, RS232C, SSCNETIII |
| Real I/O points (PX/PY) | | 256 (these I/Os can be allocated directly to the motion CPU) | | | |
| Dimensions (WxHxD) | mm | 27.4x98x119.3 | 27.4x98x114.3 | 27.4x98x119.3 | 27.4x98x114.3 |
| **Order information** | Art. no. | 209788 | 162417 | 209787 | 162416 |

## 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 MELSEC 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.

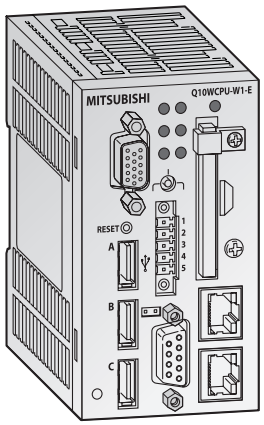
- Integration in a multi CPU – MELSEC System Q or use as a stand alone system.
- Dedicated development environment of C-/C++ language
- CompactFlash card makes handling for large quantities of data easy
- High performance addition to the existing range of automation products
- 7-segment LED display for efficient debugging and troubleshooting (Q12CCPU-V only)
- Ethernet and RS232 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 | | Q24DHCCPU-V | Q12DCCPU-V |
|---|---|---|---|
| Memory | | Standard ROM: 382 MB; Work RAM: 512 MB; Battery-backed-up RAM: 5 MB | Standard RAM: 3 MB; Work RAM: 128 MB; Battery-backed-up RAM: 128 kB |
| Operating system | | VxWorks Version 6.8.1 | VxWorks Version 6.4 (preinstalled) |
| Programming language | | C or C++ | |
| Development tool | | Workbench 3.2 | Workbench 2.6.1 |
| Communication interfaces | | 10BASE-T/100BASE-TX (2 ch.), USB (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 FFF) | |
| 5 V DC internal current consumption | A | 2.8 | 0.93 |
| Dimensions (WxHxD) | mm | 83x98x115 | 27.4x98x115 |
| **Order information** | Art. no. | 260296 | 221925 |

## iQ Platform CPUs

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

## PC CPU Module



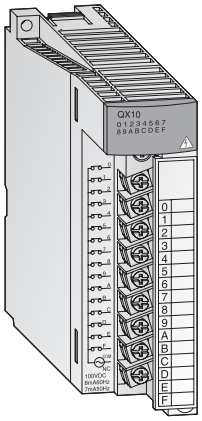

### The Windows®-CPU

The Q10WCPU uses the Microsoft Windows® operating system and can be combined with the power supplies, racks, I/O and special modules from the MELSEC System Q. The CPU module can be used in stand-alone mode or in multi-CPU mode, in conjunction with PLC CPU modules for example. This enables a seamless connection between the process and the data processing system. While the PLC CPU modules control and regulate processes, the Q10WCPU undertakes the conditioning and processing of data. The Q10WCPU-W1-E boots up from the integral solid-state drive (SSD) or from an installed Type 1 CF memory card (Q10WCPU-W1-CFE). The two integral LAN interfaces allow the unit to be incorporated in networks and enable access to Intranet and Internet. The hardware has been implemented by means of an embedded CPU and a proven chipset. The use of easily available components ensures that this CPU module can be applied with ease. In addition, the self-adapting BIOS enables support right at the BIOS level.

- Windows® operating system in a module with small dimensions (double the width of a MELSEC System Q PLC CPU module).
- Energy-saving by using an Intel Atom N450 processor. Various options for saving energy are adjustable. This ensures adequate performance and low energy consumption.
- Equipped with a variety of interfaces as standard (1000BASE-T (LAN), USB 2.0, CF-Card etc.).
- The customizable Phoenix Award BIOS enables support right at the BIOS level.
- A CF memory card can be installed as an external storage medium (Q10WCPU-W1-CFE)
- The integrated Solid State Drive (SSD) has a double write protection function and thus provides a reliable protection for important data.

| Specifications | | | Q10WCPU-WI-E | Q10WCPU-WI-CFE |
|---|---|---|---|---|
| Type | | | Personal Computer CPU | |
| CPU | | | Intel® Atom™ Processor N450 1.66 GHz | |
| Chip set | | | Intel® ICH8M | |
| Processing frequency | | GHz | 1.66 | |
| Memory | L1 cache | | Instruction 32 kB + data 24 kB | |
| | L2 cache | | 512 kB | |
| | Main | | 1 GB | |
| Video | | | Analog-RGB, resolution 1400 x 1050 at 60 Hz (16 million colors) | |
| Interfaces | Serial (RS232C) | | One 9-pin D-SUB connector, transfer rate: 50–115200 bps | |
| | USB | | Five USB2.0 compliant ports (3 at the front and 2 at the rear) | |
| | Keyboard/mouse | | Connection via one of the USB ports | |
| | LAN | | Two RJ45 sockets for 1000BASE-T/100BASE-TX/10BASE-T | |
| | Monitor | | 1x15-pin H-DSUB | |
| PC card slots | | | 1 slot for CF memory card (type I) | |
| Internal power consumption (5 V DC) | | A | Max. 3 | |
| Weight | | kg | 0.44 | 0.45 |
| Dimensions (WxHxD) | | mm | 55.2x98.0x115 | |
| **Order information** | | Art. no. | 252826 | 252827 |

# 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
- 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

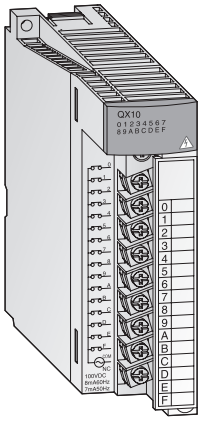


## Input modules

| 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
- 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

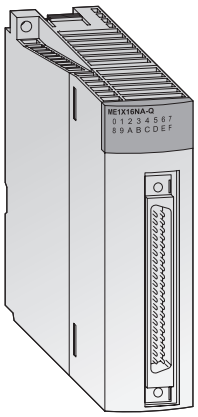


## Output modules

| 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 | QY82P |
|---|---|---|---|---|---|---|---|---|
| Outputs | | | 16 | 8 | 16 | 16 | 32 | 64 |
| Output type | | | Transistor (sink type) | Transistor (sink/source type) | Transistor (source type) | Transistor (source type) | Transistor(source type) | Transistor (source type) |
| Common terminal arrangement | | points | 16 | All independent | 16 | 16 | 32 | 32 |
| Rated output voltage | | | 12/24 V DC | 5–24 V DC | 12/24 V DC | 12/24 V DC | 12/24 V DC | 12/24 V DC |
| 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 | 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 | 40-pin connector x 2 |
| No. of occupied I/O points | | | 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 | 12–24 V DC |
| | current | mA | 20 (24 V DC) | — | 20 (24 V DC) | 20 (24 V DC) | 40 (24 V DC) | 20 (24 V DC) |
| Dimensions (WxHxD) | | mm | 27.4x98x90 | 27.4x98x90 | 27.4x98x90 | 27.4x98x90 | 27.4x98x90 | 27.4x98x90 |
| **Order information** | | Art. no. | 132578 | 136403 | 127588 | 221843 | 129607 | 242366 |
| **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 | | | | | |

## NAMUR input module




The ME1X16NA-Q is a digital input module for connection of up to 16 NAMUR sensors.

In contrast to an ordinary binary sensor with only two states (ON and OFF), a NAMUR sensor can indicate four states: ON, OFF, wire break and short circuit.

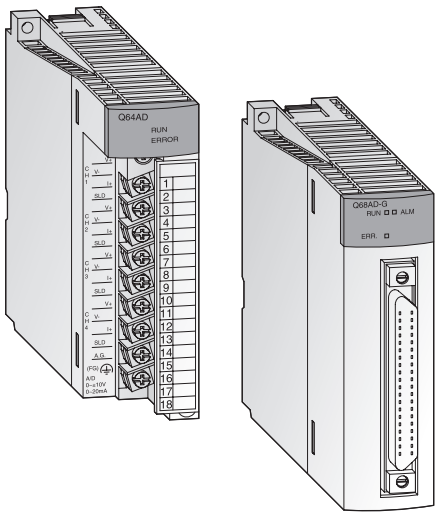
As an alternative to NAMUR sensors, contacts with an external resistor network can be used.

The ME1X16NA-Q can also monitor the sensor status (switched ON, switched OFF, wire break, short circuit, fluttering signal), and store the historical data of occurred events into an internal buffer.

- Input signal conditioning: short pulse discrimination (0–2 s), pulse stretching (0–2 s)
- Fault detection: short circuit detection, wire break detection, flutter detection
- Time stamping: trigger on input signal change, trigger on fault detection, time resolution 1 ms, buffer for 64 events with time information

| Specifications | | | ME1X16NA-Q |
|---|---|---|---|
| Number of NAMUR inputs | | | 16 |
| Sensor voltage (from internal power supply) | | V DC | 8.2 |
| ON current | | mA | >2.1 |
| OFF current | | mA | <1.2 |
| Hysteresis | | mA | 0.2 |
| Wire break detection current | | mA | <0.2 |
| Short circuit detection current | | mA | >7.5 |
| Maximum short circuit current | | mA | 8.9 |
| Response time | OFF to ON | | 3 ms/6 ms or less (configured in PLC parameter) (Default: 6 ms) |
| | ON to OFF | | |
| Time stamping | Resolution | ms | 1 |
| No. of occupied I/O points | | | 32 |
| Connection terminal | | | 40-pin connector |
| Dimensions (WxHxD) | | mm | 27.4x98x90 |
| **Order information** | | Art. no. | 257846 |
| **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
- Q64ADH has build-in logging function
- Flow amount integration function (Q64ADH only)
- 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 isolation
- Less space and wiring in the control panel required

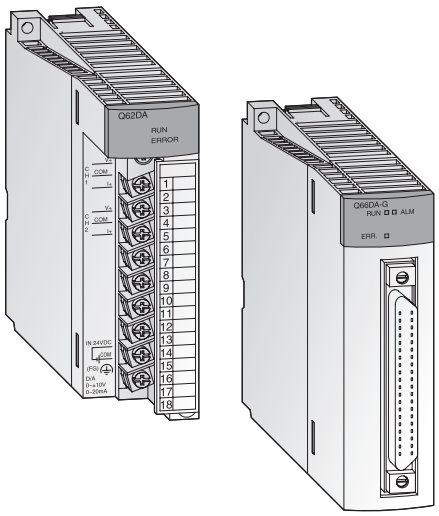
### HART compatible

The functionality of a HART Master station is integrated in the ME1AD8HAI-Q. It can communicate with up to 8 HART compatible devices.

## Input modules

| Specifications | | | Q62AD-DGH | Q64AD | Q64ADH | Q64AD-GH | Q66AD-DG | Q68AD-G | Q68ADV | Q68ADI | ME1AD8HAI-Q |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Input points | | | 2 | 4 | 4 | 4 | 6 | 8 | 8 | 8 | 8 |
| Analog input | voltage | V | — | -10 V–+10 | -10–+10 | -10 V–+10 | — | -10–+10 | -10–+10 | — | 0–+4 |
| | current | mA | 4–20 | 0–20 | 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 binary (incl. sign) | 16 bits signed binary |
| Load resistance | voltage | MΩ | — | 1 | 1 | 1 | — | 1 | 1 | — | — |
| | current | Ω | 250 | 250 | 250 | 250 | 250 | 250 | 250 | 250 | 250 |
| Max. input | voltage | V | — | ±15 | ±15 | ±15 | — | ±15 | ±15 | — | — |
| | current | mA | ±30 | ±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 | -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 | 1/12000, 1/22500 | ±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 | 200 µV | 62.5 µV | — | 0.333 mV | 1 mV | — | — |
| | current input | | 0.25 µA | 3.33 µA | 800 nA | 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) | ±0.2 % (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 | 40-pin connector | 40-pin connector | 18-point removable terminal block | 18-point removable terminal block | 18-point removable terminal block |
| I/O points | | | 16 | 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 | 27.4x98x90 |
| **Order information** | | Art. no. | 145036 | 129615 | 251331 | 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 isolation
- 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 incorrect wiring

### HART compatible

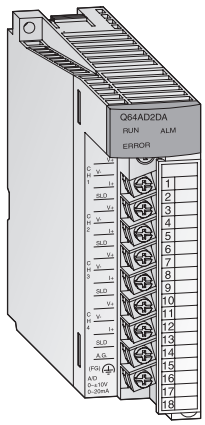
The functionality of a HART Master station is integrated in the ME1DA6HAI-Q. It can communicate with up to 6 HART compatible devices.



## Output modules

| Specifications | | | Q62DAN | Q62DA-FG | Q64DAN | Q66DA-G | Q68DAVN | Q68DAIN | ME1DA6HAI-Q |
|---|---|---|---|---|---|---|---|---|---|
| Output points | | | 2 | 2 | 4 | 6 | 8 | 8 | 6 |
| Digital input | | | -16384–+16383 | -16384–+16383 | -16384–+16383 | -16384–+16383 | -16384–+16383 | -16384–+16383 | -32768–+32767 |
| 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 | 0/4 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 | 50–600 Ω |
| Max. output | voltage | V | ±12 | ±13 | ±12 | ±13 | ±12 | — | — |
| | current | mA | 21 | 23 | 21 | 23 | — | 21 | 22 |
| 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 | 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 | 1/28000 |
| Maximum resolution | voltage output | | 0.333 mV | 0.183 mV | 0.333 mV | 0.210 mV | 0.333 mV | — | — |
| | current output | | 0.83 µA | 0.671 µA | 0.83 µA | 0.95 µA | — | 0.83 µA | 0.57 µA |
| Overall accuracy | | | ±0.1 % | ±0.1 % | ±0.1 % | ±0.1 % | ±0.1 % | ±0.1 % | 0.15 % |
| Max. conversion time | | | 80 µs/channel | 10 ms/2 channels | 80 µs/channel | 6 ms/channel | 80 µs/channel | 80 µs/channel | 70 ms |
| 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 | 18-point removable terminal block |
| I/O points | | | 16 | 16 | 16 | 16 | 16 | 16 | 32 |
| Dimensions (WxHxD) | | mm | 27.4x98x90 | 27.4x98x90 | 27.4x98x90 | 27.4x98x90 | 27.4x98x90 | 27.4x98x90 | 27.4x98x90 |
| **Order information** | | Art. no. | 200689 | 145037 | 200690 | 204677 | 200691 | 200692 | 236649 |

## Combined analog input/output module




**Q64AD2DA**

With the analog input/output module Q64AD2DA the user has a module that has both, four analog inputs and two analog outputs.

Selection of current or voltage input signal is possible for the analog inputs.

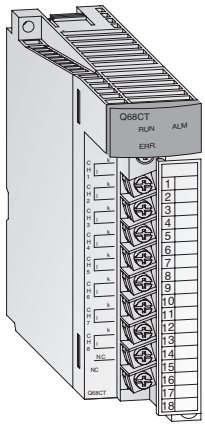
- Detection and output of voltage and current with only one module.
- Detection of analog signals with either standard or high resolution



| Specifications | | | Q64AD2DA |
|---|---|---|---|
| Input points | | | 4 |
| Analog input | voltage | V | -10–+10 |
| | current | mA | 0–+20 |
| Load resistance | voltage | MΩ | 1 |
| | current | Ω | 250 |
| Max. input | voltage | V | ±15 |
| | current | mA | ±30 |
| I/O characteristics | analog input | | -10–+10 V; 0–20 mA |
| | digital output | | ±1/4000, ±1/16000; ±1/4000, ±1/12000 |
| Max. resolution | voltage input | | 0.333 mV |
| | current input | | 0.83 µA |
| Accuracy | | | ±0.4 % (0–55 °C), ±0.1 % (20–30 °C) |
| Max. conversion time | | | 500 µs/channel |
| Output points | | | 2 |
| Digital input | | | -16384–+16383 |
| Analog output | voltage | V | -10–+10 |
| | current | mA | 0–+20 |
| Load resistance | voltage output | | 1 kΩ–1 MΩ |
| | current output | | 0–600 Ω |
| Max. output | voltage | V | ±12 |
| | current | mA | 21 |
| I/O characteristics | analog output | | -10–+10 V;<br>0–20 mA |
| | digital input | | ±1/4000, ±1/16000; ±1/4000, ±1/12000; |
| Max. resolution | voltage output | | 0.333 mV |
| | current output | | 1.33 µA |
| Accuracy | | | ±0.3 % (0–55 °C), ±0.1 % (20–30 °C) |
| Max. conversion time | | | 500 µs/channel |
| Connection terminal | | | 18-point removable terminal block |
| I/O points | | | 16 |
| Dimensions (WxHxD) | | mm | 27.4x98x90 |

| Order information | Art. no. | 229238 |
|---|---|---|

# Analog CT Input Module




**Current transformer module**

Up to eight current transformers can be connected directly to the analog CT input module Q68CT. External signal converters are not required anymore.

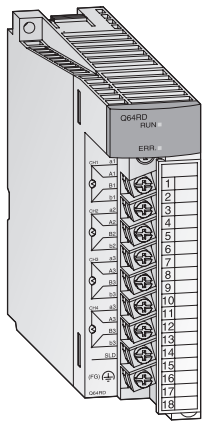
- CT sensors from 5 A AC to 600 A AC are connectable.
- High accuracy within +/-0.5 %
- Averaging calculation
- Maximum value/minimum value hold function
- Integrated scaling function
- Input signal monitoring with alarm output
- Peak current detection
- Integrated logging function



| Specifications | | Q68CT |
|---|---|---|
| Input points | | 8 |
| Analog input (via CT sensor) | | 5/50/100/200/400/600 A AC |
| Input frequency | | 50/60 Hz |
| Excessive input | | 200 % for 1 minute, 150 % continuously |
| Digital output | Converted current value | 0–10000 (12000) |
| | Scaling value | -32768–32767 |
| Max. resolution | | 0–5 A AC : 0.5 mA<br>0–50 A AC : 5 mA<br>0–100 A AC : 10 mA<br>0–200 A AC : 20 mA<br>0–400 A AC : 40 mA<br>0–600 A AC : 60 mA |
| Overall accuracy | | ±0.5 % |
| Minimum sampling cycle | | 10 ms/8 channels |
| Response time | | Max. 0.4 s |
| Insulation method | | Between input terminals and power supply: transformer. Between input channels: no isolation |
| I/O points | | 16 |
| Connection terminal | | 18-point removable terminal block with screws |
| Applicable wire size | $mm^2$ | 0.3–0.75 |
| Internal power consumption (5 V DC) | mA | 350 |
| Weight | kg | 0.19 |
| Dimensions (WxHxD) | mm | 27.4x98x112 |

| Order information | Art. no | 145036 |
|---|---|---|

## 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.

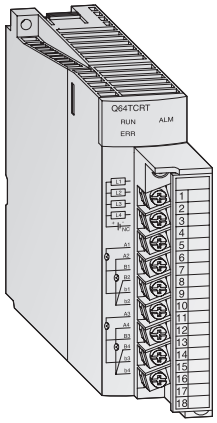
The temperature is determined by means of a thermocouple for the Q64TD, Q64TDV-GH and Q68TD-G-H01/H02

- 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 |
| Connection terminal | | All modules are fitted with a removable terminal block with 18 screw terminals. | | | | A6CON 40pin connector | |
| 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



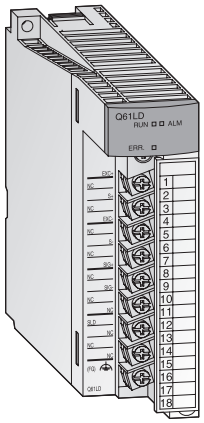

**Temperature control modules with PID algorithm**

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 | | Q64TCRTN | Q64TCRTBWN | Q64TCTTN | Q64TCTTBWN |
|---|---|---|---|---|---|
| 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 temperature sensors | | 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) | | | |
| Temperature control method | | PID ON/OFF impulse or 2-position control | | PID ON/OFF impulse or 2-position control | |
| Target value setting range | | Within the temperature range of the Pt100 sensor used | | Within the temperature range of the thermocouple used | |
| Dead band setting range | | 0.1–10.0 % | 0.1–10.0 % | 0.1–10.0 % | 0.1–10.0 % |
| Insulation method | | Transformer | Transformer | Transformer | Transformer |
| I/O points | | 16/1 slot | 32/2 slots | 16/1 slot | 32/2 slots |
| Connection terminals | | All modules are fitted with a terminal block with 18 screw terminals. | | | |
| Applicable wire size | $mm^2$ | 0.3–0.75 | 0.3–0.75 | 0.3–0.75 | 0.3–0.75 |
| Internal power consumption (5 V DC) | mA | 290 | 330 | 290 | 330 |
| Dimensions (WxHxD) | mm | 27.4x98x90 | 27.4x98x90 | 27.4x98x90 | 27.4x98x90 |
| **Order information** | Art. no. | 255456 | 255458 | 255455 | 255457 |

## Load cell input module

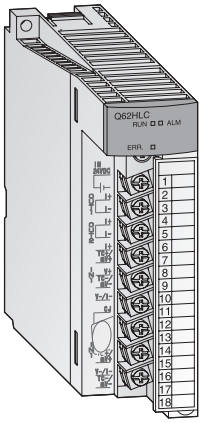



The load cell input module Q61LD can connect load cells directly to MELSEC System Q programmable controllers. External signal converters are no longer required.

- 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<br>0.0–2.0<br>0.0–3.0 |
| Load cell applied voltage | | 5 V DC ±5 %, Output current within 60 mA (Four 350 W load cells can be connected in parallel.)<br>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 removable terminal block |
| Applicable wire size | $mm^2$ | 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



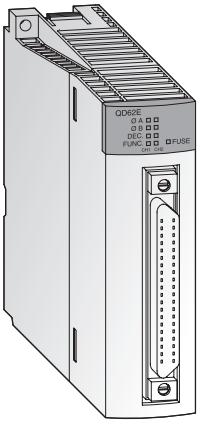

**For fast response control**

The Q62HLC loop control module uses a continuous proportional PID control format, which features a sampling period of 25 ms 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



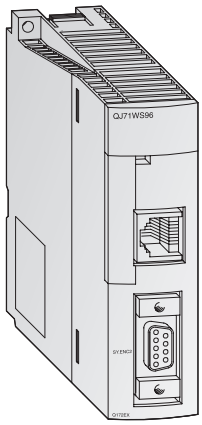

**High-speed counter with automatic detection of rotational direction**

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 bits binary: 0–99999999, 32 bits 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



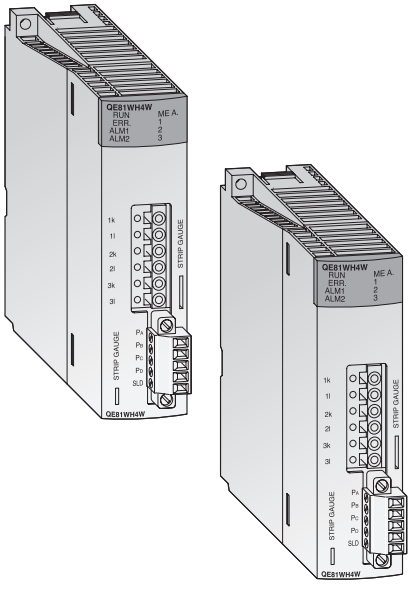

### QJ71WS96

The web server module QJ71WS96 enables the remote control monitoring of MELSEC 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 |
| RS232 communications data | interface | | RS232, 9-poles D-Sub |
| | transfer type | | Duplex |
| | synchronisations method | | Start/stop synchronisation |
| | transfer speed | Mbps | 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 CompactFlash 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 power measurement module




### QE81WH4W/QE83WH4W

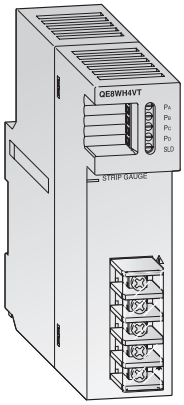
The power measurement modules QE81WH4W and QE83WH4W detect the voltage and current consumption of loads and calculate the power of the absorbed and emitted energy. This provides not only specific measures to conserve energy, but also optimizes the production processes, the preventive maintenance (e.g. at increased power consumption) and the active state control of loads (e.g. by monitoring the current consumption of heating systems).

- Direct connection of current transducers
- For voltage input the voltage converter QE8WH4VT is required.
- Space-saving installation on the base unit
- Saving of external measuring devices, wiring and communication modules
- Measured values are available directly in the PLC and can be evaluated or e.g. displayed on a GOT.
- Allows for easy power management

| Specifications | | QE81WH4W | QE83WH4W |
|---|---|---|---|
| Measuring circuit | phase wire system | 3-phase (4-wire) | |
| | rated voltage | 110 V AC, 480 V AC (When an optional external instrument transformer is used, voltages from 440 V to 6600 V can be measured.) | |
| | rated current | 5 A, 50 A, 100 A, 250 A, 400 A, 600 A (Using an optional external current transformer, currents up tp 6000 A can be measured.) | |
| | no. of circuits | 1 | 3 |
| Measured items | | Current, voltage, frequency, current demand*, active power, active power demand*, power factor, active energy (consumption, regenerative), reactive energy, energy consumption over a specified time period | |
| Accuracy | current, voltage, power | ±1.0 % | |
| | power factor | ±3.0 % | |
| | active energy | ±2 % (within 5 to 100% of rated range, power factor = 1) | |
| Buffer memory data update rate | | 250 ms | |
| Power failure compensation | | Settings and measured items are backed up in a non-volatile memory | |
| I/O points | | 16 | |
| Dimensions (WxHxD) | mm | 27.4x98x90 | 27.4x98x90 |
| **Order information** | Art. no. | 259456 | 259457 |

* "Demand" is the average movement within the specified time period.

## MELSEC System Q voltage converter



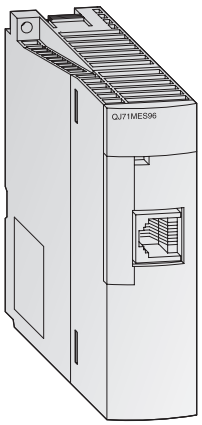

**QE8WH4VT**

The voltage converter QE8WH4VT is required for voltage input to a power measurement module Q81WH4W or QE83WH4W.

Up to five Power measurement modules can be connected to one QE8WH4VT.

| Specifications | | QE8WH4VT |
|---|---|---|
| Phase wire system | | 3-phase (4-wire) |
| Input voltage range | | 63.5/110 V to 277/480 V AC (cannot operate at less than 55/95 V AC) |
| Frequency | | 50/60 Hz |
| Voltage output permissible tolerance | | ±1.0 % (relative to rated primary voltage) |
| No. of connected units max. | | 5 |
| Consumption current | mA | 30 |
| Secondary-side cable length | | Max. 5 m |
| Mounting method | | DIN rail mounted, screw mounted |
| Dimensions (WxHxD) | mm | 27.4x98x90 |
| **Order information** | Art. no. | 259458 |

## MELSEC System Q MES interface module



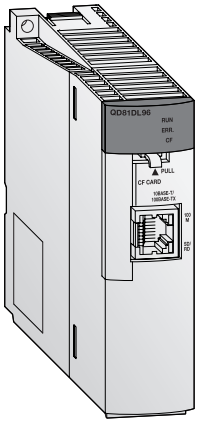

**QJ71MES96**

The MELSEC System Q 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 CompactFlash 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.

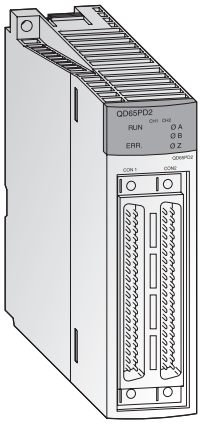
- Trigger logging function for accelerated problem analysis
- Data can be saved in list or report format to a CompactFlash Card
- Equipment error detection and failure prediction
- A single QD81DL96 module can access up to a maximum of 64 PLC CPUs

| 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) |
| CompactFlash 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 controller CPU, everyday (once in 24 hours); for SNTP server, re-obtains the time at the user specified interval.

## Multi-function counter/timer module




### High-speed counter/timer module with cam switch function

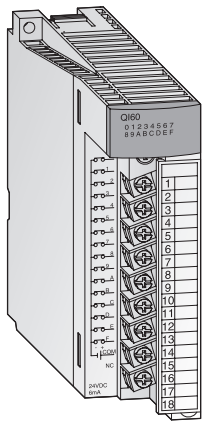
Due to its high-speed counter inputs, PWM outputs for control DC drives and the integrated cam switching function, the QD65PD2 is well suited for high precision positioning tasks.

- Max. counting speed up to 8 MHz
- Pulse measurement function with a resolution of 100 ns
- Precisely control PWM output up to 200 kHz
- The integrated cam switch function reduces the programming effort
- Integrated digital I/Os
- Connection via two 40-pin plug-in connectors with screws

| Specifications | | | QD65PD2 |
|---|---|---|---|
| Counter inputs | | | 2 |
| Signal levels | DC input | | 5/12/24 V DC (7–10 mA) |
| | Differential input | | Conforms to RS422A |
| Max. counting frequency | DC input | kHz | 200 |
| | differential input | kHz | 8000 |
| Counting range | | | 32 bits + sign (binary), -2147483648–+2147483647 |
| External digital input points | | | 6 phase Z inputs; function start and preset count 6 general purpose inputs |
| External digital output points | | | 8 coincidence outputs, which are activated by comparison of the count value with the user range 8 general purpose outputs |
| Cam switch | integrated outputs | | 8 |
| | program cycle period | | 1 ms |
| PWM outputs | output frequency | | DC to 200 kHz |
| | duty ratio | | Any ratio can be set (resolution: 0.1 µs) |
| Dimensions (WxHxD) | | mm | 27.4x98x90 |

| Order information | Art. no. | 245113 |
|---|---|---|

## Interrupt module and high-speed inputs



### Branching to subroutines

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

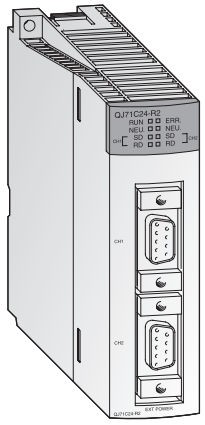
- Every input in this module is assigned to a pointer which serves as a breakpoint for a subroutine
- If an interrupt/alarm signal is applied at an input, the PLC program is interrupted after it has worked through the current statement and a subroutine assigned to the input is first processed
- Galvanic 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 System 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

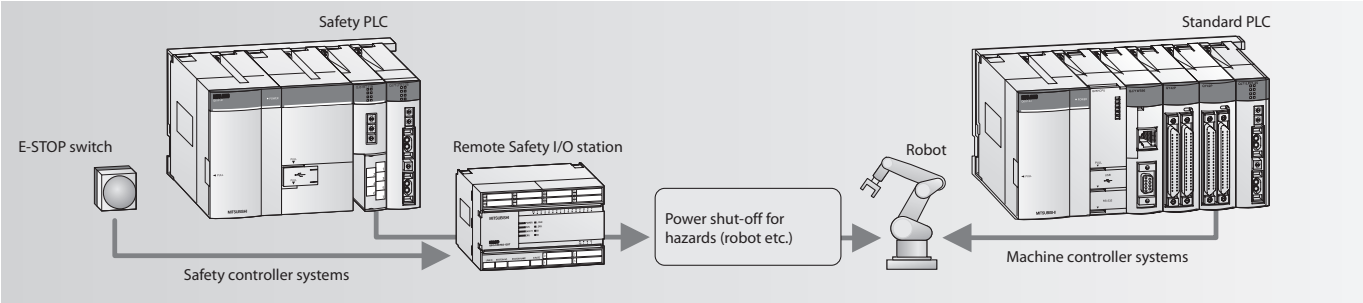
| Specifications | | | QJ71C24N | QJ71C24N-R2 | QJ71C24N-R4 | QJ71MB91 |
|---|---|---|---|---|---|---|
| Interface type | channel 1 | | RS232 (9-pin Sub-D) | RS232 (9-pin Sub-D) | RS422/RS485 (screw terminals) | RS232 (9-pin Sub-D) |
| | channel 2 | | RS422/RS485 (screw terminals) | RS232 (9-pin Sub-D) | RS422/RS485 (screw terminals) | RS422/RS485 (screw terminals) |
| 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 |
| Network configuration | | | RS232: 1:1; RS485: 1:1; 1:n; n:1; m:m | 1:1 | RS232: 1:1; RS485: 1:1; 1:n; n:1; m:m | 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 |

## 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.

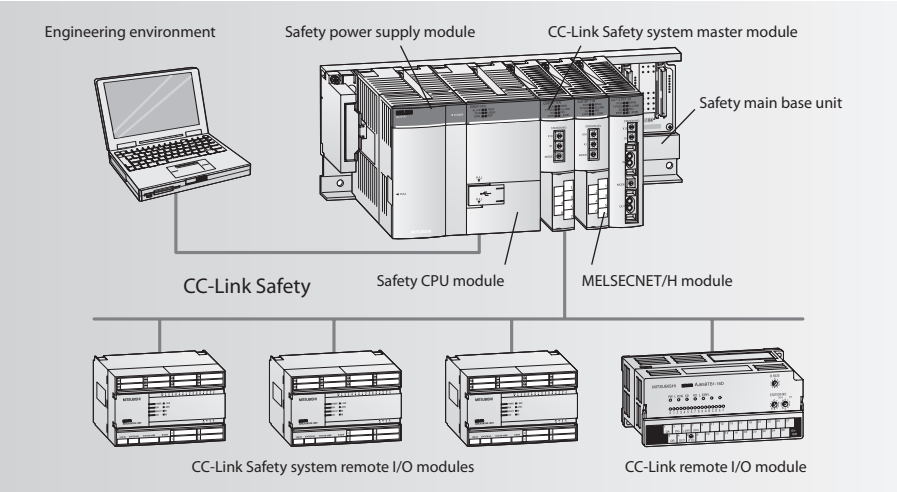



## CC-Link Safety

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



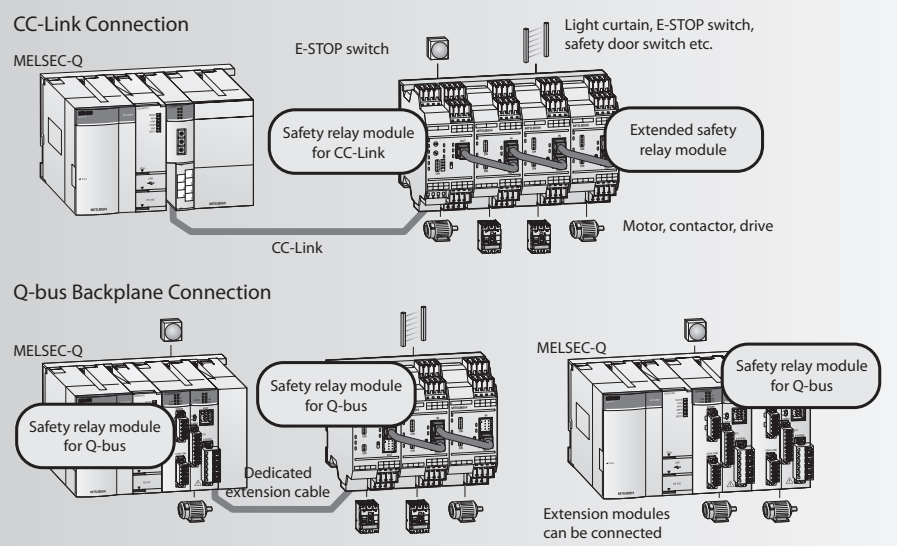

- Comprehensive diagnostics functions
- Versatile: A single Safety CPU can control up to 84 remote safety stations
- The CC-Link standard enables connection of third-party products compatible with the safety concept

| 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 |
| QS0J61BT12 | CC-Link Safety master module | 203209 |
| QS0J65BTB2-12DT | Safety remote I/O module, 8 dual safety inputs + 4 dual safety outputs | 203210 |
| QS0J65BTS2-8D | CC-Link Safety remote I/O module, 8 dual safety inputs | 217625 |
| QS0J65BTS2-4T | CC-Link Safety remote I/O module, 4 dual safety outputs | 217626 |
| QS0J71GF11-T2 | CC-Link Safety master module (local module) | 245177 |

## 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.

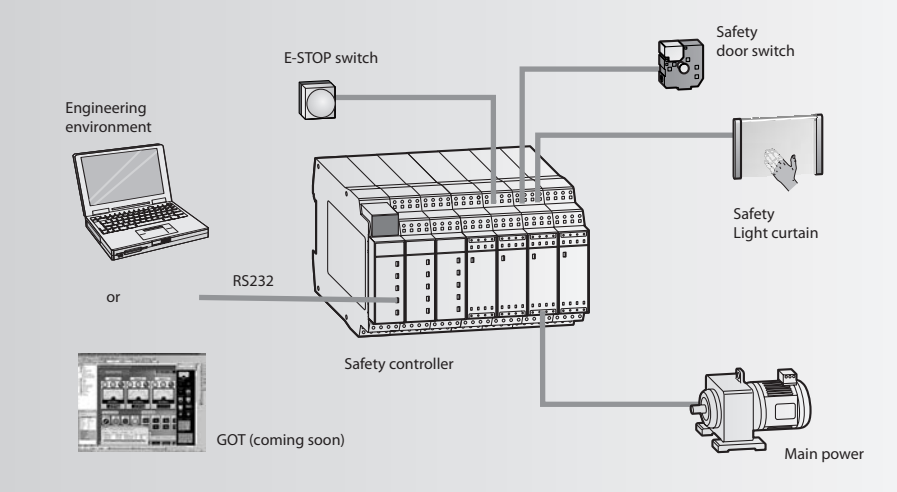
- The safety modules conform to the safety requirements of EN 954-1, Category 4 (2010: ISO 13849-1 PLe)
- Simple configuration without programming
- Easy retrofitting on existing systems
- The PLC monitors your safety functions, enabling fast diagnostics
- Extension modules allow easy modification




| 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

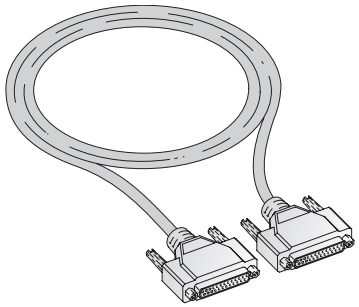
The MELSEC WS Safety Controller provides a cost effective way to add a safety controller capability to individual machines, or smaller scale systems. Mitsubishi Electric is proud to announce that the WS is a joint development with SICK AG of Germany, an acknowledged leader in the global machine safety 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 |
| | WS0-GCC100202 | Module for CC-Link communication | 235441 |
| Memory | WS0-MPL000201 | Memory plug | 230061 |
| Programming cable | WS0-C20R2 | Serial programming cable | 230062 |

# Accessories

## Connection cables



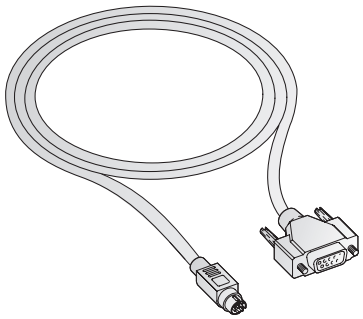
### Connection cable for extension units

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



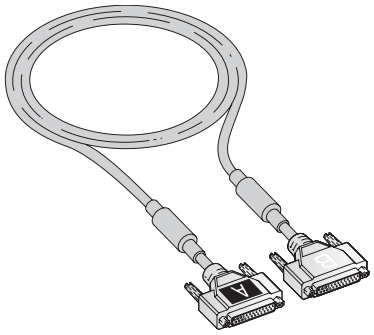
### Programming cable for RS232 interface

The QC30R2 and QC30-USB cables are used for programming a MELSEC System Q CPU via the RS232 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



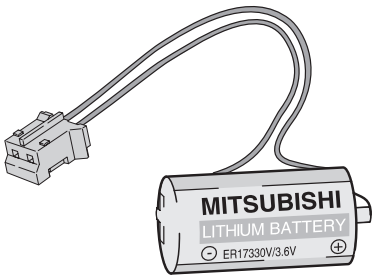
### Connection cable for redundant PLCs

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

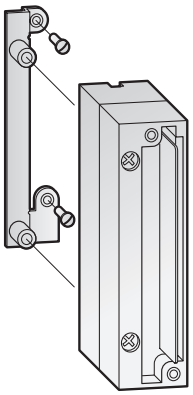



### Backup battery

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 |

## ERNT – Conversion adapters



**AnS series adapters -> MELSEC System Q**

These adapters enable a PLC of the MELSEC AnS or A series to be easily replaced by a MELSEC System Q PLC.

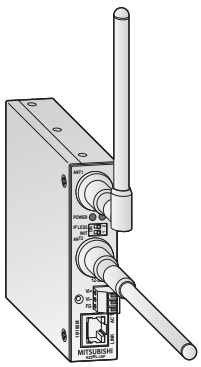
The terminal block adapters enable existing wiring for modules of the MELSEC AnS/A series to be connected to MELSEC System Q modules. The mounting adapters enable a MELSEC System Q base unit to be fitted using the existing fixing holes of the MELSEC AnS series.



| Item | Application | Art. no. |
|---|---|---|
| ERNT-ASQTXY10 | Terminal block A1SX10/A1SY10 to QX10/QY10 | 249093 |
| ERNT-ASQTX40 | Terminal block A1SX40(-S1/S2) to QX40(-S1) | 249094 |
| ERNT-ASQTX80 | Terminal block A1SX80(-S1/S2) to QX80 | 249135 |
| ERNT-ASQTY22 | Terminal block A1SY22 to QY22 | 249136 |
| ERNT-ASQTY40 | Terminal block A1SY40(P) to QY40P | 249137 |
| ERNT-ASQTY50 | Terminal block A1SY50 to QY50 | 249138 |
| ERNT-ASQTY80 | Terminal block A1SY80 to QY80 | 249139 |
| ERNT-ASQT64AD | Terminal block A1S64AD to Q64AD | 249140 |
| ERNT-ASQT68AD | Terminal block A1S68AD to Q68AD(V/I) | 249141 |
| ERNT-ASQT62DA | Terminal block A1S62DA to Q62DAN | 249142 |
| ERNT-ASQT68DA | Terminal block A1S68DA(V/I) to Q68DA(V/I)N | 249143 |
| ERNT-ASQB38 | Base unit A1S38(H)B to Q38B | 249144 |
| ERNT-ASQB35 | Base unit A1S35B to Q35B | 249145 |
| ERNT-ASQB33 | Base unit A1S33B to Q33B | 249146 |
| ERNT-ASQB00J | Base unit A1SJ(H)CPU(-S3) to Q00(U)JCPU | 249147 |
| ERNT-ASQB68 | Base unit A1S68B to Q68B | 249148 |
| ERNT-ASQB65 | Base unit A1S65B to Q65B | 249149 |
| ERNT-ASQB55 | Base unit A1S55B to Q55B | 249150 |

| Item | Application | Art. no. |
|---|---|---|
| ERNT-AQTY10A | Terminal block AY10A/AY11A/AY11AEU to QY18A (2 modules required) | 231670 |
| ERNT-AQTY13 | Terminal block AY13/AY13E/AY13EU to QY10 (2 modules required) | 231671 |
| ERNT-AQTY23 | Terminal block AY23 to QY22 (2 modules required) | 231672 |
| ERNT-AQTX11 | Terminal block AX11/AX11EU to QX10 (2 modules required) | 231673 |
| ERNT-AQTY51 | Terminal block AY51/AY51-S1 to QY50 (2 modules required) | 231674 |
| ERNT-AQT68AD | Terminal block A68AD/A68AD-S2 to Q68ADV/Q68ADI | 231705 |
| ERNT-AQT68ADN | Terminal block A68ADN to Q68ADV/Q68ADI | 231706 |
| ERNT-AQT62DA | Terminal block A62DA/A62DA-S1 to Q62DAN | 231707 |
| ERNT-AQT68DA | Terminal block A68DAV/A68DAI/A68DAI-S1 to Q68DAVN/Q68DAIN | 231708 |
| ERNT-AQTD61 | Terminal block AD61 to QD62 | 231709 |
| ERNT-AQT68AD-GH | Terminal block A68AD/A68AD-S2/A68ADN to Q64AD-GH (2 modules required) | 231710 |
| ERNT-AQT616AD | Terminal block A616AD to Q68ADV/Q68ADI (2 modules required) | 231711 |
| ERNT-AQT616DA | Terminal block A616ADV/A616ADI to Q68ADV/Q68ADI (2 modules required) | 231712 |

## Wireless LAN Adapter



**Wireless connection to networks**

With the wireless LAN adapter NZ2WL-EU, a PLC system can be wirelessly connected to a network (LAN). This shortens the configuration and connection process at end-user facilities. The adapter complies to directives IEEE 802.11 a/b/g and can be configured as an access point or station.

| Specifications | | | NZ2WL-EU |
|---|---|---|---|
| Wired LAN | Communications speed | | 10/100 Mbit/s |
| | Communications mode | | Half duplex/full duplex |
| | Number of interfaces | | 1 (10BASE-T/100BASE-TX) |
| 1 (10BASE-T/100BASE-TX) | Transmission method | | Conforms to IEEE802.11 a/b/c |
| | Communications speed | | 1–54 Mbit/s |
| External power consumption | Voltage | | 12–24 V DC |
| | Current | | Max. 0.4 A at 12 V DC, max. 0.2 A at 24 V DC |
| Dimensions (without aerial) (WxHxD) | | mm | 25x97x68 |
| Weight | | kg | 0.25 |

| Order information | Art. no | 249090 |
|---|---|---|

# Modular PLCs MELSEC L series

The MELSEC L series is a powerful but compact modular controller with many features built-in to the CPU itself. The rack-free design promotes high system flexibility with minimum form factor. Built-in Mini-B USB and Ethernet allow for easy communication, along with a built-in SD/SDHC memory slot for data logging and memory storage, and built-in digital I/O for simple high-speed counting and positioning functions.

The high-performance version CPU also includes a built-in CC-Link interface for Master/Local Station networking. This highly flexible architecture makes the MELSEC L series ideal for both stand-alone and networked machines.

- Rack-free design
- CPUs packed with comprehensive built-in features/functions
- Integrated data logging
- Built-in I/O features
- Communication and networking capabilities
- High-end 4/16-axis motion expansion possible using SSCNETIII

## Equipment features

The modular design of MELSEC L series allows flexible usage in a broad range of applications.

The following modules are available for assembling and expanding the system:

**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.

The built-in data logging function provides an easy way to collect information for trouble-shooting, performance evaluation, and other uses. The included configuration tool makes setting up the data logging function a breeze with a step-by-step wizard like interface.

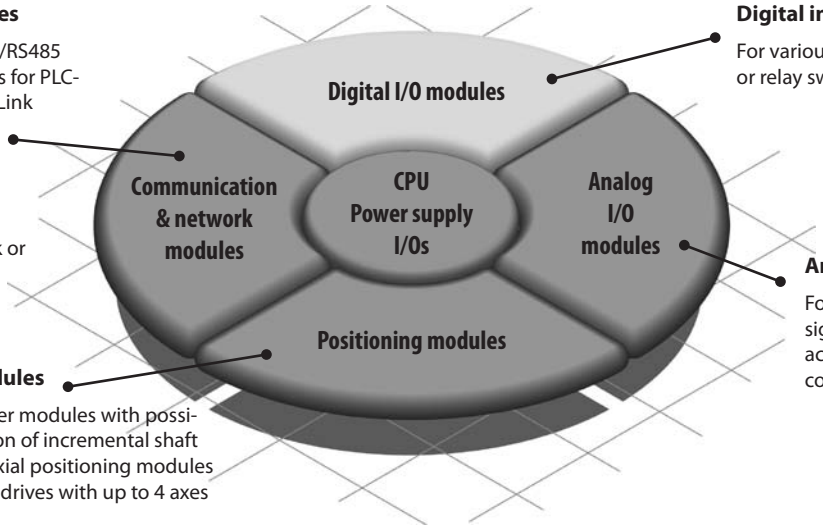
Using GX LogViewer, the captured data is easy to interpret and understand.

**Communications modules**

Modules with RS232/RS422/RS485 interface to connect devices for PLC-to-PLC communication. IO-Link module for the connection of intelligent sensors.

**Network modules**

For interfacing with CC-Link or CC-Link IE networks.




**Digital input/output modules**

For various signal levels with transistor, or relay switches.

**Analog input/output modules**

For processing current/voltage signals and for temperature value acquisition as well as temperature control.

**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 4 axes per module.

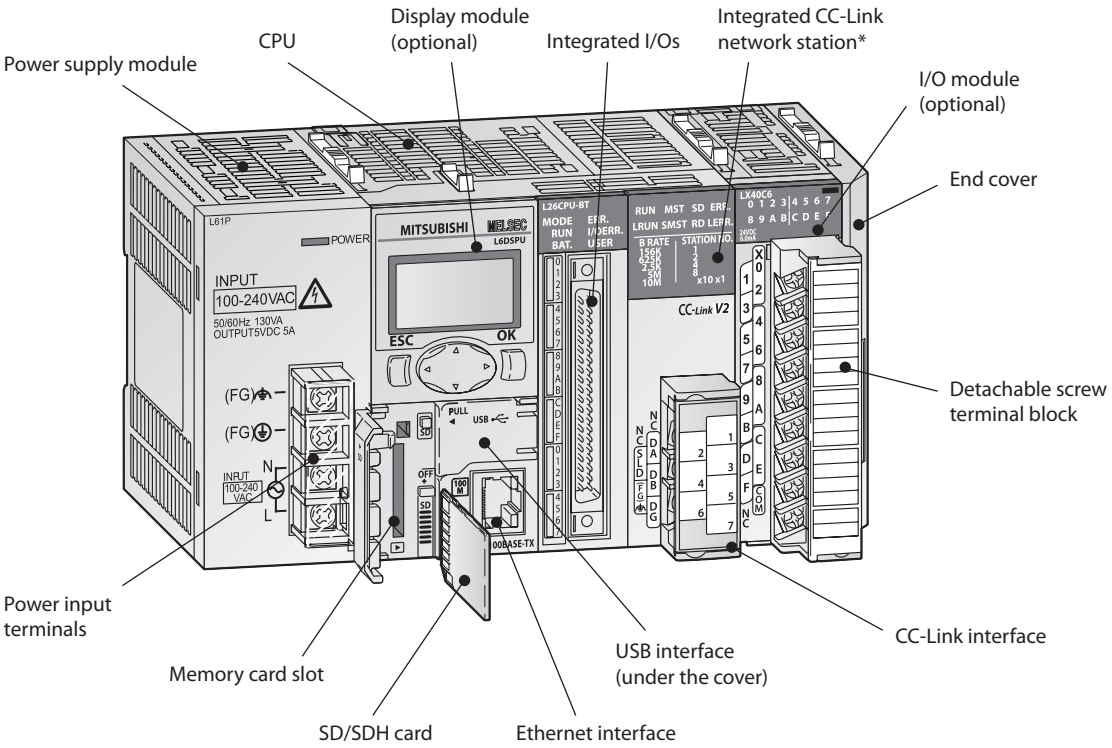
## Built-in I/O features

Every MELSEC L series CPU comes with 24 points of built-in I/Os as standard. These I/O points are capable of many functions usually reserved for separate modules. System costs can be saved by using the built-in functions rather than relying exclusively on additional modules.

| Function | | Features |
|---|---|---|
| Positioning* | Control of maximum two axes | Maximum speed: 200 kpulse/s<br>High-speed activation: 30 µs (shortest activation time)<br>S-curve acceleration and deceleration are supported |
| High-speed counter* | Two built-in channels | Maximum counting speed: 200 kpulse/s<br>Open collector, differential line driver input<br>High accuracy ON/OFF measurements with a resolution of 5 µs<br>High precision PWM control up to 200 kHz (High speed pulse output) |
| Pulse catch | 16 input points | Minimum input response time: 10 µs<br>Pulse signals whose ON time is shorter than the scan time can be detected. |
| Interrupt input | 16 interrupt input points | Built-in CPU provides high-speed processing.<br>All input points support interrupt inputs. |
| General input | 6 high-speed input points,<br>10 standard input points | Minimum input response time of high-speed input: 10 µs<br>Minimum input response time of standard input: 100 µs |
| General output | 8 output points | Output response time: 1 µs or less |

* Points used by the positioning and high speed counting functions are fixed (as in A phase, B phase, near-point dog). Custom points for these functions may not be assigned.

## What a system looks like




* High-performance CPU only

### System structure

The MELSEC L series is a powerful but compact modular controller with many features built-in to the CPU itself. The rack-free design promotes high system flexibility with minimum form factor. By connecting various types of modules, the system can be enhanced according to the application. Up to 10 expansion modules can be added per system configuration. As a baseless structure is employed, the space of the control panel can be used effectively without being limited by the size of the base.

MELSEC L series controllers are all-in-one programmable controllers that have the following functions built into the CPU module:

- 2 channels of high-speed counters up to 200 kHz
- Positioning possibilities for two axes, also up to 200 k pulses per second
- Built-in Ethernet communication
- Built-in I/Os which are available via a 40-pin high density connector supporting several I/O options
- High-speed data logging to the SD memory card
- CC-Link Ver. 2 Master/Slave interface (in the high-performance CPU)
- Full support in iQ Works and GX Works2

## What you need

### Power supply

This provides 5 V DC power for all modules on the back plane. There are two types of power supplies available, the selection is dependent on the available supply voltage.

### CPU

There are several CPU types for different applications available in a range of standard, middle and high performance. All CPUs come with built-in Mini-B USB and digital I/Os for simple high-speed counting and positioning functions. Most of the CPUs have also built-in Ethernet for easy communication, along with a built-in SD/SDHC memory slot for data logging and memory storage.

The high-performance version CPU also includes a CC-Link interface for Master/Local station networking.

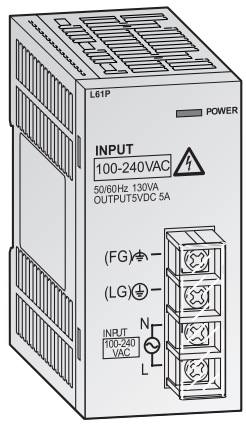
### I/Os

There is a wide selection of digital input and output modules depending on the signal level, sink or source designation and density of points required. 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.

### Special function modules

For special applications analog I/O and intelligent modules for motion, positioning, high-speed counting, communication, and networking are available.

## Power supply modules

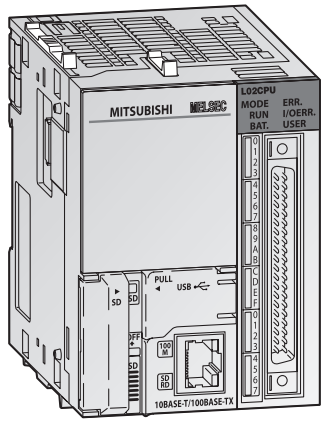



These units power the CPU and all connected modules. The choice is dependent on the input power that is available.

- The power module L61P can be used worldwide with it's wide input range from 100 to 240 V AC at 50/60 Hz.
- For applications powered by 24 V DC the L63P is used.
- LED indicator for operating status
- Screw terminals for power input on the front side

| Specifications | | | L61P | L63P |
|---|---|---|---|---|
| Input voltage | (+10 %, -15 %) | V AC | 100–240 | — |
| | (+30 %, -35 %) | V DC | — | 24 |
| Input frequency | | Hz | 50/60 (±5 %) | — |
| Inrush current | | | 20 A within 8 ms | 100 A within 1 ms (24 V DC input) |
| Max. input apparent power | | | 130 VA | — |
| Max. input power | | | — | 45 W |
| Rated output current (5 V DC) | | A | 5 | 5 |
| Overcurrent protection (5 V DC) | | A | ≥5.5 | ≥5.5 |
| Overvoltage protection | | V | 5.5–6.5 V | 5.5–6.5 V |
| Efficiency | | | ≥70 % | ≥70 % |
| Max. compensation time at power failure | | ms | Within 10 ms | Within 10 ms (24 V DC input) |
| Dimensions (WxHxD) | | mm | 45x90x109 | 45x90x109 |
| **Order information** | | Art. no. | 238063 | 238064 |

## CPU modules




The CPU modules are the heart of a MELSEC L series system and contain a diverse range of control functions. Every CPU comes with 24 points of built-in I/Os.

For many standard applications the L02CPU(-P) or L02SCPU(-P) is appropriate. When higher operation processing speed is needed the L06CPU(-P) or L26CPU(-P)(BT) is the right choice. The L26CPU(-P)(BT) provides the highest program capacity. This CPU provides furthermore a built-in CC-Link connectivity.

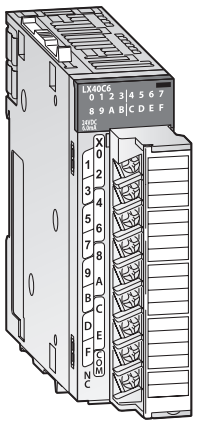
- High-speed processing
- Large memory capacity
- Integrated Data logging
- Integrated USB port for programming
- Integrated Ethernet interface for efficient network or PC communication
- SD card memory slot for quick and easy back-up of programs and parameters

| Specifications | | | L02SCPU/ L02SCPU-P | L02CPU/ L02CPU-P | L06CPU/ L06CPU-P | L26CPU/ L26CPU-P | L26CPU-BT/ L26CPU-PBT |
|---|---|---|---|---|---|---|---|
| Control method | | | Stored program repeat operation | | | | |
| Number of I/O points | | | 1024/8192* | 1024/8192* | 4096/8192* | 4096/8192* | 4096/8192* |
| Programming language | | | Function block, relay symbol language, MELSAP3 (SFC), MELSAP-L, structured text (ST), logic symbolic language | | | | |
| Basic operation processing speed | | | 60 ns | 40 ns | 9.5 ns | 9.5 ns | 9.5 ns |
| Program size (no. of steps) | | | 20 k | 20 k | 60 k | 260 k | 260 k |
| Memory capacity | program memory | byte | 80 k | 80 k | 240 k | 1040 k | 1040 k |
| | memory card | | — | Depends on the SD/SDHC memory card used | | | |
| | standard RAM | byte | 128 k | 128 k | 768 k | 768 k | 768 k |
| | standard ROM | byte | 512 k | 512 k | 1024 k | 2048 k | 2048 k |
| Built-in functions | integrated I/Os | | 16 inputs (24 V DC)/8 outputs (5–24 V DC, 0.1 A per channel) ① | | | | |
| | data logging | | 10 data logging settings (for each any of 32–4832 kB can be specified) | | | | |
| | communication | | RS232 | 10 BASE-T/100 BASE-TX (10/100 Mbps) | | | |
| | | | USB | USB | USB | USB | USB |
| | CC-Link connectivity | | — | — | — | — | CC-Link Master/ Local station (up to 10 Mbps) |
| Dimensions (WxHxD) | | mm | 70x90x95 | 70x90x95 | 70x90x95 | 98.5x90x118 | 98.5x90x118 |
| **Order information** | | Art. no. | 238057/244976 | 263070/** | 263068/** | 263069/** | 238056/244977 |

* number of points available on a program ** on request

① Model name with "P": source type digital output, model name without "P": sink type digital output.

# Digital input modules



### Detection of digital input signals

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

All models are capable of using both positive or negative common connections, so that separate modules are not necessary.

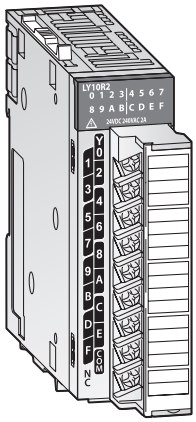
- Indication of input status via LED
- Positive/negative common
- Response time 1 to 70 ms
- Modules with 16, 32 or 64 input points available



| Specifications | | | LX40C6 | LX10 | LX41C4 | LX28 | LX42C4 |
|---|---|---|---|---|---|---|---|
| Number of input points | | | 16 | 16 | 32 | 8 | 64 |
| Rated input voltage | | V DC | 20.4–28.8 | 100–120 V AC, 50/60 Hz | 20.4–28.8 | 100–240 V AC, 50/60 Hz | 20.4–28.8 |
| Rated input current | | mA | 6.0 | 8.2 (100 V AC, 60 Hz)<br>6.8 (100 V AC, 50 Hz) | 4.0 | 16.4 (200 V AC, 60 Hz)<br>13.7 (200 V AC, 50 Hz)<br>8.2 (100 V AC, 60 Hz)<br>6.8 (100 V AV, 50 Hz) | 4.0 |
| Input derating (for rated voltage) | | | 100 % | 100 % (at 50 °C) | 100 % | 100 % (at 50 °C) | 100 % (at 35 °C) |
| ON | voltage | V | ≥15 | ≥80 | ≥19 | ≥80 | ≥19 |
| | current | mA | ≥4 | ≥5 | ≥3 | ≥5 | ≥3 |
| OFF | voltage | V | ≤8 | ≤30 | ≤9 | ≤30 | ≤9 |
| | current | mA | ≤2 | ≤1.7 | ≤1.7 | ≤1.7 | ≤1.7 |
| Response time | | ms | ≤1–70 ① | OFF ⟶ ON: ≤15<br>ON ⟶ OFF: ≤20 | ≤1–70 ① | OFF ⟶ ON: ≤10<br>ON ⟶ OFF: ≤20 | ≤1–70 ① |
| Inputs per group: | | | 16 | 16 | 32 | 16 | 32 |
| I/O points | | | 16 | 16 | 32 | 16 | 64 |
| Status display for the inputs | | | As operation indicator, all modules are equipped with a LED for each input. | | | | |
| Connection terminal | | | 18-point removable terminal block with screws | 18-point removable terminal block with screws | 40-pin connector | 18-point removable terminal block with screws | 40-pin connector x 2 |
| Internal power consumption (5 V DC) | | mA | 90 | 90 | 100 | 80 | 120 |
| Weight | | kg | 0.15 | 0.17 | 0.11 | 0.15 | 0.12 |
| Dimensions (WxHxD) | | mm | 28.5x90x117 | 28.5x90x117 | 28.5x90x95 | 28.5x90x117 | 28.5x90x95 |
| **Order information** | | Art. no. | 238085 | 255566 | 238086 | 255567 | 238087 |

① Can be changed in the PLC parameters (Default: 10 ms)

# Digital output modules



### Switching of external processes and devices

The MELSEC L series output modules have different number of outputs and different switching elements for adaptation to many control tasks.

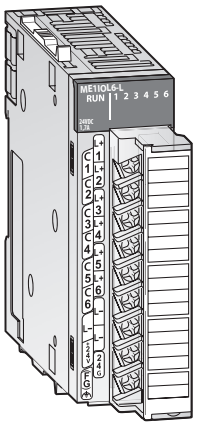
Modules are built with countermeasures in case of external load short-circuits to protect against over-current and overheating.

- Indication of output status via LED
- Sink and source type modules available
- Response time less than 0.5 ms for transistor output modules
- Modules with 16, 32 or 64 output points available



| Specifications | LY10R2 | LY20S6 | LY40NT5P | LY41NT1P | LY42NT1P | LY40PT5P | LY41PT1P | LY42PT1P |
|---|---|---|---|---|---|---|---|---|
| Number of output points | 16 | 16 | 16 | 32 | 64 | 16 | 32 | 64 |
| Output type | Relay | Triac | Transistor (sink type) | Transistor (sink type) | Transitor (sink type) | Transistor (source type) | Transistor (source type) | Transistor (source type) |
| Outputs in groups of | 16 | 16 | 16 | 32 | 32 | 16 | 32 | 32 |
| Rated load voltage | 24 V DC/240 V AC | 100–240 V AC, 50/60 Hz | 24 V DC | 24 V DC | 24 V DC | 24 V DC | 24 V DC | 24 V DC |
| Max. switching load A | 2 (8 common) | 0.6 (4.8 common) | 0.5 (5 common) | 0.1 (2 common) | 0.1 (2 common) | 0.5 (5 common) | 0.1 (2 common) | 0.1 (2 common) |
| Response time OFF ⟶ ON | ≤10 | Total of 1 ms and 0.5 cycles or less | ≤0.5 | ≤0.5 | ≤0.5 | ≤0.5 | ≤0.5 | ≤0.5 |
| Response time ON ⟶ OFF | ≤12 | Total of 1 ms and 0.5 cycles or less (resistive load) | ≤1 | ≤1 | ≤1 | ≤1 | ≤1 | ≤1 |
| Load voltage range | <125 V DC/ <264 V AC | 85–264 V AC | 10.2–28.8 V DC | 10.2–28.8 V DC | 10.2–28.8 V DC | 10.2–28.8 V DC | 10.2–28.8 V DC | 10.2–28.8 V DC |
| Protective functions | — | — | Overload protection function, overheat protection function | | | | | |
| I/O points | 16 | 16 | 16 | 32 | 64 | 16 | 32 | 64 |
| Status display for the outputs | As operation indicator, modules with 16 or 32 outputs are equipped with a LED for each output. Modules with 64 outputs have a switchable display with 32 LEDs. | | | | | | | |
| Connection terminal | 18-point removable terminal block with screws | 18-point removable terminal block with screws | 18-point removable terminal block with screws | 40-pin connector | 40-pin connector x 2 | 40-pin connector | 40-pin connector | 40-pin connector x 2 |
| External power supply of the module | — | — | 10.2–28.8 V DC, 9 mA | 10.2–28.8 V DC, 13 mA | 10.2–28.8 V DC, 9 mA | 10.2–28.8 V DC, 17 mA | 10.2–28.8 V DC, 20 mA | 10.2–28.8 V DC, 20 mA |
| Internal power consumption 5 V DC) mA | 460 | 300 | 100 | 140 | 190 | 100 | 140 | 190 |
| Weight kg | 0.21 | 0.22 | 0.15 | 0.11 | 0.12 | 0.15 | 0.11 | 0.12 |
| Dimensions (WxHxD) mm | 28.5x90x117 | 28.5x90x117 | 28.5x90x95 | 28.5x90x95 | 28.5x90x95 | 28.5x90x95 | 28.5x90x95 | 28.5x90x95 |
| **Order information** Art. no. | 238088 | 255568 | 242167 | 238089 | 238090 | 242168 | 242169 | 242170 |

## IO-Link Module




### Master module for I/O Link

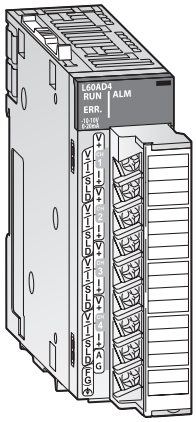
IO-Link is an extension of conventional digital inputs and outputs and allows the connection of intelligent sensors and actuators to a PLC. The 32-byte input and output data for each device are transmitted over standard cables, special bus cables or communication settings are not necessary.

- Master module for up to six IO-Link devices
- Each channel of the ME1IOL6-L can also be configured as a normal digital input or output.
- Masking of input data simplifies the data processing by the PLC CPU
- At a stop of the PLC CPU, the output states can either be deleted or retained.
- The parameterized device configuration is checked at the beginning of the IO-Link communication and deviations are detected.
- Storage of the parameters of the IO-Link devices allows the rapid exchange of the device

| Specifications | | ME1IOL6-L |
|---|---|---|
| No. of channels | | 6 |
| Channel configuration | | IO-Link, digital output, digital input, disabled |
| IO-Link | rated load voltage | 24 V DC |
| | rated output current | 15 mA |
| | sensor/actuator power supply | 200 mA |
| Digital input | common point | Positive |
| | rated load voltage | 24 V DC |
| | rated input current | 5 mA |
| | input filter | 200 µs |
| Digital output | rated load voltage | 24 V DC |
| | output type | Source |
| Rated output current | | In total max. 215 mA |
| Actuator supply | | In total max. 215 mA |
| Protective functions | | Overcurrent, overload, short circuit |
| I/O points | | 32 |
| Connection terminal | | 18-point removable terminal block with screws |
| Applicable cables | cable type | Unshielded cable |
| | max. length | 20 m |
| | cross-section | 0.3–0.75 mm² |
| External power consumption | voltage | 24 V DC (+20 %, -15 %) |
| | current | Max. 1.7 A |
| Weight | kg | 0.18 |
| Dimensions (WxHxD) | mm | 28.5x90x117 |

| Order information | Art. no. | 245825 |
|---|---|---|

## Analog input modules



### Analog to digital conversion

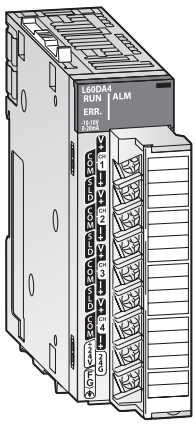
The analog input module converts analog process signals, for example pressure, flow or fill level, linearly into digital values, which are further processed by the MELSEC L series CPU.

- High-speed conversion of 20 µs/channel
- High conversion accuracy of +/-0.1 %
- High resolution of 1/20000
- Ensured stability with variable conversion speed
- Easy parameter setting

| Specifications | | | L60AD4 | L60AD4-2GH |
|---|---|---|---|---|
| Input points | | | 4 | 4 |
| Analog input | voltage | V DC | -10–10 | -10–10 |
| | current | mA DC | 0–20 | 0–20 |
| Digital output | | | -20480–20479 (-32768–32767)* | -32000–32000 (-32768–32767)* |
| Load resistance | voltage | MΩ | 1 | 1 |
| | current | Ω | 250 | 250 |
| Max. input | voltage | V | ±15 | ±15 |
| | current | mA | 30 | 30 |
| I/O characteristics (digital value) | voltage | | -20000–20000 | -32000–32000 |
| | current | | 0–20000 | 0–32000 |
| Max. resolution | voltage input | µV | 200 | 125 |
| | current input | nA | 800 | 500 |
| Overall accuracy | | | ±0.1 % | ±0.05 % |
| Conversion speed | | | 20 µs/channel | 40 µs/2 channels |
| Number of occupied I/O points | | | 16 | 16 |
| Connection terminal | | | 18-point removable terminal block | 18-point removable terminal block |
| Internal current consumption | | mA | 520 | 760 |
| Dimensions (WxHxD) | | mm | 28.5x90x117 | 28.5x90x117 |
| **Order information** | | Art. no. | 238091 | 263071 |

* Value in brackets when using the scaling function

## Analog output modules



### Digital to analog conversion

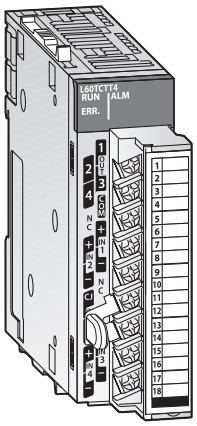
The analog output module converts digital values predetermined by the CPU into analog current or voltage signal.

- High-speed conversion of 20 µs/channel
- High conversion accuracy of +/-0.1 %
- High resolution of 1/20000
- Easy parameter setting
- Integrated scaling function

| Specifications | | | L60DA4 |
|---|---|---|---|
| Output points | | | 4 |
| Digital input | | | -20480–20479 (-32768–32767)* |
| Analog output | voltage | V DC | -10–10 |
| | current | mA DC | 0–20 |
| Load resistance | voltage | MΩ | 0.001–1 |
| | current | Ω | 0–600 |
| I/O characteristics | digital value | | -20000–20000 |
| Max. resolution | voltage input | µV | 200 |
| | current input | nA | 700 |
| Overall accuracy | | | ±0.1 % |
| Conversion speed | | | 20 µs/channel |
| Number of occupied I/O points | | | 16 |
| Connection terminal | | | 18-point removable terminal block |
| Internal current consumption | | mA | 160 |
| Dimensions (WxHxD) | | mm | 28.5x90x117 |
| **Order information** | | Art. no. | 238092 |

* Value in brackets when using the scaling function

## Temperature control modules




**Temperature control modules with PID algorithm**

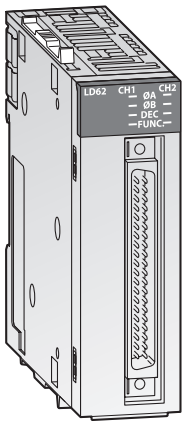
These modules apply the independent control of temperatures. This relieves the CPU of the PLC.

- 4 channels for temperature detection and 4 separate loops of temperature adjustment per module
- Modules for thermocouples and for Pt100 resistance thermometers are available
- Auto tuning function for optimum temperature adjustment control (PID control)
- The modules or single channels of a module can also be used for temperature detection.
- Temperature control can continue even when the PLC program is stopped
- Heating current monitoring at modules L60TCTT4BW and L60TCRT4BW to detect a defective or disconnected heater.
- The modules can be used for heating and cooling applications.



| Specifications | | | L60TCTT4 | L60TCRT4 | L60TCTT4BW | L60TCRT4BW |
|---|---|---|---|---|---|---|
| Control output | | type | Transistor | Transistor | Transistor | Transistor |
| Inputs | | | 4 channels per module | 4 channels per module | 4 channels per module | 4 channels per module |
| Supported temperature sensors | | | Thermocouple | Pt100 resistance thermometer | Thermocouple | Pt100 resistance thermometer |
| Sampling cycle | | | 250 ms/4 channels | 250 ms/4 channels | 250 ms/4 channels | 250 ms/4 channels |
| Control output cycle | | s | 0.5–100 | 0.5–100 | 0.5–100 | 0.5–100 |
| Input filter | | | 1–100 s (0 s: input filter OFF) | | | |
| Temperature control method | | | PID ON/OFF impulse or 2-position control | | | |
| PID constant range | PID constant setting | | Setting with automatic tuning possible | | | |
| | proportional band P | | 0.0–1000 % (0 %: 2-position control) | | | |
| | integral time I | | 1–3600 s (set 0 for P control and PD control) | | | |
| | differential time D | | 1–3600 s (set 0 for P control and PI control) | | | |
| Target value setting range | | | Within the temperature range set in the thermocouples/resistance thermometers used | | | |
| Dead band setting range | | | 0.1–10.0 % | 0.1–10.0 % | 0.1–10.0 % | 0.1–10.0 % |
| Transistor output | output signal (sink) | | ON/OFF pulse | ON/OFF pulse | ON/OFF pulse | ON/OFF pulse |
| | rated load voltage | | 10–30 V DC | 10–30 V DC | 10–30 V DC | 10–30 V DC |
| | max. load current | | 0.1 A/1 point, 0.4 A/common | 0.1 A/1 point, 0.4 A/common | 0.1 A/1 point, 0.4 A/common | 0.1 A/1 point, 0.4 A/common |
| | max. rush current | | 400 mA for 10 ms | 400 mA for 10 ms | 400 mA for 10 ms | 400 mA for 10 ms |
| | max. voltage drop when ON | | 0.1 V DC (TYP) 0.1 A<br>2.5 V DC (MAX) 0.1 A | 0.1 V DC (TYP) 0.1 A<br>2.5 V DC (MAX) 0.1 A | 0.1 V DC (TYP) 0.1 A<br>2.5 V DC (MAX) 0.1 A | 0.1 V DC (TYP) 0.1 A<br>2.5 V DC (MAX) 0.1 A |
| | response time | | OFF R ON: <2 ms<br>ON R OFF: <2 ms | OFF R ON: <2 ms<br>ON R OFF: <2 ms | OFF R ON: <2 ms<br>ON R OFF: <2 ms | OFF R ON: <2 ms<br>ON R OFF: <2 ms |
| Insulation method | | | Transformer between input channels and the power supply and between the inputs | | | |
| I/O points | | | 16 | 16 | 16 | 16 |
| Connection terminals | | | All modules are fitted with a terminal block with 18 screw terminals. | | | |
| Applicable wire size | | mm2 | 0.3–0.75 | 0.3–0.75 | 0.3–0.75 | 0.3–0.75 |
| Internal power consumption (5 V DC) | | mA | 300 | 310 | 330 | 350 |
| Weight | | kg | 0.18 | 0.18 | 0.33 | 0.33 |
| Dimensions (WxHxD) | | mm | 28.5x90x117 | 28.5x90x117 | 57x90x117 | 57x90x117 |
| **Order** information | | Art. no. | 246347 | 246348 | 246349 | 246350 |

## High-speed counter modules



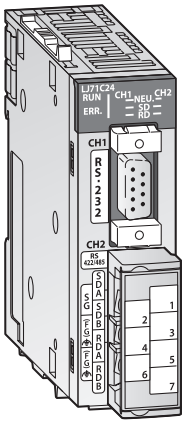

### Fast signal counting

The counter modules detect high-frequency signals, which cannot be handled by normal input modules.

- Periodic pulse counter function
- High-speed pulse measurement of up to 500 k pulses/s (LD62D)
- Linear and latch counter
- Ring counter function for counting up to a predefined value with automatic resetting to the start value
- Coincidence output function
- Easy configuration of the modules with GX Works2

| Specifications | | | LD62 | LD62D |
|---|---|---|---|---|
| Counter inputs (channels) | | | 2 | 2 |
| Count input signal | phase | | 1-phase input (multiple of 1/2), CW/CCW, 2-phase input (multiple of 1/2/4) | |
| | signal level | | 5/12/24 V DC (2–5 mA) | EIA standard RS422A differential type line driver |
| Max. counting frequency | | kHz | 200 | 500 |
| Counting range | | | 32 bits + sign (binary), -2147483648–+2147483647 | 32 bits + sign (binary), -2147483648–+2147483647 |
| Max. counting speed | | kHz | 200, 100 or 10 | 500, 200, 100 or 10 |
| Counting functions | | | UP/DOWN preset counter and ring counter | |
| Connection terminal | | | 40-pin connector | 40-pin connector |
| Number of occupied I/O points | | | 16 | 16 |
| Internal current consumption | | mA | 310 | 360 |
| Dimensions (WxHxD) | | mm | 28.5x90x95 | 28.5x90x95 |
| **Order information** | | Art. no. | 238097 | 238098 |

## Interface modules




### Data exchange with peripheral devices

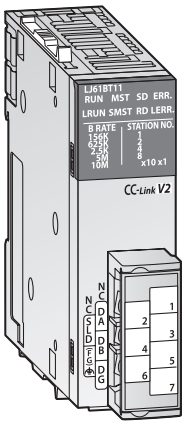
These modules enable communication with peripheral devices via a standard serial interface.

The LJ71C24 provides one RS232 and one RS422/485 interface and the LJ71C24-R2 provides two RS232 interfaces.

- Maximum transmission speed of 230.4 kbps
- Quick connection using pre-defined protocols included in GX Works2
- Easy to define custom protocols
- Enhanced debugging and support functions

| Specifications | | | LJ71C24 | LJ71C24-R2 |
|---|---|---|---|---|
| Interface type | channel 1 | | RS232-compliance (D-Sub 9P female) | RS232-compliance (D-Sub 9P female) |
| | channel 2 | | RS422/485-compliance (2-piece terminal block) | RS232-compliance (D-Sub 9P female) |
| Communications mode | | | Full duplex/half duplex | |
| Synchronisation | | | Start-stop synchronization method | |
| Data transfer | rate | bps | 50–230400 (channel 1 only) 115200 (channel 1+2 simultaneously) | |
| | distance | m | RS232: 15; RS422/485: 1200 | 15 |
| Max. no of stations in a multidrop network | | | No restrictions/64 | No restrictions/64 |
| Data format | | | 1 start bit, 7 or 8 data bits, 1 or 0 parity bits, 1 or 2 stop bits | |
| 1 or 2 stop bits | | | RS232 enabled, RS422/485 disabled | |
| Error detection | | | Parity check, checksum | |
| DTR/DSR and RS/CD control | | | RS232 enabled, RS422/485 disabled | |
| CD signal control | | | RS232 enabled, RS422/485 disabled | |
| X ON/X OFF (DC1/DC3), DC2/DC4 | | | RS232 enabled, RS422/485 enabled | |
| Number of occupied I/O points | | | 32 | 32 |
| Internal current consumption | | mA | 390 | 260 |
| Dimensions (WxHxD) | | mm | 28.5x90x95 | 28.5x90x95 |
| **Order information** | | Art. no. | 238093 | 238094 |

## CC-Link/CC-Link IE Field modules




### The gateway to CC-Link

CC-Link network enables the controlling and monitoring of decentralized I/O modules at the machine. The CC-Link master/slave module LJ61BT11 makes the MELSEC L series fully compatible with CC-Link.

With a large selection of CC-Link open network compatible devices, constructing a control system is easy.

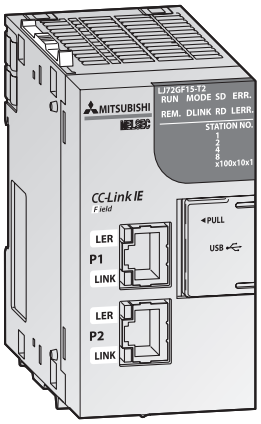
Even applications requiring vast amounts of data transmissions can be satisfied because CC-Link Version 2 is supported.

- Can be used as Master or Local station
- A huge selection of device types using CC-Link can be connected.
- With the transmission speed auto-tracking function local stations do not require transmission speed setting
- Up to 8192 addressable remote I/O points
- Maximum transmission speed of 10 Mbps
- Standby master station function

| Specifications | | | LJ61BT11 |
|---|---|---|---|
| Module type | | | Master/Slave |
| Max. no. of connected stations | | | 64 |
| Max. overall cable distance | | m | 1200 (without repeater) |
| No. of occupied stations | | | 1–4 stations |
| Max. number of link points | per system | | 2048 (8192)* |
| | per station | | 32 |
| Transmission speed | | | 156 kbps/625 kbps/2.5 Mbps/5 Mbps/10 Mbps |
| Transmission path | | | Bus (RS485) |
| Number of occupied I/O points | | | 32 |
| Internal current consumption | | mA | 460 |
| Dimensions (WxHxD) | | mm | 25.5x90x118 |

| Order information | Art. no. | 238099 |
|---|---|---|

* Link points in remote net ver. 2 mode or remote net additional mode




### CC-Link IE field network head module

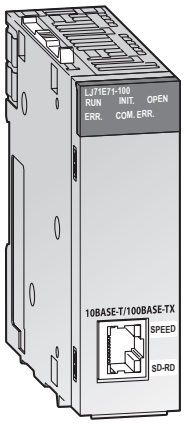
MELSEC L series I/O and intelligent function modules can be connected to the remote I/O head module without a dedicated CPU. There are many benefits to using intelligent device stations including reduced CPU and wiring costs, great flexibility in selecting I/O and intelligent function modules, and compact unit size.

- Intelligent device station
- Up to 2048 addressable remote I/O points
- Maximum transmission speed of 1 GB/s
- RAS functions (Reliability, Availability, Serviceability) for system monitor, remote RESET and self diagnostics
- A huge selection of CC-Link compatible devices can be connected.

| Specifications | | | LJ72GF15-T2 |
|---|---|---|---|
| Module type | | | Intelligent device station |
| Max. no. of connected stations | | | 120 |
| Max. overall cable distance | | m | 12000 (with 120 slave stations connected) |
| Max. station to station distance | | m | 100 |
| Max. number of link points | per network | | 16384 |
| | per station | | 2048 |
| Transmission speed | | | 1 Gbps |
| Transmission path | | | Star, line, mixed star and line, ring topology |
| Number of occupied I/O points | | | — |
| Internal current consumption | | mA | 1000 |
| Dimensions (WxHxD) | | mm | 50x90x95 |

| Order information | Art. no. | 238100 |
|---|---|---|

## Ethernet modul




In addition to the build-in Ethernet port of the CPU module the LJ71E71-100 offers a solution for a second Ethernet network to collect or change PLC data, monitor CPU module operation, control status and transfer any data by TCP/IP or UDP/IP communication. The Web function allows to monitor and control the PLC via a webbrowser.

The Ethernet module has also the capability of sending and receiving of e-mails to and from a connected device in a remote location via the Internet. E-mails can be sent/received through the CPU module by special instructions. The CPU module can receive/send up to 6K-word data from/to a personal computer or other E71 modules as an e-mail attachment or can send up to 960-word data to a personal computer or portable terminal as the main text of an e-mail.

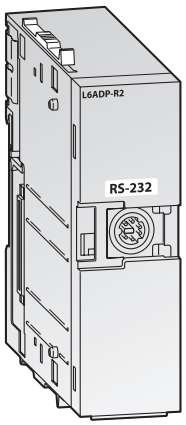
The other possibility is E-mail sending using the programmable controller CPU monitoring function. Notification conditions (CPU module status or device values) that have been set using parameters are regularly monitored. When the conditions are met, up to 960-word data can be sent as the main text of an e-mail or as attachment.

- Web function
- Communications via MC protocol, fixed buffer and random access buffer
- Up to 960 data words per query are available
- Sending and receiving data via e mail
- Up to 16 communications lines can be opened for concurrent data communications
- Prevention of unauthorized access through a remote password

| Specifications | | LJ71E71-100 |
|---|---|---|
| Communication mode | | Full-duplex/half-duplex |
| No. of simultaneous open connections | | 16 |
| Fixed buffer communication | | 1 k words x 16 |
| Random access buffer | | 6 k words x 1 |
| E-mail | attachement | 6 k words x 1 |
| | main text | 960 k words x 1 |
| Communication with mail server | | SMTP, POP3 |
| Connector | | RJ45 |
| Transmission speed | | 100 Mbps, 10 Mbps |
| Max. segment length | m | 100 |
| Cable | | CAT 5 or higher |
| Internal current consumption (5 V DC) | A | 0.6 |
| Number of occupied I/O points | | 32 |
| Dimensions (WxHxD) | mm | 28.5x95x90 |

| Order information | Art. no. | 263072 |
|---|---|---|

## Serial communications adapters

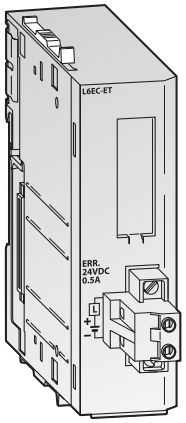



**RS232 interface adapter**

The L6ADP-R2 provides a RS232 interface for serial communication with the MELSEC L series PLC.

| Specifications | | L6ADP-R2 |
|---|---|---|
| Application | | Serial connection, e.g. GT10 Terminals |
| Power supply | | MELSEC L series Backplane |
| Max. transfer rate | kbit/s | 115.2 |
| Number of occupied I/O points | | — |
| Internal current consumption | mA | 20 |
| Dimensions (WxHxD) | mm | 28.5x90x95 |
| **Order information** | Art. no. | 238059 |

## End cover




**END cover with error terminal**

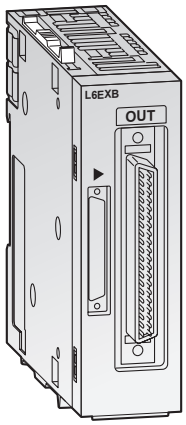
This end cover can be used instead of the standard end cover which comes with the CPU in the basic equipment.

The optional L6EC-ET end cover has a single relay output for error notification.

| Specifications | | L6EC-ET | L6EC |
|---|---|---|---|
| Application | | Error notification via relay output | Standard end cover |
| Output | | Screw terminal | — |
| Max. switching load | A | 0.5 (24 V DC) | — |
| Dimensions (WxHxD) | mm | 28.5x90x112.5 | 13x90x95 |
| **Order information** | Art. no. | 238062 | 249151 |

Note: MELSEC L series CPU modules are supplied with a standard End Cover L6EC.

## Branch/extension module

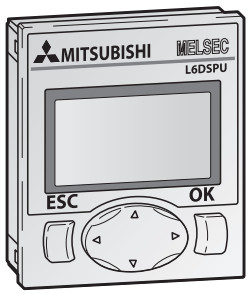



**Extension for MELSEC L series PLC**

With a L6EXB branch module, which is connected to the CPU, and with up to two (L02CPU, L02CP-P) or up to three extension modules (L26CPU-BT, L26CPUPBT), a MELSECL series PLC can be extended to max. 30/40 modules.

| Specifications | | L6EXB [Branch module] | L6EXE [Extension module] |
|---|---|---|---|
| Internal power consumption (5 V DC) | A | 0.08 | 0.08 |
| Weight | kg | 0.12 | 0.13 |
| Dimensions (WxHxD) | mm | 28.5x90x95 | 28.5x90x95 |
| **Order information** | Art. no. | 247227 | 247226 |

# Accessories




### Display module

The display module allows to check the system status and to make setting changes directly from the display, which will be built-in directly into the CPU.

Error status is clearly identified and trouble-shooting and error investigation can be performed all without the need for any connections or engineering software.

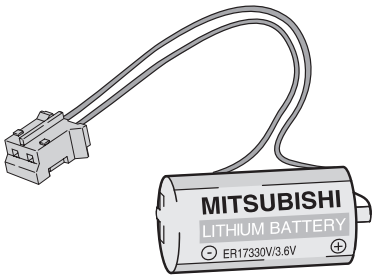
| Specifications | | L6DSPU |
|---|---|---|
| Application | | Displaying menus, time, and monitoring data. Setting of values and parameters. |
| Display | | 16 letters x 4 lines |
| Power supply | | From CPU |
| Display | | LCD with backlight (green/red) |
| Language | | English, Japanese |
| Dimensions (WxHxD) | mm | 45x50x17.3 |
| **Order information** | Art. no. | 238058 |

### SD memory card

The SD memory card allows quick and easy back-up of the CPU program and parameters. It can also be used to hold data captured with the data logging function.

The card is selectively available with 2 GB and 4 GB capacity.

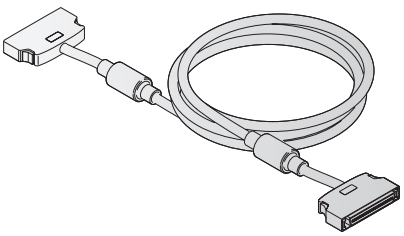
| Specifications | | L1MEM-2GBSD | L1MEM-4GBSD |
|---|---|---|---|
| Card type | | SD memory card | SDHC memory card |
| Memory capacity | | 2 GB | 4 GB |
| **Order information** | Art. no. | 238060 | 238061 |




### Backup battery

Two different batteries as replacement for the built-in back-up battery are available for the L series CPU.

| Specifications | | Q6BAT | Q7BAT | Q7BAT-SET |
|---|---|---|---|---|
| Voltage | V | 3.0 | 3.0 | 3.0 |
| Capacity | mAh | 1800 | 5000 | 5000 |
| Scope of delivery | | Battery | Battery | Battery plus holder |
| **Order information** | Art. no. | 130376 | 204127 | 204128 |



### Extension cables

These cables connect a branch module with one or two extension modules.

| Specifications | | LC06E | LC10E | LC30E |
|---|---|---|---|---|
| Cable length | m | 0.6 | 1.0 | 3.0 |
| Weight | kg | 0.19 | 0.23 | 0.45 |
| **Order information** | Art. no. | 247228 | 247229 | 247230 |

# 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 six independent but compatible product ranges.

Depending on your application and control needs, you can choose from the small, attractively priced, "stand-alone" FX1S series or the more powerful FX3G, FX3GC, FX3GE, FX3U and FX3UC series.

All FX series PLCs can be expanded to adapt them to the changing needs of your installations and applications.

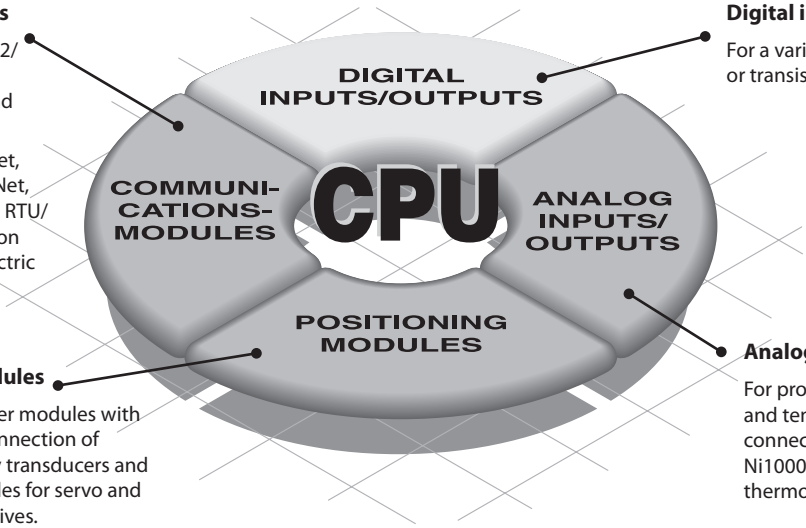
Network integration is also supported, making it possible for your FX controllers to communicate with other PLCs, controllers and HMIs.

## Equipment features

**Communications modules**

Interface modules with RS232/RS422/RS485 or USB for the connection of peripherals and PLC–PLC links.

Network modules for Ethernet, Profibus DP, CC-Link, DeviceNet, CANopen, Ethernet, Modbus RTU/ASCII and for the configuration of proprietary Mitsubishi Electric 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.

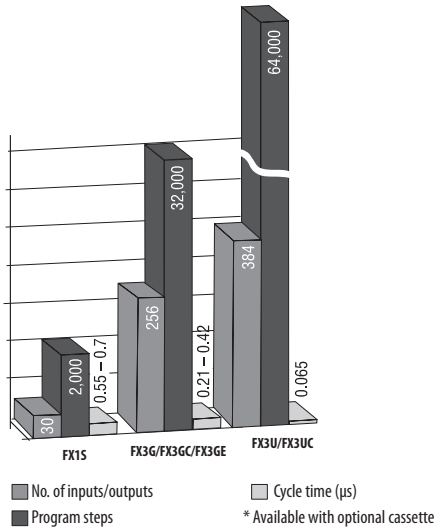
It is the ideal choice, no matter whether you need to install a simple control application requiring up to 30 I/Os (FX1S) or a demanding, complex system with up to 384 I/O points (FX3U/FX3UC).

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 six 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 Works2 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

Except for the FX3GC and FX3UC series, 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 FX1S, FX3G, FX3GE or FX3U controller. Interface adapter boards can also provide the FX PLC with additional RS232, RS422, RS485 or USB interfaces. To connect adapter 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 FX3G, FX3GC, FX3GE, 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).

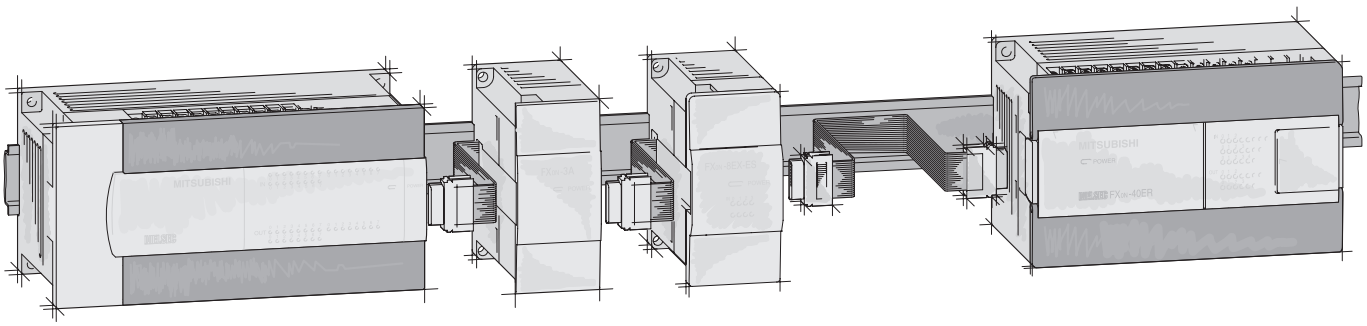
### Special function modules

A wide variety of special function modules are available for the FX3G, FX3GC, FX3GE, 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 (except FX3GC) 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 | FX3G | FX3GC | FX3GE | FX3U | FX3UC |
|---|---|---|---|---|---|---|---|---|
| Extensions for inside PLC installation | Digital | ● | ● | — | — | — | — | — |
| | Analog | ● | ● | ● | — | ● | — | — |
| Extension modules (installation outside the PLC) | Digital | — | — | ● | ● | ● | ● | ● |
| | Analog | — | — | ● | ● | ● | ● | ● |
| | Temperature | ● | — | ● | ● | ● | ● | ● |
| | Ethernet | — | ● | ● | ● | ● | ● | ● |
| | CC-Link | — | — | ● | ● | ● | ● | ● |
| | CANopen | — | — | ● | ● | ● | ● | ● |
| | Profibus DP | — | — | ● | ● | ● | ● | ● |
| | DeviceNet | — | — | ● | ● | ● | ● | ● |
| | Modbus RTU/ASCII | — | — | ● | ● | ● | ● | ● |
| | SSCNET | — | — | — | — | — | ● | ● |
| | J1939 | — | — | ● | ● | ● | ● | ● |
| Communications boards | RS232 | ● | ● | ● | — | ● | ● | — |
| | RS422 | — | ● | ● | — | ● | ● | — |
| | RS485 | — | ● | ● | — | ● | ● | — |
| | USB | — | — | — | — | — | ● | — |
| Communications modules | RS232 | — | ● | ● | ● | ● | ● | ● |
| | RS485 | — | ● | ● | ● | ● | ● | ● |
| Dedicated function modules | High speed counter | — | — | — | — | — | ● | ● |
| | Positioning | — | — | — | — | — | ● | ● |
| Memory cassettes | | ● | ● | ● | — | ● | ● | ● |
| External display | | — | ● | ● | — | ● | ● | — |

## 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 | | | | | | | | | | | | |

## 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 | 2 | 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 !)** |

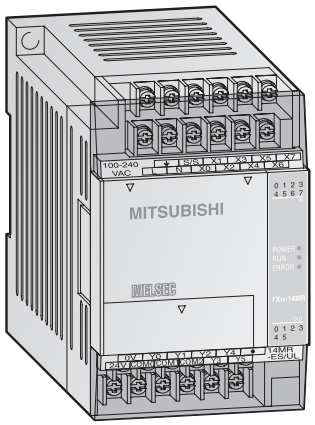
An external 24 V power supply has to be added in the example above.

| 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<br>Y = 24<br>→ | +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<br>Y = 0<br>→ | +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 61131-3 (EN 61131-3) compatible programming software, HMIs and hand-held programming units



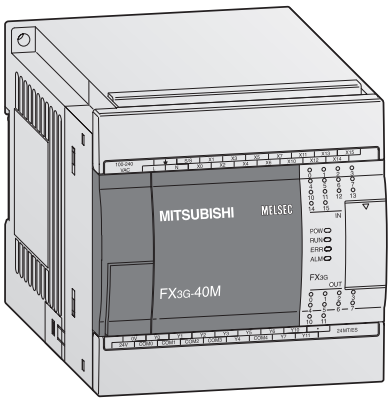
## Base units with 10–14 I/Os

| 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 |

## 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 61131-3 (EN 61131-3) compatible programming software, HMIs and hand-held programming units



## Base units with 14–24 I/Os

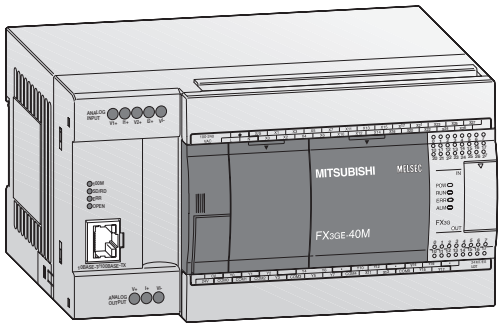
| Specifications | | FX3G-14 MR/ES | FX3G-14 MT/ESS | FX3G-14 MR/DS | FX3G-14 MT/DSS | FX3G-24 MR/ES | FX3G-24 MT/ESS | FX3G-24 MR/DS | FX3G-24 MT/DSS |
|---|---|---|---|---|---|---|---|---|---|
| Integrated inputs/outputs | | 14 | 14 | 14 | 14 | 24 | 24 | 24 | 24 |
| Power supply | | 100–240 V AC | 100–240 V AC | 24 V DC | 24 V DC | 100–240 V AC | 100–240 V AC | 24 V DC | 24 V DC |
| 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 AC | 100–240 V AC | 24 V DC | 24 V DC | 100–240 V AC | 100–240 V AC | 24 V DC | 24 V DC |
| 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.

## FX3GE series




The FX3GE series base units are available with 24 or 40 input/output points.

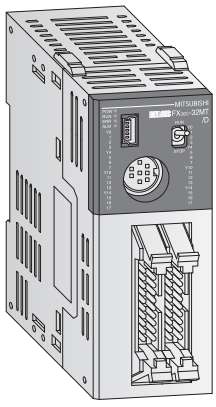
All base units are equipped with relay outputs.

- Integrated analog input (2ch)
- Integrated analog output (1ch)
- Integrated Ethernet interface
- Integrated USB interface for communication between PLC and PC
- Integrated serial interface for communication between PLC and HMI
- LEDs for indicating the input and output status
- Connection of inputs and outputs via terminals.
- Slot for memory cassettes
- Integrated positioning control
- Expandable with special function modules and ADP modules
- User-friendly programming systems, including IEC 61131-3 (EN 61131-3) compatible programming software, HMIs and hand-held programming units

## Base units with 24/40 I/Os

| Specifications | | FX3GE-24MR/ES | FX3GE-40MR/ES |
|---|---|---|---|
| Integrated inputs/outputs | | 24 | 40 |
| Power supply | | 100–240 V AC | 100–240 V AC |
| Integrated inputs | | 14 | 24 |
| Integrated outputs | | 10 | 16 |
| Output type | | Relay | Relay |
| Power consumption | W | 32 | 37 |
| Weight | kg | 0.6 | 0.8 |
| Dimensions (WxHxD) | mm | 130x90x86 | 175x90x86 |
| **Order information** | Art. no. | 264869 | 264870 |

## FX3GC series



The FX3GC series base units are available with 32 input/output points.

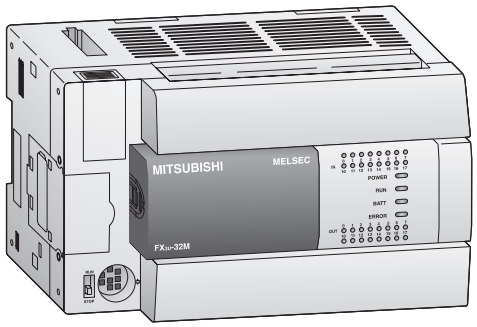
All base units are equipped with transistor outputs.

- Integrated USB interface for communication between PLC and PC
- Integrated serial interface for communication between PLC and HMI
- LEDs for indicating the input and output status
- Connection of inputs and outputs via connectors.
- Integrated positioning control
- Expandable with digital I/O modules, special function modules and ADP modules
- User-friendly programming systems, including IEC 61131-3 (EN 61131-3) compatible programming software, HMIs and hand-held programming units

## Base units with 32 I/Os

| Specifications | | FX3GC-32MT/D | FX3GC-32MT/DSS |
|---|---|---|---|
| Integrated inputs/outputs | | 32 | 32 |
| Power supply | | 24 V DC | 24 V DC |
| Integrated inputs | | 16 | 16 |
| Integrated outputs | | 16 | 16 |
| Output type | | Transistor (sink type) | Transistor (source type) |
| Power consumption | W | 8 | 8 |
| Weight | kg | 0.2 | 0.2 |
| Dimensions (WxHxD) | mm | 34x90x87 | 34x90x87 |
| **Order information** | Art. no. | 251545 | 251546 |

## 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 61131-3 (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-32 MS/ES | FX3U-48 MR/ES | FX3U-64 MR/ES | FX3U-64 MS/ES | FX3U-80 MR/ES | FX3U-128 MR/ES |
|---|---|---|---|---|---|---|---|---|---|
| Integrated inputs/outputs | | 16 | 32 | 32 | 48 | 64 | 32 | 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 | 100–240 V AC | 100–240 V AC |
| Integrated inputs | | 8 | 16 | 16 | 24 | 32 | 32 | 40 | 64 |
| Integrated outputs | | 8 | 16 | 16 | 24 | 32 | 32 | 40 | 64 |
| Output type | | Relay | Relay | Triac | Relay | Relay | Triac | Relay | Relay |
| Power consumption | W | 30 | 35 | 35 | 40 | 45 | 45 | 50 | 65 |
| Weight | kg | 0.6 | 0.65 | 0.65 | 0.85 | 1.0 | 1.0 | 1.2 | 1.8 |
| Dimensions (WxHxD) | mm | 130x90x86 | 150x90x86 | 150x90x86 | 182x90x86 | 220x90x86 | 220x90x86 | 285x90x86 | 350x90x86 |
| **Order information** | Art. no. | 231486 | 231487 | 237263 | 231488 | 231489 | 237264 | 231490 | 231491 |

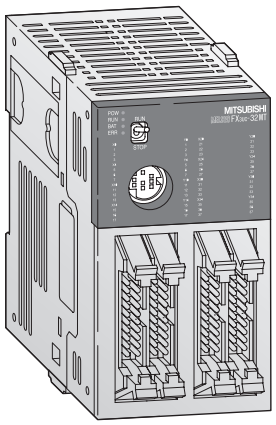
| Specifications | | FX3U-16 MT/ESS | FX3U-32 MT/ESS | FX3U-48 MT/ESS | FX3U-64 MT/ESS | FX3U-80 MT/ESS | FX3U-128 MT/ESS |
|---|---|---|---|---|---|---|---|
| Integrated inputs/outputs | | 16 | 32 | 48 | 64 | 80 | 128 |
| Power supply | | 100–240 V AC | 100–240 V AC | 100–240 V AC | 100–240 V AC | 100–240 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 V DC | 24 V DC | 24 V DC | 24 V DC | 24 V DC |
| 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 V DC | 24 V DC | 24 V DC | 24 V DC | 24 V DC |
| 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 61131-3 (EN 61131-3) compatible programming software, HMIs and hand-held programming units

## Base units with 16–96 I/Os

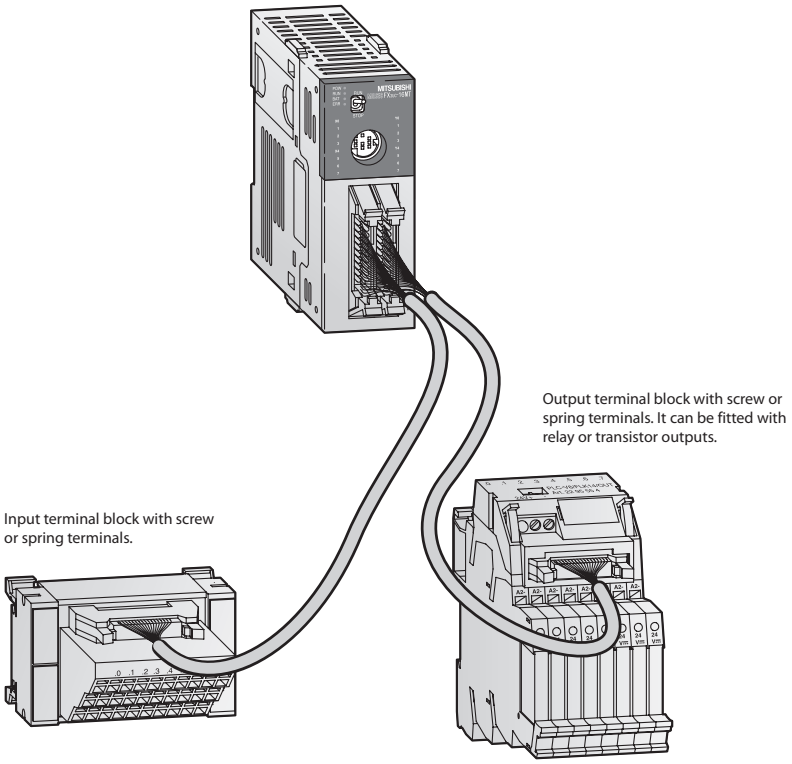
| Specifications | | FX3UC-16 MT/DSS | FX3UC-16 MR/D-T | FX3UC-16 MR/DS-T | FX3UC-32 MT/DSS | FX3UC-64 MT/DSS | FX3UC-96 MT/DSS |
|---|---|---|---|---|---|---|---|
| Integrated inputs/outputs | | 16 | 16 | 16 | 32 | 64 | 96 |
| Power supply | | 24 V DC (+20 %, -15 %) | 24 V DC | 24 V DC | 24 V DC (+20 %, -15 %) | 24 V DC (+20 %, -15 %) | 24 V DC (+20 %, -15 %) |
| Integrated inputs | | 8 | 8 | 8 | 16 | 32 | 48 |
| Integrated outputs | | 8 | 8 | 8 | 16 | 32 | 48 |
| Output type | | Transistor (source type)* | Relay | Relay | Transistor (source type)* | Transistor (source type)* | Transistor (source type)* |
| Power consumption | W | 6 | 6 | 6 | 8 | 11 | 14 |
| Weight | kg | 0.2 | 0.25 | 0.25 | 0.2 | 0.3 | 0.35 |
| Dimensions (WxHxD) | mm | 34x90x74 | 34x90x74 | 34x90x74 | 34x90x74 | 59.7x90x74 | 85.4x90x74 |
| **Order information** | Art. no. | 231508 | 237305 | 237306 | 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 information about the terminal blocks, please refer to the FX Family catalogue.

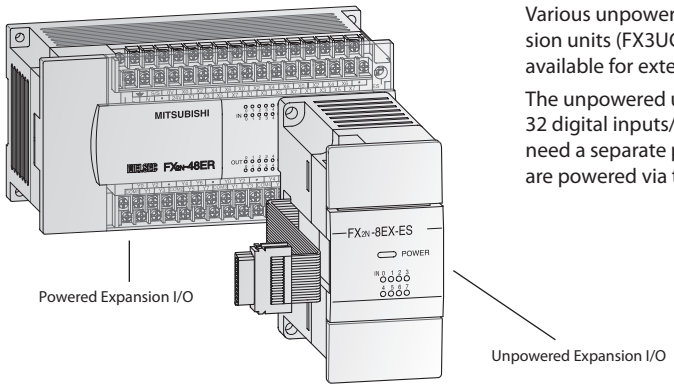


## Expandability and functionality

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, FX3G, FX3GE 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.

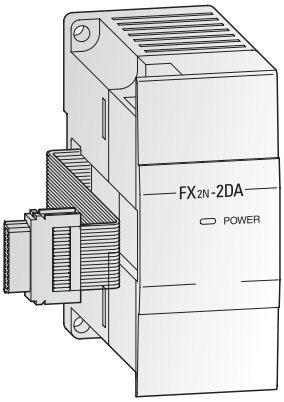
The powered extension units contain a larger number of inputs/outputs and an integrated power supply unit, to power the system bus and the digital inputs.

| 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 | | | 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.

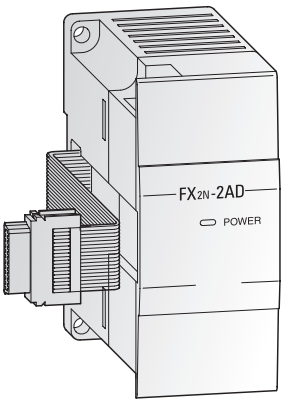



## Analog output modules

The analog output modules provide the user with 2 to 4 analog outputs. The modules convert digital values from the FX3G, FX3GE, FX3U and 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) | 120 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 | 55x90x87 |
| **Order information** | Art. no. | 102868 | 65586 | 169509 |

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

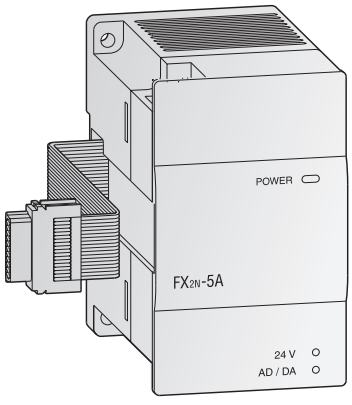



## Analog input modules

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 FX3G, FX3GC, FX3GE, FX3U and 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 | 2.5 mV, 1.25 mV, 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 % | ±0.3–1 % | ±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

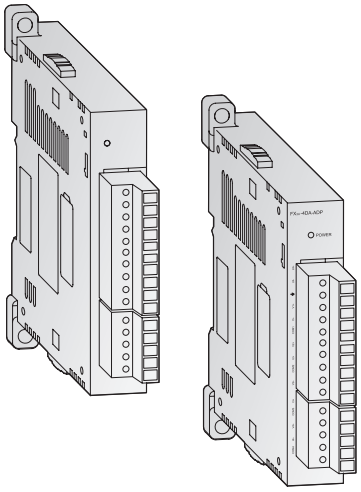



## Combined analog I/O modules

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

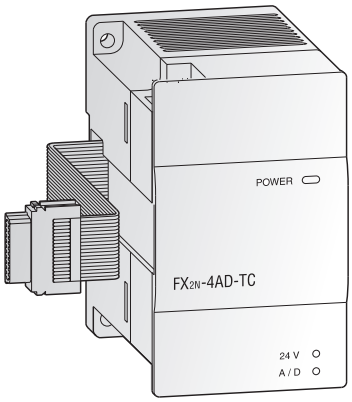
The FX3U-4AD-ADP adapter module for analog input is a special function adapter to add four analog input points to the FX3G or FX3U/FX3UC PLC system.

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) | | 17.6x90 (106)x89.5 | 17.6x90 (106)x89.5 |
| **Order information** | | 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

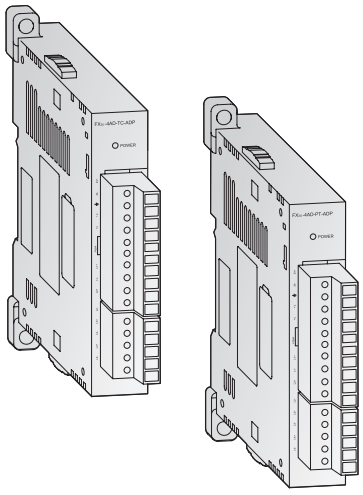
The analog input module for thermocouples FX2N-4AD-TC is used for processing temperatures. It has 4 independent inputs for detecting signals from thermocouples of types J and K. The type of thermocouple can be chosen independently for each point.

The analog input module for Pt100 inputs FX2N-4AD-PT permits the connection of four Pt100 sensors to the FX3G, FX3GC, FX3GE, FX3U or 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 | °C | -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 °C | 0.1 °C or 1 °C |
| 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.

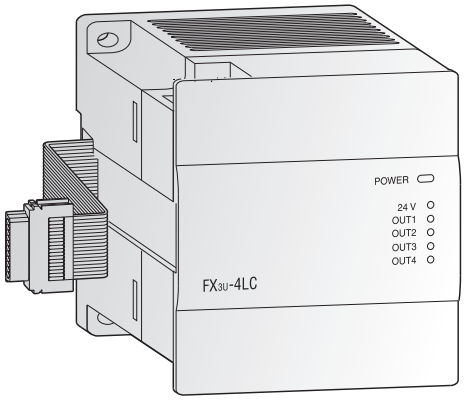
The FX3U-4AD-PT-ADP and FX3U-4AD-PTW-ADP analog input adapters enable the connection of up to four Pt100 thermocouples to the PLC system.

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 | °C | -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 | °C | 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.

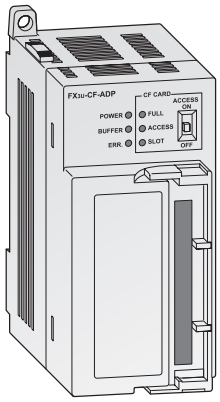
The proportional band, the integral time and the derivative time can be easily set by auto tuning.

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 | ℃ | -200–+2300 |
| Digital outputs | | 4 NPN transistor open collector output points |
| Resolution | ℃ | 0.1 or 1 |
| Total accuracy | | ±0.3–0.7 % (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 |
|---|---|---|

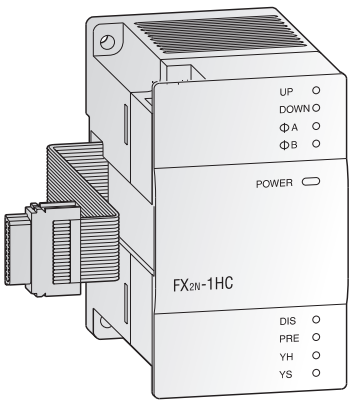



### Data logger module

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 2 GB 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 |
|---|---|---|

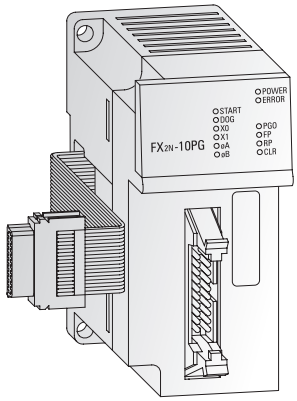



### High speed counter and pulse train modules

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



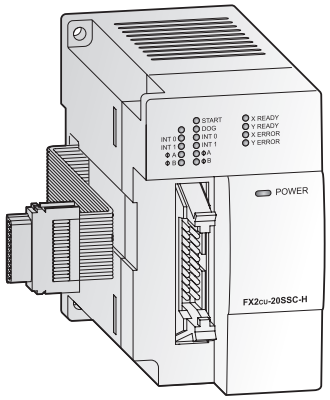

### Positioning modules

The positioning modules FX3U-1PG and FX2N-10PG are extremely efficient single-axis positioning modules for controlling either step drives or servo drives (by external regulator) with a pulse chain. They are 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 | | | FX3U-1PG | FX2N-10PG |
|---|---|---|---|---|
| Accessible axes | | | 1 | 1 |
| Output frequency | | pulse/s | 10–200 000 | 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 | | 150 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. | 259298 | 140113 |



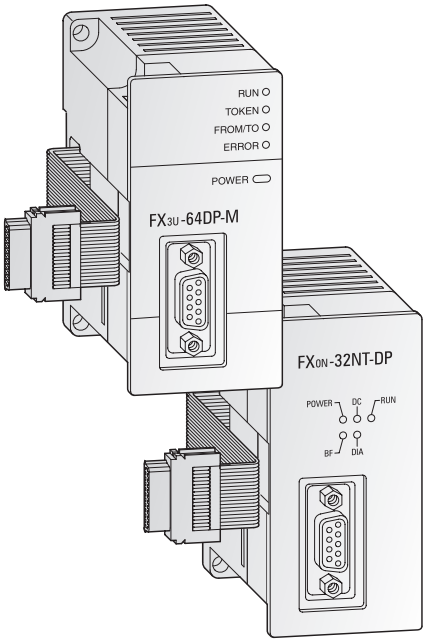

### SSCNETIII module FX3U-20SSC-H

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 SSCNETIII (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 Electric 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.

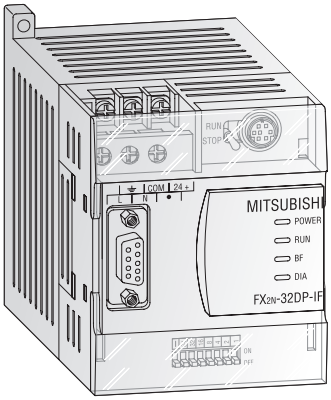
The FX3U Profibus DP master supplys comprehensive data and alarm processing to the Profibus DP V1 standard. It is easily set up with the GX Configurator-DP software.

The FX0N-32NT-DP and FX3U-32DP are Profibus DP slave modules that make it possible to integrate a FX3G, FX3GC, FX3GE, FX3U or 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)<br>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

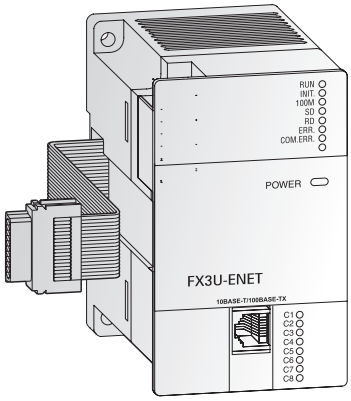
The remote I/O station FX2N-32DP-IF forms an extremely compact communication unit and provides a connection of I/O modules with up to 256 I/O points and/or up to 8 special function modules of the FX2N series as an alternative (analog I/Os, network, communications and positioning modules).

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 | |



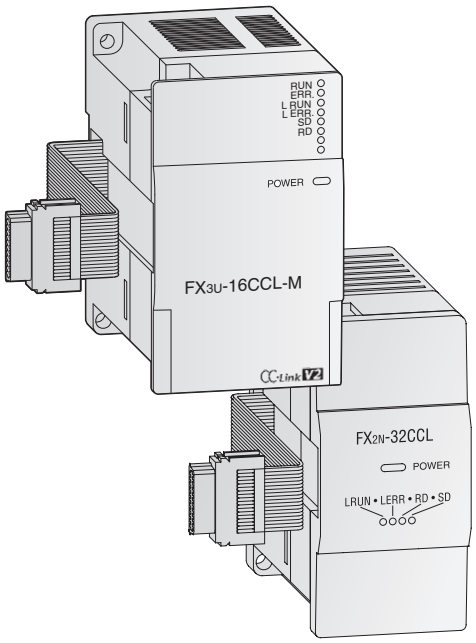

### Network module for Ethernet

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, FX3GC, FX3GE, FX3U or a 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/FX3U-ENET-P502 |
|---|---|---|
| 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 Mbps, 10 Mbps |
| 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. | 166086/225142 |




### 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 FX3U-16CCL-M is a special extension block which assigns an FX3G, FX3GC, FX3GE, FX3U or FX3UC 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 16 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 8 remote device stations or 8 intelligent device stations. 1 master module can be connected to one FX3G, FX3GC, FX3GE, FX3U or 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 existing CC-Link network.

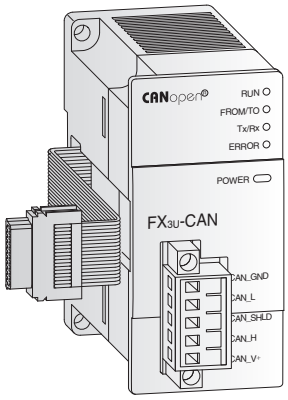
The buffer memory of the FX2N-32CCL is read and written by FROM/TO instructions.

The slave modules can be used in combination with a FX3G, FX3GC, FX3GE, FX3U and FX3UC PLC.

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

| Specifications | | FX3U-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 | | FX3G:<br>32 x number of stations ≤128<br>FX3U/FX3UC:<br>32 x number of stations ≤256** | — | — |
| Number of connectable modules | | Max. 16 | — | 1–4 |
| Power supply | 5 V DC | — | Max. 130 mA (from base unit) | — |
| | 24 V DC | 240 mA | 50 mA | 220 mA |
| Related I/O points | | 8 | 8 | 8 |
| Dimensions (WxHxD) | mm | 55x90x87 | 43x90x87 | 55x90x87 |
| **Order information** | Art. no. | 248224 | 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 of the base unit and extension units and inside the CC-Link network ≤384.




### Network module for CANopen

The FX3U-CAN communications module makes it possible to connect an FX3G/ FX3GC/FX3GE or FX3U/FX3UC PLC to an existing CANopen network.

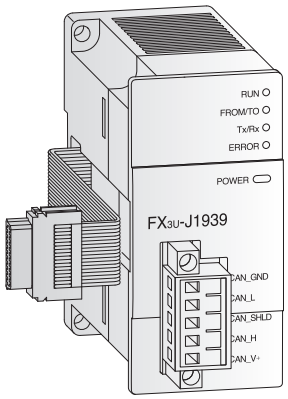
In addition to real-time capabilities and high-speed data transfer at rates of up to 1 Mbps the CANopen module also has high transfer reliability and simple network configuration.

Up to 320 data words can be sent and received as process data objects (PDOs). The CANopen profiles CiA 405 V2.0 and CiA 417 V2.0 are supported.

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

| Specifications | | FX3U-CAN |
|---|---|---|
| Module type | | CANopen master |
| CAN standard | | ISO 11898/1993 |
| CANopen standard by CiA | | DS-301 version 3.0 |
| Additional CANopen features | | Based on CiA 301 V4.1, CiA 302, CiA 305 V2.2, CiA 405 V2.0, CiA 417 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 | — |
| | 24 V DC | 110 mA (from base unit) |
| Related I/O points | | 8 |
| Dimensions (WxHxD) | mm | 43x90x95 |

| Order information | Art. no. | 252845 |
|---|---|---|




### Network module for J1939

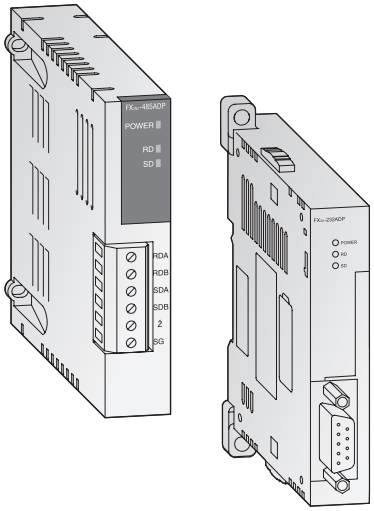
The FX3U-J1939 communication module allows the connection of FX3G/FX3GC*/ FX3U/FX3UC* Series PLCs to a J1939 network. J1939 is a CAN based protocol used for communication with motors, generators and compressors.

In a J1939 network are no master or slave stations. All nodes may receive each others' messages. Standard messages contain up to 8 bytes of data, extended messages contain up to 250 bytes of data. Up to 75 standard messages and 4 extension messages can be sent and received.

The FX3U-J1939 is compatible with the NMEA2000 standard used for ship automation and with CAN Layer 2 communication. In this mode, a FX3U-J1939 can send and receive up to 42 messages on a CAN network.

| Specifications | | FX3U-J1939 |
|---|---|---|
| Communication standard version | | J1939, NMEA2000® compatibel node |
| Network node size | | J1939: 2–30 |
| | | NMEA2000®: 2–50 |
| Communication method | | Cyclic, acyclic or request driven (user configurable) |
| CAN layer-2 communication | | Send and receive |
| Max. cable length | m | 5000 |
| Baud rates | kbit/s | 10, 20, 50, 100, 125, 250, 500, 800, 1000 |
| Power supply | | 24 V DC/110 mA (from base unit) |
| Weight | kg | 0.2 |
| Dimensions (WxHxD) | mm | 43x90x95 |

| Order information | Art. no. | 254276 |
|---|---|---|



### 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, PCs, PLCs etc. Information can be sent and received and is handled by the PLC program with the RS instruction.

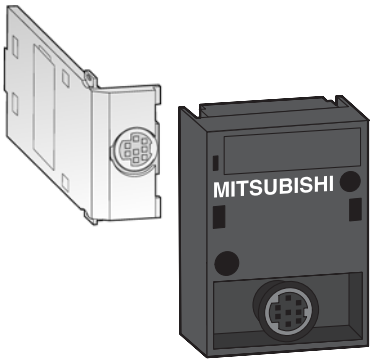
With RS485 communication can be configured as either 1:N multidrop, parallel link or peer to peer operation.

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 base unit ② Application for FX3G/FX3GC/FX3GE/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 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.




### Interface adapters

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

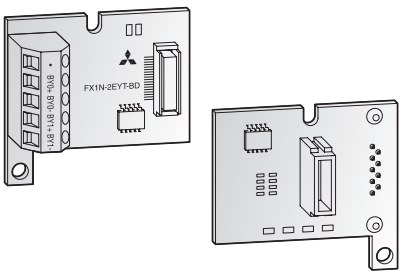
With the help of the interface adapter FX□□-422-BD a RS422 interface can be added to a MELSEC FX1S, FX3G, FX3GE or FX3U PLC.

The interface adapters FX□□-485-BD provide a MELSEC FX1S, FX3G, FX3GE 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 | 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 | 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 |

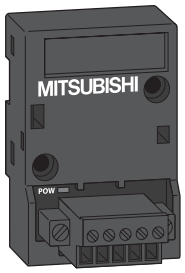
| Specifications | | FX1N-485-BD | FX3G-485-BD | FX3U-485-BD |
|---|---|---|---|---|
| Applicable for | | Base units FX1S | Base units FX3G | Base units FX3U |
| Interface | | RS485/RS422 | | |
| Power supply | | 5 V DC/60 mA (from base unit) | | |
| Related I/O points | | — | — | — |
| Dimensions (WxHxD)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




### Digital and analog extension adapters FX1S

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

| Specifications | | FX1N-4EX-BD | FX1N-2EYT-BD | FX1N-2AD-BD | FX1N-1DA-BD |
|---|---|---|---|---|---|
| Applicable for | | Base units FX1S | Base units FX1S | Base units FX1S | Base units FX1S |
| 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 |



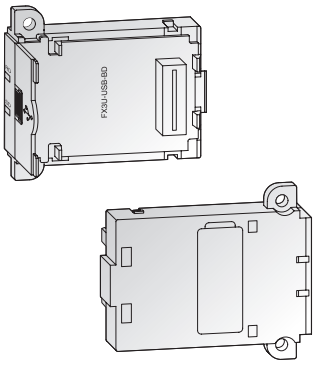

### Extension adapters FX3U/FX3G/FX3GE

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 FX3U-8AV-BD analog setpoint adapter enables the user to set 8 analog setpoint values.

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

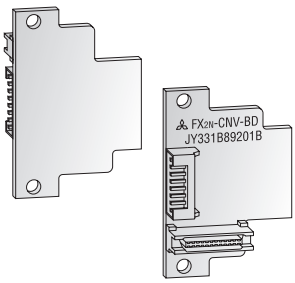
| Specifications | | FX3G-2AD-BD | FX3G-1DA-BD | FX3G-8AV-BD | FX3U-8AV-BD |
|---|---|---|---|---|---|
| Applicable for | | Base units FX3G | Base units FX3G | Base units FX3G | Base units FX3U |
| Function | | A-D converter | D-A converter | Analog setpoint | Analog setpoint |
| Dimensions (WxHxD) | mm | 35x51 | 35x51 | 35x51 | 19.6x46.1x53.5 |
| **Order information** | Art. no. | 221265 | 221266 | 221267 | 237307 |




### 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

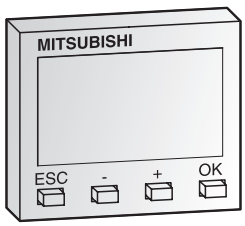
The below listed communications adapters enable the connection of the adapter modules FX□□-□□□ADP on the left hand side of the FX3G and FX3U base units.

| Specifications | | FX1N-CNV-BD | FX3G-CNV-ADP | FX3U-CNV-BD |
|---|---|---|---|---|
| Applicable for | | Base unit FX1S | Base units FX3G | Base units FX3U |
| General specifications | | Conforms to 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.

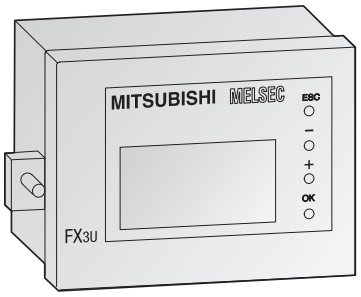
For detailed information please refer to the power supplies chapter in this catalogue.




### 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.

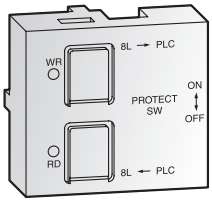
| Specifications | | FX1N-5DM | FX3G-5DM |
|---|---|---|---|
| Applicable for | | Base units FX1S | Base units FX3G series |
| Display | | LCD (with backlight) | LCD (with backlight) |
| Power supply | | 5 V DC ±5 % (from base unit) | 5 V DC ±5 % (from base unit) |
| Current consumption | mA | 110 | 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 | — |
| 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 |



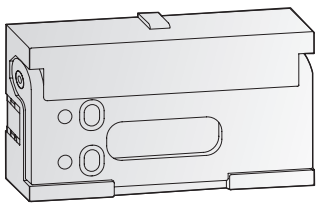

### Memory cassettes for FX1S, FX3G and FX3GE

All FX1S, FX3G and FX3GE 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 | 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 |



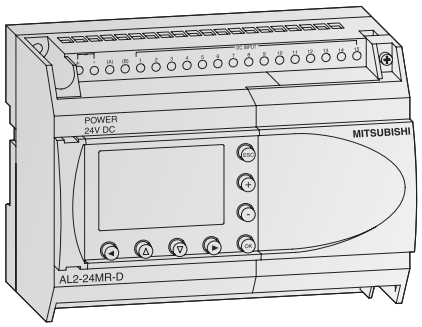
### Memory cassettes for FX3U and FX3UC

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 PLC memory with the help of 2 buttons.

| Specifications | | FX3U-FLROM-16 | FX3U-FLROM-64 | FX3U-FLROM-64L | FX3U-FLROM-1M |
|---|---|---|---|---|---|
| Applicable for | | Base units FX3U | Base units FX3U | Base units FX3U | Base units FX3U |
| Number of steps | | 16000 | 64000 | 64000 | 64000 + 1.3 MB for source data |
| Memory type | | Flash memory | Flash memory | Flash memory | Flash memory |
| Protect switch | | Provided | Provided | Provided | Provided |
| Data transfer buttons | | Not provided | Not provided | Provided | — |
| Dimensions (WxHxD) | mm | 37x20x6.1 | 37x20x6.1 | 37x20x6.1 | 37x20x6.1 |
| **Order information** | Art. no. | 165278 | 165279 | 165280 | 245565 |

## The ALPHA 2 series




### Alpha base units

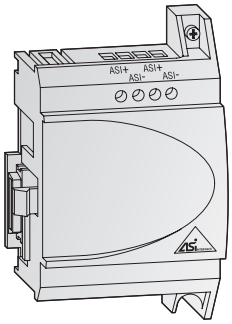
The Alpha 2 brings the benefits of the Alpha closer to the functionality of a Micro PLC. A program capacity of 200 functions and 38 function blocks including mathematical operations, PWM,1 KHz high speed counter and SMS text messaging, along with a wide operating temperature (-25 to 55 °C) open up new 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 can increase 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<br>3.0/1.55 120 V AC | 2.5/0.75 | 4.5/2.0 240 V AC<br>3.5/1.5 120 V AC | 4.0/1.0 | 5.5/2.5 240 V AC<br>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);<br>IP40 mounting frame AL2-FRAME-14/24-IP40, art. no.: 231366; IP54 mounting frame AL2-FRAME-14/24-IP54, art. no.: 231368 for AL2-14/24<br>IP40 mounting frame AL2-FRAME-10-IP40, art. no.: 231365; IP54 mounting frame AL2-FRAME-10-IP54, art. no.: 231367 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.

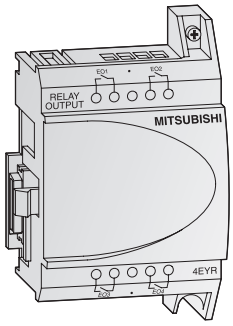
The addresses of the slave devices are assigned either automatically via the master in the network or via a programming device (software).

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.

| 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 |

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




## Digital extension modules

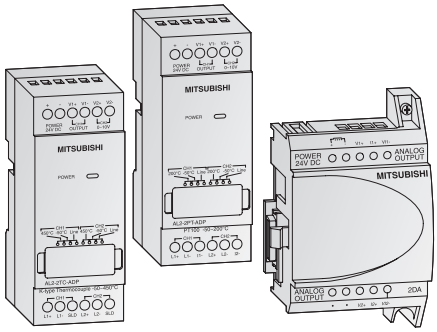
There are 4 different extension modules available for the ALPHA 2, which allow the controller to be extended through additional inputs or outputs. The modules are inserted directly into the ALPHA 2 and therefore do not take up any additional space.

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<br>Temp. coefficient 3.850 ppm/°C (IEC 751) | Thermocouple (K type), isolated type<br>(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.

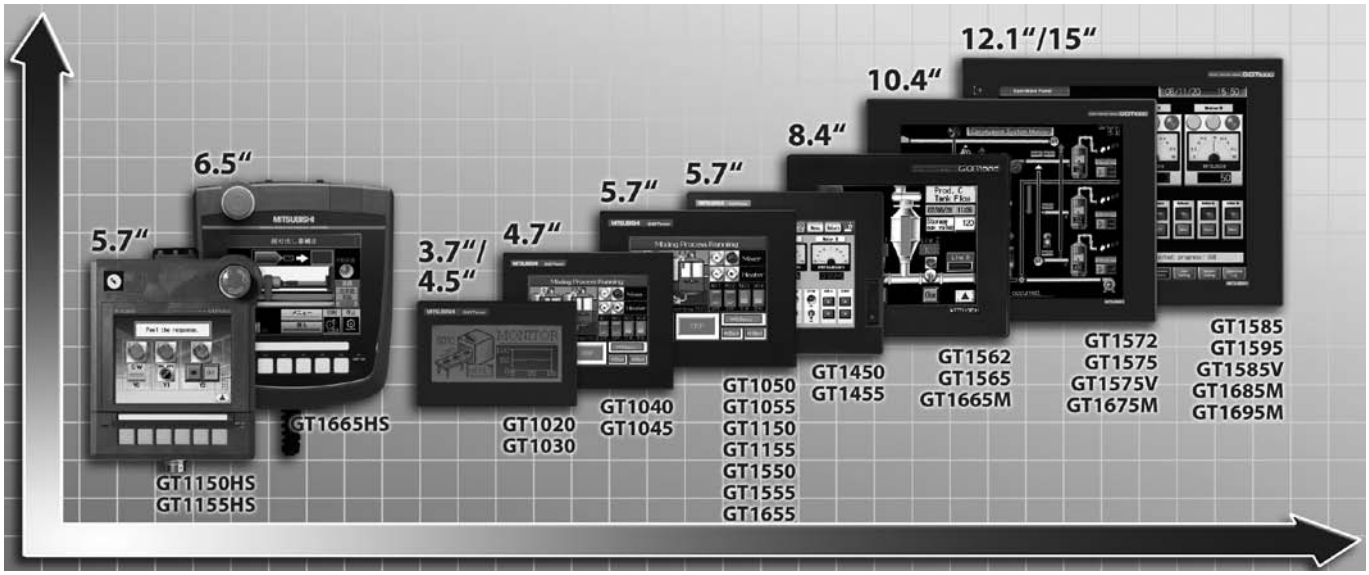
All the information required is at your fingertips, providing maximum transparency for all system processes and with an IP65 rating (IP67 for GOT1000) the HMIs can be used under heavy-duty conditions.

Mitsubishi Electric 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 touch screen operation give users everything they want and need.

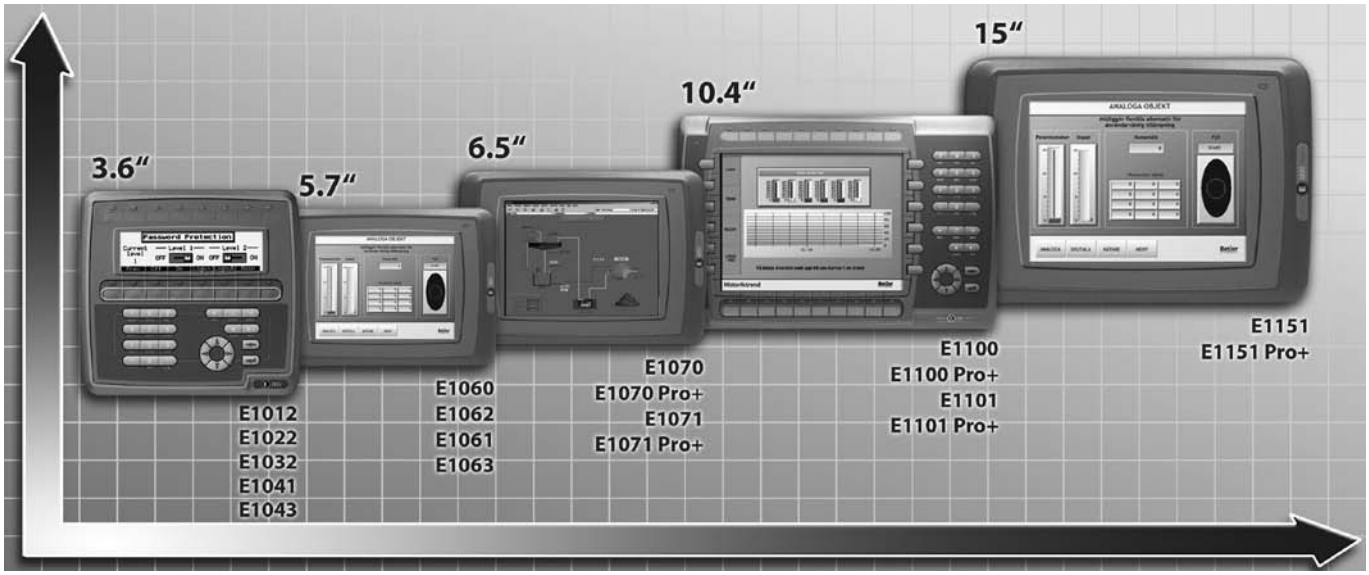



## E series range

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 touch screen 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 iQ 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
- CompactFlash 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
- VNC® server support for GT14 and GT16 series

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 running on a standard PC under MS Windows®.

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.

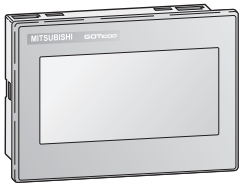
Mitsubishi Electric's HMIs can support a large range of international character sets. Like all products in the MELSEC range, the HMI units have CE approval.

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 (4 models) | GT14 (2 models) | GT15 (22 models) | GT16 (20 models) |
|---|---|---|---|---|---|---|---|
| Display | type | STN | STN | TFT color LCD | TFT, STN | STN, TFT | TFT |
| | dimensions | 3.7"/4.5"/4.7"/5.7" | 5.7" | 10.4"/8.4" | 5.7" | 5.7"–15" | 5.7"–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) | 16-dot standard font: 20 chars. x 15 lines (2-byte) 12-dot standard font: 26 chars. x 20 lines (2-byte) | User definable | User definable |
| | graphical resolution (pixels) | 160x64/288x96/320x240 | 320x240 | 640x480 | 320x240 | 320x240 to 1024x768 | 640x480 to 1024x768 |
| Power supply | | 5 V DC/24 V DC | 24 V DC | 100 to 240 V AC | 24 V DC | 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 | 9 MB | 9 MB | 5–9 MB (expandable up to 57 MB) | |
| External memory card | | — | 1 (CF, 2 GB max.) | 1 (CF, 2 GB max.) | 1 (CF) | 1 (CF, 2 GB max.) | 1 (CF) |
| Keyboard | | Touch-panel | 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 | Touch keys |
| Interfaces | serial | 2 x RS232, RS422/RS232 (depending on model) | RS232, RS422 | RS232, RS422/485 | RS232, RS422/485 | RS232 | RS232 |
| | others | GT104□/GT105□: USB (back side) | USB (front) | USB | USB (Mini-B) (front side) USB (Type-A) (rear side) | USB (front) | USB (front), USB host for memory stick |
| Network possibilities | | Serial | Serial | Ethernet (TCP/IP) | 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 | 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**

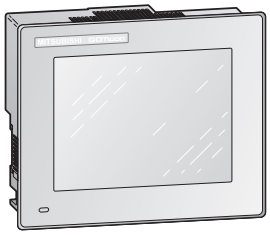


The micro GOTs GT1020 and GT1030 offer a bright monochrome STN 3.7" or 4.5" display with touch screen functionality and tri-colour background illumination (LBDW and LBLW models, also with white background available) for a broad variety of applications.

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 (LBL2 and LBD2 models) programming interface.

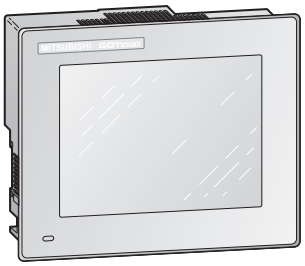
**GT1040**
**GT1045**



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 320x240 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.

**GT1050**
**GT1055**



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 Electric PLCs, frequency inverters and servo amplifiers by using transparent mode.

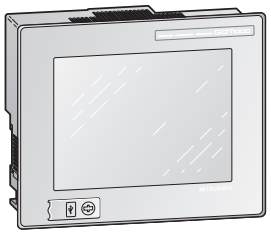
All GOT1000 can be programmed easily via PC with the software package GT Designer3.

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-HBD/-HBD2/-HBDW/-HBDW2/-HWD/-HWD2/ GT1030-HWDW/-HWDW2/-HBL /HBLW/-HWL/-HWLW | 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. | 200738/200491/200492/208670/208668/208669242110/ 242111/242112/242113/242114/242115/ 242116/242117/242118/242119/242120/242121 | 221929 218492 | 221930 218491 |
| **Accessories** | | Programming software (refer to page 5), cables and interface adapters (refer to page 101) | | |

**GT1150**
**GT1155**

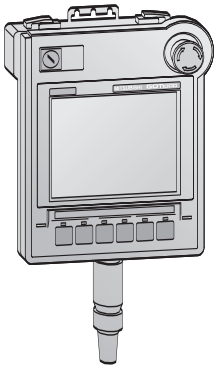


The GT11 series graphic operating terminals GT1150-QLBD and GT1150HS-QLBD (display with 16 grey scales), GT1155-QSBD and GT1155HS-QSBD (256 colours) are the standard models of the versatile GOT1000 series. They offer a wide range of basic functions for standalone use.

Beside their outstanding speed and performance they feature 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**



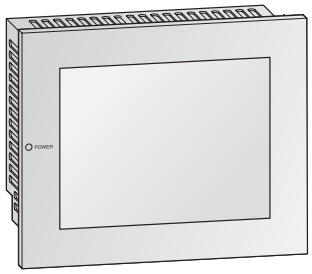
The GT1150HS-QLBD and GT1155HS-QSBD are handsome portable terminals that boast top level quality for medium sized terminals. They share the same functions as all GT11 series terminals.

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

All GT11 terminals feature recipes, alarms, multilanguage and Unicode support.

Furthermore they offer various graphical object libraries.

**GT1275**
**GT1265**



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.

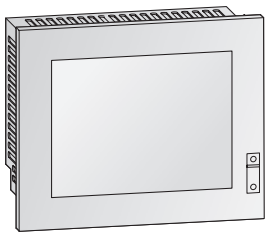
The GT1275 has a 10.4" color touch screen, while the screen size of the GT1265 is 8.4".

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



| Specifications | | GT1150-QLBD/ GT1155-QSBD/GT1155-QTBD | GT1150HS-QLBD/ GT1155HS-QSBD | GT1275-VNBA/GT1275-VNBD/ GT1265-VNBA/GT1265-VNBD |
|---|---|---|---|---|
| Display unit | type | QL: STN, 16 grey scales<br>QS: STN, 256 colours<br>QT: TFT, 256 colours | QL: STN, 16 grey scales<br>QS: STN, 256 colours | TFT color LCD |
| | dimensions (mm) | 115x86 (5.7") | 115x86 (5.7") | 10.4"/8.4" |
| | text (lines x characters) | User definable | User definable | 16-dot standard font: 40 chars. x 30 lines (2-byte)<br>12-dot standard font: 53 chars. x 40 lines (2-byte) |
| | character height (mm) | User definable, Windows fonts | User definable, Windows fonts | User definable, Windows fonts |
| | graphical resolution (pixels) | 320x240 | 320x240 | 640x480 |
| Power supply | | 24 V DC | 24 V DC | VNBA: 100–240 V AC<br>VNBD: 24 V DC |
| Internal memory capacity | | 3 MB | 3 MB | 9 MB |
| Memory card slot | | 1 (CompactFlash) | 1 (CompactFlash) | 1 (CompactFlash, 2 GB max.) |
| Keyboard type | | Touch-panel | Touch-panel | Touch-panel |
| Function keys | internal | Touch keys | Touch keys + 6 function keys | Touch keys |
| | external | — | — | — |
| LED indicators | | 1 (Power ON) | 1 (Power ON) | 1 (Power ON) |
| Interfaces | serial | RS232C, RS422 (2ch) | RS232C, RS422 (1ch) | RS232, RS422/485 |
| | parallel | — | — | — |
| | others | USB (front side) | USB (top side) | USB |
| Interface slot for optional cards | | — | — | — |
| Real-time clock | | Integrated | Integrated | Integrated |
| Network communication possibilities | type | Serial (max. 2 GOTs per FX or Q PLC),<br>Multidrop master (max. 16 GOTs via master unit per FX or Q PLC, Modbus RTU) | — | Ethernet, RS422/485, RS232 |
| | max. no. of nodes | 2 | — | — |
| IP Rating (front panel) | | IP67 | IP67 | IP67 |
| Dimensions (WxHxD) | mm | 164x135x56 | 176x220x93 | 303x214x53/241x190x58 |
| Weight | kg | 0.7 | 1.0 | 2.3/1.7 |
| **Order information** | Art. no. | 162709/<br>162710/215077 | 170180/170181 | 229836/237188<br>229837/237189 |
| **Accessories** | | Programming software (refer to page 5), cables and interface adapters (refer to page 101) | | |

**GT1450**
**GT1455**

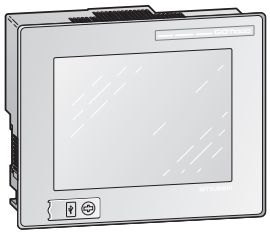


The GT1450 and GT1455 models provide an exceptionally clear 5.7" display comprising 16 grey scale steps or up to 65,536 colours with a resolution of 320x240 pixels.

Windows fonts are utilized for clear text presentation and a CF card interface for project operation systems and data storage is provided.

The front side USB interface can be used for communication with a PC, OS installation and project data download. Optionally an Ethernet compatible version of each model is available.

**GT1550**
**GT1555**

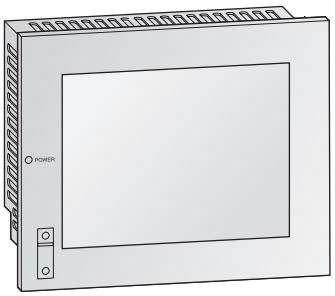


The GT1550 and GT1555 models provide an exceptionally clear 5.7" display comprising 16 grey scale steps over 4,096 colours up to 65,536 colours and full VGA resolution quality (640x480 pixels).

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

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

**GT1562**
**GT1565**




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.

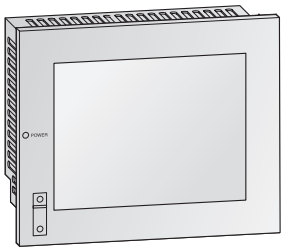
In addition, the GT15 offer Ethernet project transfer via the optional Ethernet interface GT15-J71E71-100.



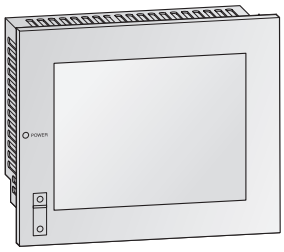
| Specifications | | GT1455-QTBDE/ GT1450-QLBDE | GT1550-QLBD/GT1555-QSBD/ GT1555-QTBD/GT1555-VTBD | GT1562-VNBA/GT1565-VTBA GT1562-VNBD/GT1565-VTBD |
|---|---|---|---|---|
| Display unit | type | QT: TFT color LCD<br>QL: STN, 16 grey scales | QL: STN monochrome<br>QS: STN 4096 colours<br>QT, VT: TFT, 65536 | TFT, 16 colours/65536 colours |
| | dimensions (mm) | 115x86 (5.7") | 115x86 (5.7") | 171x128 (8.4") |
| | text (lines x characters) | 16-dot standard font: 20 chars. x 15 lines (2-byte)<br>12-dot standard font: 26 chars. x 20 lines (2-byte) | User definable | User definable |
| | character height (mm) | User definable, Windows fonts | User definable, Windows fonts | User definable, Windows fonts |
| | graphical resolution (pixels) | 320x240 | 320x240/VTBD: 640x480 | 640x480 |
| Power supply | | 24 V DC | 24 V DC | A types: 100–240 V AC<br>D types: 24 V DC |
| Internal memory capacity | | 9 MB | 9 MB | VN types: 5 MB (expandable up to 53 MB)<br>VT types: 9 MB (expandable up to 57 MB) |
| Memory card slot | | 1 (CompactFlash) | 1 (CompactFlash) | 1 (CompactFlash, 256 MB max.) |
| Keyboard type | | Touch-panel | Touch-panel | Touch-panel |
| Function keys | internal | Touch keys | Touch keys (300 per screen) | Touch keys |
| | external | — | — | — |
| LED indicators | | 1 (Power ON) | 1 (Power ON) | 1 |
| Interfaces | serial | RS232, RS422/485 | RS232 | RS232C |
| | parallel | — | — | — |
| | others | USB (Mini-B) (front side)<br>USB (Type-A) (rear side) | USB (front side) | USB (on panel front) |
| Interface slot for optional cards | | — | 2 | 1/2 |
| Real-time clock | | Integrated | Integrated | Integrated |
| Network communication possibilities | type | Ethernet ①, RS422/485, RS232 | 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 |
| | max. no. of nodes | — | 2 | 2 |
| IP Rating (front panel) | | IP67 | IP67 | IP67 |
| Dimensions (WxHxD) | mm | 164x135x56 | 167x135x60 | 241x150x56 |
| Weight | kg | 0.7 | 1.1 | 1.9 |
| **Order information** | Art. no. | 248881/248880 | 203472/203471/203470/ 209823 | 166240/162705 169480/169481 |
| **Accessories** | | Programming software (refer to page 5), cables and interface adapters (refer to page 101) | | |

① Only for models GT1455-QTBDE and GT1450-QLBDE (equipped with Ethernet)

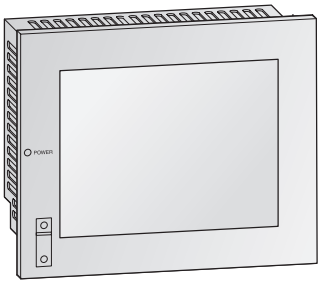
**GT1572**



**GT1575**
**GT1575V**



**GT1585**
**GT1595**
**GT1585V**



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.

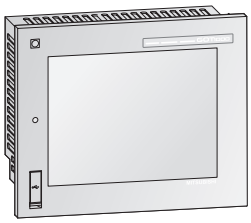
All GT15 operator terminals listed on this page are available as AC type (-A models*) or as DC type (-D models).

* Not for the video models

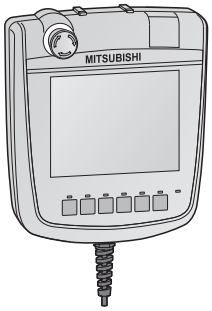


| Specifications | | | GT1572-VNBA/GT1575-VNBA<br>GT1572-VNBD/GT1575-VNBD | GT1575-VTBA/GT1575-STBA<br>GT1575-VTBD/GT1575-STBD,<br>GT1575V-STBD | GT1585-STBA/GT1595-XTBA<br>GT1585-STBD/GT1595-XTBD,<br>GT1585V-STBD |
|---|---|---|---|---|---|
| Display unit | type | | TFT, 16 colours/256 colours | TFT, 65536 colours (expandable) | TFT, 256 colours (expandable) |
| | dimensions (mm) | | 211x158 (10.4") | 211x158 (10.4") | 246x185 (12.1")/304x228 (15") |
| | 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) | | 640x480 | 640x480/800x600 | 800x600/1024x768 |
| Power supply | A types | | 100–240 V AC | 100–240 V AC | 100–240 V AC |
| | D types | | 24 V DC | 24 V DC | 24 V DC |
| Internal memory capacity | | | 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 (CompactFlash 256 MB max.) | 1 (CompactFlash 256 MB max.) | 1 (CompactFlash 256 MB max.) |
| Keyboard type | | | Touch-panel | Touch-panel | Touch-panel |
| Function keys | internal | | Touch keys | Touch keys | Touch keys |
| | external | | — | — | — |
| LED indicators | | | 1 | 1 | 1 |
| Interfaces | serial | | RS232C | RS232C | RS232C |
| | parallel | | — | — | — |
| | others | | USB (on panel front) | USB (on panel front) | USB (on panel front) |
| Interface slot for optional cards | | | 1 | 2 | 2 |
| Real-time clock | | | 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 |
| IP Rating (front panel) | | | IP67 | IP67 | IP67 |
| Dimensions (WxHxD) | | mm | 303x214x56 | 303x214x56 | 316x242x56/397x296x61 |
| Weight | | kg | 2.3 | 2.3/2.4 | 2.8/4.9 |
| **Order information** | | Art. no. | 166241/166242<br>169482/169483 | 162706/162707/169484/169485,<br>video model 203496 | 162708/169464/169486/203469,<br>video model 203495 |
| **Accessories** | | | Programming software (refer to page 5), cables and interface adapters (refer to page 101) | | |

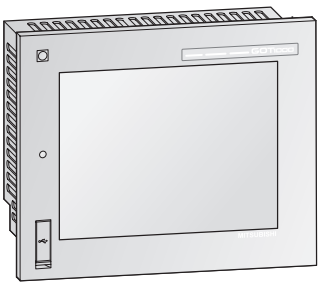
**GT1655-VTBD**
**GT1662-VNBA**
**GT1662-VNBD**



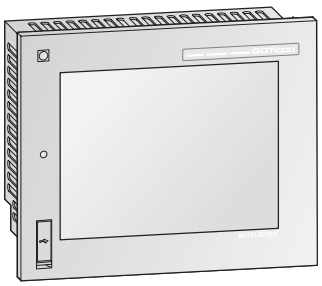
**GT1665HS-VTBD**




**GT1672-VNBA**
**GT1672-VNBD**



**GT1675-VNBA**
**GT1675-VNBD**



The graphic operating terminals of the GT16 series impress with their functionality and comprehensive connection options. The high-resolution TFT display delivers crisp, sharp images in up to 65,536 colours and can be viewed clearly even from less favourable angles. Screen displays can be created with the intuitive GT Designer3 PC programming package, which makes it easy to program graphical elements like data displays, diagrams and touch key controlled switch elements and arrange them on the spacious 10.4" screen. The resulting interfaces simplify the operation of even more complex processes.

In addition to generously-dimensioned project and data memory of up to 15 MB (expandable with a CF card), the units come with comprehensive network connections already integrated, including Ethernet, CC-Link, Modbus and MELSECNET. In addition to this you can also use standard serial interfaces like RS232, RS2422 and RS485. With the exception of the handheld GT1665HS-VTBD control terminal, all the models can also be connected to the bus connector of a MELSEC PLC rack system.

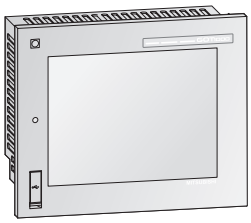
USB ports on the front of the units (except on the handheld GT1665HS-VTBD) make it possible to use standard USB thumb drives for storing projects and data – for example when you are switching the PLC CPU. You just save the PLC program to the thumb drive via the GT16's USB port and then load it back onto the new PLC when it has been installed.

The GT1665HS-VTBD is a handheld control terminal with the same functions as the stationary units, plus additional function keys and an Emergency OFF button.



| Specifications | | | GT1655-VTBD<br>GT1662-VNBA<br>GT1662-VNBD | GT1665HS-VTBD | GT1672-VNBA<br>GT1672-VNBD | GT1675-VNBA<br>GT1675-VNBD |
|---|---|---|---|---|---|---|
| Display unit | type | | 5.7", TFT, 65536 colours<br>8.4", TFT, 16 colours | 6.5", TFT, 65536 colours | 10.4", TFT, 16 colours | 10.4", TFT, 4096 colours |
| | dimensions (mm) | | 115x86/171x128 | 211x158 | 211x158 | 211x158 |
| | text (lines x characters) | | 40 chars. x 30 lines (16 Pkt.)<br>53 chars. x 40 lines (12 Pkt.) | User definable | 40 chars. x 30 lines (16 Pkt.)<br>53 chars. x 40 lines (12 Pkt.) | 40 chars. x 30 lines (16 Pkt.)<br>53 chars. x 40 lines (12 Pkt.) |
| | 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 | 640x480 |
| Power supply | A types | | 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 | | | 11–15 MB | 15 MB | 11 MB | 11 MB |
| Internal memory capacity | | | 1 (CompactFlash) | 1 (CompactFlash) | 1 (CompactFlash) | 1 (CompactFlash) |
| 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 | Ethernet (TCP/IP), RS232, RS422/485, USB (Front), CF-Slot | | |
| Interface slot for optional cards | | | 1 CF slot | 1 CF slot | 1 CF slot | 1 CF slot |
| Multimedia capability | | | — | — | — | — |
| 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 | Ethernet (TCP/IP), Modbus, RS232, RS422/485 | Ethernet (TCP/IP), CC-Link (IE), Modbus, RS232, RS422/485, A-bus, Q-bus, MELSECNET/10/H | 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 | 167x135x60/241x190x52 | 210x230x97 | 303x214x49 | 303x214x49 |
| Weight | | kg | 1.0/1.8 | 2.1 | 2.3 | 2.3 |
| **Order information** | | Art. no. | 244210<br>237194<br>237194 | 237248 | 237192<br>237193 | 237190<br>237191 |
| **Accessories** | | | Programming software (refer to page 5), cables and interface adapters (refer to page 101) | | | |

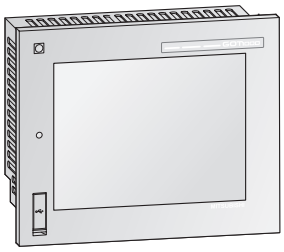
**GT1665M**



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.

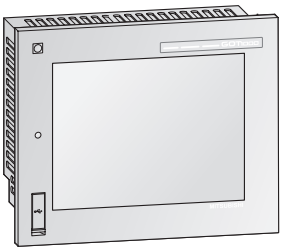
Many of the well-known useful functions are already integrated, e.g. a variety of network connections such as Ethernet and RS422/RS485 beside the generously measured project and data memory of 15 MB (with CF card expandable up to 57 MB max.).

**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.

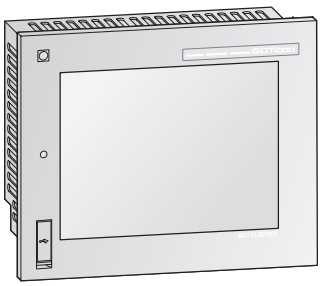
**GT1685M**



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.

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.

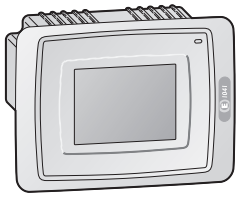


| Specifications | | GT1665M-STBA, GT1665M-STBD, GT1665M-VTBA, GT1665M-VTBD | GT1675M-STBA, GT1675M-STBD, GT1675M-VTBA, GT1675M-VTBD | GT1685M-STBA, GT1685M-STBD | GT1695M-XTBA, GT1695M-XTBD |
|---|---|---|---|---|---|
| Display unit | type | 8.4", TFT, 65536 colours | 10.4", TFT, 65536 colours | 12.1", 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<br>VTB□: 640x480 | STB□: 800x600<br>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 (CompactFlash) | 1 (CompactFlash) | 1 (CompactFlash) | 1 (CompactFlash) |
| 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 | | Optional | Optional | Optional | 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<br>221951/221952 | 221945/221946<br>221947/221948 | 221360<br>221361 | 221358<br>221359 |
| **Accessories** | | Programming software (refer to page 5), cables and interface adapters (refer to page 101) | | | |

**E1012**
**E1022**
**E1032**

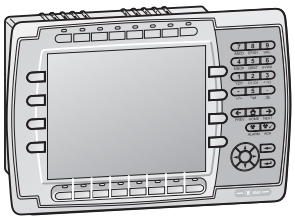
E1012, E1022 and E1032 have programmable function keys and a separate keypad. The graphic-capable displays illustrate symbols, alarms, line diagrams and text in arbitrary sizes. Formulas, text and changes in the sequence program can be done directly via the keys.

**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.

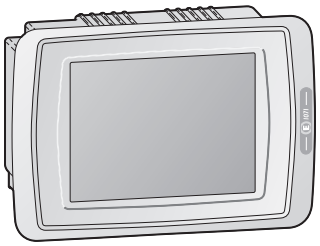
**E1060**
**E1062**



The 5.7" TFT display of the E1060 offers 65,536 colors and 16 function keys for screen-based user-friendly operation. Inputs and changes can be made with the help of the keys. The integrated password protection prevents from unauthorized access. 16 alarm groups keep you informed and up-to date of all important events.

The E1062 is functionally identical to the E1060, but offers 16 shades of gray TFT display instead of the color display.

**E1061**
**E1063**



The E1061 and E1063 operator terminals have the same features as E1041 and E1043, but with the 5.7" TFT touch screen (65,536 colors or 16 gray levels), they offer the larger display.

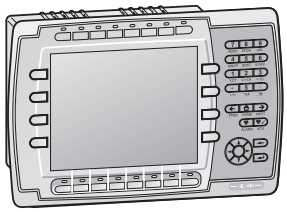
Each unit features two PLC ports, one USB host port to connect mouse, keyboard, printer and USB memory sticks as well as an integrated Ethernet interface.

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 5), cables and interface adapters (refer to page 101) | | | | |

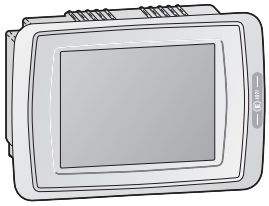
**E1070**
**E1070 Pro+**



The operator terminal E1070 offers a 6.5" TFT display with 65,536 colours and a resolution of 640x480 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.

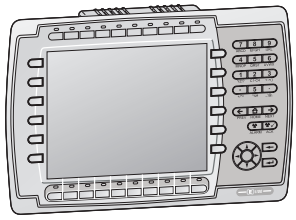
**E1071**
**E1071 Pro+**



The operator terminal E1100 offers a 10.4" TFT display with 65,536 colours and a resolution of 800x600 pixels. Freely programmable function keys facilitate the inputs directly at the terminal.

The operator terminals E1101 and E1151 provide a user-friendly TFT colour touch screen. The E1101 offers a resolution of 800x600 pixels on a 10.4" screen, the E1151 provides a 15" screen with 1024x768 pixels.

**E1100**
**E1100 Pro+**

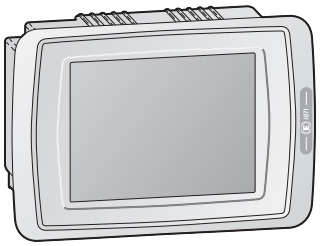


All E1000 operator terminals on this page provide two PLC ports, a USB host port to connect mouse, keyboard, printer and USB memory as well as an integrated Ethernet interface. Profibus DP is available via a separate extension module.

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 1024x768 pixels.

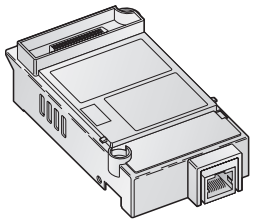


| Specifications | | E1070/E1070 Pro+ | E1071/E1071 Pro+ | E1100/E1100 Pro+ | E1101/E1101 Pro+, E1151/E1151 Pro+, DT1151 |
|---|---|---|---|---|---|
| Display unit | type | TFT | TFT | TFT | TFT |
| | dimensions (mm) | 134x100 (6.5") | 134x100 (6.5") | 211x158 (10.4") | 211x158 (10.4") , 304x228 (15") |
| | 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 (CompactFlash 4–1024 MB) | 2 (CompactFlash 4–1024 MB) | 2 (CompactFlash 4–1024 MB) | 2 (CompactFlash 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<br>156100/203325/DT1151: 203326 |
| **Accessories** | | Programming software E-Designer (refer to page 5), cables and interface adapters (refer to page 101) | | | |

## 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 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** | RS485 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 |
| | **GT15-J71GF13-T2** | GT15/GT16, CCLink IE Field interface | 247574 |
| 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 |
| | RS232 | **CAB34** | D-Sub male connector 9 pin<–> MINI-DIN male connector 6 pin | MELSEC System Q | 3 | 163006 |
| | RS422 | **CAB36** | D-Sub male connector 25 pin <-> D-Sub male connector 9 pin | Siemens S7/MPI direct | 3 | 205178 |
| | RS422 | **CAB17** | D-Sub male connector 25 pin <–> MINI-DIN male connector 6 pin | MELSEC System Q | 3 | 140472 |
| | RS422 | **CAB19** | D-Sub male connector 25 pin <–> MINI-DIN male connector 8 pin | MELSEC FX family | 3 | 146861 |
| GT1020 GT1030 | RS232 | **GT01-C30R2-6P** | Mini-DIN male connector 6 pin <-> D-Sub male connector 9 pin | Personal Computer | 3 | 163959 |
| | RS422 | **GT10-C30R4-8P** | Open terminals <-> MINI-DIN male connector 8 pin | MELSEC FX family | 3 | 200494 |
| | RS232 | **GT10-C30R2-6P** | Open terminals <-> MINI-DIN male connector 6 pin | MELSEC System Q | 3 | 200498 |
| | RS232 | **GT10-RS2TUSB-5S** | Mini-DIN male connector 6 pin <-> MINI-B USB | PC + GT09-C20USB-5P | 3 | 200500 +166373 |
| GT10 QVGA GT11 GT14 GT15 GT16 | RS232 | **FX-232-CAB1** | D-Sub male connector 9 pin <–> D-Sub male connector 9 pin | Personal Computer | 3 | 124972 |
| | USB | **GT09-C20USB-5P** | USB <–> USB | | 2 | 166373 |
| | RS232 | **GT01-C30R2-6P** | D-Sub male connector 9 pin<–> MINI-DIN male connector 6 pin | MELSEC System Q | 3 | 163959 |
| | RS232 | **GT01-C30R2-9S** | D-Sub male connector 9 pin <–> D-Sub male connector 9 pin | MELSEC FX family | 3 | 163957 |
| | 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 (3 m) |
| | RS422 | **GT01-C□□□R4-25P** | D-Sub female connector 9 pin <–> D-Sub female connector 25 pin | MELSEC A/System Q | 3, 10, 20, 30 | 163953 (3 m) |
| | RS232/RS485 | **GT14-RS2T4-9P** | Signal conversion adapter for D-sub female connector 9 pin <-> 5 pin (fixed type) | | | 248882 |
| | USB | **GT14-C10EXUSB-4S** | Panel-mounted USB port extension | HMI USB Host | 1 | 248883 |
| | Q(A)nS-bus | **GT15-A1SC□□B** | Special bus connector | MELSEC (Q)AnS series | 0.7, 1.2, 3, 5 | 166358 (3 m) |
| | 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 (3 m) |
| | MELSEC System Q-bus | **GT15-QC□□□B** | Special bus connector | MELSEC System Q | 0.6, 1, 3, 5, 10 | 166348 (3 m) |
| 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

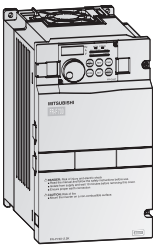
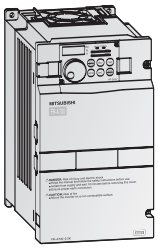
Mitsubishi Electric's comprehensive range of frequency inverters offers a wealth of benefits for the user, making it easy to choose the perfect solution for every drive application.

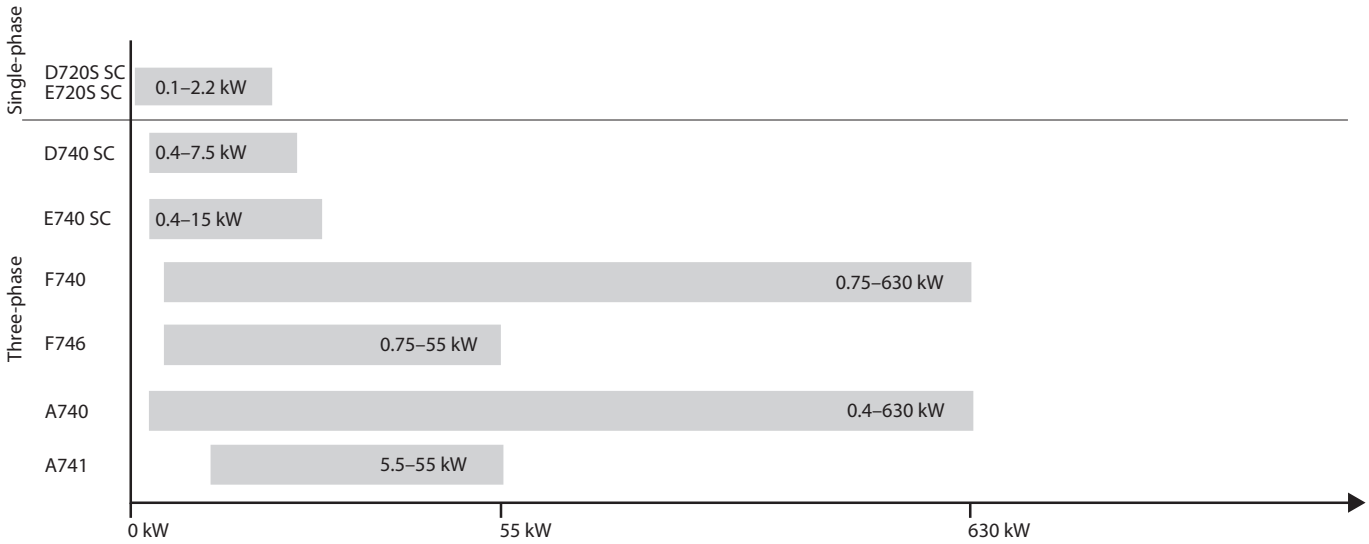
With most Mitsubishi Electric Frequency Inverters an overload capacity of 200 % is standard. This means they deliver double the performance of the competing inverters with the same rating.

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

Mitsubishi Electric 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 SC | FR-E700 SC | 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 | 0.2–400 Hz | 0.5–400 Hz | 0.2–400 Hz |
| **Power supply** | Single-phase, 200–240 V (-15 %/+10 %)<br>Three-phase, 380–480 V (-15 %/+10 %) | Single-phase, 200–240 V (-15 %/+10 %)<br>Three-phase, 380–480 V (-15 %/+10 %) | Three-phase, 380–500 V (-15 %/+10 %) | Three-phase, 380–500 V (-15 %/+10 %) |
| **Protection** | IP20 | IP20 | FR-F700: IP00/IP20<br>FR-F746: IP54 | FR-A740: IP00/IP20<br>FR-A741: IP00 |
| **Special functions** | ● V/f control<br>● Sensorless vector control<br>● Brake transistor<br>● Safe Torque Off (STO) according EN 61800-5-2<br>● Energy saving control (Optimum excitation control)<br>● Maintenance timer<br>● dancer Control | ● V/f control<br>● Sensorless vector control<br>● Brake transistor<br>● Safe Torque Off (STO) according EN 61800-5-2<br>● Torque limit<br>● Ext. brake control<br>● Flying start<br>● Remote I/O<br>● Maintenance timer | ● Energy saving control<br>● Simple magnetic flux vector control<br>● V/f control<br>● Traverse function<br>● Switch motor to direct mains operation<br>● Special Function for the Water and HVAC application<br>● Regeneration avoidance function<br>● Flying start<br>● Life time diagnostics<br>● Integrated PLC function<br>● Integrated BACNet<br>● Integrated EMC filter | ● Torque control<br>● Positon control<br>● Real Sensorless Vector Control<br>● Closed loop vector control<br>● Continuous energy recovery capability (FR-A741)<br>● Regeneration avoidance function<br>● Integrated PLC function<br>● Easy gain tuning<br>● Life time diagnostics<br>● Integrated EMC filter |
| **Specifications** | Refer to page 104 | Refer to page 105 | Refer to page 106 | Refer to page 108 |



# Intelligent technology

### Compatible with many new applications

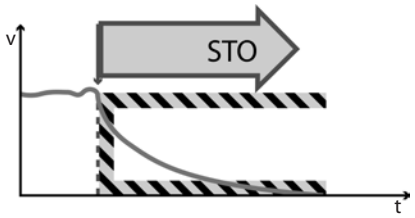
- PID control
  The integrated PID control for example supports a flow control for pumps.
- Torque boost
  Torque boost selection is possible.

### Comprehensive protection functions for safe operation

- Built-in electronic overcurrent protection
- Selection of the protection function for automatic retry after alarm occurence.

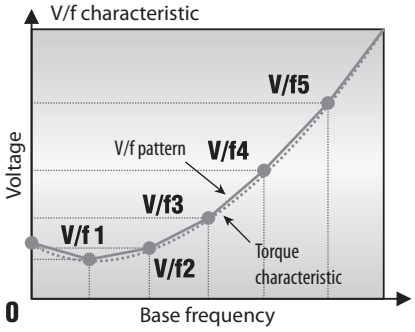
### Safety function "Safe Torque Off" (STO) according EN 61800-5-2

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.

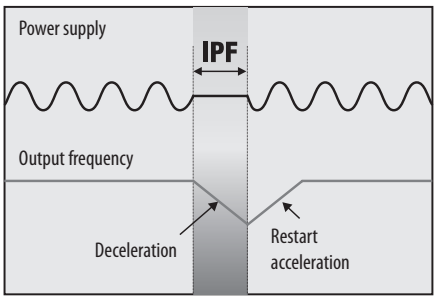
The function then temporarily increases the output frequency above the setpoint value.

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

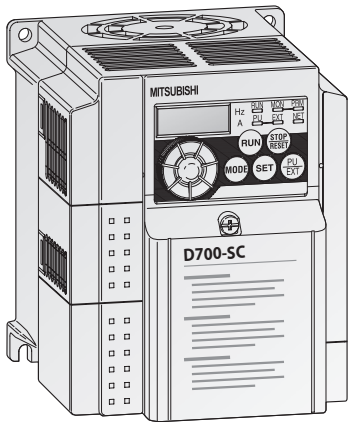
The maintenance timer function can be used to monitor the service life of different components.

### 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 SC ultra-compact standard inverters




The ultra compact FR-D700 SC 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 D700 has an integrated safety stop and internal safety diodes.

The small dimensions render the FR-D700 SC 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 SC is available in the output power range from 0.1 to 2.2 kW, the FR-D740 SC in the output power range from 0.4 to 7.5 kW.

The frequency inverters FR-D720S SC are for single-phase use 200 to 240 V AC. The freqency inverters FR-D740 SC are designed for three-phase connections 380 to 480 V AC (50/60 Hz).

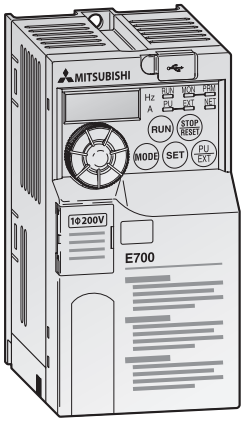
The output frequency ranges from 0.2 to 400 Hz.

| Product line | | | FR-D720S-□SC-EC/-E6 | | | | | | FR-D740-□SC-EC/-E6 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 008 | 014 | 025 | 042 | 070 | 100 | 012 | 022 | 036 | 050 | 080 | 120 | 160 |
| Output | Rated motor capacity ① | kW | 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 ② | kVA | 0.3 | 0.5 | 1 | 1.6 | 2.8 | 3.8 | 1.2 | 2 | 3 | 4.6 | 7.2 | 9.1 | 13 |
| | Rated current ③ | A | 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 ⑥ | kVA | 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 | s | 0.1–3600 | | | | | | | | | | | | |
| | 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 178–182 (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 | Single coated PCB (EC) | Art. no. | 247595 | 247596 | 247597 | 247598 | 247599 | 247600 | 247601 | 247602 | 247603 | 247604 | 247605 | 247606 | 247607 |
| | Double coated PCB (E6) | Art. no. | 266097 | 266098 | 266099 | 266100 | 266100 | 266102 | 266103 | 266104 | 266135 | 266136 | 266137 | 266137 | 266139 |

Remarks:
① The rated motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi Electric 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 SC 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 SC 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 SC is available in the output power range from 0.1 to 2.2 kW, the FR-E740 SC in the output power range from 0.4 to 15 kW.

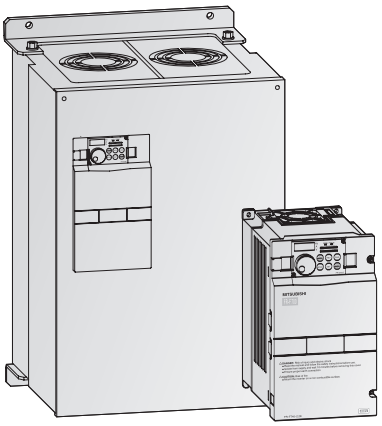
The frequency inverters FR-E720S SC are for single-phase use 200 to 240 V AC. The frequency inverters FR-E740 SC are designed for three-phase connections 380 to 480 V AC (50/60 Hz).

The output frequency ranges from 0.2 to 400 Hz.

| Product line | | | FR-E720S-□SC-EC/-E6 | | | | | | FR-E740-□SC-EC/-E6 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 008 | 015 | 030 | 050 | 080 | 110 | 016 | 026 | 040 | 060 | 095 | 120 | 170 | 230 | 300 |
| Output | Rated motor capacity ① | kW | 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 ② | kVA | 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 ③ | A | 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 ⑥ | kVA | 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) | | | | | | | | | | | | | | |
| | Safety stop function | | The safety stop signal can be input to terminals S1 and S2 (complying with the safety standards EN ISO 13849-1 category 3, PLd EN62061, IEC61508 SIL2). | | | | | | | | | | | | | | |
| | 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,(from FR-E720S-050SC, from FR-E740-040SC) heatsink overheat pre-alarm, deceleration at an instantaneous power failure, PID control activated, monitor output„safety stop", monitor output 2„safety stop", 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 | | | | | Self 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 | 6.0 | 6.0 |
| | Dimensions (WxHxD) | mm | 68x128x86.5 | | 68x128 x148.5 | 108x128x 141.5 | 108x128 x167 | 140x150 x161.5 | 140x150x120 | | 140x150x141 | | | 220x150x153 | | 220x260x196 | |
| Order information | Single coated PCB | Art. no. | 234795 | 234796 | 234797 | 234798 | 234799 | 234800 | 234801 | 234802 | 234803 | 234804 | 234805 | 234806 | 234807 | 234808 | 234809 |
| | Double coated PCB (-E6) | Art. no. | 240974 | 240975 | 240976 | 240977 | 240978 | 240979 | 240980 | 240981 | 240982 | 240983 | 240984 | 240985 | 240986 | 240987 | 240988 |

Remarks:
① The rated motor capacity indicated is the maximum capacity applicable for use of the Mitsubishi Electric 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 (integrated BACNet)
- Air extraction systems
- Fans and blowers
- Hydraulics systems
- Compressors
- Sewage and drains systems
- Ground water pumps
- Heat pumps
- Drive systems with high idling rates

The integrated PLC functions allow an easy individualisation of the customer's application. The entire machine is controlled by the inverter, where the display functions as a HMI.

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 500 V (50/60 Hz) power supplies.

The output frequency ranges from 0.5 to 400 Hz.

| Product line | | | | FR-F740-□-EC/-E1/FR-F746-□-EC | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 00023 | 00038 | 00052 | 00083 | 00126 | 00170 | 00250 | 00310 | 00380 | 00470 | 00620 | 00770 | 00930 | 01160 |
| Output | Rated motor capacity ① kW | 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 ③ A | 120 % | $I_{rated}$ | 2.3 | 3.8 | 5.2 | 8.3 | 12.6 | 17 | 25 | 31 | 38 | 47 | 62 | 77 | 93 | 116 |
| | | overload | $I_{max.}$ 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 |
| | | capacity (SLD) 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 % | $I_{rated}$ | 2.1 | 3.5 | 4.8 | 7.6 | 11.5 | 16 | 23 | 29 | 35 | 43 | 57 | 70 | 85 | 106 |
| | | overload | $I_{max.}$ 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 |
| | | capacity (LD) | $I_{max.}$ 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 | 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 |
| | 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, 380–500 V AC, -15 %/+10 % | | | | | | | | | | | | | |
| | Voltage range | | | 323–550 V AC at 50/60 Hz | | | | | | | | | | | | | |
| | Power supply frequency | | | 50/60 Hz ±5 % | | | | | | | | | | | | | |
| | Rated input capacity ④ kVA | 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 ⑥ | FR-F740 | | IP20 ⑦ | | | | | | | | | | | IP00 | | |
| | | FR-F746 | | IP54 | | | | | | | | | | | | | |
| | EMC filter | | | The frequency inverters FR-F740 are fitted with an integrated EMC noise filter for industrial environments (Environment 2) and meet the emission requirements of EN 61800-3, Category C3/C4. | | | | | | | | | | | | | |
| | 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 | 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 | | | | | 220x260x170 | | 220x300x190 | | 250x400x190 | | 325x550 x195 | 435x550x250 | |
| | | FR-F746 | | 249x395x210 | | | | | 319x395x240 | | 319x445x260 | | 354x560x260 | | 360x590 x265 | 471x660x320 | |

| | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Order information FR-F740 ⑨ | Frequency inverters | | 156569 | 156570 | 156571 | 156572 | 156573 | 156594 | 156595 | 156596 | 156597 | 156598 | 156599 | | | | |
| | Double coated PCB (-E1) | | 158589 | 158591 | 158592 | 158593 | 158594 | 158595 | 158596 | 158597 | 158598 | 158599 | 158600 | 158601 | 158602 | 158603 | |
| | 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 | |

Remark:
Explanation for ① to ⑨ see next page.

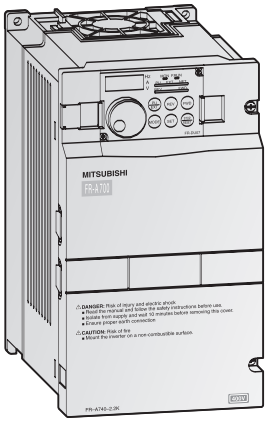
| Product line | | | | FR-F740-□-EC | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 01800 | 02160 | 02600 | 03250 | 03610 | 04320 | 04810 | 05470 | 06100 | 06830 | 07700 | 08660 | 09620 | 10940 | 12120 |
| Output | Rated motor capacity ① kW | 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 ⑥ A | 120 % | $I_{rated}$ | 180 | 216 | 260 | 325 | 361 | 432 | 481 | 547 | 610 | 683 | 770 | 866 | 962 | 1094 | 1212 |
| | | overload | $I_{max.}$ 60 s | 198 | 238 | 286 | 357 | 397 | 475 | 529 | 602 | 671 | 751 | 847 | 953 | 1058 | 1203 | 1333 |
| | | capacity (SLD)⑤ | $I_{max.}$ 3 s | 216 | 259 | 312 | 390 | 433 | 518 | 577 | 656 | 732 | 820 | 924 | 1039 | 1154 | 1313 | 1454 |
| | | 150 % | $I_{rated}$ | 144 | 180 | 216 | 260 | 325 | 361 | 432 | 481 | 547 | 610 | 683 | 770 | 866 | 962 | 1094 |
| | | overload | $I_{max.}$ 60 s | 173 | 216 | 259 | 312 | 390 | 433 | 518 | 577 | 656 | 732 | 820 | 924 | 1039 | 1154 | 1313 |
| | | capacity (LD) | $I_{max.}$ 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 | | Hz | 0.5–400 | | | | | | | | | | | | | | |
| | Carrier frequency | | kHz | 0.7–6 (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 ④ kVA | 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 ⑦ | | | | | | | | | | | | | | |
| | 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 | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Art. no. | 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 Electric 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 ³3 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.<br>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 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 |
| | | 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 500 V (50/60 Hz) power supplies.

The output frequency ranges from 0.2 to 400 Hz.

| Product line | | | | FR-A740-□-EC/-E1 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 00023 | 00038 | 00052 | 00083 | 00126 | 00170 | 00250 | 00310 | 00380 | 00470 | 00620 | 00770 | 00930 | 01160 |
| Output | Rated motor capacity ① kW | 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 ③ A | 120 % | $I_{nenn}$ ③ | 2.3 | 3.8 | 5.2 | 8.3 | 12.6 | 17 | 25 | 31 | 38 | 47 | 62 | 77 | 93 | 116 |
| | | overload | $I_{max.}$ 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 |
| | | capacity (SLD) | $I_{max.}$ 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 % | $I_{nenn}$ ③ | 2.1 | 3.5 | 4.8 | 7.6 | 11.5 | 16 | 23 | 29 | 35 | 43 | 57 | 70 | 85 | 106 |
| | | overload- | $I_{max.}$ 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 |
| | | capacity (LD) | $I_{max.}$ 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 % | $I_{nenn}$ ③ | 1.5 | 2.5 | 4 | 6 | 9 | 12 | 17 | 23 | 31 | 38 | 44 | 57 | 71 | 86 |
| | | overload- | $I_{max.}$ 60 s | 2.3 | 3.8 | 6 | 9 | 13.5 | 18 | 25.5 | 34.5 | 46.5 | 57 | 66 | 85.5 | 106.5 | 129 |
| | | capacity (ND) | $I_{max.}$ 3 s | 3 | 5 | 8 | 12 | 18 | 24 | 34 | 46 | 62 | 76 | 88 | 114 | 142 | 172 |
| | | 250 % | $I_{nenn}$ ③ | 0.8 | 1.5 | 2.5 | 4 | 6 | 9 | 12 | 17 | 23 | 31 | 38 | 44 | 57 | 71 |
| | | overload- | $I_{max.}$ 60 s | 1.6 | 3 | 5 | 8 | 12 | 18 | 24 | 34 | 46 | 62 | 76 | 88 | 114 | 142 |
| | | capacity (HD) | $I_{max.}$ 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 ② kVA | 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, 380–500 V AC, -15 %/+10 % | | | | | | | | | | | | | |
| | Voltage range | | | 323–550 V AC at 50/60 Hz | | | | | | | | | | | | | |
| | Power supply frequency | | | 50/60 Hz ±5 % | | | | | | | | | | | | | |
| | Rated input capacity ⑦ kVA | 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 | | |
| | EMC filter | | | The frequency inverters FR-A740 are fitted with an integrated EMC noise filter for industrial environments (Environment 2) and meet the emission requirements of EN 61800-3, Category C3/C4. | | | | | | | | | | | | | |
| | 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 | | 250x400x190 | | 325x550 x195 | 435x550x250 | |

| Order information | Art. no. | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Frequency inverters | 169826 | 169797 | 169798 | 169799 | 169800 | 169801 | 169802 | 169803 | 169804 | 169805 | 169806 | | | |
| | | Double coated PCB (-E1) | 206810 | 206811 | 206812 | 206813 | 206844 | 206845 | 206846 | 206847 | 206848 | 206849 | 206850 | 206851 | 206852 | 206853 |
| | | Input power frame | | | | | | | | | | | | 169827 | 169828 | 169829 |
| | | Control card FR-CA70-EC | | | | | | | | | | | | 169877 | 169877 | 169877 |

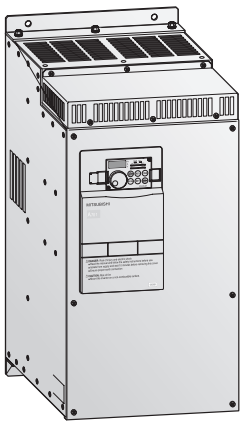
Remark:
Explanation for ① to ⑨ see next page.

| Product line | | | | FR-A740-□-EC | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 01800 | 02160 | 02600 | 03250 | 03610 | 04320 | 04810 | 05470 | 06100 | 06830 | 07700 | 08660 | 09620 | 10940 | 12120 |
| Output | Rated motor capacity ① kW | 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 ③ A | 120 % | $I_{rated}$ ③ | 180 | 216 | 260 | 325 | 361 | 432 | 481 | 547 | 610 | 683 | 770 | 866 | 962 | 1094 | 1212 |
| | | overload | $I_{max.}$ 60 s | 198 | 238 | 286 | 358 | 397 | 475 | 529 | 602 | 671 | 751 | 847 | 953 | 1058 | 1203 | 1333 |
| | | capacity (SLD) | $I_{max.}$ 3 s | 216 | 259 | 312 | 390 | 433 | 518 | 577 | 656 | 732 | 820 | 924 | 1039 | 1154 | 1313 | 1454 |
| | | 150 % | $I_{rated}$ ③ | 144 | 180 | 216 | 260 | 325 | 361 | 432 | 481 | 547 | 610 | 683 | 770 | 866 | 962 | 1094 |
| | | overload | $I_{max.}$ 60 s | 173 | 216 | 259 | 312 | 390 | 433 | 518 | 577 | 656 | 732 | 820 | 924 | 1039 | 1154 | 1313 |
| | | capacity (LD) | $I_{max.}$ 3 s | 216 | 270 | 324 | 390 | 488 | 542 | 648 | 722 | 821 | 915 | 1025 | 1155 | 1299 | 1443 | 1641 |
| | | 200 % | $I_{rated}$ ③ | 110 | 144 | 180 | 216 | 260 | 325 | 361 | 432 | 481 | 547 | 610 | 683 | 770 | 866 | 962 |
| | | overload | $I_{max.}$ 60 s | 165 | 216 | 270 | 324 | 390 | 488 | 542 | 648 | 722 | 821 | 915 | 1025 | 1155 | 1299 | 1443 |
| | | capacity (ND) | $I_{max.}$ 3 s | 220 | 288 | 360 | 432 | 520 | 650 | 722 | 864 | 962 | 1094 | 1220 | 1366 | 1540 | 1732 | 1924 |
| | | 250 % | $I_{rated}$ ③ | 86 | 110 | 144 | 180 | 216 | 260 | 325 | 361 | 432 | 481 | 547 | 610 | 683 | 770 | 866 |
| | | overload | $I_{max.}$ 60 s | 172 | 220 | 288 | 360 | 432 | 520 | 650 | 722 | 864 | 962 | 1094 | 1220 | 1366 | 1540 | 1732 |
| | | capacity (HD) | $I_{max.}$ 3 s | 215 | 275 | 360 | 450 | 540 | 650 | 813 | 903 | 1080 | 1203 | 1368 | 1525 | 1708 | 1925 | 2165 |
| | Rated output capacity ② kVA | 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/ continu-ous | 10 % torque/continuous ⑥ | | | | | | | | | | | | | |
| | 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 ⑦ kVA | 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 ⑧ | | | | | | | | | | | | | | |
| | 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 | 13.2 |
| | | 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 (WxHxD) | | mm | 435x550 x250 | 465x620x300 | | 465x740x360 | | 498x1010x380 | | 680x1010x380 | | | 790x1330x440 | | 995x1580x440 | | |

| Order information | Art. no. | 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 75 K (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 11 K to 22 K 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

The 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 500 V (50/60 Hz) power supplies.

The output frequency ranges from 0.2 to 400 Hz.

| Product line | | | FR-A741 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 5.5k | 7.5k | 11k | 15k | 18.5k | 22k | 30k | 37k | 45k | 55k |
| Output | Rated current ③ A | 200 % overload capacity (ND) | 12 | 17 | 23 | 31 | 38 | 44 | 57 | 71 | 86 | 110 |
| | Rated motor capacity ① kW | 200 % overload capacity (ND) | 5.5 | 7.5 | 11 | 15 | 18.5 | 22 | 30 | 37 | 45 | 55 |
| | Rated output capacity ② | kVA | 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, 380–500 V AC, -15 %/+10 % | | | | | | | | | |
| | Voltage range | | 323–550 V AC at 50/60 Hz | | | | | | | | | |
| | Power supply frequency | | 50/60 Hz ±5 % | | | | | | | | | |
| | Rated input capacity ⑤ | kVA | 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 √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)<br>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)<br>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;<br>±0.01 % of the set output frequency (via digital input) |
| | Voltage/frequency characteristics | | Base frequency adjustable from 0 to 400 Hz;<br>selection between constant torque, variable torque or optional flexible 5-point V/f characteristics |
| | Starting torque | | 200 %, 0.3 Hz (0.4–3.7 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.<br>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<br>Terminal 1: 0–±5 V DC, 0–±10 V DC |
| | | Digital input | Input using the setting dial of the operation panel or parameter unit<br>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:<br>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:<br>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<br>(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 ⑤, 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 |

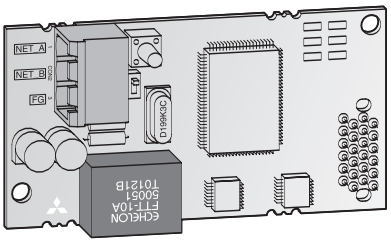
Remarks:
① Only when the option (FR-A7AP) is mounted
② Can be displayed only on the parameter unit (FR-DU07).
③ Can be displayed only on the parameter unit (FR-PU07).
④ This protective function does not function in the initial status.
⑤ FR-A740 only
⑥ FR-A741 only

## General operating conditions for all inverters

| Specifications | FR-D700 SC | FR-E700 SC | FR-F700 | FR-A700 |
|---|---|---|---|---|
| Ambient temperature in operation | -10–+50 °C (non-freezing) | -10–+50 °C (non-freezing) | FR-F740: -10–+50 °C; FR-F746: -10–+40 °C (non-freezing) ① | -10–+50 °C (non-freezing) |
| Storage temperature ② | -20–+65 °C | -20–+65 °C | -20–+65 °C | -20–+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.

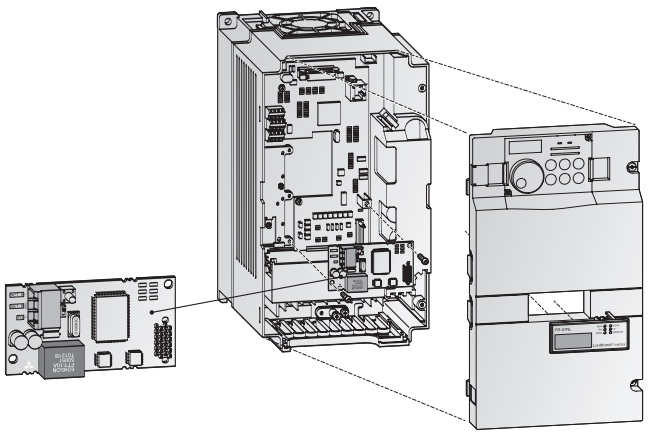
| Option | | | Description | FR-D700 SC | FR-E700 SC | FR-F700 | FR-A700 |
|---|---|---|---|---|---|---|---|
| Internal options | Digital input | | Input of the frequency setting via BCD or binary code | — | ● | ● | ● |
| | Digital output | | Selectable standard output signals of the inverter can be 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 | SSCNETIII | 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. | — | ● | ● | ● |
| | | CC-Link IE Field | Integration of a frequency inverter into a CC-Link IE Field network. | — | — | — | ● |
| | | LonWorks | Integration of a frequency inverter into a LonWorks network. | — | ● | ● | ● |
| | | Ethernet multi-protocol | Ethernet multi-protocol interface card | — | — | ● | ● |
| | | RS485 multi-protocol | RS485 multi-protocol interface card | — | — | ● | ● |

| Option | | | Description | FR-D700 SC | FR-E700 SC | 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. | — | — | ● | ● |
| | Filter module | | Passive harmonic filter to reduce mains pollution | ● | ● | ● | ● |
| | Power feedback unit | | For feeding back electrical energy in short-term operation (ED<50 %) | ● | ● | ● | ● |
| | Power feedback unit | | For feeding back electrical energy in continuous operation (ED=100 %) | ● | ● | ● | ● |
| | Communications | Profibus DP | High speed converter for Profibus DP 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-Ekit-SC-E | FR-E700 SC-EC | 239641 |
| 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. 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 | 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 |
| | | | | FR-A7AY-Ekit-SC-E | FR-E700 SC-EC | 239642 |
| 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-Ekit-SC-E | FR-E700 SC-EC | 239643 |
| 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 |
| 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 |
| Communi-cations | 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-Ekit-SC-E | FR-E700 SC-EC | 239644 |
| | CC-Link IE Field | Option board for the integration of a frequency inverter into a CC-Link IE Field network. | Maximum transfer rate: 1 GBaud | FR-A7NCE | FR-A700 | 244993 |
| | 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-Ekit-SC-E | FR-E700 SC-EC | 239645 |
| | 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-Ekit-SC-E (terminals) | FR-E700 SC-EC | 239646 |
| | | | | FR-A7NP-Ekit-01-E (D-Sub9) | | 235696 |
| | | | 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: 500 kBaud | FR-A7ND | FR-F700, FR-A700 | 158525 |
| | | | | FR-A7ND-Ekit-SC-E | FR-E700 SC-EC | 239648 |
| | SSCNETIII | Option board for the integration of a frequency inverter into the Mitsubishi Electric servo system network SSCNETIII. 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 |
| | RS485 multi-protocol | RS485 multi-protocol interface card; Siemens FLN and Metasys N2 | | FR-A7N-XLT | FR-F700, FR-A700 | 208972 |

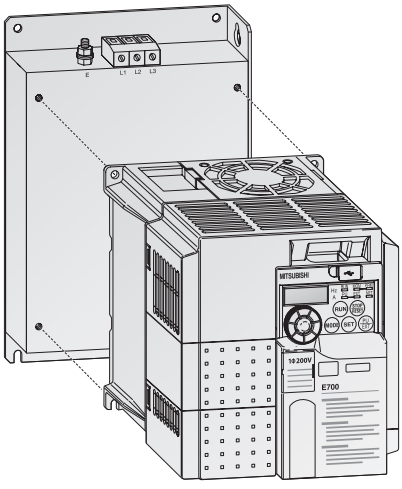
Mounting example of an internal option



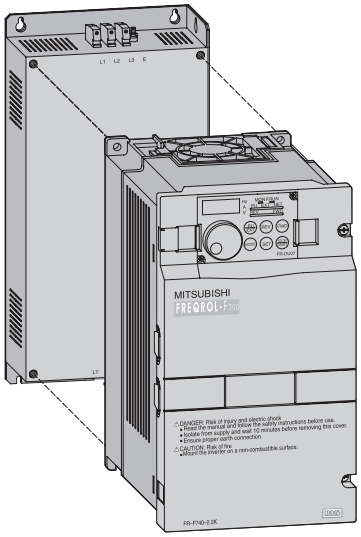
## Overview external options

| 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 Electric 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 SC-EC, FR-E700 SC-EC | 214795 |
| | Interactive parameter unit with LC display and battery pack | | FR-PU07BB | FR-E700 SC-EC, 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 |
| | | | FR-PU07-01 | | 242151 |
| 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<br>2.5 m: 70728<br>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 |
| Montageset für externe Kühlluftführung | | 8 connections | FR-RJ45-HUB10 | | 167613 |
| Montageset für externe Kühlluftführung | 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 RS232 to USB | USB specification 1.1, 0.35 m long | USB-RS232 | FR-D700 SC, FR-F700 | 155606 |
| FR-Configurator | Parameterization and setup software for Mitsubishi Electric inverter. | Further details are provided by your Mitsubishi Electric 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 SC, FR-E700 SC-EC, FR-F700, FR-A740 | — |
| DC reactor | DC reactor for compensation of voltage fluctuations. | | FR-HEL, FFR-HEL-(H)-E | FR-D700 SC, FR-E700 SC-EC, 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 SC, FR-E700 SC-EC, 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 SC, FR-E700 SC-EC, 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 |

Installing an EMC noise filter on an FR-E700 SC




Installing an optional 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-008SC EC | 247595 | D1 |
| ● | | — | — | — | — | 1.4 | 0.2 | FR-D720S-014SC EC | 247596 | D1 |
| ● | | — | — | — | — | 2.5 | 0.4 | FR-D720S-025SC EC | 247597 | D1 |
| ● | | — | — | — | — | 4.2 | 0.75 | FR-D720S-042SC EC | 247598 | D1 |
| ● | | — | — | — | — | 7 | 1.5 | FR-D720S-070SC EC | 247599 | D2 |
| ● | | — | — | — | — | 10 | 2.2 | FR-D720S-100SC EC | 247600 | D3 |
| | ● | — | — | — | — | 1.2 (1.4) | 0.4 (0.55) | FR-D740-012SC EC | 247601 | D4 |
| | ● | — | — | — | — | 2.2 (2.6) | 0.75 (1.1) | FR-D740-022SC EC | 247602 | D4 |
| | ● | — | — | — | — | 3.6 (4.3) | 1.5 (2.2) | FR-D740-036SC EC | 247603 | D4 |
| | ● | — | — | — | — | 5 (6) | 2.2 (3) | FR-D740-050SC EC | 247604 | D5 |
| | ● | — | — | — | — | 8 (9.6) | 3.7 (4) | FR-D740-080SC EC | 247605 | D5 |
| | ● | — | — | — | — | 12 (14.4) | 5.5 (7.5) | FR-D740-120SC EC | 247606 | D6 |
| | ● | — | — | — | — | 16 (19.2) | 7.5 (11) | FR-D740-160SC EC | 247607 | D6 |
| ● | | — | — | — | — | 0.8 (0.8) | 0.1 | FR-E720S-008SC EC | 234795 | E1 |
| ● | | — | — | — | — | 1.5 (1.4) | 0.2 | FR-E720S-015SC EC | 234796 | E1 |
| ● | | — | — | — | — | 3 (2.5) | 0.4 | FR-E720S-030SC EC | 234797 | E1 |
| ● | | — | — | — | — | 5 (4.1) | 0.75 | FR-E720S-050SC EC | 234798 | E2 |
| ● | | — | — | — | — | 8 (7) | 1.5 | FR-E720S-080SC EC | 234799 | E2 |
| ● | | — | — | — | — | 11 (10) | 2.2 | FR-E720S-110SC EC | 234800 | E3 |
| | ● | — | — | — | — | 1.6 (1.4) | 0.4 | FR-E740-016SC EC | 234801 | E4 |
| | ● | — | — | — | — | 2.6 (2.2) | 0.75 | FR-E740-026SC EC | 234802 | E4 |
| | ● | — | — | — | — | 4.0 (3.8) | 1.5 | FR-E740-040SC EC | 234803 | E4 |
| | ● | — | — | — | — | 6.0 (5.4) | 2.2 | FR-E740-060SC EC | 234804 | E5 |
| | ● | — | — | — | — | 9.5 (8.7) | 3.7 | FR-E740-095SC EC | 234805 | E5 |
| | ● | — | — | — | — | 12 | 5.5 | FR-E740-120SC EC | 234806 | E6 |
| | ● | — | — | — | — | 17 | 7.5 | FR-E740-170SC EC | 234807 | E6 |
| | ● | — | — | — | — | 23 | 11 | FR-E740-230SC EC | 234808 | E7 |
| | ● | — | — | — | — | 30 | 15 | FR-E740-300SC EC | 234809 | 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 |

| 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 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).

# EMC filter and electromagnetic compatibility

### 1st and 2nd environment

Different interference levels are permissible depending on the place of use. Differentiation is made between 1st and 2nd environment. The first environment includes residential and business areas which are connected directly to the low-voltage network, i.e. which are not supplied via dedicated high-voltage or medium-voltage transformers. In contrast, the second environment is not connected directly to the public low-voltage network. The second environment is also referred to as the industrial environment.

### Norms and directives

The limits for the respective environments are specified in norms. The environmental norm EN 55011 defines the limits of the basic environments in the industrial area with Classes A1 and A2 and in the residential area with Class B. In addition, the product norm EN 61800-3 for electrical drive systems, which defines the new categories C1 to C4, has been in force since June 2007.

| No. | Frequency inverter | EMC Filter conf. 55011A | Art. no. | EMC Filter conf. 55022B | Art. no. |
|---|---|---|---|---|---|
| D1 | FR-D720S-008–042SC 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-070SC 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-100SC 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-D740-012–036SC 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-D740-050/080SC 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-D740-120/160SC 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 |
| | | FFR-MSH-170-30A-RB1-LL* | 261978 | FFR-MSH-170-30A-RB1-LL* | 261978 |
| E1 | FR-E720S-008–030SC 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 |
| E2 | FR-E720S-050/080SC 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 |
| E3 | FR-E720S-110SC 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 |
| E4 | FR-E740-016-040SC EC | FFR-MSH-040-8A-RF1 | 214953 | FFR-MSH-040-8A-RF1 | 214953 |
| E5 | FR-E740-060/095SC EC | FFR-MSH-095-16A-RF1 | 215004 | FFR-MSH-095-16A-RF1 | 215004 |
| E6 | FR-E740-120/170SC EC | FFR-MSH-170-30A-RF1 | 215005 | FFR-MSH-170-30A-RF1 | 215005 |
| E7 | FR-E740-230/300SC EC | 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.
* LL filters allow a lower leakage current for portable machines, that are connected with a plug to the power supply, e.g. mixers (23.5 mA with short motor cables (1.10 m)). The LL filters are available for FR-D720S, D740 and FR-FR-E720S SC.

# 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 MELSEC 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 take Mitsubishi Electric Motion Control to new levels of precision with a wide range of motors and a wide range of amplifiers (up to 110 kW). All MR-ES series motors are fitted with 131072 pulse-per-revolution encoders, all MR-J3 series motors with 262144 pulse-per-revolution encoders, all MR-J4 series motors with 4,194,304 pulse-per-revolution encoders.

All Mitsubishi Electric Servo and Motion system hardware is complimented by a range of software packages allowing easy programming and set-up of the units.

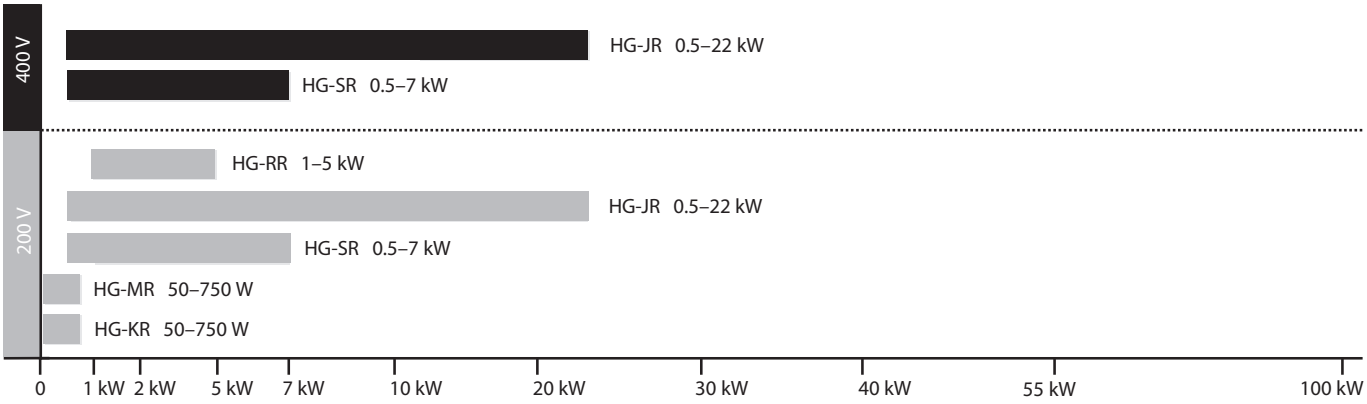
## What are the components of a MR-J4 servo system?

### 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 Electric 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 a considerable number of motor types like rotary, linear and direct drive servo motors a complete line-up of products can be offered by Mitsubishi Electric.

Also, all motors in the MR-J4 series are fitted with absolute encoders as standard. Therefore, an absolute position 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.




### Improving machine performance with high-performance motors

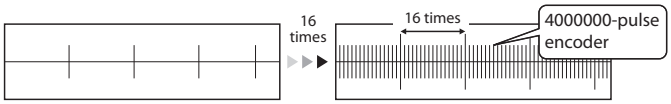
To raise your machine on a high productive level, you need not only powerful servo amplifiers but also high performance servo motors. These motors have to support the high encoder resolution of 22 bits with the MR-J4 series for improved accuracy and speed. Fully closed loop control is supported as standard. A variety of models is available to match various applications.

Rotary servo motors achieve high-accuracy, high-torque output during high speed positioning and smooth rotation with a high resolution encoder and improved processing speed. Linear servo motors support highly accurate tandem synchronous control. Direct drive motors are used for compact and rigid machine and high-torque operations.

For rough environment conditions some motor series are also available with higher protection class like IP65 or IP67.

The MR-J4 series servo amplifiers are able to operate rotary servo motors, linear servo motors, and direct drive motors as standard.

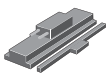
[Resolution comparison with the prior model]




MR-J3 series
18 bits = 262,144 pulses/rev

MR-J4 series
22 bits = 4,194,304 pulses/rev

Rotary servo motor



Linear servo motor

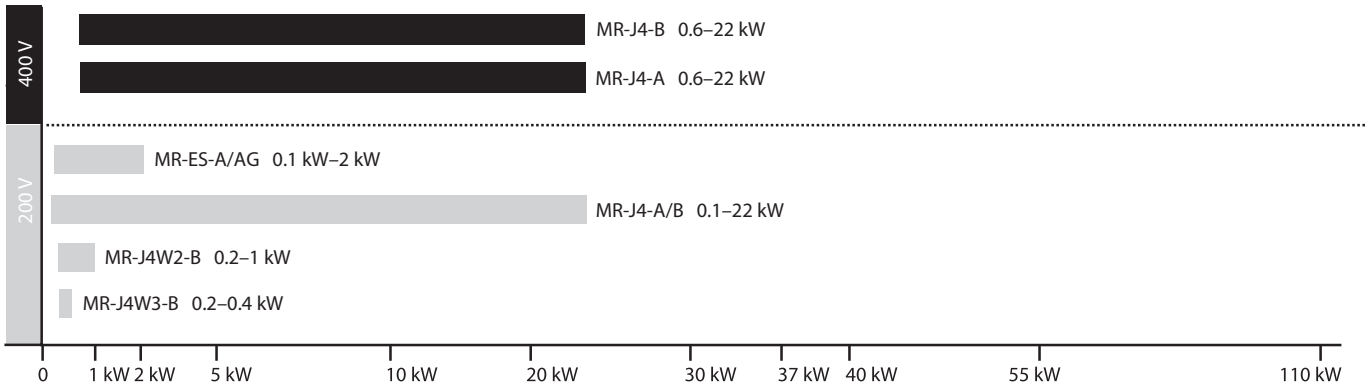
Direct drive motor

### Servo amplifiers

Mitsubishi Electric offers 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 SSCNETIII bus type amplifiers, there is a product for all circumstances.

Real Time Adaptive Tuning (RTAT) is a unique Mitsubishi Electric 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 the MR-J4 series from 100 W to 22 kW. The SSCNETIII/H bus type amplifiers (type MR-J4-B) offer the user ease of connectivity, via SSCNETIII.




### Positioning controllers

For the compact, cost effective, FX range of PLCs, the FX2N-10PG unit provides single-axis control with built-in 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-J4-B series. This module provides a quick and easy, but efficient positoning control system for simpler applications.

For larger and more complex applications the L-series and the MELSEC System Q provide numerous positioning and Simple motion modules (1, 2, 4 and 16 axes).

These are: open-collector output type (LD75P/QD75P series), Differential output type (LD75D/QD75D series) and SSCNETIII bus type (LD77MH/QD75MH), SSCNETIII/H bus type (QD77MS). Using the SSCNETIII system can provide much improved, easier to use positioning systems, with reduced wiring and better noise immunity. All positioning modules provide functions such as interpolation, speed control and positioning operations, etc. For advanced motion applications like axes synchronisation and CAM control the Simple Motion modules (LD77/QD77) are available.

### 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 MELSEC System Q 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 SSCNETIII, which is more than capable for handling any motion application.

### Advanced one-touch tuning function

Servo gain adjustment for precise vibration suppression control can be done only by one touch. Machine resonance suppression filter, advanced vibration suppression control II (adjustment for one frequency), and robust filter are adjusted just by turning on this function. The advanced vibration suppression control function enables the machine to operate with high speed at the highest performance.

### Advanced vibration suppression control II

The vibration suppression algorithm supports a three-inertia system so that two types of low frequency vibrations are suppressed at the same time. For adjustment the setup software MR Configurator2 is used. This function is effective in suppressing vibration at the end of an arm and in reducing residual vibration in a machine. Droop pulses are reduced to a minimum.

### Machine diagnosis function

This function is a powerful monitoring and maintenance support tool. It detects changes of machine parts (ball screw, guide, bearing, belt, etc.) by analyzing machine friction, load moment of inertia, unbalanced torque, and changes in vibration component from the data inside the servo amplifier. Monitoring is done with the setup software MR Configurator2. Timely maintenance of wear parts will be indicated before breakdown.

### Multi-axis servo amplifier

2-axis and 3-axis servo amplifiers are available for operating two and three servo motors, respectively. They are designed to cut waste and save on space, wiring, and energy use. The 2-axis servo amplifier MR-J4W2-B requires 26 % less installation space than two units of MR-J4-B, and the 3-axis servo amplifier MR-J4W3-B requires 30% less installation space than three units of MR-J4-B. Wiring of the 3-axis type is reduced by approx. 50 %, because the three axes use the same connections for main and control circuit power, peripheral equipment, control signal wire, etc. These multi-axis servo amplifiers enable energy-conservative and compact machine design at lower cost. Different types of servo motors including rotary servo motors, linear servo motors, and direct drive motors are freely combined as long as the servo motors are compatible with the servo amplifier.

**MR-J3-□A**
**(General-purpose interface compatible)**

Pulse train and analog input, etc., are provided as a standard for the command interface. The control mode can be switched accordingly for position, speed or torque control.

**MR-J3-□BSafety**
**(SSCNETIII compatible/Drive safety compatible/Fully closed loop control)**

STO (Safe torque off) function is provided as a safety function. SS1 function is also supported by using the optional module MR-J3-D05. Fully closed loop control is also supported.

**MR-J3-□T**
**(CC-Link compatible/Built-in positioning function)**

The built-in positioning function sets position and speed data in the point tables in the servo amplifier. Positioning operation can be started using start signals from a host controller.

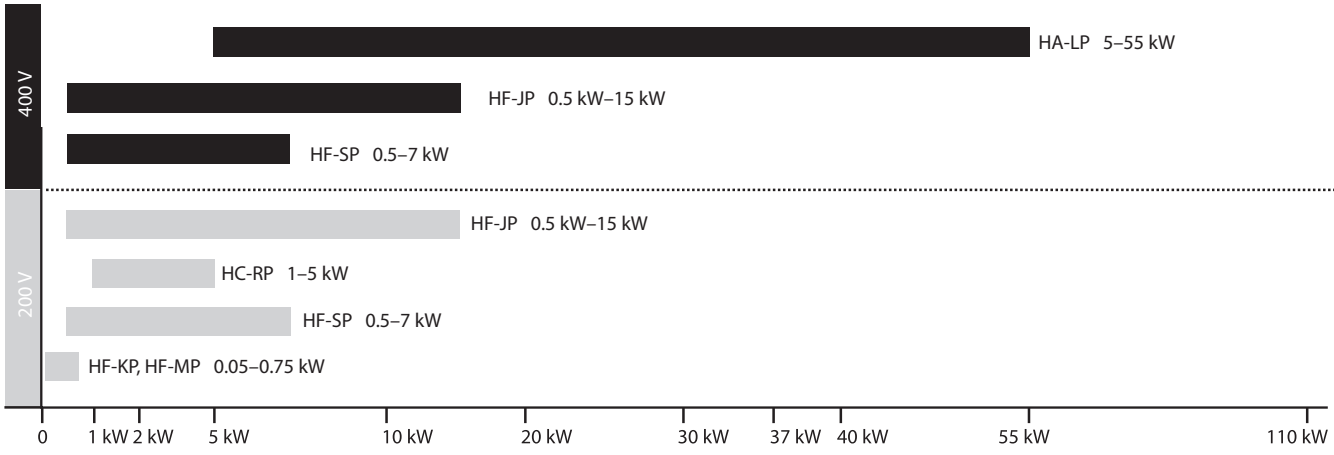
**MR-J3-□A-EtherCAT**
**(EtherCAT compatible)**

This is an AC servo amplifier based on the MR-J3-□A series, and is compatible with high speed communication through the open network EtherCAT. The drive supports CANopen over EtherCAT (CoE) CiA402 Drive Profile with PDO communication cycle time of 500 µs, 1 ms, 2 ms.

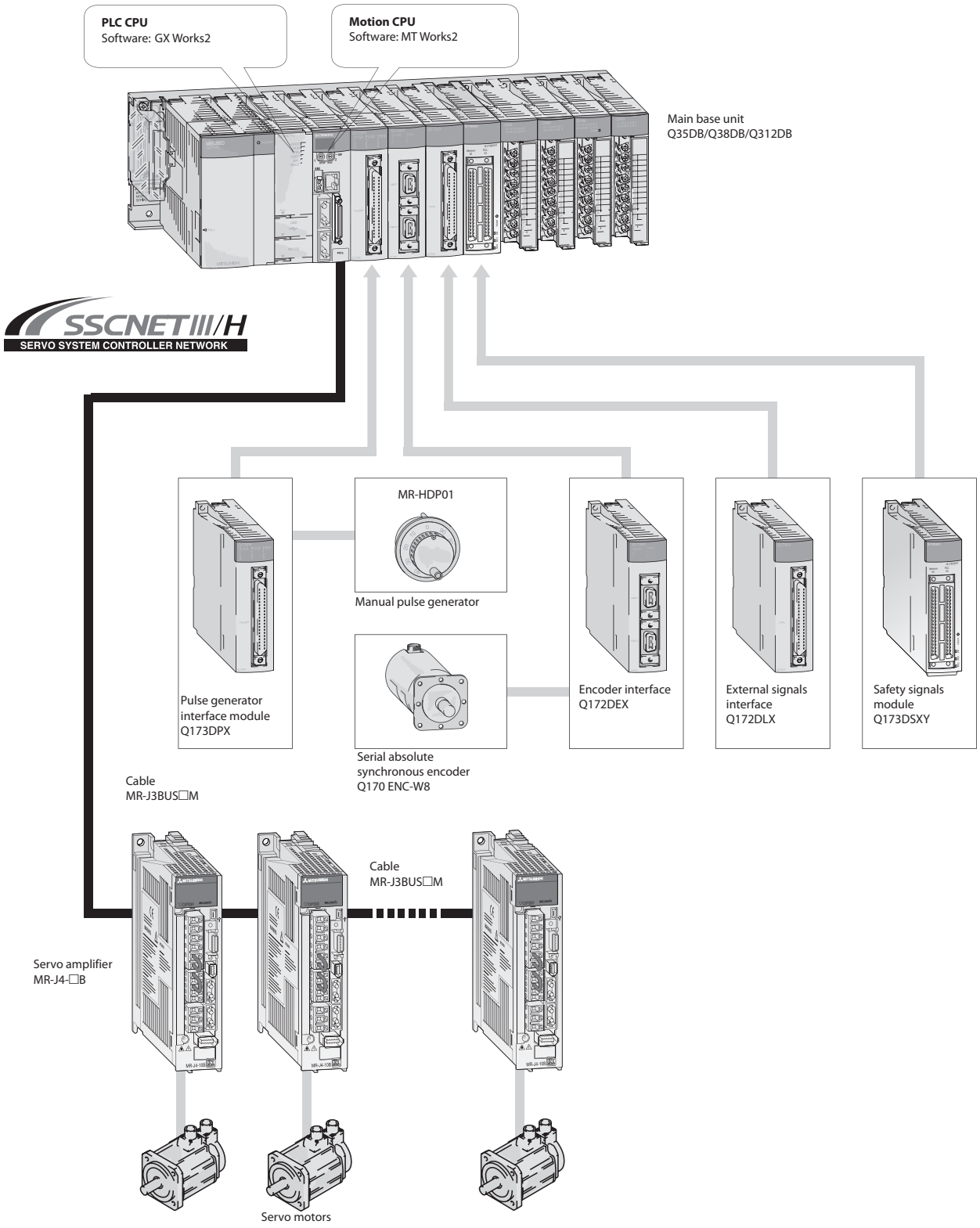
| Specifications | MR-J3-□A | MR-J3-□BSafety | MR-J3-□T | MR-J3-□A-EtherCAT |
|---|---|---|---|---|
| Command interface | Pulse train/Analog/RS422 multi-drop | SSCNETIII | CC-Link/DIO/RS422 multi-drop pulse train | EtherCAT |
| Control mode | Position/Speed/Torque | Position/Speed/Torque/Fully closed loop control | Position/Speed/Torque/ Built-in Positioning function | Home position return, Position, Speed |
| Power specifications | 1-phase 200 V AC/ 3-phase 200 V AC/ 3-phase 400 V AC | 1-phase 200 V AC/ 3-phase 200 V AC/ 3-phase 400 V AC | 1-phase 200 V AC/ 3-phase 200 V AC/ 3-phase 400 V AC | 1-phase 200 V AC/ 3-phase 200 V AC/ 3-phase 400 V AC |
| Capacity range | 100 W to 55 kW | 100 W to 55 kW | 100 W to 22 kW | 100 W to 22 kW |

For order information, please contact your Mitsubishi Electric representative

**A wide range of capacities and series for various system applications**



## System configuration




Notes:
1. The first CPU on the main base unit must always be a PLC CPU (e.g. Q□UD(E)(H) series).

# 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 Electric automation equipment.

The first is a FX3G-24MT/ESS based system and the second is a more complex interpolating QD77MS2 (SSCNETIII/H) 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-KN13 | Motor |
| MR-E-70A-QW003 | Servo amplifier |
| HF-SN52JK | 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 Works2

GX Works2 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 Blocks.

- User friendly positioning
- Easy setting in GX Works2
- Cost effective
- Simple functionality

### System 2: QD77MS2 based system

| Products | Function |
|---|---|
| Q00J | Q PLC |
| QD77MS2 | Simple motion module |
| MR-J4-10B | Servo amplifier |
| HG-KR13 | Motor |
| MR-J4-60B | Servo amplifier |
| HG-SR52 | Motor |
| MR-BAT6V1SET | Servo amplifier battery |

The QD77MS2 based system uses the powerful modular Qn PLC Series, providing greater functionality and expandability options. The QD77MS2 system is connected using SSCNETIII/H (Servo System Controller Network), which is Mitsubishi Electric's dedicated motion control network. SSCNETIII/H simplifies the set-up of the system and reduces the wiring required. SSCNETIII/H systems are created by simply plugging an amplifier into the main controller (QD77MS2) and then "daisy-chaining" each additional axis that is added. SSCNETIII/H connectivity requires MR-J4-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 QD77MS2 module.

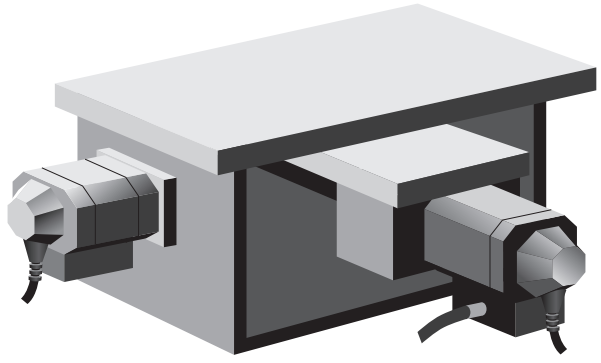
Also, all of the internal Servo parameters can be set from the PLC, again due to the bus system used.

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 (QD77MS2), interpolation between the two axes is possible.

- SSCNETIII/H capability
- Easy of set-up
- High functionality
- Expandability
- Module options
- Reduced wiring

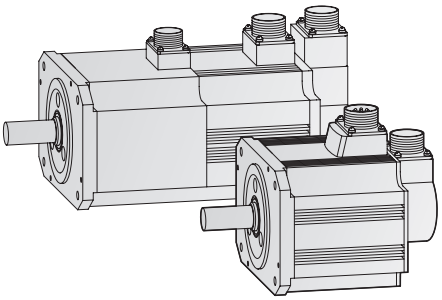
### X-Y table control

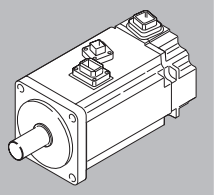
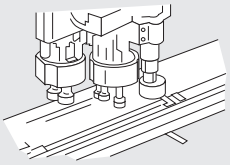
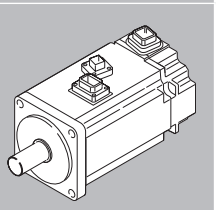
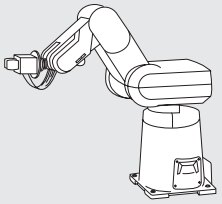
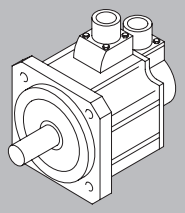
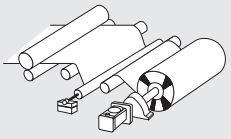
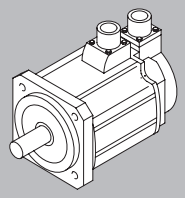
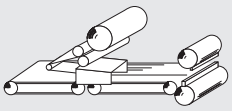
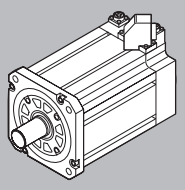


## Servo motor features and typical applications

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 available with an electromagnetic brake.



| Model designation | Features | Application example | |
|---|---|---|---|
| M  | **Ultra low inertia**<br>Small motor inertia moment makes this unit well suited for high-dynamic positioning operations with extra small cycle times. | ● Inserters, mounters, bonders<br>● Printed board hole openers<br>● In-circuit testers<br>● Label printers<br>● Knitting and embroidery machinery<br>● Ultra-small robots and robot tips |  <br>Inserters, mounters, bonders |
| K  | **Low inertia**<br>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<br>● Food preparation machinery<br>● Printers<br>● Small loaders and unloaders<br>● Small robots and component assembly devices<br>● Small X-Y tables<br>● Small press feeders |  <br>Small robots |
| S  | **Medium inertia**<br>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<br>● Specialised machinery<br>● Robots<br>● Loaders and unloaders<br>● Winders and tension devices<br>● Turrets<br>● X-Y tables<br>● Test devices |  <br>Winders and tension devices |
| R  | **Low inertia**<br>A compact sized low-inertia moment model with medium capacity. Well suited for high-frequency operation. | ● Roll feeders<br>● Loaders and unloaders<br>● High-frequency conveyor machinery |  <br>Wrapping machinery |
| J  | **Low Inertia (400 V)**<br>A 400 V Servo Motor for the MELSERVO-J3 Series for a power range up to 9 kW with low inertia and high speed. It has a compact size, is equipped with high resolution encoder and is compatible to global standards. | ● Food and Packaging<br>● Printing machine<br>● Pick up robot for Injection molding machine<br>● Palletizing machine<br>● General machine which require High speed and High frequency | |

Note:
Other types of motors are available on request.

## Servo motors overview

### Motors for MR-J4 series servo amplifiers (200 V)

| Motor series 200 V | Rated speed [r/min] | Max. speed [r/min] | Rated torque [Nm] | Max. torque [Nm] | Moment of inertia J [x10$^{-4}$ kg m$^2$] | Rated output capacity [kW] | Servo motor model | Servo motor type: Voltage | Servo motor type: Protective structure | Amplifier pairing MR-J4: 10 | 20 | 40 | 60 | 70 | 100 | 200 | 350 | 500 | 700 | 11K | 15K | 22K | Art. no. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HG-MR M | 3000 | 6000 | 0.16 | 0.48 | 0.0162 | 0.05 | HG-MR053 | 200 V AC | IP65 | ● | | | | | | | | | | | | | 248661 |
| | | | 0.32 | 0.95 | 0.0300 | 0.10 | HG-MR13 | | | ● | | | | | | | | | | | | | 248662 |
| | | | 0.64 | 1.9 | 0.0865 | 0.20 | HG-MR23 | | | | ● | | | | | | | | | | | | 248663 |
| | | | 1.3 | 3.8 | 0.142 | 0.40 | HG-MR43 | | | | | ● | | | | | | | | | | | 248664 |
| | | | 2.4 | 7.2 | 0.586 | 0.75 | HG-MR73 | | | | | | | ● | | | | | | | | | 248665 |
| HG-KR K | 3000 | 6000 | 0.16 | 0.56 | 0.0450 | 0.05 | HG-KR053 | 200 V AC | IP65 | ● | | | | | | | | | | | | | 248651 |
| | | | 0.32 | 1.1 | 0.0777 | 0.10 | HG-KR13 | | | ● | | | | | | | | | | | | | 248652 |
| | | | 0.64 | 2.2 | 0.221 | 0.20 | HG-KR23 | | | | ● | | | | | | | | | | | | 248653 |
| | | | 1.3 | 4.5 | 0.371 | 0.40 | HG-KR43 | | | | | ● | | | | | | | | | | | 248654 |
| | | | 2.4 | 8.4 | 1.26 | 0.75 | HG-KR73 | | | | | | | ● | | | | | | | | | 248655 |
| HG-SR S | 2000 | 3000 | 2.4 | 7.2 | 7.26 | 0.50 | HG-SR52 | 200 V AC | IP67 | | | | ● | | | | | | | | | | 248671 |
| | | | 4.8 | 14.3 | 11.6 | 1.00 | HG-SR102 | | | | | | | | ● | | | | | | | | 248672 |
| | | | 7.2 | 21.5 | 16.0 | 1.50 | HG-SR152 | | | | | | | | | ● | | | | | | | 248673 |
| | | | 9.5 | 28.6 | 46.8 | 2.00 | HG-SR202 | | | | | | | | | ● | | | | | | | 248674 |
| | | | 16.7 | 50.1 | 78.6 | 3.50 | HG-SR352 | | | | | | | | | | ● | | | | | | 248675 |
| | | | 23.9 | 71.6 | 99.7 | 5.00 | HG-SR502 | | | | | | | | | | | ● | | | | | 248676 |
| | | | 33.4 | 100 | 151 | 7.00 | HG-SR702 | | | | | | | | | | | | ● | | | | 248677 |
| HG-JR J | 3000 | 6000 | 1.6 | 4.8 <6.4> ① | 1.52 | 0.5 | HG-JR53 | 200 V AC | IP67④ | | | | ● | | ●② | | | | | | | | 261539 |
| | | | 2.4 | 7.2 <9.6> ① | 2.09 | 0.75 | HG-JR73 | | | | | | | ● | | ●② | | | | | | | 261540 |
| | | | 3.2 | 9.6 <12.7> ① | 2.65 | 1.0 | HG-JR103 | | | | | | | | ● | ●② | | | | | | | 261541 |
| | | | 4.8 | 14.3 <19.1> ① | 3.79 | 1.5 | HG-JR153 | | | | | | | | | ● | ●② | | | | | | 261542 |
| | | | 6.4 | 19.1 <25.5> ① | 4.92 | 2.0 | HG-JR203 | | | | | | | | | ● | ●② | | | | | | 261543 |
| | | | 10.5 <11.1> ③ | 32.0 <44.6> ① | 13.2 | 3.3 <3.5> ③ | HG-JR353 | | | | | | | | | | ● | ●②③ | | | | | 261544 |
| | | | 15.9 | 47.7 <63.7> ① | 19.0 | 5.0 | HG-JR503 | | | | | | | | | | | ● | ●② | | | | 261545 |
| | | 5000 | 22.3 | 66.8 | 43.3 | 7.0 | HG-JR703 | | | | | | | | | | | | ● | | | | 261546 |
| | | | 28.6 | 85.8 | 55.8 | 9.0 | HG-JR903 | | | | | | | | | | | | | ● | | | 261547 |
| | 1500 | 3000 | 70.0 | 210 | 220 | 11 | HG-JR11K1M | | | | | | | | | | | | | ● | | | 261557 |
| | | | 95.5 | 286 | 315 | 15 | HG-JR15K1M | | | | | | | | | | | | | | ● | | 261558 |
| | | 2500 | 140 | 420 | 489 | 22 | HG-JR22K1M | | | | | | | | | | | | | | | ● | 261559 |
| HG-RR R | 3000 | 4500 | 3.2 | 8.0 | 1.50 | 1.0 | HG-RR103 | 200 V AC | IP65 | | | | | | | ● | | | | | | | 262896 |
| | | | 4.8 | 11.9 | 1.90 | 1.5 | HG-RR153 | | | | | | | | | ● | | | | | | | 262897 |
| | | | 6.4 | 15.9 | 2.30 | 2.0 | HG-RR203 | | | | | | | | | | ● | | | | | | 262898 |
| | | | 11.1 | 27.9 | 8.30 | 3.5 | HG-RR353 | | | | | | | | | | | ● | | | | | 262899 |
| | | | 15.9 | 39.8 | 12.0 | 5.0 | HG-RR503 | | | | | | | | | | | ● | | | | | 262900 |

① The value in angle brackets is applicable when the maximum torque is increased. The maximum torque will be increased by changing the servo amplifier to be combined (see ②).

② This combination of the HG-JR servo motor and the servo amplifier increases the maximum torque from 300 % to 400 % of the rated torque.

③ The value in angle brackets is applicable when the servo motor is used with MR-J4-500B or MR-J4-500A.

④ 22 kW of HG-JR series is rated IP44

### Motors for MR-J4 series servo amplifiers (400 V)

| Motor series 400 V | Rated speed [r/min] | Max. speed [r/min] | Rated torque [Nm] | Max. torque [Nm] | Moment of inertia J [x10$^{-4}$ kg m$^2$] | Rated output capacity [kW] | Servo motor model | Servo motor type: Voltage | Servo motor type: Protective structure | Amplifier pairing MR-J4: 60 | 100 | 200 | 350 | 500 | 700 | 11K | 15K | 22K | Art. no. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| HG-SR S | 2000 | 3000 | 2.4 | 7.2 | 7.26 | 0.5 | HG-SR524 | 400 V AC | IP67 | ● | | | | | | | | | 261431 |
| | | | 4.8 | 14.3 | 11.6 | 1.0 | HG-SR1024 | | | | ● | | | | | | | | 261432 |
| | | | 7.2 | 21.5 | 16.0 | 1.5 | HG-SR1524 | | | | | ● | | | | | | | 261433 |
| | | | 9.5 | 28.6 | 46.8 | 2.0 | HG-SR2024 | | | | | ● | | | | | | | 261434 |
| | | | 16.7 | 50.1 | 78.6 | 3.5 | HG-SR3524 | | | | | | ● | | | | | | 261435 |
| | | | 23.9 | 71.6 | 99.7 | 5.0 | HG-SR5024 | | | | | | | ● | | | | | 261436 |
| | | | 33.4 | 100 | 151 | 7.0 | HG-SR7024 | | | | | | | | ● | | | | 261437 |
| HG-JR J | 3000 | 6000 | 1.6 | 4.8 <6.4> ① | 1.52 | 0.5 | HG-JR534 | 400 V AC | IP67 ④ | ● | ●② | | | | | | | | 261445 |
| | | | 2.4 | 7.2 <9.6> ① | 2.09 | 0.75 | HG-JR734 | | | | ● | ●② | | | | | | | 261446 |
| | | | 3.2 | 9.6 <12.7> ① | 2.65 | 1.0 | HG-JR1034 | | | | ● | ●② | | | | | | | 261447 |
| | | | 4.8 | 14.3 <19.1> ① | 3.79 | 1.5 | HG-JR1534 | | | | | ● | ●② | | | | | | 261448 |
| | | | 6.4 | 19.1 <25.5> ① | 4.92 | 2.0 | HG-JR2034 | | | | | ● | ●② | | | | | | 261449 |
| | | | 10.5 <11.1> ③ | 32.0 <44.6> ① | 13.2 | 3.3 <3.5> ③ | HG-JR3534 | | | | | | ● | ●②③ | | | | | 261450 |
| | | | 15.9 | 47.7 <63.7> ① | 19.0 | 5.0 | HG-JR5034 | | | | | | | ● | ●② | | | | 261451 |
| | | 5000 | 22.3 | 66.8 | 43.3 | 7.0 | HG-JR7034 | | | | | | | | ● | | | | 261452 |
| | | | 28.6 | 85.8 | 55.8 | 9.0 | HG-JR9034 | | | | | | | | | ● | | | 261453 |
| | 1500 | 3000 | 70.0 | 210 | 220 | 11 | HG-JR11K1M4 | | | | | | | | | ● | | | 261384 |
| | | | 95.5 | 286 | 315 | 15 | HG-JR15K1M4 | | | | | | | | | | ● | | 261535 |
| | | 2500 | 140 | 420 | 489 | 22 | HG-JR22K1M4 | | | | | | | | | | | ● | 261536 |

① The value in angle brackets is applicable when the maximum torque is increased. The maximum torque will be increased by changing the servo amplifier to be combined (see ②).

② This combination of the HG-JR servo motor and the servo amplifier increases the maximum torque from 300 % to 400 % of the rated torque.

③ The value in angle brackets is applicable when the servo motor is used with MR-J4-500B or MR-J4-500A.

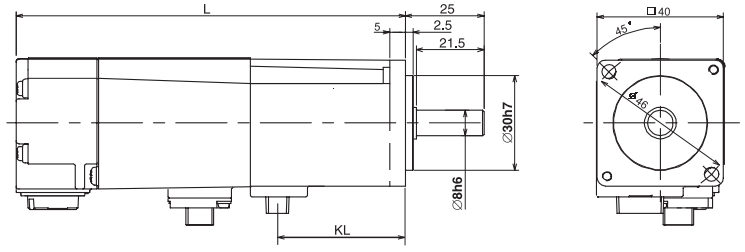
④ 22 kW of HG-JR series is rated IP44

### Motors for MR-ES series servo amplifiers

| Motor series | Rated speed [r/min] | Max. speed [r/min] | Rated torque [Nm] | Max. torque [Nm] | Moment of inertia J [x10$^{-4}$ kg m$^2$] | 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-KN K | 3000 | 4500 | 0.32 | 0.95 | 0.088 | 0.1 | HF-KN13 | 200 V AC | IP65 | ● | | | | | | 239797 |
| | | | 0.64 | 1.9 | 0.24 | 0.2 | HF-KN23K | | | | ● | | | | | 253946 |
| | | | 1.3 | 3.8 | 0.42 | 0.4 | HF-KN43K | | | | | ● | | | | 253947 |
| | | | 2.4 | 7.2 | 1.43 | 0.75 | HF-KN73JK | | | | | | ● | | | 253948 |
| HF-SN S | 2000 | 3000 | 2.39 | 7.16 | 6.1 | 0.5 | HF-SN52JK | 200 V AC | IP67 | | | | ● | | | 253952 |
| | | | 4.77 | 14.3 | 11.9 | 1.0 | HF-SN102JK | | | | | | | ● | | 253953 |
| | | | 7.16 | 21.5 | 17.8 | 1.5 | HF-SN152JK | | | | | | | | ● | 253954 |
| | | | 9.55 | 28.6 | 38.3 | 2.0 | HF-SN202JK | | | | | | | | ● | 253965 |

# Dimensions of motors for MR-J4 series servo amplifiers

### HG-KR13 (B), HG-KR053 (B), HG-MR13 (B), HG-MR053 (B)

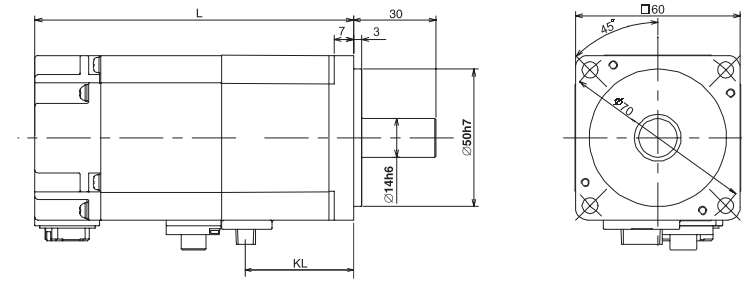



| Type | L [mm] | KL [mm] |
|---|---|---|
| HG-KR13 (B)<br>HG-MR13 (B) | 66.4 (107) | 23.8 |
| HG-KR053 (B)<br>HG-MR053 (B) | 82.4 (123) | 39.8 |

Dimensions for motors with brake in brackets ( ).

Unit: mm

### HG-KR23 (B), HG-KR43 (B), HG-MR23 (B), HG-MR43 (B)

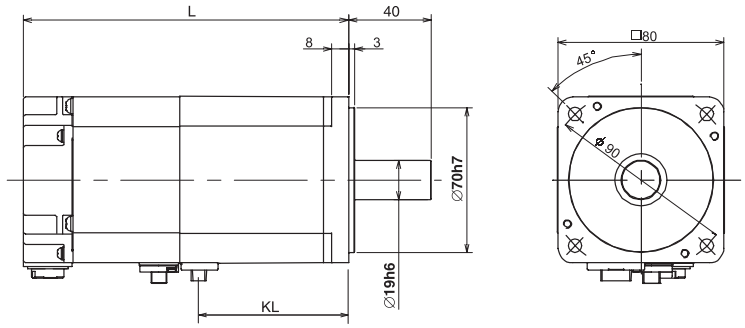



| Type | L [mm] | KL [mm] |
|---|---|---|
| HG-KR23 (B)<br>HG-MR23 (B) | 76.6 (113.4) | 36.4 |
| HG-KR43 (B)<br>HG-MR43 (B) | 98.3 (135.1) | 58.1 |

Dimensions for motors with brake in brackets ( ).

Unit: mm

### HG-KR73 (B), HG-MR73 (B)

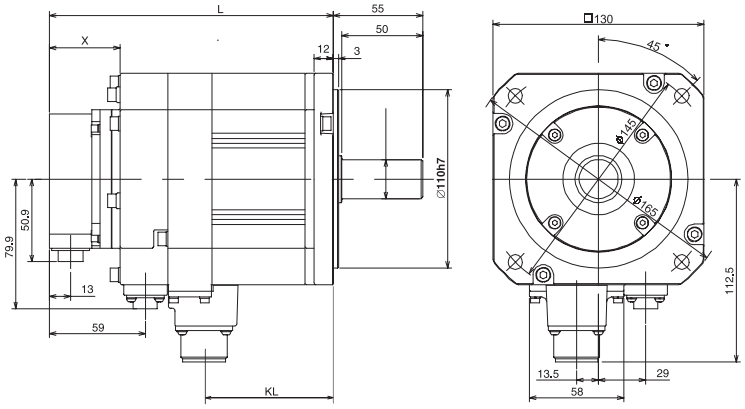



| Type | L [mm] | KL [mm] |
|---|---|---|
| HG-KR73 (B)<br>HG-MR73 (B) | 112 (152.3) | 69.6 |

Dimensions for motors with brake in brackets ( ).

Unit: mm

### HG-SR52 (B), HG-SR524 (B), HG-SR102 (B), HG-SR1024 (B), HG-SR152 (B), HG-SR1524 (B)

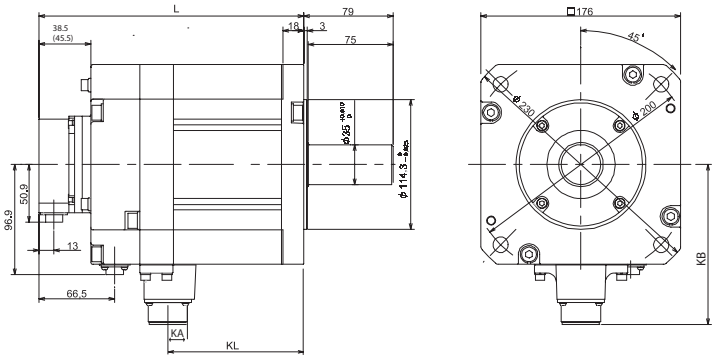



| Type | L [mm] | KL [mm] | X [mm] |
|---|---|---|---|
| HG-SR52 (B)<br>HG-SR524 (B) | 118.5 (153.0) | 57.8 | 38.2 (43.5) |
| HG-SR102 (B)<br>HG-SR1024(B) | 132.5 (167) | 71.8 | 38.2 (43.5) |
| HG-SR152 (B)<br>HG-SR1524 (B) | 146.5 (181) | 85.8 | 38.2 (43.5) |

Dimensions for motors with brake in brackets ( ).

Unit: mm

**HG-SR202 (B), HG-SR352 (B), HG-SR502 (B), HG-SR702 (B), HG-SR2024 (B), HG-SR3524 (B), HG-SR5024 (B), HG-SR7024 (B),**

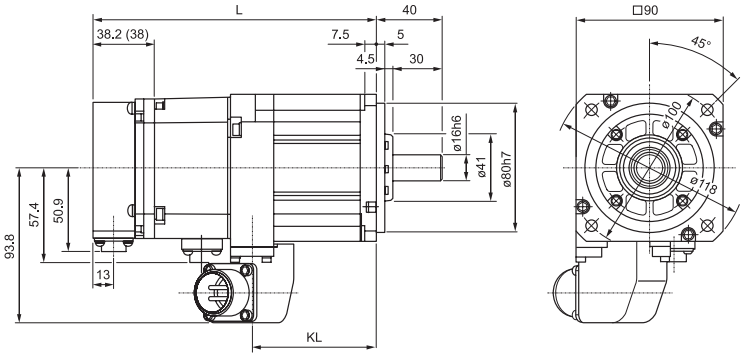



| Type | L [mm] | KL [mm] | KA [mm] | KB [mm] |
|---|---|---|---|---|
| HG-SR202 (B)<br>HG-SR2024 (B) | 138.5 (188) | 74.8 | 24.8 | 140.9 |
| HG-SR352 (B)<br>HG-SR3524 (B) | 162.5 (212) | 98.8 | | |
| HG-SR502 (B)<br>HG-SR5024 (B) | 178.5 (228) | 114.8 | | |
| HG-SR702 (B)<br>HG-SR7024 (B) | 218.5 (268) | 146.8 | 32 | 149.1 |

Dimensions for motors with brake in brackets ( ).

Unit: mm

**HG-JR53 (B),HG-JR534 (B), HG-JR73 (B),HG-JR734 (B), HG-JR103 (B), HG-JR1034 (B),**
**HG-JR153 (B), HG-JR1534 (B), HG-JR203 (B), HG-JR2034(B)**

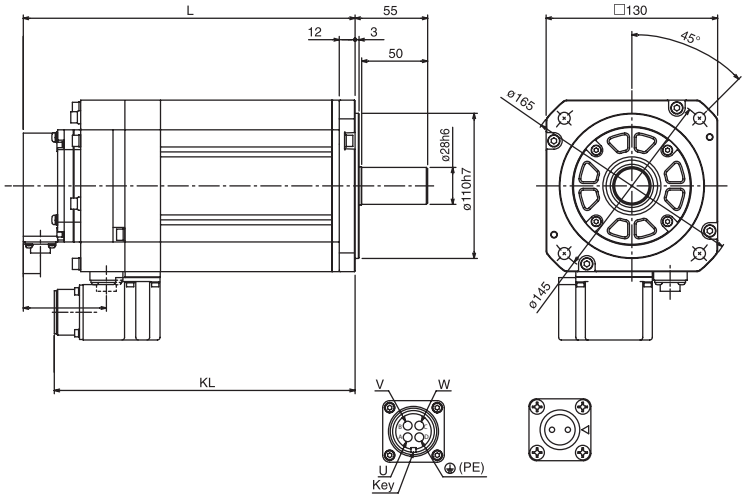



| Type | L [mm] | KL [mm] |
|---|---|---|
| HG-JR53 (B)<br>HG-JR534 (B) | 127.5 (173) | 76 |
| HG-JR73 (B)<br>HG-JR734 (B) | 145.5 (191) | 94 |
| HG-JR103 (B)<br>HG-JR1034 (B) | 163.5 (209) | 112 |
| HG-JR1534 (B)<br>HG-JR1534 (B) | 199.5 (245) | 148 |
| HG-JR203 (B)<br>HG-JR2034 (B) | 235.5 (281) | 184 |

Dimensions for motors with brake in brackets ( ).

Unit: mm

**HG-JR353(B), HG-JR503(B)**

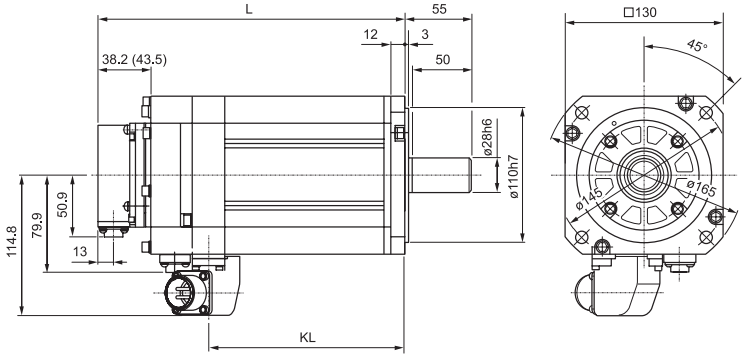



| Type | L [mm] | KL [mm] |
|---|---|---|
| HG-JR353(B) | 213 (251.5) | 228 |
| HG-JR5034(B) | 267 (305.5) | 282 |

Dimensions for motors with brake in brackets ( ).

Unit: mm

### HG-JR3534(B), HG-JR5034(B)

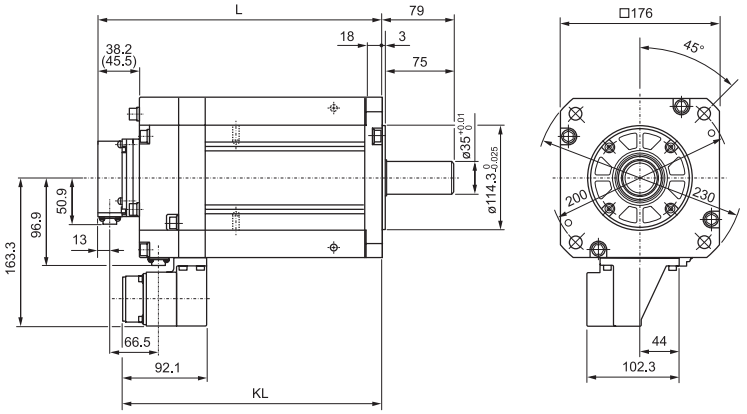



| Type | L [mm] | KL [mm] |
|---|---|---|
| HG-JR3534(B) | 213 (251.5) | 161 |
| HG-JR5034(B) | 267 (305.5) | 215 |

Dimensions for motors with brake in brackets ( ).

Unit: mm

### HG-JR703(B), HG-JR903(B), HG-JR7034(B), HG-JR9034(B)

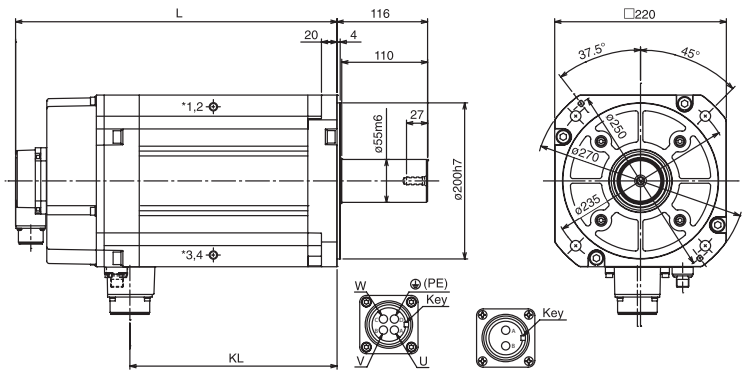



| Type | L [mm] | KL [mm] |
|---|---|---|
| HG-JR703(B)<br>HG-JR7034(B) | 263.5 (313) | 285.4 |
| HG-JR903(B)<br>HG-JR9034(B) | 303.5 (353) | 325.4 |

Dimensions for motors with brake in brackets ( ).

Unit: mm

### HG-JR11K1M(B), HG-JR15K1M(B), HG-JR11K1M4(B), HG-JR15K1M4(B)

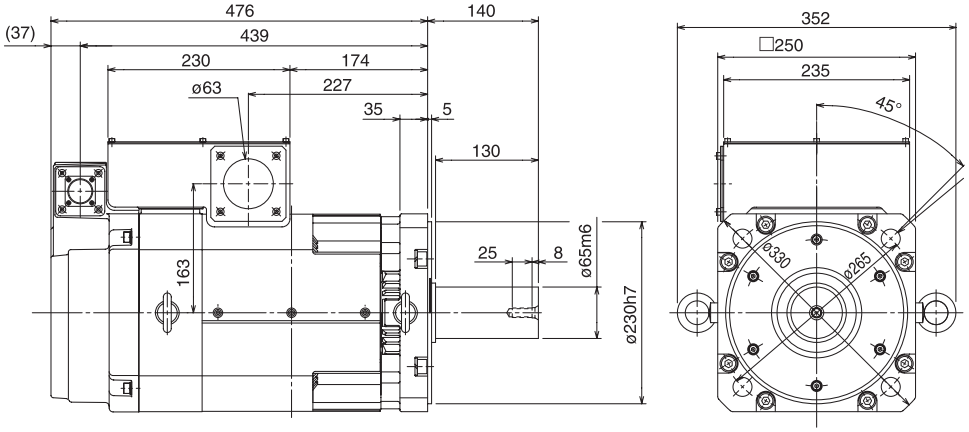



| Type | L [mm] | KL [mm] |
|---|---|---|
| HG-JR11K1M(B)<br>HG-JR11K1M4(B) | 339.5 (412) | 265.5 |
| HG-JR15K1M(B)<br>HG-JR15K1M4(B) | 439.5 (512) | 365.5 |

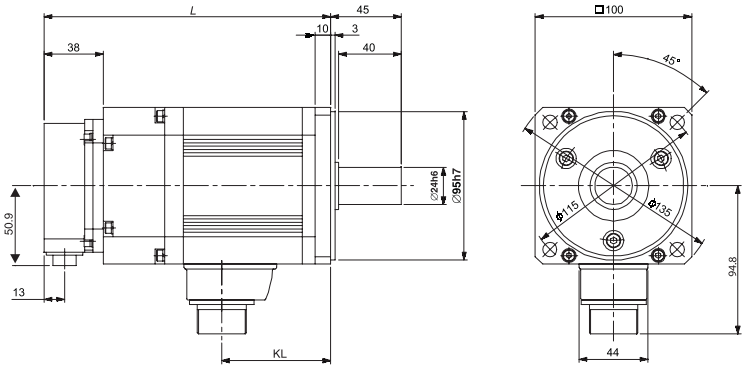
Dimensions for motors with brake in brackets ( ).

Unit: mm

### HG-JR22K1M, HG-JR22K1M4




### HG-RR103(B), HG-RR153(B), HG-RR203(B)

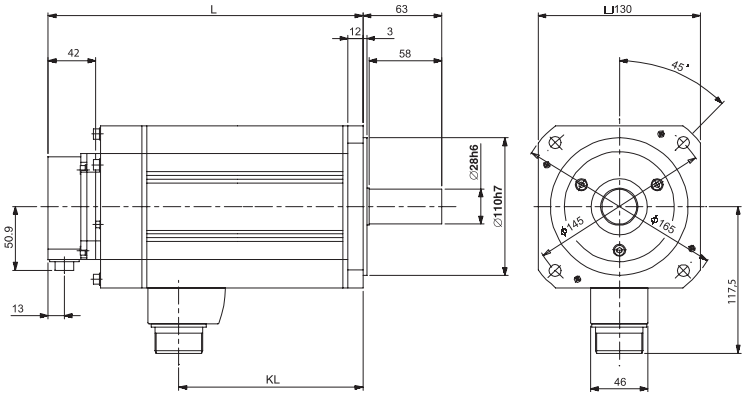



| Type | L [mm] | KL [mm] |
|---|---|---|
| HG-RR103(B) | 145.5 (183) | 69.5 |
| HG-RR153(B) | 170.5 (208) | 94.5 |
| HG-RR203(B) | 195.5 (233) | 119.5 |

Dimensions for motors with brake in brackets ( ).

Unit: mm

### HG-RR353(B), HG-RR503(B)



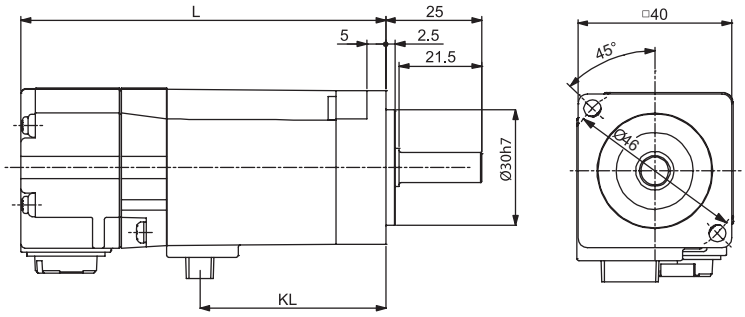

| Type | L [mm] | KL [mm] |
|---|---|---|
| HG-RR353(B) | 215.5 (252) | 147.5 |
| HG-RR503(B) | 272.5 (309) | 204.5 |

Dimensions for motors with brake in brackets ( ).

Unit: mm

# Dimensions of motors for MR-ES series servo amplifiers

### HF-KN13(B)

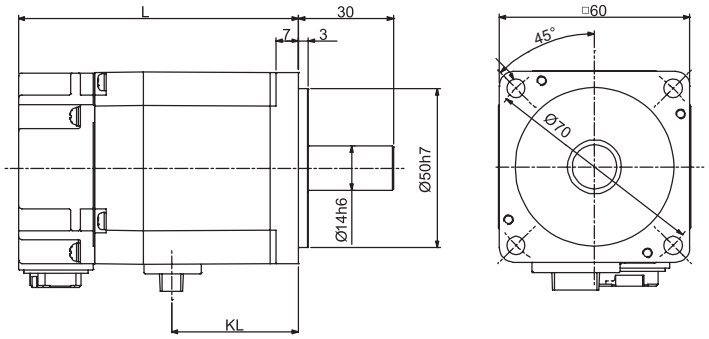



| Type | L [mm] | KL [mm] |
|---|---|---|
| HF-KN13(B) | 87 (123.9) | 40.4 |

Dimensions for motors with brake in brackets ( ).

Unit: mm

### HF-KN23(B)K

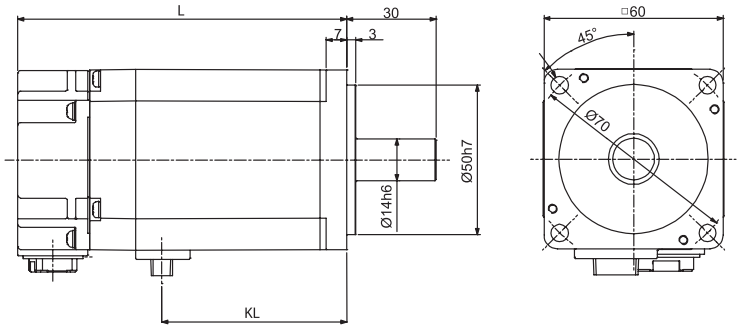



| Type | L [mm] | KL [mm] |
|---|---|---|
| HF-KN23(B)K ① | 88.2 (116.8) | 40 |

Dimensions for motors with brake in brackets ( ).
① Motor with keyway shaft. (A key is supplied with the motor).

Unit: mm

### HF-KN43(B)K

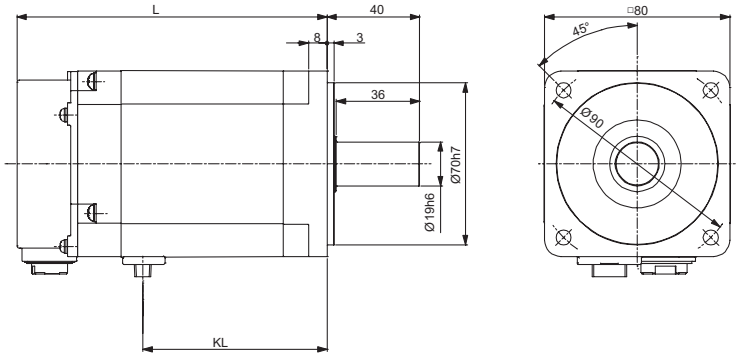



| Type | L [mm] | KL [mm] |
|---|---|---|
| HF-KN43(B)K ① | 110.2 (138.8) | 62 |

Dimensions for motors with brake in brackets ( ).
① Motor with keyway shaft. (A key is supplied with the motor).

Unit: mm

### HF-KN73(B)JK

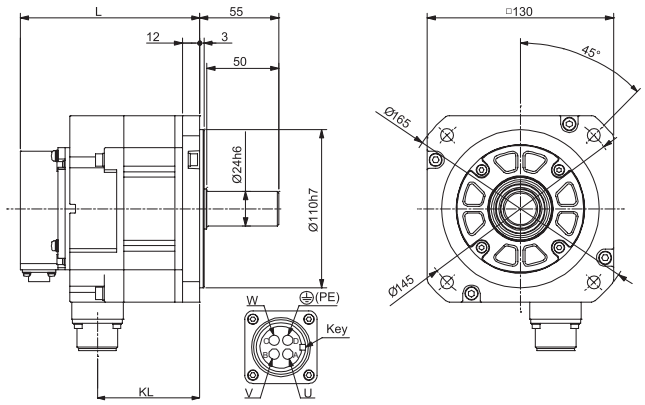



| Type | L [mm] | KL [mm] |
|---|---|---|
| HF-KN73(B)JK ① | 133.9 (166.5) | 79.6 |

Dimensions for motors with brake in brackets ( ).
① Motor with keyway shaft. (A key is supplied with the motor).

Unit: mm

### HF-SN52(B)JK

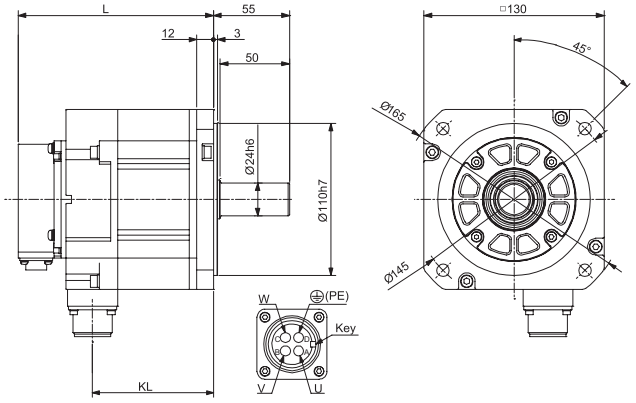



| Type | L [mm] | KL [mm] |
|---|---|---|
| HF-SN52(B)JK ① | 125 (163) | 71.3 |

Dimensions for motors with brake in brackets ( ).
① Motor with keyway shaft. (A key is NOT supplied with the motor).

Unit: mm

### HF-SN102(B)JK

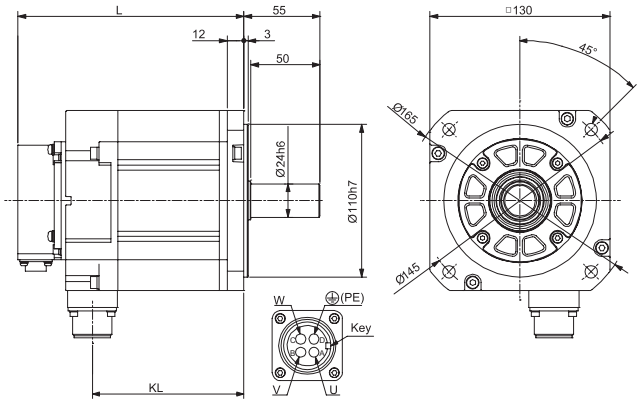



| Type | L [mm] | KL [mm] |
|---|---|---|
| HF-SN102(B)JK ① | 141 (179) | 87.3 |

Dimensions for motors with brake in brackets ( ).
① Motor with keyway shaft. (A key is NOT supplied with the motor).

Unit: mm

### HF-SN152(B)JK

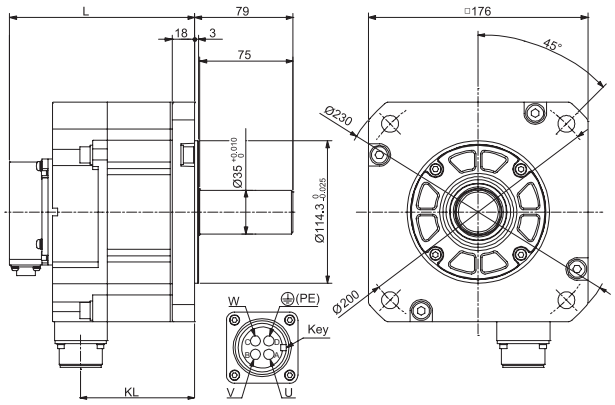



| Type | L [mm] | KL [mm] |
|---|---|---|
| HF-SN152(B)JK ① | 163 (201) | 109.3 |

Dimensions for motors with brake in brackets ( ).
① Motor with keyway shaft. (A key is NOT supplied with the motor).

Unit: mm

### HF-SN202(B)JK

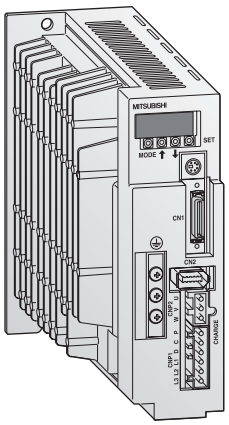



| Type | L [mm] | KL [mm] |
|---|---|---|
| HF-SN202(B)JK ① | 148.5 (200.5) | 91.5 |

Dimensions for motors with brake in brackets ( ).
① Motor with keyway shaft. (A key is NOT supplied with the motor).

Unit: mm

# MR-ES servo amplifier specifications




### The servo amplifier of the series

ME-E Super combines unique functions with very compact dimensions. With its high positioning accuracy and high responsiveness the MR-E Super is suitable for applications from 100 W to 2 kW. Available functions of the drive are e.g. position/internal speed control mode, speed/torque control mode and Mitsubishi Electric's 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.

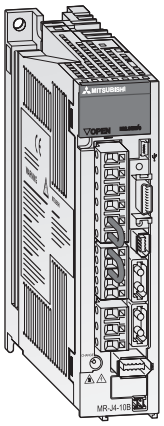
For a fast, easy and secure wiring all connectors are located on the front of the servo amplifier. The powerful software package SETUP154E makes set up and diagnostics of the system quick and comfortable.

| Servo amplifier MR-E-A/AG ① | | 10A<br>10AG<br>0.1 kW | 20A<br>20AG<br>0.2 kW | 40A<br>40AG<br>0.4 kW | 70A<br>70AG<br>0.75 kW | 100A<br>100AG<br>1 kW | 200A<br>200AG<br>2 kW |
|---|---|---|---|---|---|---|---|
| Power supply | | 3-phase 200–230 V AC, 50/60 Hz; 1phase 200–230 V AC, 50/60 Hz | | | | 3-phase 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/s² (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 Type A: pulse train interface, type AG: analog input interface

| 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–±10 V DC/max. torque) |
| Torque control mode | command input | — | 0–±8 V DC/max. torque |
| | speed limit | — | Set by parameters or external analog input (0–±10 V DC/rated speed) |

## MR-J4 servo amplifier specifications (200 V type)



The MELSERVO MR-J4 series is designed for ease of use and setup, safety, energy-efficiency and user friendly handling. With additional functions like "One-touch Tuning" and "Advanced Vibration Suppression Control" the servo performance achieves industry-leading level. The range covers 100 W units through to 22 kW.

- Processing of encoder signals with 22 bit resolution (4.194.304 pulses/rev.)
- Speed frequency response is increased to 2.5 kHz
- Operating of rotary, linear and direct drive motors as standard
- Compatible with safety functions STO (Safe Torque Off) and SS1 (Safe Stop 1) corresponding EN 61800-5-2 as standard.

The MR-J4-B servo amplifier receives a command signal from a control system via high speed motion network SSCNETIII/H with a communication speed of 150 Mbps and a cycle time of 0.22 ms. This optical network is very reliable in operation because it is not affected by EMC.

For control, the MR-J4-A servo amplifier has a pulse train input and two analog inputs for current or voltage. Possible modes of the MR-J4-A are torque, speed or position control.

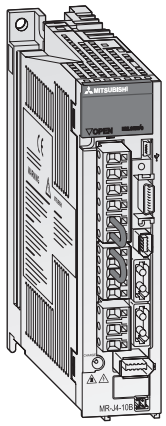
| Common specifications MR-J4-A/B | | 10A 10B | 20A 20B | 40A 40B | 60A 60B | 70A 70B | 100A 100B | 200A 200B | 350A 350B | 500A 500B | 700A 700B | 11KA 11KB | 15KA 15KB | 22KA 22KB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Power supply | voltage /frequency ① | 1-phase or 3-phase 200–240 V AC, 50/60 Hz | | | | | 3-phase 200–240 V AC, 50/60 HZ | | | | | | | |
| | permissible voltage fluctuation | 1-phase or 3-phase 170–264 V AC | | | | | 3-phase 170–264 V AC | | | | | | | |
| | permissible frequency fluctuation | ± 5 % max. | | | | | | | | | | | | |
| Control system | | Sinusoidal PWM control/current control system | | | | | | | | | | | | |
| Dynamic brake | | Built-in | | | | | | | | | | External option | | |
| Speed frequency response | | 2500 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. | | | | | | | | | | | | |
| Safety function | | STO (IEC/EN 61800-5-2); (SS1 function is available by using the safety option card MR-J3-D05) | | | | | | | | | | | | |
| Structure | | Self-cooling, open (IP20) | | | | Fan cooling, open (IP20) | | | | | | | | |
| 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 corrosive 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 | 2.1 | 2.3 | 4.0 | 6.2 | 13.4 | 13.4 | 18.2 |
| Dimensions (WxHxD) | mm | 40x 168x135 | 40x 168x135 | 40x 168x170 | 40x 168x170 | 60x 168x185 | 60x 168x185 | 90x 168x195 | 90x 168x195 | 105x 250x200 | 172x 300x200 | 220x 400x260 | 220x 400x260 | 260x 400x260 |
| **Order information** | | | | | | | | | | | | | | |
| A type | Art. no. | 248600 | 248601 | 248602 | 248628 | 248629 | 248630 | 248631 | 248632 | 248633 | 248634 | 261419 | 261420 | 261421 |
| B type | Art. no. | 248635 | 248636 | 248637 | 248638 | 248639 | 248640 | 248641 | 248642 | 248643 | 248644 | 261422 | 261423 | 261424 |

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-J4-A | | 10A | 20A | 40A | 60A | 70A | 100A | 200A | 350A | 500A | 700A | 11KA | 15KA | 22KA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Position control mode | maximum input pulse frequency | 4 Mpps (when using differential receiver), 200 kpps (when using open collector) | | | | | | | | | | | | |
| | positioning feedback pulse | Resolution per encoder/servo motor rotation: 4194304 pulses/revolution (22 Bit) | | | | | | | | | | | | |
| | command pulse multiple | Electronic gear A/B multiple; A: 1–16777216, B: 1–16777216, 1/10 <A/B <4000 | | | | | | | | | | | | |
| | positioning complete width setting | 0–±65535 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 (The speed at 10 V can be changed by parameter) | | | | | | | | | | | | |
| | speed fluctuation rate | ±0.01 % max. (load fluctuation 0–100 %); 0 % (power fluctuation ±10 %)<br>±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 10–12 kΩ) | | | | | | | | | | | | |
| | speed limit | Set by parameters or external analog input (0–± 10 V DC, rated speed) | | | | | | | | | | | | |

| Control specifications MR-J4-B (SSCNETIII/H) | 10B | 20B | 40B | 60B | 70B | 100B | 200B | 350B | 500B | 700B | 11KB | 15KB | 22KB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Position and speed control | Possible using SSCNETIII/H control | | | | | | | | | | | | |
| Communication speed | 150 Mbps | | | | | | | | | | | | |

## MR-J4 servo amplifier specifications (400 V type)



The MELSERVO MR-J4 servo amplifiers for 400 V power supply offer the same industry leading performance as the 200 V types. The range of rated output is from 600 W to 22 kW.

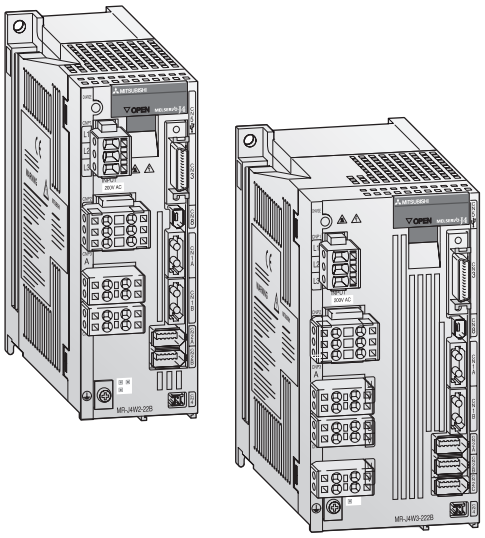
| Common specifications MR-J4-A4/B4 | | | 60A4<br>60B4 | 100A4<br>100B4 | 200A4<br>200B4 | 350A4<br>350B4 | 500A4<br>500B4 | 700A4<br>700B4 | 11KA4<br>11KB4 | 15KA4<br>15KB4 | 22KA4<br>22KB4 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Power supply | voltage /frequency ① | | 3-phase 380–480 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 | | | | | | | | |
| Speed frequency response | | | 2500 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. | | | | | | | | |
| Safety function | | | STO (IEC/EN 61800-5-2) ; (SS1 function is available by using the safety option card MR-J3-D05) | | | | | | | | |
| Structure | | | Self-cooling, open (IP20) | | | | Fan cooling, open (IP20) | | | | |
| 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 corrosive 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 | 3.6 | 4.3 | 6.5 | 13.4 | 13.4 | 18.2 |
| Dimensions (WxHxD) | | mm | 90x168x195 | 90x168x195 | 90x168x195 | 130x250x200 | 130x250x200 | 180x350x200 | 260x400x260 | 260x400x260 | 260x400x260 |
| **Order information** | | | | | | | | | | | |
| A type | | Art. no. | 261367 | 261368 | 261369 | 261370 | 261371 | 261372 | 261425 | 261426 | 261427 |
| B type | | Art. no. | 261373 | 261374 | 261415 | 261416 | 261417 | 261418 | 261428 | 261429 | 261430 |

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-J4-A4 | | 60A | 100A | 200A | 350A | 500A | 700A | 11KA | 15KA | 22KA |
|---|---|---|---|---|---|---|---|---|---|---|
| Position control mode | maximum input pulse frequency | 4 Mpps (when using differential receiver), 200 kpps (when using open collector) | | | | | | | | |
| | positioning feedback pulse | Resolution per encoder/servo motor rotation: 4194304 pulses/revolution (22 Bit) | | | | | | | | |
| | command pulse multiple | Electronic gear A/B multiple; A: 1–16777216, B: 1–16777216, 1/10 <A/B <4000 | | | | | | | | |
| | positioning complete width setting | 0–±65535 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 (The speed at 10 V can be changed by parameter.) | | | | | | | | |
| | speed fluctuation rate | ±0.01 % max. (load fluctuation 0–100 %); 0 % (power fluctuation ±10 %)<br>±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 10–12 kΩ) | | | | | | | | |
| | speed limit | Set by parameters or external analog input (0–± 10 V DC, rated speed) | | | | | | | | |

| Control specifications MR-J4-B4 (SSCNETIII/H) | 60B | 100B | 200B | 350B | 500B | 700B | 11KB | 15KB | 22KB |
|---|---|---|---|---|---|---|---|---|---|
| Position and speed control | Possible using SSCNETIII/H control | | | | | | | | |
| Communication speed | 150 Mbps | | | | | | | | |

## MR-J4W2-B/MR-J4W3-B servo amplifier specifications

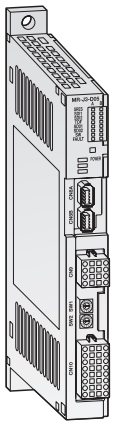


Additional to the standard version of the MR-J4 amplifiers (SSCNETIII/H Motion Network) for one servo motor Mitsubishi Electric now offers also servo amplifiers for two or three servo motors. The amplifiers for two (MR-J4W2-B) and three axes (MR-J4W3-B) are space and wiring saving and more efficient than two or three single amplifiers. Therefore the engineer saves not only space inside the cabinet and costs due to less wires, but also valuable energy what reduces the pollution of $CO_2$ at the same time. The range of output power for the amplifier for two axes is from 0.2 to 1 kW, for three axes from 0.2 to 0.4 kW per axis. All other specification items are identical with the standard version of the MR-J4-B for one axis.

| Common specifications MR-J4W-B | | W2-22B | W2-44B | W2-77B | W2-1010B | W3-222B | W3-444B |
|---|---|---|---|---|---|---|---|
| Power supply | voltage /frequency ① | 1-phase or 3-phase 200–240 V AC, 50/60 Hz | | | 3-phase 200–240 V AC, 50/60 Hz | 1-phase or 3-phase 200–240 V AC, 50/60 Hz | |
| | permissible voltage fluctuation | 1-phase or 3-phase 170–264 V AC | | | 3-phase 170–264 V AC | 1-phase or 3-phase 170–264 V AC | |
| | permissible frequency fluctuation | ±5 % max. | | | | | |
| Control system | | Sinusoidal PWM control/current control system | | | | | |
| Dynamic brake | | Built-in | | | | | |
| Speed frequency response | | 2500 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. | | | | | |
| Safety function | | STO (IEC/EN 61800-5-2); (SS1 function is available by using the safety option card MR-J3-D05) | | | | | |
| Structure | | Self-cooling, open (IP20) Fan cooling, open (IP20) | | | | | |
| Environment | ambient temperature | Operation: 0–55 °C (no freezing), storage: -20–65 °C (no freezing) | | | | | |
| | atmosphere | Inside control panel; no corrosive 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 | 1.5 | 1.5 | 2.0 | 2.0 | 1.9 | 1.9 |
| Dimensions (WxHxD) | mm | 60x168x195 | 60x168x195 | 85x168x195 | 85x168x195 | 85x168x195 | 85x168x195 |
| **Order information** | Art. no. | 248645 | 248646 | 248647 | 248648 | 248649 | 248650 |

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



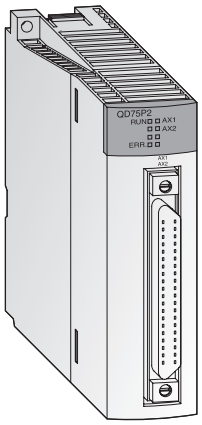
The function of the safety option card MR-J3-D05 can be compared with a programmable safety relay. In combination with MR-J3-BSafety and MR-J4-A/B additional safety functions according EN 61800-5-2 and additional Emergency Stop functions according EN IEC 60204-1 are available. Among "Safe Torque Off" (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 Stop) 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 axes | | 2 axes, independently controlled |
| Extendible safety standards | | Cat. 3 (EN 954-1), SIL2 (IEC 61508), SILCL2 (EN 62061), PL d (EN ISO 13849-1), STO/SS1 (EN 61800-5-2) cat. 0/1 (EN 60204-1), MTTFd 100 years, DC 90 %, PFH 1.01E-07 1/h |
| Shut-off input (Safety devices) | | 4 points (2 points x 2 axes), source/sink logic compatible |
| Shut-off release input (restart devices) | | 2 points (1 points x 2 axes), 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, 2 % (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 corrosive 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 10–55 Hz (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 1.5 mA 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.

## Positioning modules MELSEC System Q




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)
- SSCNETIII bus type (QD75MH series)

The open-collector and differential output controllers can be used with standard type servo amplifiers (MR-ES-A/MR-J4-A), whilst the QD75MH series controllers should be used with the MR-J4-B (SSCNETIII bus type) servo amplifiers. Using the SSCNETIII 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.

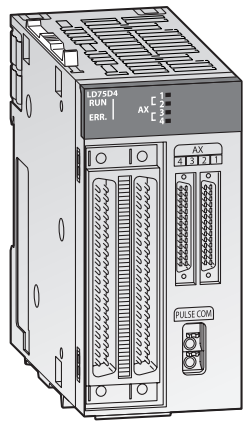
The open-collector output type modules provide positioning with open loop control. The modules generate the travel command via the pulse chain. The speed is proportional to the pulse frequency and the distance travelled is proportional to the pulse length.

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 | QD75D2 | QD75D4 | QD75P1 | QD75P2 | QD75P4 |
|---|---|---|---|---|---|---|---|
| Number of control axes | | 1 | 2 | 4 | 1 | 2 | 4 |
| Interpolation | | — | 2 axes linear and circular interpolation | 2, 3, or 4 axes linear and 2 axes circular interpolation | — | 2 axes linear and circular interpolation | 2, 3, or 4 axes linear and 2 axes circular interpolation |
| Positioning data items | | 600 | | | | | |
| Output type | | Differential driver | Differential driver | Differential driver | Open collector | Open collector | 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 switching control: incremental; locus/speed control: incremental; path control: absolute data and/or incremental | | | | | |
| | units | Absolute data:<br>-2 147 483 648 – 2 147 483 647 pulse<br>-214 748 364.8 – 214 748 364.7 µm<br>-21 474.83648 – 21 474.83647 inch<br>0 – 35.99999 degree | | Incremental method:<br>-2 147483 648 – 2 147 483 647 pulse<br>-214 748 364.8 – 214 748 364.7 µm<br>-21 474.83648 – 21 474.83647 inch<br>-21 474.83648 – 21 474.83647 degree | | Speed/position switching control:<br>0 – 2 147 483 647 pulse<br>0 – 21 4748 364.7 µm<br>0 – 21 474.83647 inch<br>0 – 21 474.83647 degree | |
| | speed | 1 – 1 000 000 pulse/s<br>0.01 – 20 000 000.00 mm/min<br>0.001 – 200 000.000 degree/min<br>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 deceleration 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 axes linear and circular interpolation | 2, 3, or 4 axes linear and 2 axes circular interpolation |
| Positioning data items | | 600 | | |
| Output type | | SSCNETIII | SSCNETIII | SSCNETIII |
| Output signal | | Bus | Bus | Bus |
| Positioning | method | PTP control: absolute data and/or incremental; speed/position switching control: incremental; locus/speed control: incremental; path control: absolute data and/or incremental | | |
| | units | Absolute data:<br>-2 147 483 648 – 2 147 483 647 pulse<br>-21 4748 364.8 – 214 748 364.7 µm<br>-21 474.83648 – 21 474.83647 inch<br>0 – 359.99999 degree | Incremental method:<br>-2 147 483 648 – 2 147 483 647 pulse<br>-214 748 364.8 – 214 748 364.7 µm<br>-21 474.83648 – 21 474.83647 inch<br>-21 474.83648 – 21 474.83647 degree | Speed/position switching control:<br>0 – 2 147 483 647 pulse<br>0 – 21 4748 364.7 µm<br>0 – 21 474.83647 inch<br>0 – 21 474.83647 degree |
| | speed | 1 – 50 000 000 pulse/s<br>0.01 – 20 000 000.00 mm/min<br>0.001 – 2 000 000.000 degree/min<br>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 deceleration time | 1–8388608 ms | | |
| I/O points | | | 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 | | |

# Positioning modules




### Control of high resolution drives

The MELSEC L series offers two different positioning modules for control of up to four axes.

- Differential output type (LD75D☐ )
- Open-collector output type (LD75P☐)

These positioning modules can be used with standard type servo amplifiers (Mitsubishi Electric MR-ES-A, MR-J4-A).

All MELSEC L series positioning modules can provide functionality such as interpolation, speed positioning operation etc.

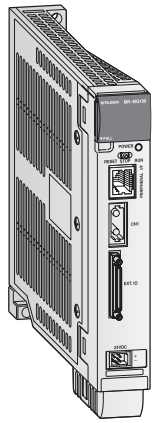
The open-collector output type module provides positioning with open loop control. The module generates the travel command via the pulse chain. The speed is proportional to the pulse frequency and the distance travelled is proportional to the pulse length.

The differential output type module is suitable for bridging long distances between the module and the drive system due to the fact that the output allows large cable lengths.

- Up to 600 positioning data per axis
- Maximum output pulse of 200 k pulses/s for LD75P4 and 4 Mpulses/s for LD75D4)
- High speed control of high resolution devices such as linear servos and direct drive motors
- Reduced machine vibration by using the optional acceleration/deceleration system
- Visualization of positioning module buffer data with customizable graphs

| Specifications | | LD75D1 | LD75D2 | LD75D4 | LD75P1 | LD75P2 | LD75P4 |
|---|---|---|---|---|---|---|---|
| Accessible axes | | 1 | 2 | 4 | 1 | 2 | 4 |
| Output frequency | pulse/s | — | 2-axis linear interpolation, 2-axis circular interpolation | 2-/3-/4-axis linear interpolation, 2-axis circular interpolation | — | 2-axis linear interpolation, 2-axis circular interpolation | 2-/3-/4-axis linear interpolation, 2-axis circular interpolation |
| Positioning data items per axis | | 600 | | | | | |
| Output type | | Differential driver | | | Open collector | | |
| Output signal | | Pulse chain | | | | | |
| Positioning | method | PTP (Point To Point) control, path control (both linear and arc can be set), speed control, speed-position switching control, position-speed switching control | | | | | |
| | range | Absolute/incremental system:<br>–214 748 364.8–214 748 364.7 µm<br>–21 474.83648–21 474.83647 inch<br>0–359.99999 degree (absolute); 21 474.83648–21 474.83647 (incremental)<br>–2 147 483 648–2 147 483 647 pulse | | | | | |
| | | In speed-position switching control (INC mode)/position-speed switching control:<br>0–214 748 364.7 µm<br>0–21 474.83647 inch<br>0–21 474.83647 degree<br>0–2 147 483 647 pulse | | | | | |
| | speed | 1–1 000 000 pulse/s<br>0.01–20 000 000.00 mm/min<br>0.001–200 000.000 degree/min<br>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/ deceleration time | 1–83 88 608 ms<br>(four patterns can be set for each of acceleration time and deceleration time) | | | | | |
| | rapid stop deceleration time | 1–8 388 608 ms | | | | | |
| Number of occupied I/O points | | 32 | 32 | 32 | 32 | 32 | 32 |
| Internal current consumption | mA | 510 | 620 | 760 | 440 | 480 | 550 |
| Dimensions (WxHxD) | mm | 45x90x95 | 45x90x95 | 45x90x95 | 45x90x95 | 45x90x95 | 45x90x95 |
| **Order information** | Art. no. | 251448 | 251449 | 238095 | 251446 | 251447 | 238096 |

## 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 SSCNETIII motion networking capability as well as an Ethernet port.

The MR-MQ100 uses Mitsubishi Electric's simple but rugged optical fiber motion network SSCNETIII. A single fiber connection is all that's needed to provide full communication and control over all functions of the MR-J4-B servo amplifier regardless of capacity. A standard Ethernet connection is also provided to link the MR-MQ100 to the MT Developer2 software and to the control system.

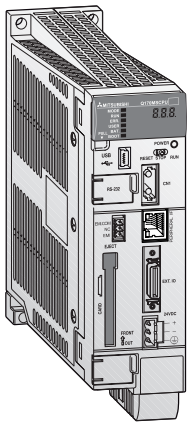
- Stand-alone Motion Control System only with servo amplifier without additional hardware
- Optical high-speed SSCNETIII network
- Ethernet interface 100/10 Mbps
- High speed inputs for mark sensors
- External encoder input for axis sychronisation
- MC protocol Ethernet communication
- Increase of the number of inputs/outputs by connecting an I/O expansion board (MR-J3-D01) to the servo amplifier series MR-J3-BSafety.
- Integrated serial interface (RS422) for communication with HMI operator terminals

| Specifications | | 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)<br>SSCNETIII (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 control axes | | 1 axis |
| Operation cycle | | 0.44 ms |
| Servo amplifier | | MR-J3-BSafety/MR-J4-B over SSCNETIII |
| 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 Q170MSCPU/Q170MSCPU-S1



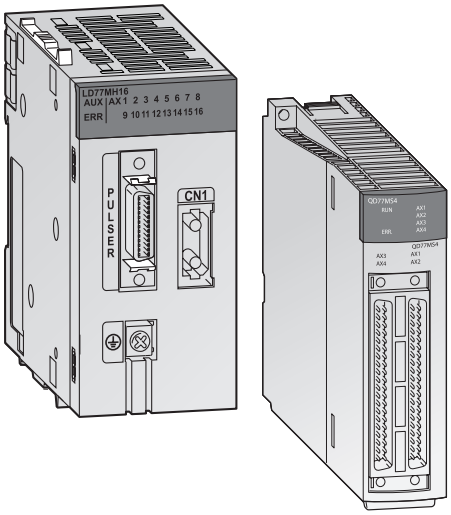
The Q170MSCPU/Q170MSCPU-S1 combines a PLC CPU, a Motion CPU and a power supply module into one compact unit. No base unit is required, although an extension base unit with standard PLC modules can be connected if required. An encoder interface is included as standard, enabling multiple axes synchronization with an external encoder.

The well-reputed mechanical support language (SV13, SV22) from the MELSEC System Q Motion Controller is incorporated.

- Small size
- Controls up to 16 axes
- Communication with servo amplifier via high-speed network SSCNETIII/H and a communication speed up to 150 Mbps.
- Programming and configuration is performed using the familiar software GX Works2 und MT Works2.
- 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 | | Q170MSCPU | Q170MSCPU-S1 |
|---|---|---|---|
| Motion-CPU | number of controllable axes | 16 | |
| | operation cycle | 0.22 ms, 0.44 ms, 0.88 ms, 1.77 ms, 3.55 ms, 7.11 ms | |
| | programming languages | Motion SFC, dedicated instruction, mechanical support language (SV22) | |
| | servo program capacity | 16 k steps | |
| | servo amplifier | MR-J3-BSafety over SSCNETIII/ MR-J4-B over SSCNETIII/H | |
| 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 | 4096 points | |
| | programming languages | Ladder, instruction list, SFC, structured text | |
| | program capacity | 30 k steps (120 k bytes) | 60 k steps (240 k bytes) |
| | processing speed | 20 ns (LD instruction); 40 ns (MOV instruction) | 9.5 ns (LD instruction); 19 ns (MOV instruction) |
| | total number of instructions | 858 (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, 4096, 8192, 16384, 32768 | |
| | stroke ratio data | -2147483648 to 2147483647 | |
| | control mode | Two-way cam, feed cam | |
| Dimensions (WxHxD) | mm | 52x178x135 | |
| **Order information** | Art. no. | 266524 | 266535 |

## MELSEC Simple Motion module




The MELSEC System Q and MELSEC L series lineup includes Simple Motion modules in addition to the regular positioning modules. Various control functions previously only possible with Motion Controllers, such as speed control, torque control, synchronous control and cam control, are now available with the Simple Motion modules. These functions can be realized with simple parameter adjustments and via the PLC program.

Mark sensors allow use in packaging industry, filling plants, etc., without additional optional modules. A function for automatic calculation of cam data for applications with rotating cutters is implemented – only by setting the length of the product and the synchronisation path. With positioning functions, like linear interpolation (up to 4 axes), circular interpolation (2 axes) and path control it is easy to realize different applications, like X-Y tables, sealing, etc.

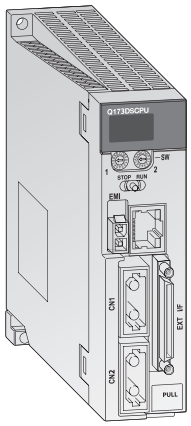
Proved and tested programs for the QD75MH can be used, since the QD77MS and the LD77MH are compatible with the QD75MH.

- Compatible with QD75MH
- Up to 600 positions per axis
- External encoder input for axis synchronisation
- Electronic cam control
- High-speed digital inputs for mark sensors to capture encoder position, motor position etc.
- Parameterization, programming, diagnostics and test operation by GX Works2
- Certified PLCopen function blocks
- Communication between the Simple Motion module and servo amplifiers via the high-speed network SSCNETIII/ SSCNETIII/H

PLCopen motion control

| Specifications | | LD77MH4 | LD77MH16 | QD77MS2 | QD77MS4 | QD77MS16 |
|---|---|---|---|---|---|---|
| Number of controllable axes | | 4 | 16 | 2 | 4 | 16 |
| Interpolation functions | | Linear interpolation for up to 4 axes, circular interpolation for 2 axes | | 2 axes linear and circular interpolation | Linear interpolation for up to 4 axes, circular interpolation for 2 axes | |
| Output type | | SSCNETIII | SSCNETIII | SSCNETIII/H | SSCNETIII/H | SSCNETIII/H |
| Output signal | | Bus | Bus | Bus | Bus | Bus |
| Servo amplifier | | MR-J3-BSafety/MR-J4-B over SSCNETIII | | MR-J3-BSafety over SSCNETIII/MR-J4-B over SSCNETIII/H | | |
| Operation cycle | | 0.88 ms | 0.88 ms/1.7 ms | 0.88 ms | 0.88 ms | 0.88 ms/1.7 ms |
| Positioning | method | PTP (Point To Point) control, path control (linear and arc), speed control, speed-position switching control, position-speed switching control, torque control | | | | |
| | acceleration/deceleration control | Trapezoidal acceleration/deceleration, S-curve acceleration/deceleration | | | | |
| | compensation | Backlash compensation, electronic gear, near pass function | | | | |
| | OPR control | 5 different methods | | | | |
| Number of positioning points | | 600 per axis (can be set with GX Works2 or PLC program) | | | | |
| External input signals | encoder | 1 encoder, A/B phase | | | | |
| | high-Speed Inputs | 4 digital inputs [DI1–DI4] | | | | |
| Cam function | storage area cam data | 256 kbytes | | | | |
| | number of cams | Max. 256 (depends on resolution) | | | | |
| | resolution per cycle | 256, 512, 1024, 2048, 4096, 8192, 16384, 32768 | | | | |
| | stroke resolution | 2–16284 | | | | |
| I/O points | | 32 | 32 | 32 | 32 | 32 |
| Dimensions (WxHxD) | mm | 45x90x98.5 | 45x90x98.5 | 27.4x98x90 | 27.4x98x90 | 27.4x98x90 |
| **Order information** | Art. no. | 241243 | 241244 | 248702 | 248703 | 248704 |

## MELSEC System 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 SSCNETIII/H network for communication with high-performance servo amplifiers at up to 150 Mbps

| Specifications | | Q172DSCPU | Q173DSCPU |
|---|---|---|---|
| Type | | Motion CPU | Motion CPU |
| I/O points | | 8192 | 8192 |
| No. of control axes | | 16 | 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 | | Ethernet 100 Mbps/10Mbps (for programming and additional options), SSCNETIII/H (for connection to servo amplifier with optical cable) (USB, RS232C via PLC-CPU) | |
| Servo amplifier | | MR-J3-BSafety over SSCNETIII/ MR-J4-B over SSCNETIII/H | |
| Dimensions (WxHxD) | mm | 27.4x120.5x120.3 | 27.4x120.5x120.3 |
| **Order information** | Art. no. | 248700 | 248701 |

## MELSEC System Q-Motion system modules

### Servo external signals interface module Q172DLX

The 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 Q172DEX

The serial absolute synchronous encoder interface module Q172DEX is a motion system module for receiving and evaluating up to two serial absolute-value encoders. (Incremental encoders cannot be connected.) Via an external encoder it is possible to feed a setpoint source to the motion system, which in turn is programmed as a master axis.

In addition to the interfaces for the signals of two absolute value encoders, the Q172DEX has two digital inputs with ultra-rapid response-times.

- Serial communication (2.5 Mbps)
- Resolution of 22 Bit Q170ENC-W8
- 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 Q173DPX

The manual pulse generator interface module 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 Q173DPX has three digital inputs with which the encoder signal counting procedure can be started (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

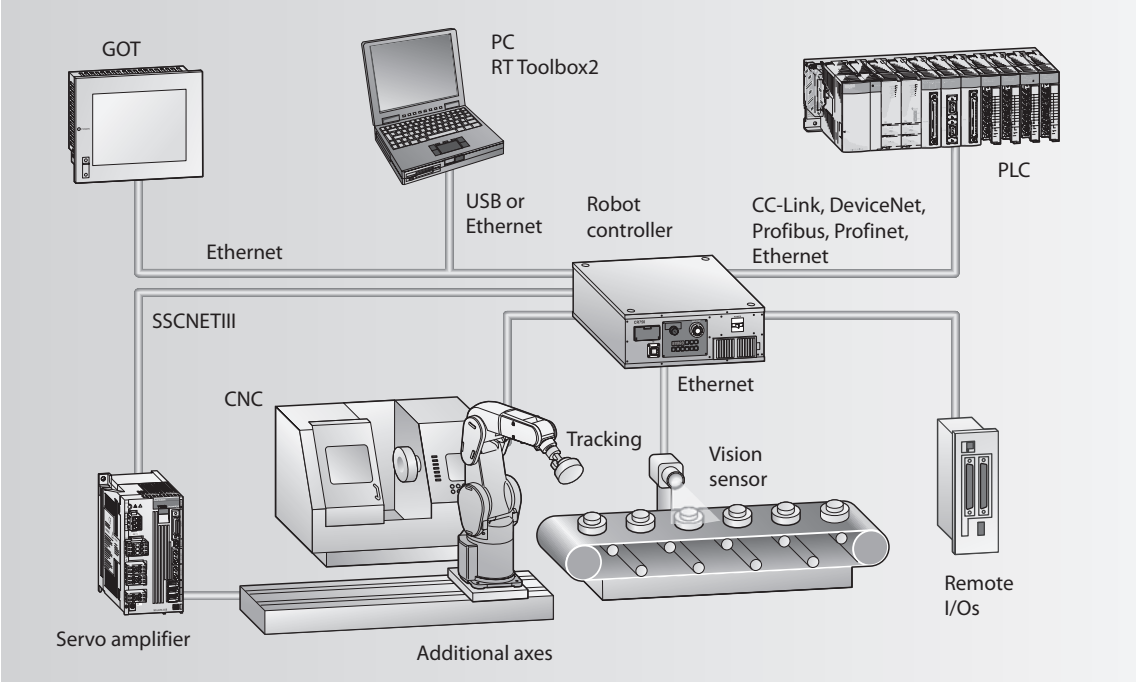
### Safety signal module Q173DSXY

The safety signal module is an input/output extension with 20 safety input points ×2 paths and 12 safety output points ×2 paths to pass input/output information to the Motion CPU and PLC CPU module.

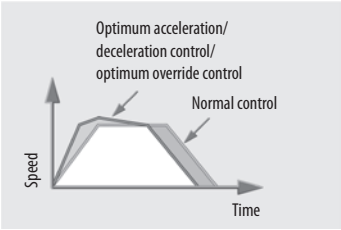
With the safety observation function the system complies to the safety functions: STO, SS1, SS2, SOS, SLS, SBC, SSM (IEC 61800-5-2: 2007)

# MELFA Robot Systems

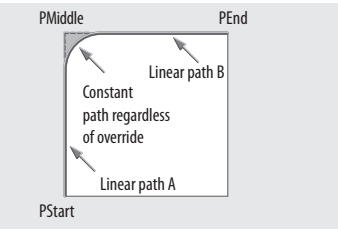
**Example of a robot system configuration**



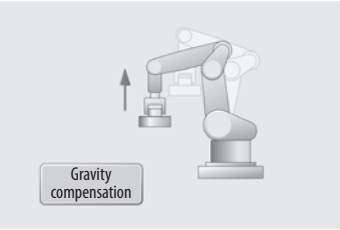

## Practical functions for all applications



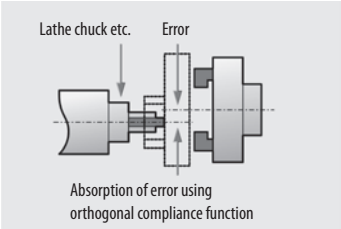

Automatic acceleration and braking ramp optimisation for faster cycle times



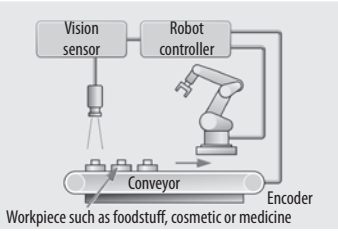

Continuous path function for faster cycle times



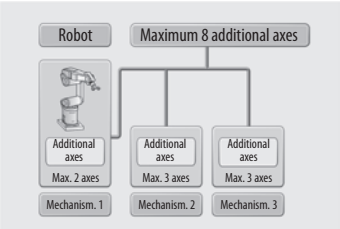

Gravity compensation for greater positioning and palletising precision



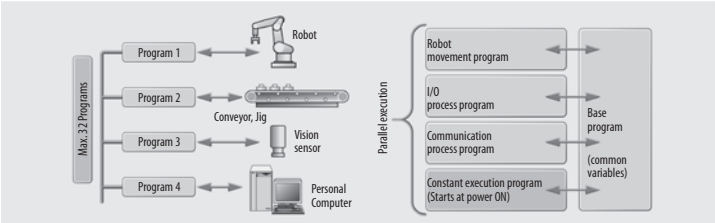

Orthogonal "compliance control" function for interactive response to opposing forces



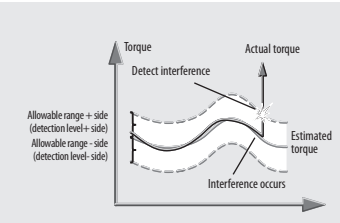

Object tracking function for faster cycle times




Control functions for up to 8 additional axes




Multitasking function for parallel execution of multiple tasks



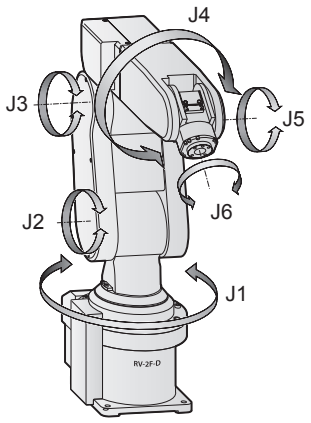

The sensorless crash detection reduces robot, machine and workpiece damages

## RV-2FB articulated-arm robots – the powerful compact class

The compact and light RV-2FB can be seamless integrated into different automation systems. Flexibility and the wide range of motion permits acting in applications with limited space, like mounting, assembling, palletising, sorting or bonding.

Even the basic model is available with fully equipped standard controller or as SPS robot with integration into the iQ Platform (see for more details on page 30).

| Model | | RV-2FB-D1-S15 | RV-2FB-Q1-S15 |
|---|---|---|---|
| Degrees of freedom | | 6 | |
| Maximum payload | | 2.0 kg | |
| Gripper flange reach | | 504 mm | |
| Repeatability | | ±0.02 mm | |
| Max. speed | | 4955 mm/s | |
| Controller type | | CR750-D | CR750-Q + Q172DRCPU |
| Operating range | J1 | 480 (±240) | |
| | J2 | 240 (-120–+120) | |
| | J3 | 160 (0–+160) | |
| | J4 | 400 (±200) | |
| | J5 | 240 (-120–+120) | |
| | J6 | 720 (-360–+360) | |
| Robot weight | | 19 kg | |
| Protection | | IP30 | |
| **Order information** | Art. no. | 255211 | 255213 |



RV-2F

## RV-4FLM articulated-arm robots – the easy access to high-performance

The RV-4F series of robots have been designed to be very simple to integrate into an existing automation cell. Features such as the direct control over 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.

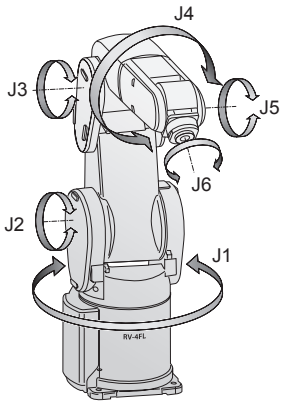
The RV-4F series has been optimised with a choice of major networking technologies: Ethernet, DeviceNet, Profibus DP, Profinet and CC-Link. For complex automation cells where movement is restricted, or there is a large distance between working points, the RV-4F robots can control up to 8 additional axes to its standard robot arm configuration.

Two of these axes can be interpolated allowing easy and efficient movement around obstructions in combination with the robot arm.

The other six axes can be used to control elements such as linear slides to move the robot between work stations.

The robots are available in different versions with varying arm lengths and for stand-alone use or as a part of the iQ Platform (see page 30 for more details). Robots arms have IP67 protection as standard.

| Model | | RV-4FLM-D1-S15 | RV-4FLM-Q1-S15 |
|---|---|---|---|
| Degrees of freedom | | 6 | |
| Maximum payload | | 4.0 kg | |
| Gripper flange reach | | 649 mm | |
| Repeatability | | ±0.02 mm | |
| Max. speed | | 9048 mm/s | |
| Controller type | | CR750-D | CR750-Q + Q172DRCPU |
| Operating range | J1 | 480 (±240) | |
| | J2 | 240 (-120–+120) | |
| | J3 | 164 (0–+164) | |
| | J4 | 400 (±200) | |
| | J5 | 240 (-120–+120) | |
| | J6 | 720 (±360) | |
| Robot weight | | 41 kg | |
| Protection | | IP67 standard | |
| **Order information** | Art. no. | 255268 | 255272 |



RV-4FLM

## RV-7FM/RV-7FLM articulated-arm robots – the reliable mid-range solution

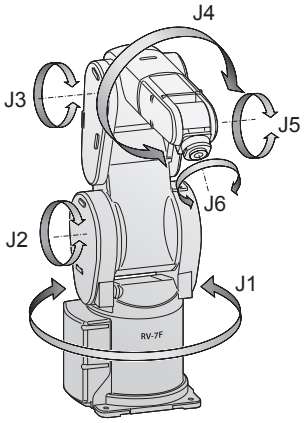
The RV-7F with handling payloads of up to 7 kg sets new benchmark standards for speed, flexibility, ease of integration and simplicity of programming. With a pick & place cycle of 0.32 seconds (12" test), the robots of the RV-7F series provide the fastest motion in its class. Ethernet, USB, tracking, camera connection and additional axis connections are standard in all MELFA Robot Series.

Two of these axes 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.

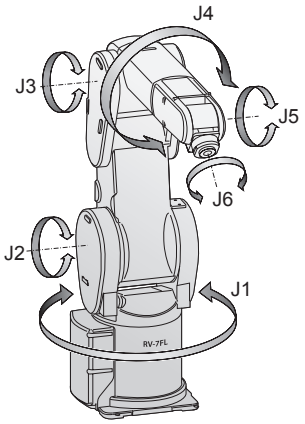
The robots are available in different versions with varying arm lengths and for stand-alone use or as a part of the iQ Platform (see page 30 for more details).

For the iQ Platform type robots an anti-collision function is available to prevent automatically a collision between robots which are working close together. Also RV-7F series robot arms have IP67 protection as standard.

| Model | | RV-7FM-D1-S15<br>RV-7FM-Q1-S15 | RV-7FLM-D1-S15<br>RV-7FLM-Q1-S15 |
|---|---|---|---|
| Degrees of freedom | | 6 | 6 |
| Maximum payload | | 7.0 kg | 7.0 kg |
| Gripper flange reach | | 712 mm | 908 mm |
| Repeatability | | ±0.02 mm | ±0.02 mm |
| Max. speed | | 11064 mm/s | 10977 mm/s |
| Controller type | | CR750-D/CR750-Q + Q172DRCPU | CR750-D/CR750-Q + Q172DRCPU |
| Operating range | J1 | 480 (±240) | |
| | J2 | 240 (-115–+125) | 240 (-110–+130) |
| | J3 | 156 (-0–+156) | 162 (-0–+162) |
| | J4 | 400 (±200) | |
| | J5 | 240 (-120–+120) | |
| | J6 | 720 (±360) | |
| Robot weight | | 65 kg | 67 kg |
| Protection | | IP67 standard | |
| **Order information** | Art. no. | 255275<br>255279 | 255276<br>255280 |



RV-7FM



RV-7FLM

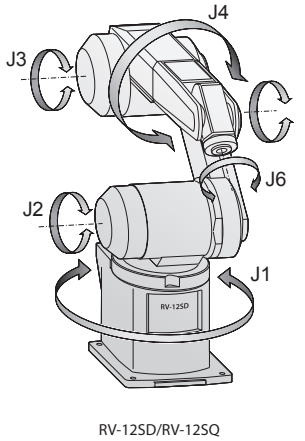
## RV-12SD/RV-12SQ/RV-12SDL/RV-12SQL articulated-arm robots – exceptional power and reach

With handling payloads of 12 kg, a truly impressive maximum workspace radius of 1,385 mm and exceptional precision (repeatability: ±0.05 mm) the RV-SD/RV-SQ 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!

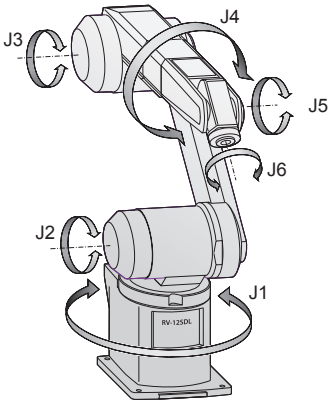
### Multifunctional robot controllers

The robots are controlled by the multitasking controller CR2D. 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-12SD-S315<br>RV-12SQ-S315 | RV-12SDL-S315<br>RV-12SQL-S315 |
|---|---|---|---|
| Degrees of freedom | | 6 | 6 |
| Maximum payload | | 12 kg | 12 kg |
| Gripper flange reach | | 1086 | 1385 mm |
| Repeatability | | ±0.05 mm | ±0.05 mm |
| Max. speed | | 9600 mm/s | 9500 mm/s |
| Controller type | | CR2DA/QR2QA + Q172DRCPU | CR2DA/CR2QA + Q172DRCPU |
| Operating range | J1 | 340 (-170–+170) | |
| | J2 | 230 (-100–+130) | |
| | J3 | 290 (-130–+160) | |
| | J4 | 320 (-160–+160) | |
| | J5 | 240 (-120–+120) | |
| | J6 | 720 (-360–+360) (expandable) | |
| Robot weight | | 93 kg | 98 kg |
| Protection | | IP54 (J1–J3), IP65 (J4–J6) | |
| **Order information** | Art. no. | 235687<br>235697 | 235688<br>235698 |



RV-12SD/RV-12SQ

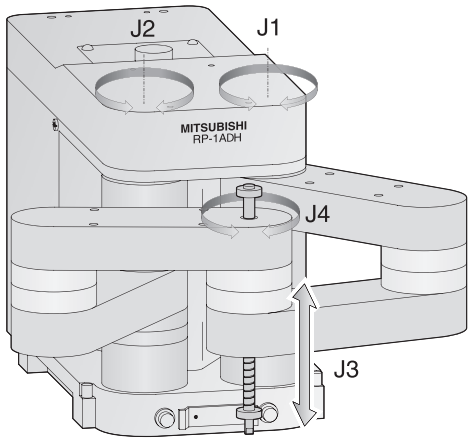


RV-12SDL/RV-12SQL

## RP series SCARA robots – outstanding speed plus high precision

The RP series 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 200x160 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-1ADH | RP-3ADH | RP-5ADH |
|---|---|---|---|---|
| Degrees of freedom | | 4 | 4 | 4 |
| Maximum payload | | 1 kg | 3 kg | 5 kg |
| Controller type | | CR1DA | CR1DA | CR1DA |
| Operating range | WxD (mm) | 150x105 (A6 size) | 210x148 (A5 size) | 297x210 (A4 size) |
| | J3 vertical motion (mm) | 30 | 50 | 50 |
| | J4 (deg.) | ±200 | ±200 | ±200 |
| Repeat 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 |
| Robot weight | | 12 kg | 24 kg | 25 kg |
| **Order information** | Art. no. | 252843 | 252844 | 252885 |




## RH-3SDHR/SQHR SCARA robots – overhead installation for minimum space requirements

### 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.

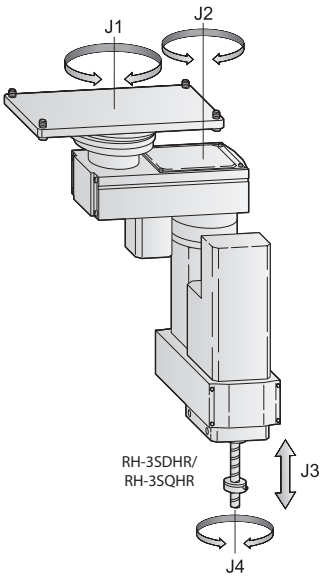
### Unpack, calibrate, start work

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 high-performance systems for mechanical assembly, material handling, packaging and other applications that require fast and precise automation. The short cycle period of less than 0.5 seconds enables a movement sequence of 25 mm vertical lift, 300 mm horizontal traverse and 25 mm vertical and lower return.

| Model | | RH-3SDHR3515 | RH-3SQHR3515 |
|---|---|---|---|
| Degrees of freedom | | 4 | |
| Maximum payload | | 3 kg | |
| Controller type | | CR2DA | CR2QA + Q172DRCPU |
| Gripper flange reach | | 350 mm | |
| Operating range | J1 (deg.) | 450 (±225) | |
| | J2 (deg.) | 450 (±225) | |
| | J3 (Z) (mm) | 150 | |
| | J4 (θ axis) (deg.) | 1440 (±720) | |
| Repeatability X-Y direction | | ±0.01 mm | |
| Max. speed (mm/s) | | 6267 (J1, J2) | |
| Robot weight | | 24 kg | |
| Protection | | IP65 | |
| Degree of cleanliness* | | ISO 3 (optional) | |
| **Order information** | Art. no. | 237390 | 237391 |

* according to ISO 14644-1



# RH-FH SCARA robots – specialists for palletising

### More productivity and efficiency

SCARA robots are ideal for sorting, palletising and component installation due their short cycle time. The robots of the RH-F series achieve the highest speeds in their class thanks to the new motors developed by Mitsubishi Electric, high arm rigidity and unique control technology. The resulting reduced cycle time of only 0.29 seconds for a 12" cycle make for significantly increased productivity and improved continuous operation.

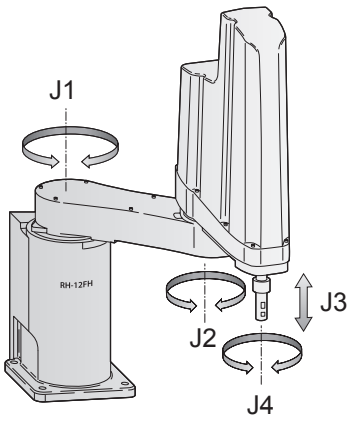
### Easy integration and application

Straight from the factory, the RH-F series offers many features which are only available as optional extras on comparable products. For example, every model has connections for pneumatic grippers, Ethernet, USB, tracking functions, camera interface, hand I/O, additional axis controller and an interface for GOT HMIs with freely programmable user interfaces. The standard grease is foodgrade H1 grease – ideal for the food and beverage industry.

An ISO Level III cleanroom model is also available for pharmaceutical and microelectronics applications.

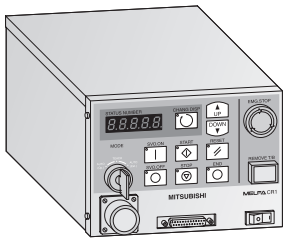
The RH-6/12/20FH has the tried-and-tested protection class IP54 for industrial systems which protects against dust and spray water. For use in particularly contaminated or dusty environments, the model can be retrospectively upgraded to IP65 at relatively little cost and without any problems thanks to the closed housing concept.

| Model | | RH-3FH5515-D1-S15<br>RH-3FH5515-Q1-S15 | RH-6FH5520-D1-S15<br>RH-6FH5520-Q1-S15 | RH-12FH8535N-D1-S15<br>RH-12FH8535N-Q1-S15 | RH-20FH10035N-D1-S15<br>RH-20FH10035N-Q1-S15 |
|---|---|---|---|---|---|
| Degrees of freedom | | 4 | 4 | 4 | 4 |
| Maximum payload | | 3 kg | 6 kg | 12 kg | 20 kg |
| Controller type | | CR750-D/CR750-Q + Q172DRCPU | CR750-D/CR750-Q + Q172DRCPU | CR750-D/CR750-Q + Q172DRCPU | CR750-D/CR750-Q + Q172DRCPU |
| Gripper flange reach | | 550 mm | 550 mm | 850 mm | 1000 mm |
| Operating range | J1 (deg.) | 340 (±170) | 340 (±170) | 340 (±170) | 340 (±170) |
| | J2 (deg.) | 290 (±145) | 290 (±145) | 306 (±153) | 306 (±153) |
| | J3 (Z) (mm) | 150 | 200 | 350 | 350 |
| | J4 (θ axis) (deg.) | 720 (±360) | 720 (±360) | 720 (±360) | 720 (±360) |
| Repeatability X-Y direction | | ±0.012 mm | ±0.012 mm | ±0.015 mm | ±0.02 mm |
| Max. speed (mm/s) | | 8300 | 8300 | 11350 | 13283 |
| Robot weight | | 32 kg | 37 kg | 69 kg | 77 kg |
| Protection | | IP20 | IP54 (IP65 optional) | | |
| **Order information** | Art. no. | 250377<br>250380 | 250383<br>250389 | 254377<br>254383 | 254388<br>254392 |



RH-12FH

## Powerful controller



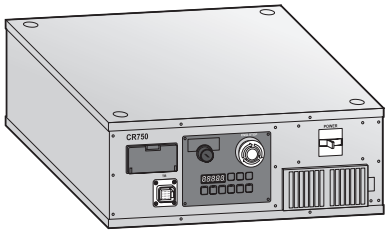
Every robot system has its own compact, modular robot controller, which contains the CPU and the power electronics for controlling the robot.

Mitsubishi Electric's robot controllers have a particularly slim, compact design. No matter which Mitsubishi robot you use the programming language and options are always the same. You can add special application functions by inserting expansion option cards in the slots in the controllers. Therefore it is possible, to integrate the controller into different types of networks.

The CR750 Controller has already implemented functions like Ethernet- and USB-Connection, Additional Axes Control over SSCNETIII and Tracking Encoder interface as a standard.

A teaching box for defining the robots' working positions can be connected to the controller's RS422 port. The teaching box can also be used for testing the entire program sequence.

The interfaces make 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 | | CR1DA | CR2DA/CR2QA |
|---|---|---|---|
| Shipped with robot | | RP-1ADH/3ADH/5ADH | RH-3SDHR/RH-3SQHR<br>RV-12SD/12SDL/12SQ/12SQL |
| Number of controllable axes | | 6 robot axes + 2 interpolation axes + 6 independent axes | |
| Interfaces | | USB, Ethernet, RS232 (all integrated) | |
| Memory capacity | no. of teaching points | Max. 13000 | |
| | no. program steps | Max. 26000 | |
| | no. of programs | 256 | |
| External inputs/ outputs | general purpose I/Os | Optional | |
| | hand open/close | 8 | |
| | emergency stop I/Os | 1 | 2 (redundant) in accordance with DIN EN ISO 10218 |
| | door switch input | 1 | 2 (redundant) |
| Power supply | | 1~180–253 V AC; 50/60Hz | |
| Dimensions (WxHxD) mm | | 270x200x290 | 470x200x400 |

| Characteristics/Functions | | CR750-D | CR750-Q + Q172DRCPU |
|---|---|---|---|
| Shipped with robot | | RV-2F/4F/4FL/7F/7FL<br>RH-3FH/6FH/12FH/20FH | |
| Number of controllable axes | | 6 robot axes + 2 interpolation axes + 6 independent axes | |
| Interfaces | | Ethernet, USB, SSCNETIII | |
| Memory capacity | no. of teaching points | 39000 | 13000 |
| | no. program steps | 78000 | 26000 |
| | no. of programs | 512 | 256 |
| External inputs/ outputs | general purpose I/Os | up to 256 | up to 8192 |
| | hand open/close | 8 inputs/8 outputs | |
| | emergency stop I/Os | 1 (redundant) | |
| | door switch input | 1 (redundant) | |
| Power supply | Input voltage | 1~180–253 V AC; 50/60Hz | |
| | Power consumption kVA | 0.5–2.0 | |
| Dimensions (WxHxD) mm | | 430x174x425 | 430x174x425 |

## F-D and F-Q series

High flexibility and full production line integration can easily be realised with F-Q-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 F-Q system.

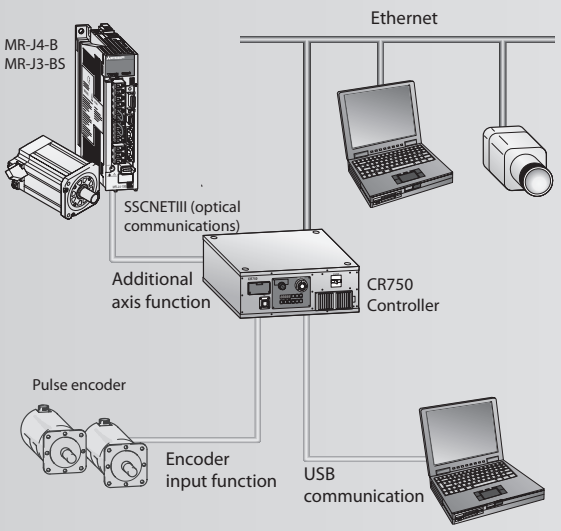
F-D-system robots are also available as F-Q-robot systems. Powerful features like fully integrated HMI terminal application monitoring, communication on most of the widely used networks and high performance MES functionality for 100 % data logging are just some of the features of this system.

The F-Q-system provides cost reduction during installation and through to production by reducing the cycle time for every single product.

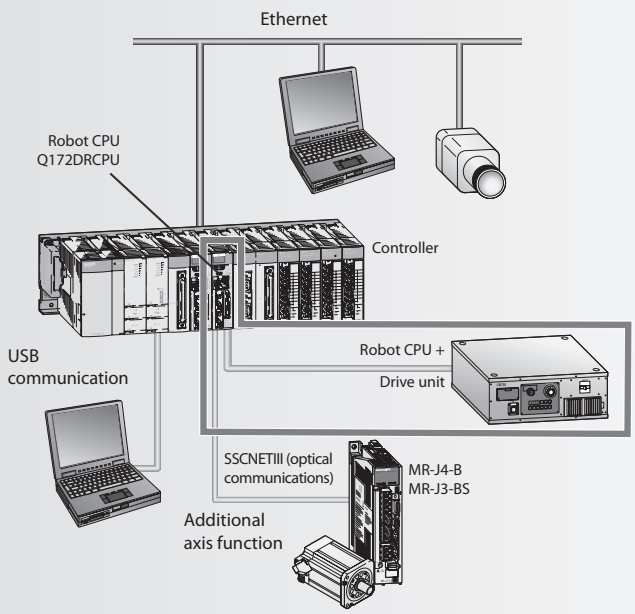
For the design of robotic systems, Mitsubishi Electric offers unrivalled choice. Our two key robot families cover all requirements no matter how complex or demanding your application. Our F-D series offers a high level of performance for maximum productivity, while our F-Q series extends these benefits with the highest level of integration available from any robotic system anywhere.

- Improved responsivity through high-speed communications
- Reduced wiring and number of units used
- Direct communication between CPU units
- Batch management of multiple robots
- Direct control between I/O units
- Shared memory expansion
- GOT connection (transparent function) (for GOT1000 series)
- GOT backup/restore functions (supported on GT14, GT15 and GT16)
- Direct execution function for programmable controllers

**F-D series**

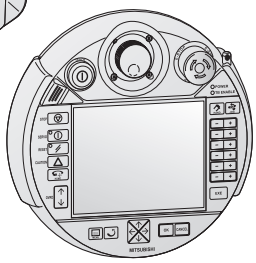



**F-Q series**



## Robots teach panel for operation and programming

R32TB



R56TB

The R56TB teach panel is a multifunctional control and programming terminal for all Mitsubishi Electric F series, SD/SQ series and ADH 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 Electric F series, SD/SQ series and ADH 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 (640x480 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 | RS422 for connection to the robot controller |
| Connection | | Direct connection to the robot controller, cable length 7m | |
| Protection rating | | IP65 | IP65 |
| Weight | kg | 1.25 | 0.9 |
| **Order information** | Art. no. | 218854 | 214968 |

## Options overview for all robots

| Option | Marking | RV-2FB | RV-4FLM | RV-7FM/ RV-7FLM | RV-12SD/SQ, RV-12SDL/ SQL | RH-3FH | RH-6FH | RH-12FH/ RH-20FH | RH-3SDHR/ RH-3SQHR | RP-1/3/5ADH | Art. no. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Teaching Box | R32TB | ● | ● | ● | ● | ● | ● | ● | ● | ● | 214968 |
| Teaching Box | R56TB | ● | ● | ● | ● | ● | ● | ● | ● | ● | 218854 |
| Single valve set | 1E-VD01E | ● | | | | | | | | | 47397 |
| Double valve set | 1E-VD02E | ● | | | | | | | | | 47398 |
| Single valve set | 1F-VD01E-02 | | ● | ● | | | | | | | 255281 |
| Double valve set | 1F-VD02E-02 | | ● | ● | | | | | | | 255282 |
| Triple valve set | 1F-VD03E-02 | | ● | ● | | | | | | | 255283 |
| Quadruple valve set | 1F-VD04E-02 | | ● | ● | | | | | | | 255284 |
| 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 | 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 | 1S-VD01E-05 | | | | | | | | ● | | 238282 |
| Double valve set | 1S-VD02E-05 | | | | | | | | ● | | 238283 |
| Triple valve set | 1S-VD03E-05 | | | | | | | | ● | | 238284 |
| Quadruple valve set | 1S-VD04E-05 | | | | | | | | ● | | 238375 |
| Single valve set | 1F-VD01E-01 | | | | | ● | ● | | | | 250470 |
| Double valve set | 1F-VD02E-01 | | | | | ● | ● | | | | 250471 |
| Triple valve set | 1F-VD03E-01 | | | | | ● | ● | | | | 250472 |
| Quadruple valve set | 1F-VD04E-01 | | | | | ● | ● | | | | 250473 |
| CC-Link interface * | 2D-TZ576 | ● | ● | ● | ● | ● | ● | ● | ● | ● | 219063 |
| Profibus interface * | 2D-TZ577 | ● | ● | ● | ● | ● | ● | ● | ● | ● | 218861 |
| I/O interface * | 2D-TZ378 | ● | ● | ● | ● | ● | ● | ● | ● | ● | 218862 |
| Pneumatic hand interface * | 2A-RZ375 | | | | ● | | | | ● | ● | 124657 |
| Hand signal output cable | 1A-GR200-RP | | | | | | | | | ● | 129778 |
| | 1F-GR35S-02 | | ● | ● | | | | | | | 255285 |
| | 1S-GR35S-01 | | ● | ● | ● | | | | | | 153078 |
| | 1F-GR60S-01 | | | | | ● | ● | ● | | | 250467 |
| Hand signal input cable | 1S-HC30C-11 | ● | | | | | | | | | 257063 |
| | 1A-HC200-RP | | | | | | | | | ● | 129779 |
| | 1F-HC35S-02 | | ● | ● | | | | | | | 255286 |
| | 1S-HC25C-01 | | | | ● | | | | | | 153079 |
| | 1F-HC35C-01 | | | | | ● | ● | | | | 250474 |
| | 1F-HC35C-02 | | | | | | | ● | | | 254395 |
| Gripper output connector | R-SMR-09V-B | | | | | | | | | ● | 132112 |
| Gripper input connector | R-SMR-10V-N | | | | | | | | | ● | 132113 |
| Hand signal output connector | S-series Hand OUTPUT | ● | ● | ● | ● | ● | ● | ● | ● | | 164814 |
| Hand signal input connector | S-series Hand INPUT | ● | ● | ● | ● | ● | ● | ● | ● | | 164815 |
| Internal wiring and piping set | 1F-HS304S-01 | | | | | ● | | | | | 250468 |
| | 1F-HS408S-01 | | | | | | ● | | | | 250469 |
| | 1F-HS604S-01 | | | | | | | ● | | | 254396 |
| 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 |
| Connection cable for I/O interface * | 2D-CBL05 | ● | ● | ● | ● | ● | ● | ● | ● | ● | 218857 |
| | 2D-CBL15 | ● | ● | ● | ● | ● | ● | ● | ● | ● | 218858 |

* only for D series

# The complete solution for line and load side

Mitsubishi Electric 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 I, 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 Electric 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**

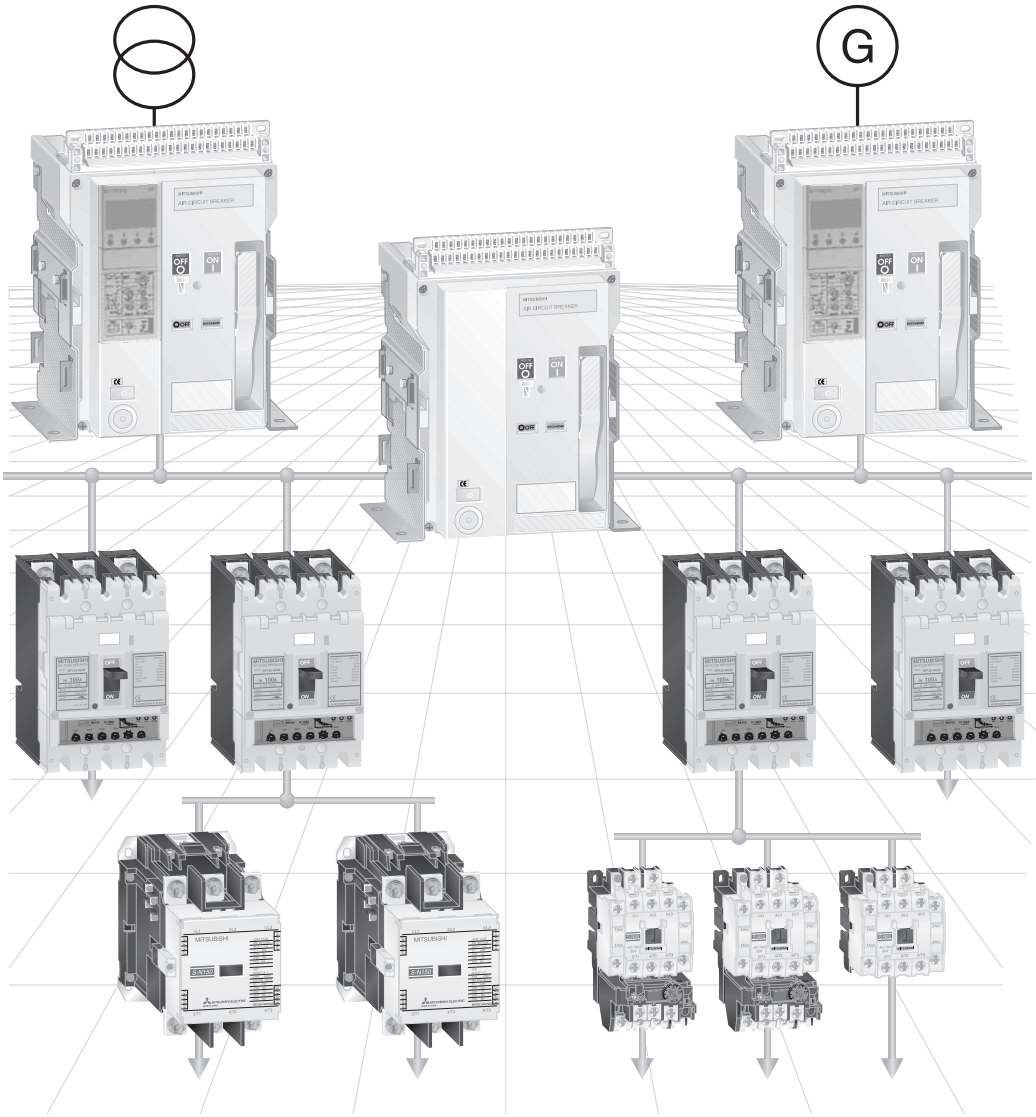
- 3 A to 1600 A rated capacity (3- and 4-pole)
- Interchangeable relay unit (thermal type or electronic type)
- Available in fixed and slot-in versions
- Breaking capacity up to 200 kA
- Additional disconnectors available

### MS-N series magnetic contactors and thermal overload relays

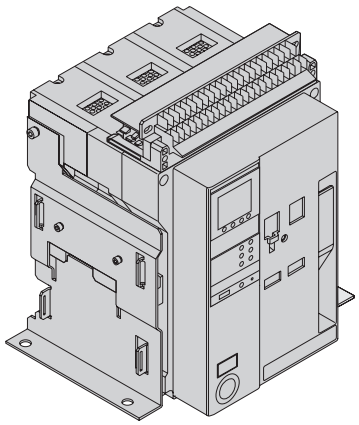
Compact, modular extensions and an energy-saving design – these are the main requirements set by users of contactors and auxiliary contactors.

**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:

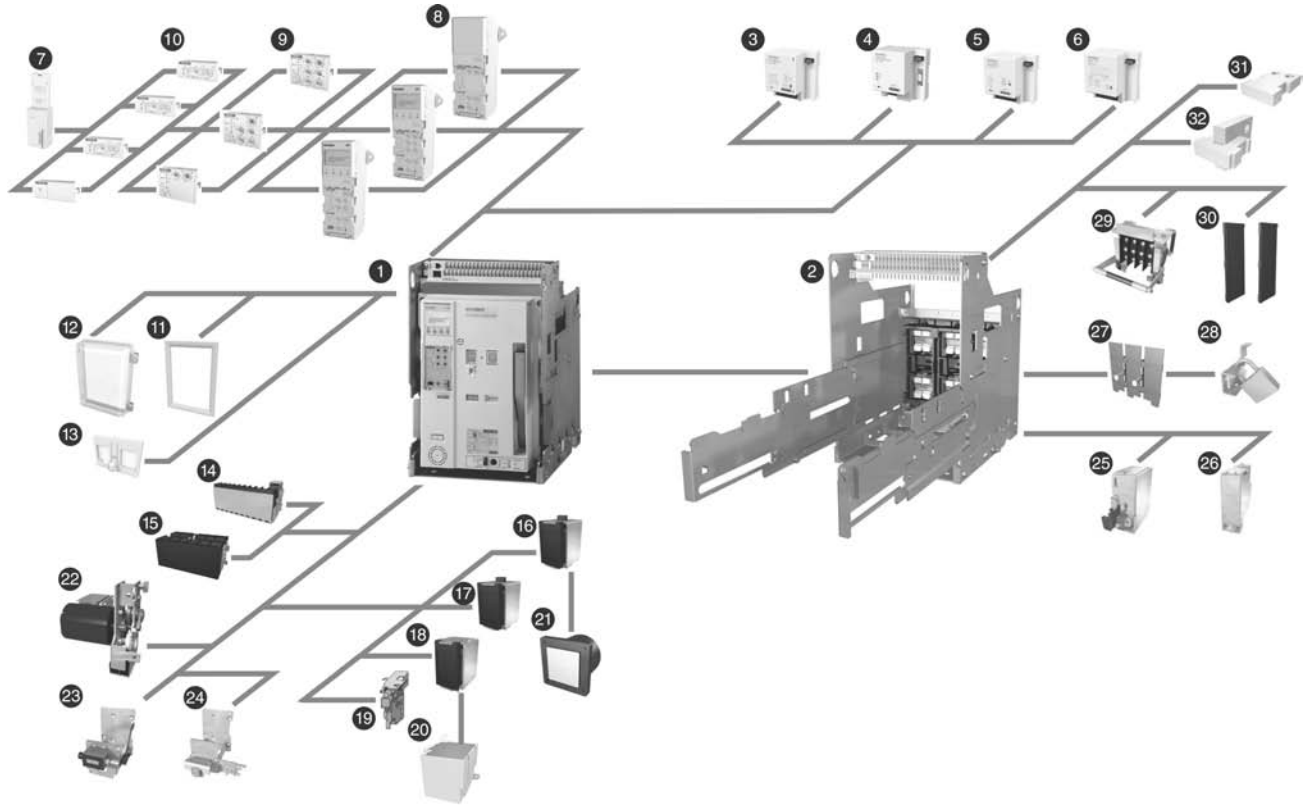
- Simple operation for maximum user-friendliness
- Flexible installation and customised protection for your systems
- Class leading performance range and extended service life
- Enhanced network support for comprehensive monitoring and control

| 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 $I_n$ (A) 40 °C | | 1000 | | 1250 | | 1600 | | 2000 | | 2000 | | 2500 | | 3200 | | 4000 | | 4000 | | 5000 | | 6000 | |
| Max. rated operational voltage $U_e$ (V) | | 690 | | | | | | | | 690 | | | | | | | | 690 | | | | | |
| Rated insulation voltage $U_i$ (V) | | 1000 | | | | | | | | 1000 | | | | | | | | 1000 | | | | | |
| Rated impulse withstand voltage $U_{imp}$ (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 $I_r$ (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 a $I_{cu}$ (kA, rms) $I_{cs} = I_{cu} = 100$ % | 690 V AC | 65 | | | | | | | | 75 | | | | | | | | 85 | | | | | |
| | 400 V AC | 65 | | | | | | | | 85 | | | | | | | | 130 | | | | | |
| Rated short-time withstand current (kA rms) $I_{cw}$ | 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) WxHxD | fixed type | 3-pole: 410x340x290<br>4-pole: 410x425x290 | | | | | | | | 3-pole: 410x475x290<br>4-pole: 410x605x290 | | | | | | | | 3-pole: 414x873x290<br>4-pole: 414x1003x290 | | | | | |
| | draw-out type | 3-pole: 430x300x368<br>4-pole: 430x385x368 | | | | | | | | 3-pole: 430x435x368<br>4-pole: 430x565x368 | | | | | | 3-pole: 430x439x368<br>4-pole: 430x569x368 | | 3-pole: 480x875x368<br>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) |
| 12 | Dust cover (DUC) |

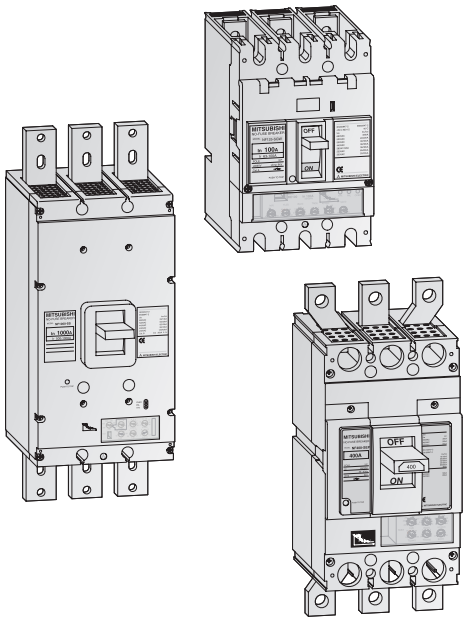
| Position | Name |
|---|---|
| 13 | Push button cover (BC-L) |
| 14 | Auxiliary switch standard (AX) |
| 15 | Auxiliary switch high capacity type (HAX) |
| 16 | Shunt trip device (SHT) |
| 17 | Closing coil (CC) |
| 18 | Under voltage trip device (UVT) |
| 19 | Trip coil |
| 20 | UVT-controller (U-CON) |
| 21 | Condenser trip device (COT) |
| 22 | Motor charging device (MD) |
| 23 | Counter (CNT) |
| 24 | Cylinder lock (CYL) |

| Position | Name |
|---|---|
| 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 Electric 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.

- 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-SV | NF63-SV | NF63-HV | NF125-SGV | NF125-SEV | NF125-LGV |
|---|---|---|---|---|---|---|---|---|---|
| Rated current $I_{n\,max.}$ [A] | | | | 32 | 63 | 63 | 125 | 125 | 125 |
| Rated insulation voltage $U_i$ [V] | | | AC | 600 | 600 | 690 | 690 | 690 | 690 |
| Number of poles | | | | 3 | 3/4 | 3/4 | 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 | — | — | 2.5/2.5 | 8/8 | 8/8 | 8/8 |
| | | | 440 V | 2.5/2.5 | 7.5/7.5 | 10/8 | 36/36 | 36/36 | 50/50 |
| | | | 400 V | 5/5 | 7.5/7.5 | 10/8 | 36/36 | 36/36 | 50/50 |
| Dimensions (WxHxD) | | | mm | 75x130x68 | 75/100x130x68 | 75/100x130x68 | 105/140x165x68 | 105/140x165x68 | 105/140x165x68 |

| Specifications | | | | NF125-HGV | NF125-HEV | NF125-RGV | NF125-UGV | NF160-SGV | NF160-LGV | NF160-HGV |
|---|---|---|---|---|---|---|---|---|---|---|
| Rated current $I_{n\,max.}$ [A] | | | | 125 | 125 | 125 | 125 | 160 | 160 | 160 |
| Rated insulation voltage $U_i$ [V] | | | AC | 690 | 690 | 690 | 690 | 690 | 690 | 690 |
| Number of poles | | | | 3/4 | 3/4 | 3 | 3/4 | 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 | 10/8 | 10/8 | — | 15/15 | 8/8 | 8/8 | 10/8 |
| | | | 440 V | 65/65 | 65/65 | 125/125 | 200/200 | 36/36 | 50/50 | 65/65 |
| | | | 400 V | 75/75 | 75/75 | 150/150 | 200/200 | 36/36 | 50/50 | 75/75 |
| Dimensions (WxHxD) | | | mm | 105/140x165x68 | 105/140x165x68 | 105x165x68 | 105/140x240x68 | 105/140x165x68 | 105/140x165x68 | 105/140x165x68 |

| Specifications | | | | NF250-SGV | NF250-SEV | NF250-LGV | NF250-HGV | NF250-HEV | NF250-RGV | NF250-UGV |
|---|---|---|---|---|---|---|---|---|---|---|
| Rated current $I_{n\,max.}$ [A] | | | | 250 | 250 | 250 | 250 | 250 | 250 | 250 |
| 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 | 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 | 8/8 | 10/8 | 10/8 | — | 15/15 |
| | | | 440 V | 36/36 | 36/36 | 50/50 | 65/65 | 65/65 | 125/125 | 200/200 |
| | | | 400 V | 36/36 | 36/36 | 50/50 | 75/75 | 75/75 | 150/150 | 200/200 |
| Dimensions (WxHxD) | | | mm | 105/140x165x68 | 105/140x165x68 | 105/140x165x68 | 105/140x165x68 | 105/140x165x68 | 105x165x68 | 105/140x240x68 |

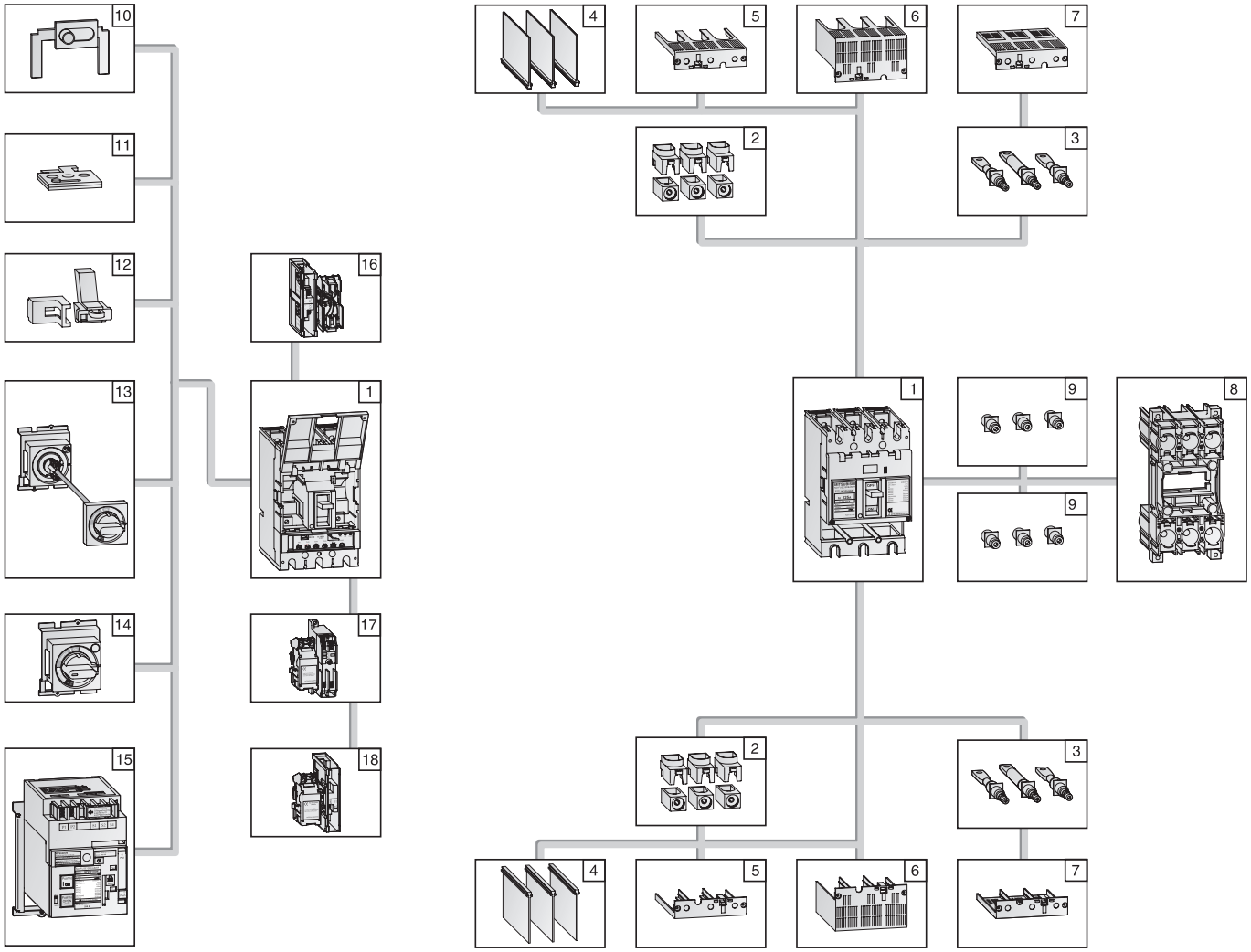
| Specifications | | | | NF400-SEW | NF400-HEW | NF400-REW | NF630-SEW | NF630-HEW | NF630-REW | NF800-SEW | NF800-HEW | NF800-REW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Rated current $I_{n\,max.}$ [A] | | | | 400 | 400 | 400 | 630 | 630 | 630 | 800 | 800 | 800 |
| Rated insulation 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 |

WS-V series up to 250 A available from october 2013

## Product skeleton of accessories for moulded case circuit breakers

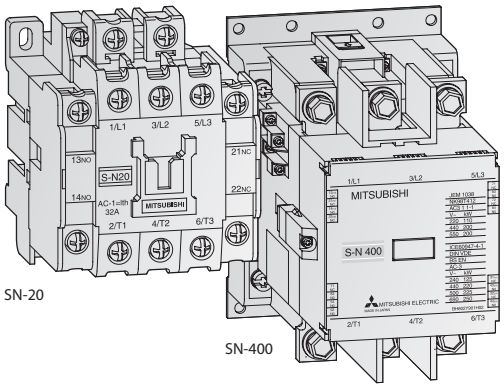
Mitsubishi Electric offers a wide range of accessories for the Moulded Case Circuit Breakers and disconnectors to serve almost all variations of applications.




| 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




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 $I_{th}$ 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.

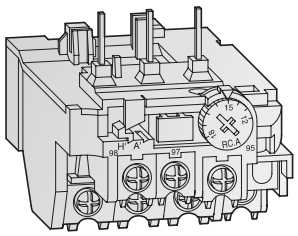
The coil rating is displayed in a location readily visible even after the unit is installed onto the panel.

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

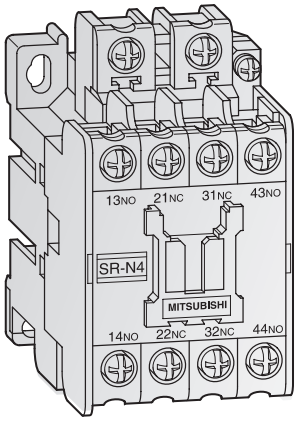
**A selection of relays for optimum motor protection characteristics**

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.

- 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 are designed for use in low voltage control circuit applications.

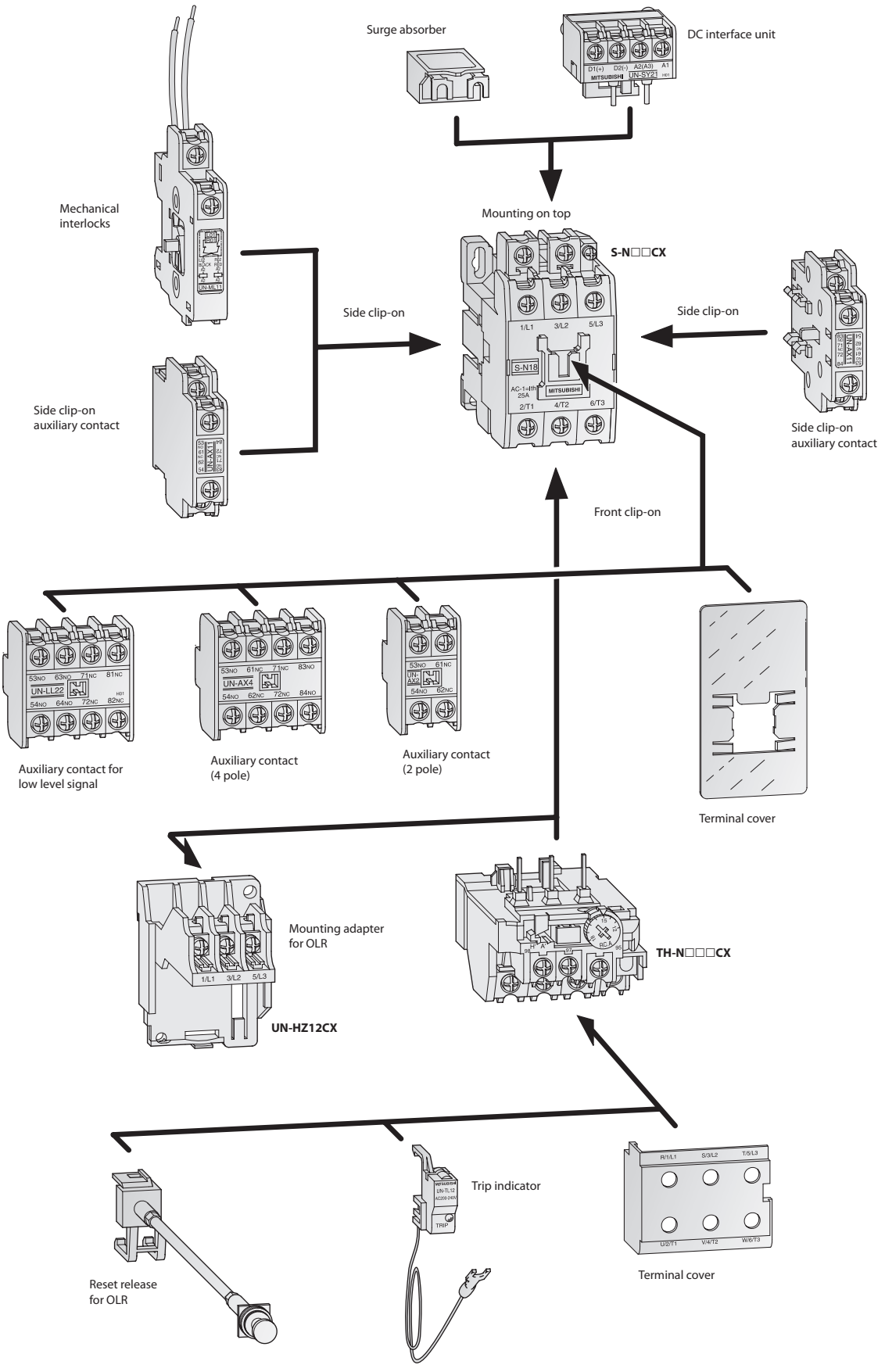
Our standard contactor relay version is with 4 auxiliary contacts.

With side clip-on and front clip-on configurations available, a maximum of 8 auxiliary contacts are possible.

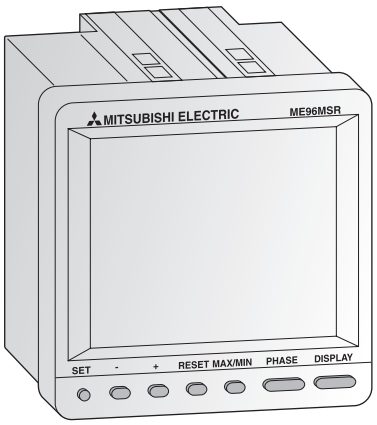
- High reliability: By adopting bifurcated moving contacts and by improving the shape of the contacts, contact performance has been made more reliable than ever.
- Different types: Standard, large capacity, overlap contact
- Various contact arrangement and long life
- Mountable on 35 mm DIN rails
- Dust-proof 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

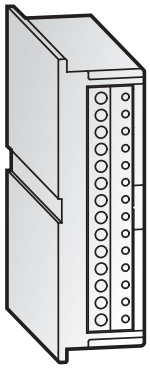



### ME96NSR

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; 75–140 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:

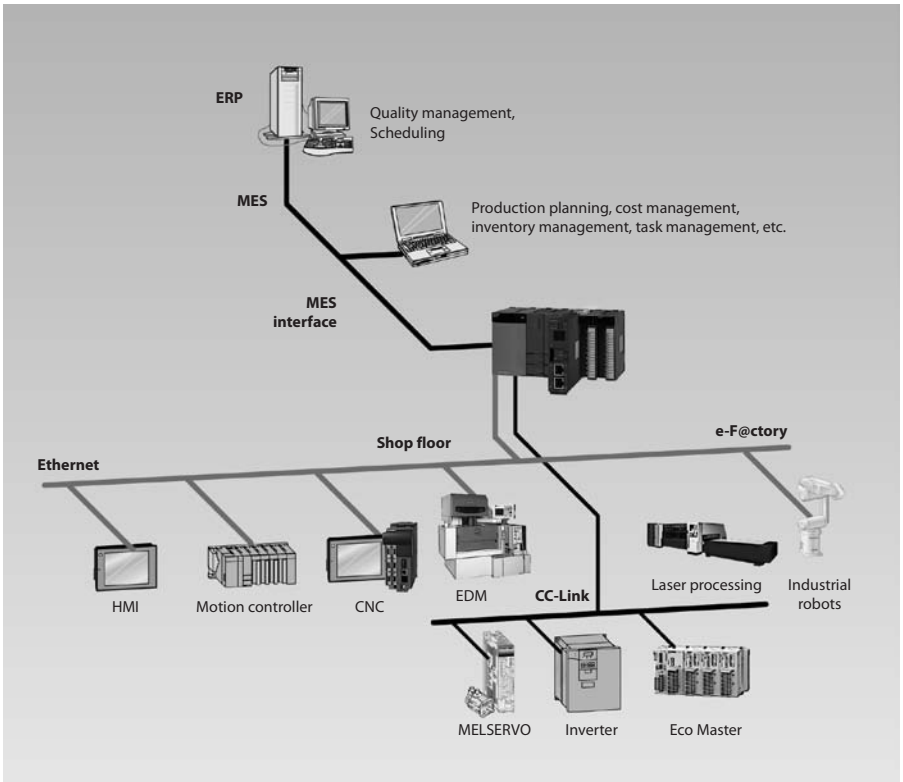
- Measuring of voltage, current, active power, reactive power, apparent power, power factor, and frequency.
- In addition, total of six types of energy (incoming energy, outgoing energy, incoming lag reactive energy, incoming lead reactive energy, outgoing lag reactive energy, and outgoing lead reactive 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

## Effectively optimizing production by directly connecting enterprise systems with the shop floor.

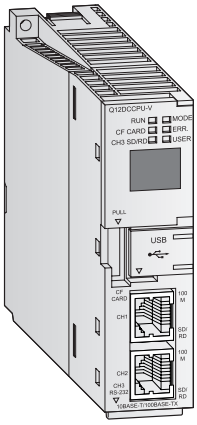
MES Solutions The MES interface product group enables direct connection between the MES (Manufacturing Execution System) database and shop floor equipment, without a communication gateway such as a PC.

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

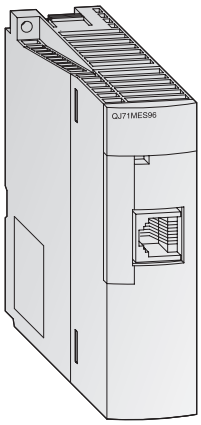


The MES Interface IT module provides a direct link from the iQ Platform to enterprise IT systems. Hence any shop floor system using the iQ Platform can communicate directly with high level IT systems. This allows the removal of the usual intermediate layer of PC infrastructure required to process shop 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 CompactFlash 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 Electric 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 Electric MC Protocol driver 231543 |
| | | Modbus driver 231544 |
| | | Rockwell driver 227395 |
| | | Omron driver 227397 |

## MELSEC System Q MES Interface module

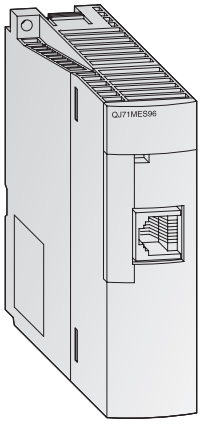



### QJ71MES96

The MELSEC System Q 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 CompactFlash 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.

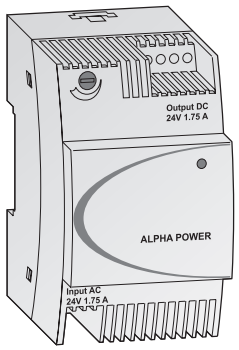
| Specifications | | | GT15-MESB48M | GT16M-MESB |
|---|---|---|---|---|
| Module type | | | GT15 option card with 48 MB expansion memory and MES functionality (for direct database connection) | GT16 option card with MES functionality (for direct database connection) |
| DB interface function | general | | 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 2 GB is required

The information collected on the MELSEC System 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

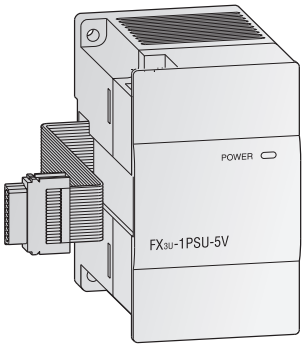



The ALPHA POWERs are convenient power supplies for the 24 V units and other external devices. They are applicable for wall or DIN rail mounting and their dimensions are matched to those of the Alpha family.

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 |

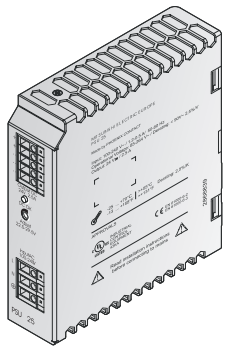



The power supply modules FX3U-1PSU-5V and FX3UC-1PS-5V are used to reinforce the build-in 5 V DC and 24 V DC power supply of a FX3U/FX3UC main unit. They do not occupy any I/O points and deliver up to 1 A more current for the 5 V system bus (for special function modules).

Two FX3U-1PSU-5V units can be installed in parallel for more power.

| 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 |

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.



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 adapter PSU-UWA, art. no.: 208853 | | | | | |

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The European Automation portal

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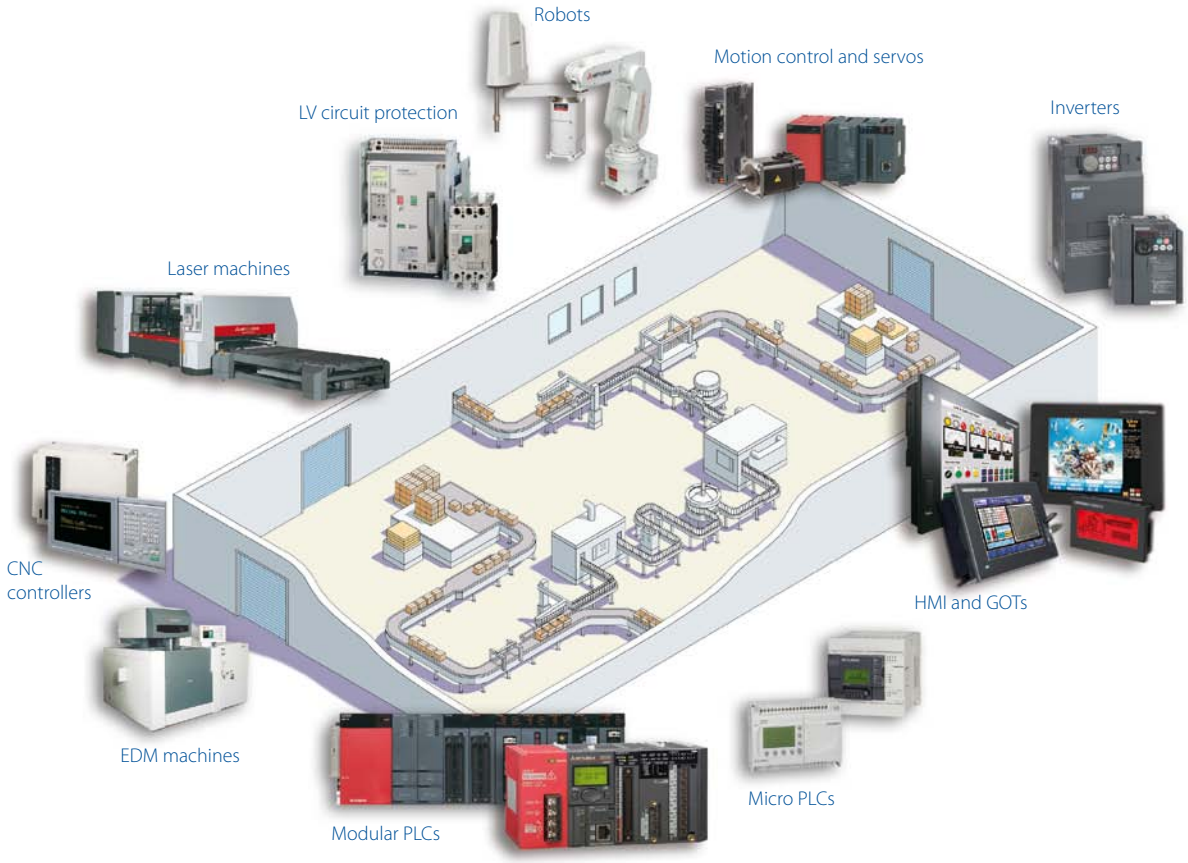
# A world of automation solutions




Mitsubishi Electric offers a wide range of automation equipment from PLCs and HMIs to CNC and EDM machines.

## A name to trust

Since its beginnings in 1870, some 45 companies use the Mitsubishi name, covering a spectrum of finance, commerce and industry.

The Mitsubishi brand name is recognized around the world as a symbol of premium quality.

Mitsubishi Electric Corporation is active in space development, transportation, semiconductors, energy systems, communications and information processing, audio visual equipment, home electronics, building and energy management and automation systems, and has 237 factories and laboratories worldwide in over 121 countries.

This is why you can rely on a Mitsubishi Electric automation solution – because we know first hand about the need for reliable, efficient, easy-to-use automation and control in our own factories.

As one of the world's leading companies with a global turnover of over 4 trillion Yen (over $40 billion), employing over 100,000 people, Mitsubishi Electric has the resource and the commitment to deliver the ultimate in service and support as well as the best products.

# Global partner. Local friend.

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