MITSUBISHI ELECTRIC
FACTORY AUTOMATION

The Automation Book
A world of solutions

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

Global impact of Mitsubishi Electric

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

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

Mitsubishi Electric is involved in many areas including the following

■ **Energy and Electric Systems**
A wide range of power and electrical products from generators to large-scale displays.

■ **Electronic Devices**
A wide portfolio of cutting-edge semiconductor devices for systems and products.

■ **Home Appliances**
Dependable consumer products like air conditioners and home entertainment systems.

■ **Information and Communication Systems**
Commercial and consumer-centric equipment, products and systems.

■ **Industrial Automation Systems**
Maximising productivity and efficiency with cutting-edge automation technology.

Changes for the Better

Contents

Present right through Europe

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

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

Global partner, local friend

Mitsubishi Electric Factory Automation is synonymous with innovative, high-quality products. Our programmable logic controllers, drive solutions and industrial robots are among the most powerful on the market, and have been contributing to the success of European manufacturing for almost 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 and Russia. In addition, we have developed an extensive network of partner companies across the whole of Europe and neighbouring countries.

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

Trust and loyalty is as important as products

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

A focus on service

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

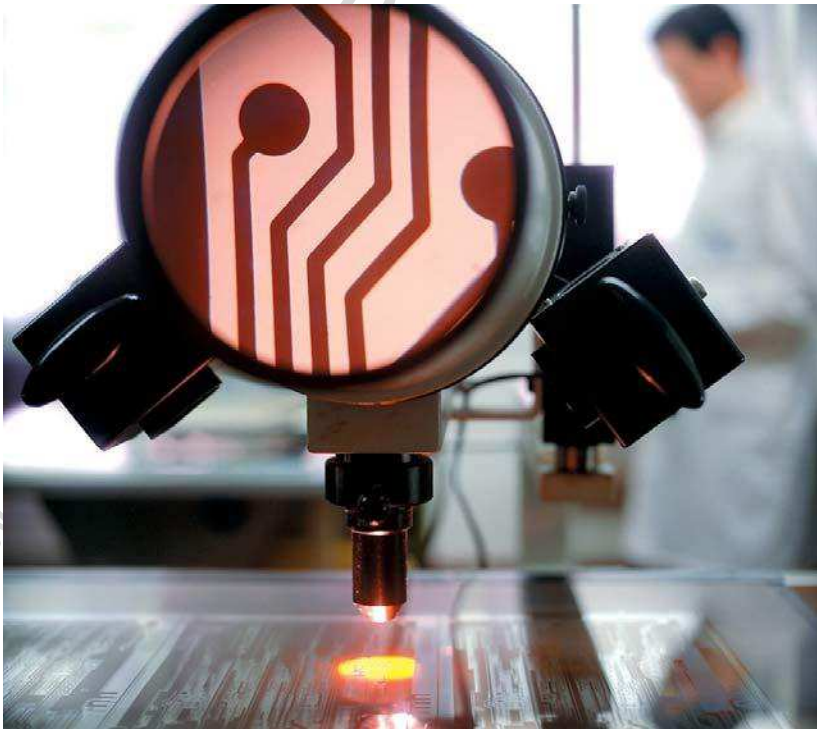
Setting the standards

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

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

Market leaders

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



Attention to detail leaves little to chance.

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

Water

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

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

Food

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

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

Manufacturing

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

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

Automotive

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

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

Application in action
Company: Global Engine Manufacturing Alliance (GEMA)
Location: USA
Application: Manufacture of automotive engines
Products: Mitsubishi System Q PLCs, A900 HMIs, MR-J2S Servos, C64 CNC Controllers and software
Note:
GEMA is an alliance of the Chrysler Group, Mitsubishi Motors and Hyundai Motor Co. There are two facilities which will, together, produce up to 840,000 engines per year.
Comment:
The Chrysler Group estimates that they will save annual costs of around 100 million dollars per year with the new automation concept.

Chemical

Application in action
Company: Follmann & Co.
Location: Germany
Application: Adhesive manufacture
Products: Mitsubishi FX2N PLCs, E900 HMIs, FR-S500 Inverters
Networks: Ethernet + Profibus
Note:
The system has control over the manufacturing process for processes for 17 different adhesives
Comment :
"This economical alternative to centralised process control technology makes all functions and process and production data transparent, from the source up to the management Level."
Axel Schuschies Works Manager

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

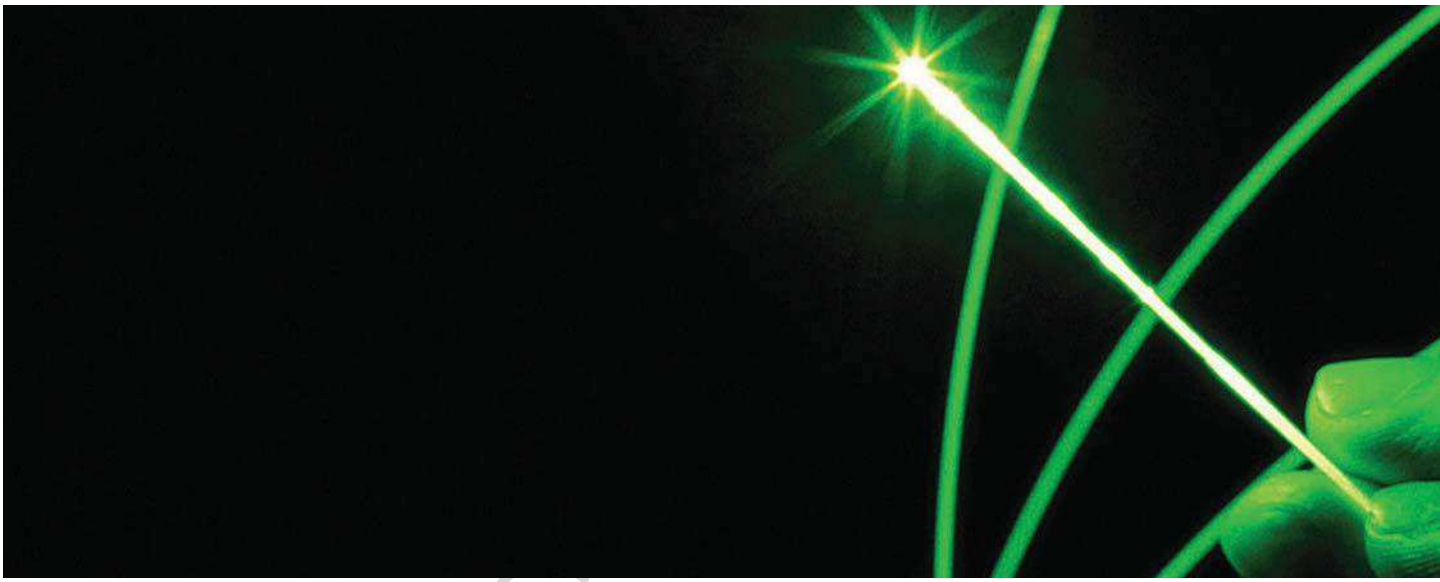
Process

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

Application in action
Company: European Vinyls Corporation (EVC)
Location: United Kingdom
Automation specialist: Tritec
Application: Combined Heat and Power (CHP) plant
Products: Mitsubishi Q series dual redundant PLCs, MX SCADA
Note:
Dual redundant PLC solution cost 25% of traditional DCS solution. Installed system now saves £500,000 (approx. €750k) per year. Payback for the control system was 6 months.
Comment :
"The PLC control system we developed had a system cost of around £0.25m, compared to £1m or more for a conventional system"
Tim Hartley, Tritec

Tomorrow's quality...

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



Tomorrows technology requires investment today.

R&D - lifeblood of the future

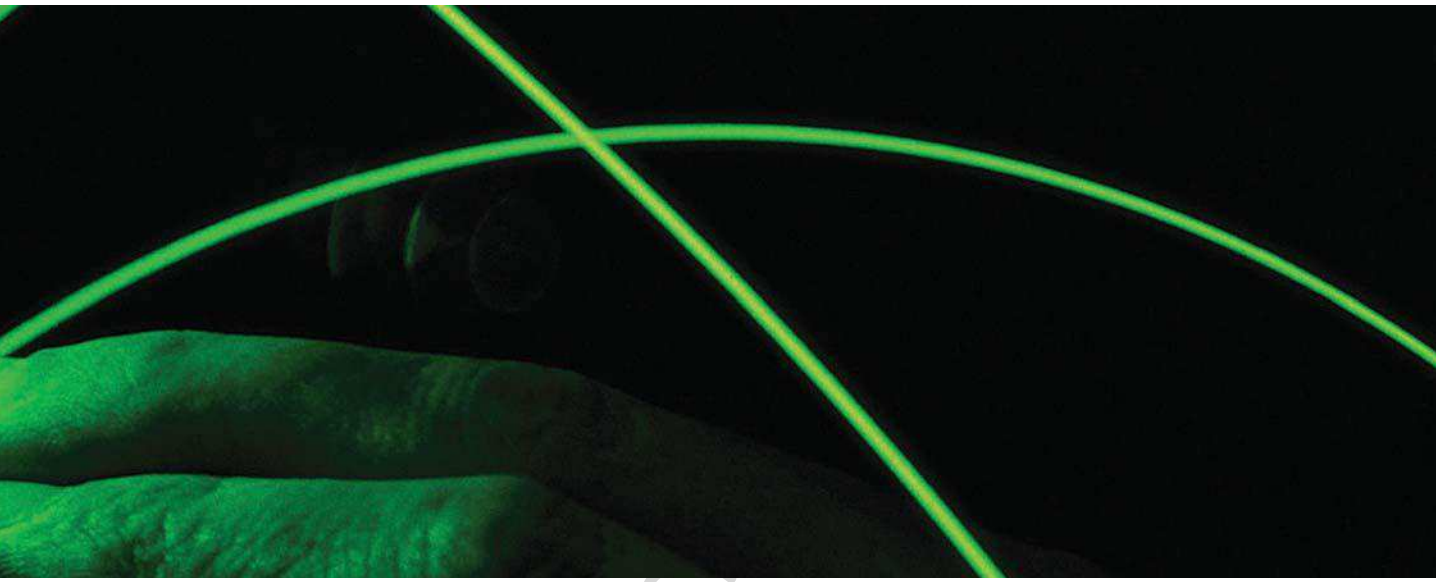
Research and development is the lifeblood of Mitsubishi Electric. Our research and development centres in Japan, the United States and in Europe are working on innovative technologies today for the breakthrough products of tomorrow. Mitsubishi Electric invests approximately 4% of sales in developing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

...today's goals

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

Helping the environment

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



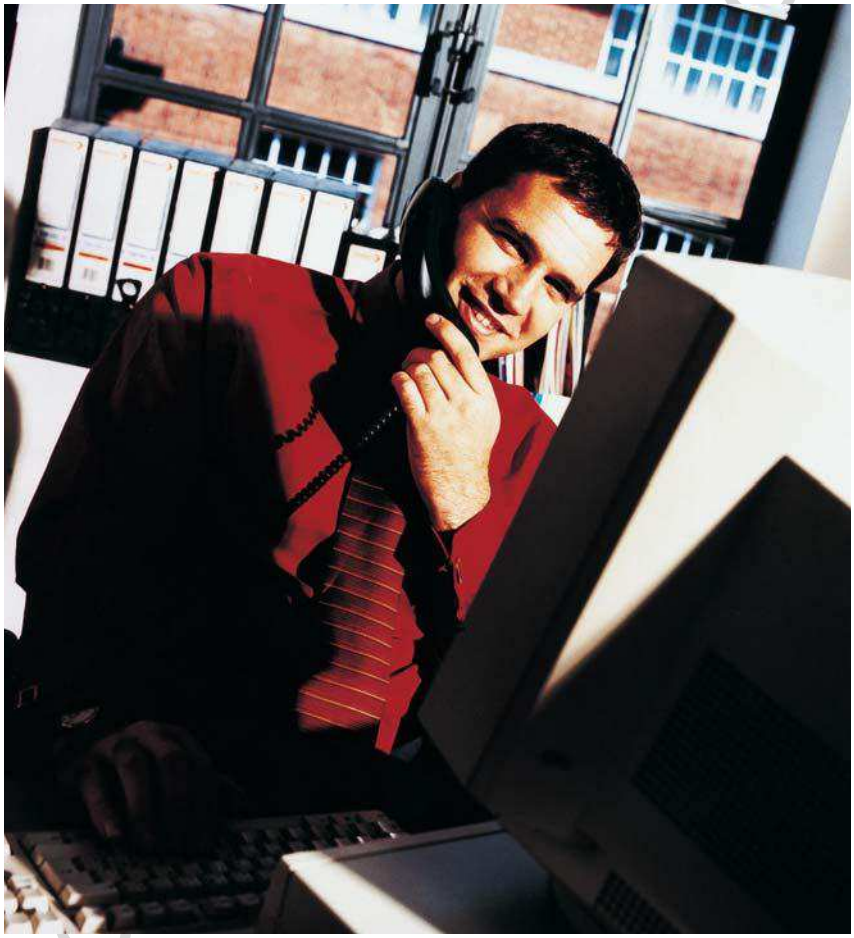
This insight into the balance between efficient automated manufacture and care for our environment helps us to better understand the needs of our customers. For example, the need to monitor and control waste in accordance with the European Integrated Pollution Prevention Control (IPPC) directive.

Working for a sustainable future.

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

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

Product and service



Technical support is about getting the right answers first time.

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

The European Service Group is here to help you

The European Service Group

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

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

The human element

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

Reliable technical support is only a call away.

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

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

Minimizing downtime

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

All repairs are carried out by qualified and experienced engineers.

Training for performance

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

Comprehensive training programs.

Automation solutions...

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

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

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

HMIs, GOTs and IPC
Probably the widest range of HMI's, GOT's and IPC's from a single manufacturer.

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

e-F@ctory

Mitsubishi Electric's Factory Automation and e-F@ctory solutions can help solve the significant challenge of increasing the performance of existing plant infrastructure, with its mixed control systems and legacy systems architecture, by improving the delivery of plant information to the MES systems.

...whatever the application

The advantage of Mitsubishi Electric's e-F@ctory is the breadth of product that is available from one supplier. e-F@ctory is simply the combination of best in class automation elements into a single harmonious system. The reason it is so powerful is because it is scalable to business size and modular to fit the available budget.

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

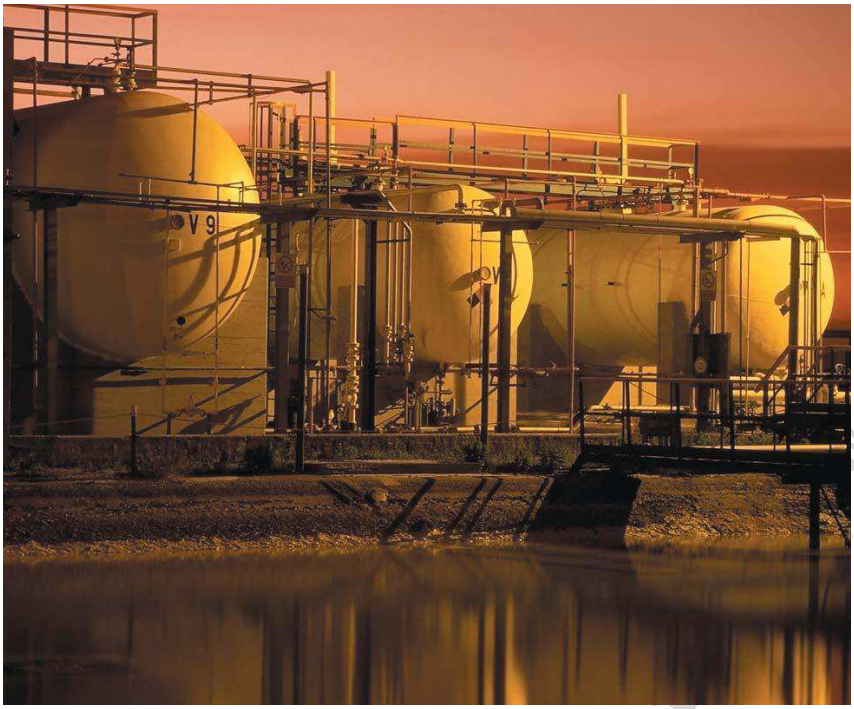
Robots
MELFA robots offer class leading technology for both SCARA and articulated arm systems.

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

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

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

Simple, easy, reliable



Proven reliability from standalone to complete installations.

Simple

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

Easy

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

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

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

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

PLC Programming

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

Reliable

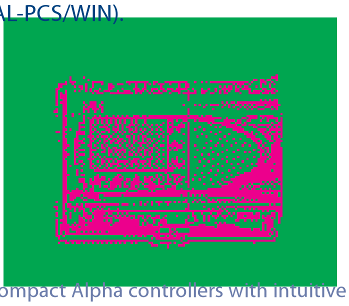
We design and build our PLCs to the highest international standards gaining many marine and specialist approvals in the process. We do this as part of our drive to supply the best quality products possible. A prime example of Mitsubishi quality: is the widespread use of our components in the global auto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

Control to fit

A wide range of solutions

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

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



Compact Alpha controllers with intuitive programming.

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

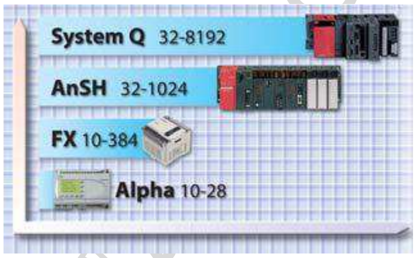
The worlds best selling range of micro controllers

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

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

High level, high function modular PLC

Mitsubishi's System Q demonstrates one of the greatest benefits of an automation platform. It features a unique multi CPU processor concept where PLC, motion, and process CPUs can all be mixed 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.

	Logic controller	Compact PLC	Modular PLC	
	Alpha2	FX Family	AnSH	System Q
I/O	10 – 28	10 – 384	32 – 1024	32 – 8192
Memory	200 Function Block	2 – 64k	28 – 60k	28 – 252k
Cycle period/log. instruction	20µs	0.065 – 0.55µs	0.075 – 0.2µs	0.034 – 0.2µs

Seeing is believing

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

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

Vision 1000

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

The GOT 1000 series utilises the latest touchscreen technology.

■ Dedicated HMI solutions

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

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

■ Open HMI solutions

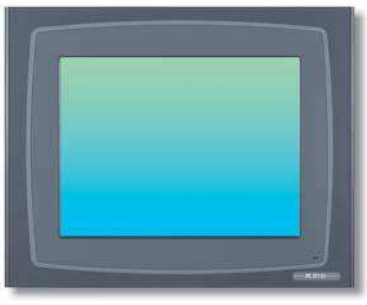
The E1000 range of HMIs is designed and built on the latest open technology combining Microsoft's Windows CE platform with Intel Xscale processors. This leading edge technology delivers fast and reliable operation ensuring maximum uptime for HMI users.

A wide range of open HMI solutions.

■ Industrial PC (IPC) solutions

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

A range of Mitsubishi automation software called MELSOFT supports the IPCs. This provides users with a choice of software components that they can embed in their own solution to complete visualisation packages such as MX4SCADA.



High performance Industrial PCs.

Perfect vision

Hardware with flexibility

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

■ **Water protection**
Mitsubishi's Vision1000 products feature a range of solutions with different protective levels to suit the user's applications. This includes models with IP65 ratings indicating that the display can be washed down with a water jet, which is often the case in the food industry where high levels of hygiene have to be maintained at all times.

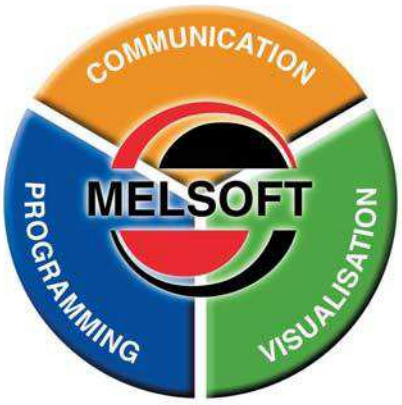
■ **Communication**
An important part of automation is communication. This can be implemented at many levels, ranging from a Fieldbus to data networks to remote telemetry solutions using Mitsubishi Industrial Modems.

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

■ **Ease of use**
Programming and using Mitsubishi HMIs is easy. All of the packages come with pre-defined graphic libraries to help users get started quickly. Some of the software programs have simulators so that system operation can be checked before downloading into an HMI or IPC.

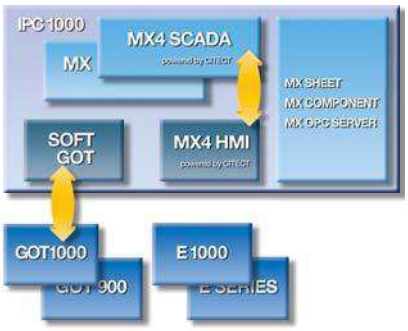
MELSOFT

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



Solutions for every visualisation and programming application.

■ **Free MELSOFT demo disk**
A free demonstration disk is available for many of these packages. To order a copy simply go to: www.mitsubishi-automation.com.



There is a solution to match your needs.

HMI Programming/Simulation

Feature \ Package	E Designer	GT Works	MX4 HMI
Functions:			
Programming	•	•	•
Simulation		•	•
Graphics Library	•	•	•
HMI Hardware	E Series HMI	GOT900 and GOT1000 series / PC	PC
Soft HMI Capability		(SoftGOT)	•

PC based visualisation

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

Driving performance

Intelligent solutions for every task.

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 seven million Mitsubishi frequency inverters are in operation around the world in a wide range of applications.

High standards

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

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

Cut costs

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

Inverters help reduce power consumption and machine wear.

Intelligent solutions for every task

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

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

Powering the future

FR-S500E

■ **Simple inverters**

Ultra-compact, this range of inverters is ideal for embedding in small motor applications such as conveyors, feed belts, automated door drives, saws and drilling machines as well as fans and pumps. The integrated, one-touch, digital dial gives users fast and efficient access to parameters and settings.

FR-E500

■ **Economy inverters**

E500 inverter systems pack a whole host of innovations into a compact chassis. These vector-controlled drives include Mitsubishi's Soft PWM function for reducing motor noise and a powerful torque management system that ensures the application has the power it needs. The E500 series can be used in many applications, including textile machines, material transport conveyors, door and gate drive systems and palletisers.

FR-F700

■ **Flexible inverters**

All inverters save energy, however, the F700 saves more than most. Featuring a new technology called Optimum Excitation Control (OEC), it provides ideal electrical operating conditions for the motor. This means maximum motor effectiveness and peak efficiency. The F700 is also optimized for fan and pump operation, providing greater protection for the motor and quicker control of overhauling loads.

FR-A700

■ **Advanced control**

The A700 series are Mitsubishi's most powerful inverters. Even torque control can be performed with the RSV (real sensorless vector control) function. In addition there are 4 overload ratings, options for controlled shut downs as well as a built in PLC function demonstrating again the flexibility of this inverter. The FR-A700's dynamic control is ideal for lifting applications as well as machine control.

Comprehensive range from ultra compact to ultra powerful.

Inverter range

	FR-S500E		FR-E500		FR-F700		FR-A700
	S520SE	S540E	E520S	E540	F740	F746	A700
Input voltage	1 phase 200 – 240V AC	3 phase 380 – 480V AC	1 phase 200 – 240V AC	3 phase 380 – 480V AC	3 phase 380 – 480V AC or 500 V	3 phase 380 – 480V AC	3 phase 380 – 480V AC or 500 V
Output kW	0.2 – 1.5	0.4 – 3.7	0.4 – 2.2	0.4 – 7.5	0.75 – 630	0.75 – 55	0.4 – 630
Overload	200%		150%, 200%		120%, 150%		120%, 150%, 200%, 250%
Rating	IP 20		IP 20		IP 20-00	IP 54	IP 20-00

Poetry in motion

Speed, accuracy and control when you need it.

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

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

Speed and performance

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

Mitsubishi has been pushing forward the boundaries of servomotor design, creating ultra compact brushless motors. All Mitsubishi Super series (MR-J2S) motors are fitted with 131072 pulse-per-revolution encoders, and all MR-J3 series motors are fitted with 262144 pulse-per-revolution encoders. This permits greater machine speed and accuracy.

Plug and play

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

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

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

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

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

Power and precision

Powerful Amplifiers

A wide spectrum of Mitsubishi MR-J3 and MR-J2S series amplifiers is available, ranging in power from 100W to 37kW for 200V operation, and 600W to 110kW for 400V systems. With such a wide choice of types and series users are sure to find the solution they need.

Plug and play technology.

■ **Performance**
With a speed frequency responce of up to 900Hz Mitsubishi servo systems offer world class performance.

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

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

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

Motor solutions for all

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

HF-KP motor – IP65 standard protection.

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

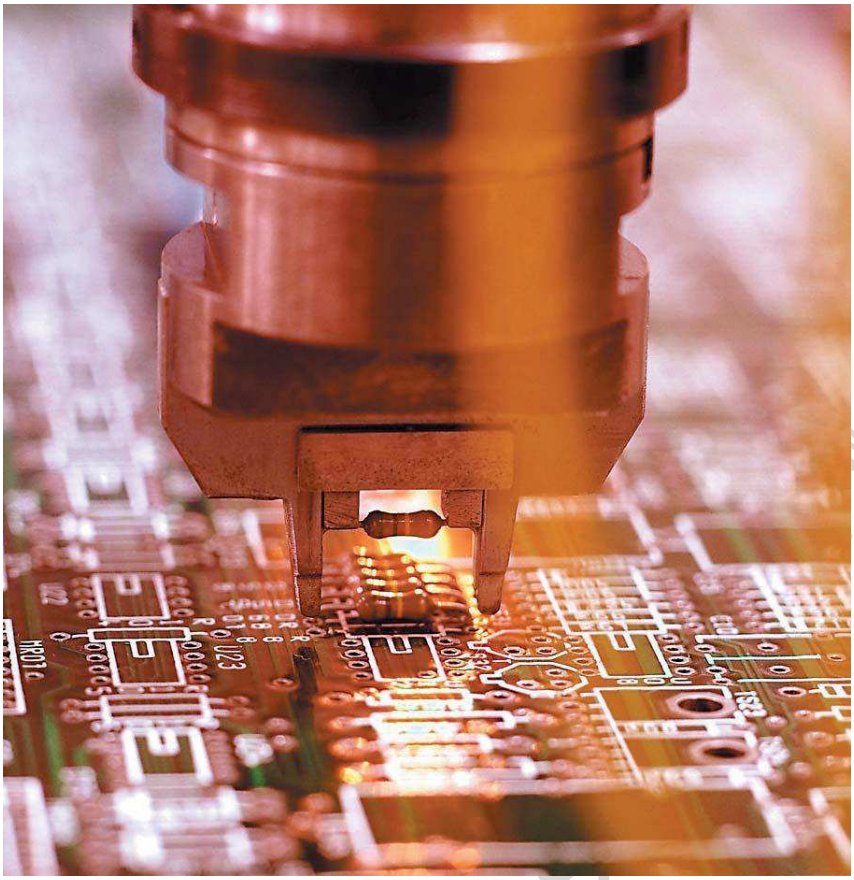
Moreover, Mitsubishi's low, ultra-low and medium inertia motor designs allow users to select the best motor characteristics for their application.

Motion controllers

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

A wide range of powerful amplifiers.

Innovation in movement



High speed, high accuracy pick and place applications.

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

€1.65/hr

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

Basic talk

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

Making life easy

Users can also benefit from COSIROP and COSIMIR, Mitsubishi’s advanced programming and simulation packages. 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.

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

Advanced control as standard

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

Task driven

Thoughtful design

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

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

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

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

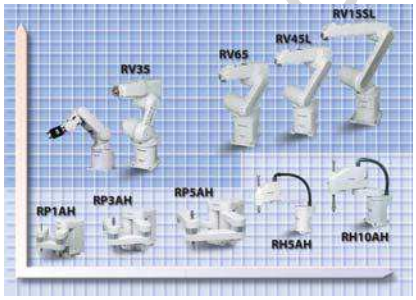
■ **Extended axis**
All MELFA robots can be mounted on an additional linear axis to provide greater reach and utilization of the robot arm.

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

Articulated arm robots

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

Articulated arm robots feature a single connection point



A robot solution for most applications up to 12kg.

SCARA robots

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

RH-SH is the second range of SCARA robots available. These models are ideal for palletizing and other specialised uses. These robots can be deployed where space is limited but loads weighing up to 12kg need to be moved quickly.

SCARA robots are ideal for applications where space is limited.

Robot range

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

Breakthrough technology

Groundbreaking research and design.

Mitsubishi Electric has been active in the low voltage (LV) switchgear market since 1933. Ever since Mitsubishi developed and manufactured its 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 is used in the PA (Polymer Ablation type Auto-Puffer) to provide greater safety, high voltage breaking performance.

Leading edge

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

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

Global products

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

Standards are at the centre of our product development.

A complete solution

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

■ **Air Circuit Breakers (ACBs)**
These compact Super AE units come in a broad spectrum of performance categories from 1,000 to 6,300 Amps. The basic unit is available as a fixed or "draw out" design, which can be augmented with options for enhanced overload control, network and energy consumption. Thanks to these features Mitsubishi's ACBs provide users with the flexibility to meet most applications.

Virtually maintenance free.

■ **Moulded Case Circuit Breakers (MCCBs)**
Mitsubishi's MCCBs are available in three designs: World Super Series (WSS), Progressive Super Series (PSS) and Super Series (SS). These three ranges, working together, provide protection across the current range from 16 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.

MCCBs are available in 3 designs.

■ **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 users specific needs.

Advanced low voltage technology.

Selection made easy

MELSHORT2 is a Mitsubishi software tool that helps you configure compatible LV systems. The quick and easy selection process is based on rated operation, trip voltage and the required accessories.

Quick and easy selection process.

Where have Mitsubishi products been used?

Automotive control solutions.

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

- Agriculture
  - Plant watering systems
  - Plant handling systems
  - Saw mill (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 manufacture (mixing/baking)
  - Food processing (washing/sorting/slicing/packaging)
- Leisure
  - Multiplex cinema projection
  - Animated mechatronics (museums/theme parks)
- Medical
  - Respiration machine testing
  - Sterilization
- Pharmaceutical/chemical
  - Dosing control
  - Polution measurement systems
  - Cryogenic freezing
  - Gas chromotography
  - Packaging
- Plastics
  - Plastic welding systems
  - Energy management systems for injection molding machines
  - Loading/unloading machines
  - Blow molding test machines
  - Injection molding machines
- Printing
- Textiles
- Transportation
  - Sanitation on passenger ships
  - Sanitation on rail rolling stock
  - Fire tender, pump management
  - Waste disposal truck management
- Utilities
  - Waste water treatment
  - Fresh water pumping

Remote management solutions including SCADA, networking, Telemetry and Industrial Modems.

Technical Information Section

More information?

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

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

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

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

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

About this technical information section

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

OVERVIEW

SOFTWARE

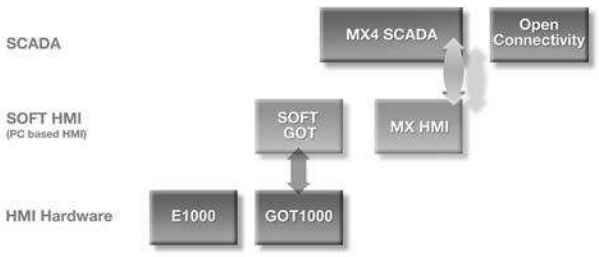
Our MELSOFT suite of Automation software is designed to help you integrate your production process and maximise your business potential. MELSOFT embodies a wide range of software to optimise your plant productivity; from visualisation and control systems to historic and downtime monitoring capabilities.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

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

Visualisation Software

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

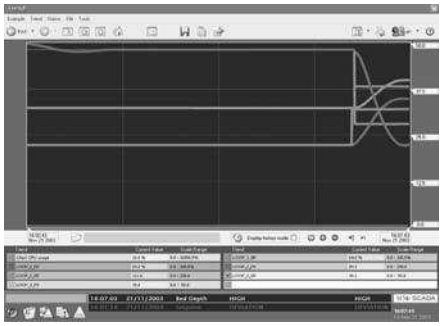
MX4 Software Integration



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

SCADA

MX4 SCADA



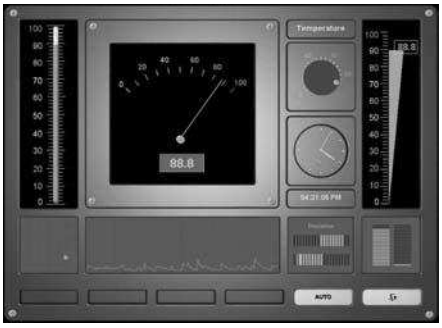
MX4 SCADA is a complete Supervisory Control And Data Acquisition system. It is able to support your business as it grows, whatever the size, since there is virtually no limit on the number of I/O points and drivers. The main features of MX4 SCADA are:

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

Hardware Specification			
Processor Speed	RAM	Hard-disk	O.S.
266 MHz	128 MB	200 MB	See page 12

Soft HMI

MX4 HMI



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

- A large number of I/O points ranging from100 to a maximum of 600, with the ability to connect to three different types of drivers.
- It is a scalable solution that can be upgraded from a HMI to a SCADA solution and then have additional upward connectivity to business systems.
- Basic functions like alarms, trend analysis and reports have been set-up and are ready-to-use, saving you time and the expertise needed to program them.
- The use of super genies enables you to save repetitive machinery processes, and replicate the process by a click of a button. This saves time and the cost of skilled labour, allowing a complex task to be performed much more simply.

Hardware Specification			
Processor Speed	RAM	Hard-disk	O.S.
266 MHz	128 MB	200 MB	See page 12

GTWorks2 (SoftGOT)

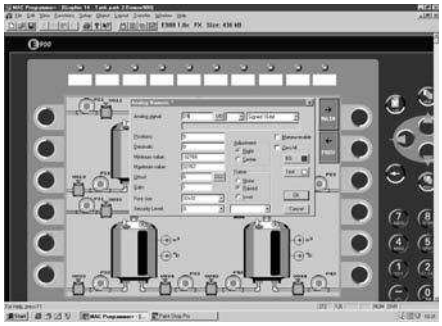
GTWorks2 is a wide-ranging visualisation control tool from Mitsubishi. A major benefit of GT Works2 is that visualisation screens can be created independently of their final target platform, i. e. a hardware platform such as GOT900, GOT1000 or a PC based platform such as SoftGOT. SoftGOT is a PC based HMI module within GTWorks2. A further benefit of SoftGOT is that it inherits the advanced simulation features of GTWorks2. 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.

Hardware Specification			
Processor Speed	RAM	Hard-disk	O.S.
200 MHz	64 MB	250 MB	See page 12

HMI Programming

E Designer

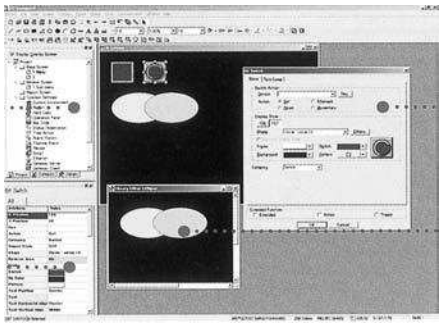


E Designer is a complete PC-based programming software program for the E Series HMIs. Projects are built from menu hierarchies or as sequences, providing the user with an easy to follow logical progression of operations. The main features of E Designer are:

- 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.

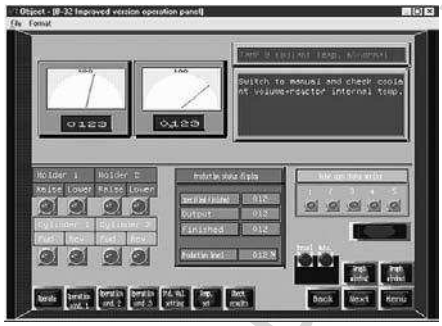
Hardware Specification			
Processor Speed	RAM	Hard-disk	O.S.
200 MHz	64 MB	55 MB	See page 12

GTWorks2 (GT Designer2)



As part of GTWorks2, GT Designer2 is a drawing program designed to create HMI screens for GOT900 and 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:

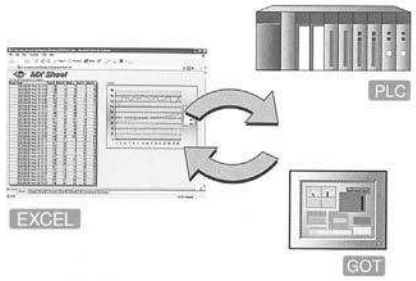
- An extensive picture and graphics library editor that enables you to modify the graphics to meet your exact specifications.
- A tree format of the project gives you an overview of the structure of the project. This gives you the opportunity to navigate through your project and add, delete or move any 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 Works2-SoftGOT).
- German and English version available.



Hardware Specification			
Processor Speed	RAM	Hard-disk	O.S.
200 MHz	64 MB	350 MB	See page 12

PC Data Management

MX Sheet



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

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

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

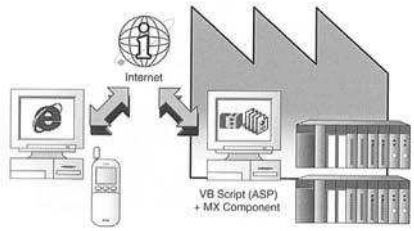
Hardware Specification			
Processor Speed	RAM	Hard-disk	O.S.
266 MHz	64 MB	100 MB	See Page 12

MX OPC Server

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

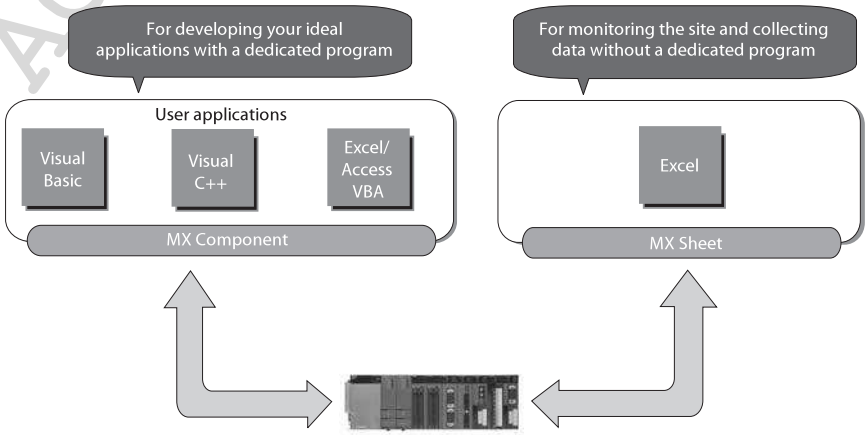
Mitsubishi's drivers incorporate OLE Automation technology and can therefore expose their features to scripting tools and other applications. Because the drivers are OLE Automation applications you can create and manipulate objects exposed in the I/O Server from another application. You can also create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

MX Component



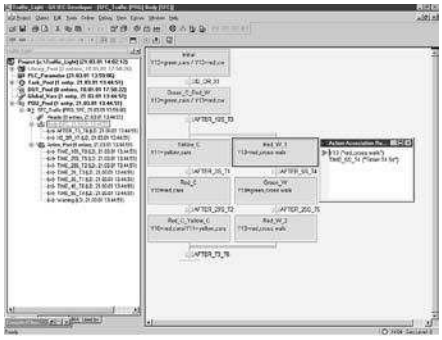
Just by accessing the Web Pages created with VBScript (ASP function) using Internet Explorer or mobile devices, the factory's PLC can be remotely monitored and operated.

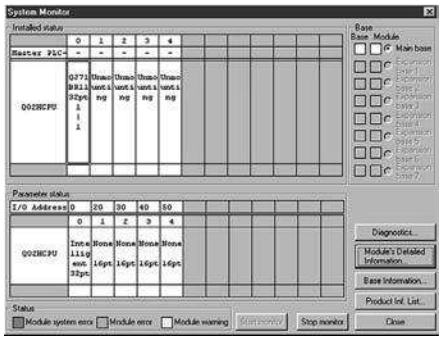
MX Component provides users with powerful ActiveX controls that simplify the communication between a PC and PLC. Users to not have to design complex communication protocols and is ideal for implementing specific software applications requiring PLC connectivity.
MX Component supports a wide variety of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



PLC Programming

GX IEC Developer





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

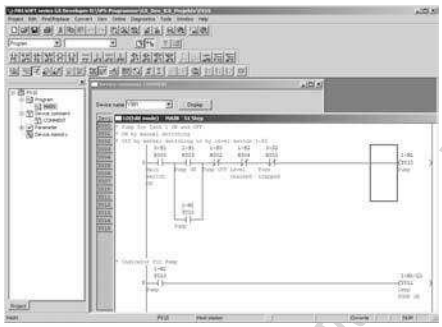
- ST (Structured Text)
- SFC (Sequential Function Chart)
- LD (Ladder Diagram)
- FBD (Function Block Diagram)
- IL (Instruction List)

The main features of GX IEC Developer are:

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

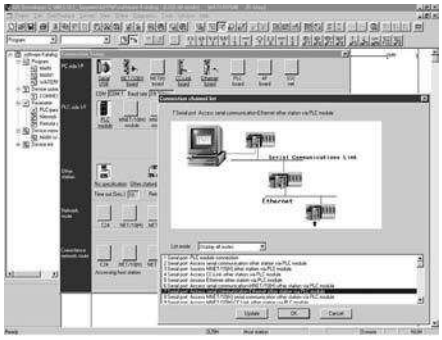
Hardware Specification			
Processor Speed	RAM	Hard-disk	O.S.
350 MHz	32MB	100 MB	See page 12

GX IEC Developer FX



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

GX Developer



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

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

The main features of GX Developer are:

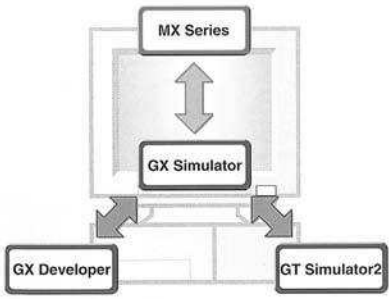
- The ability to switch between IL and LD while working on a project, means people are able to collaborate as a team. Individuals scan choose the programming method which best suits them, therefore reducing the time needed to learn a new language and the overall project timescale.
- GX Developer is compatible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

Hardware Specification			
Processor Speed	RAM	Hard-disk	O.S.
450 MHz	64MB	130 MB	See page 12

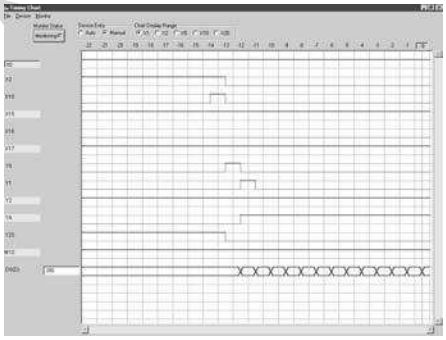
GX Developer FX

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

Simulator

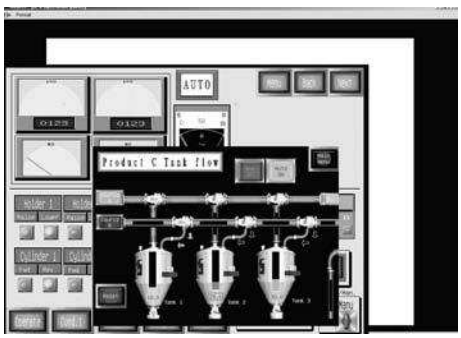


GX Simulator



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

GT Simulator

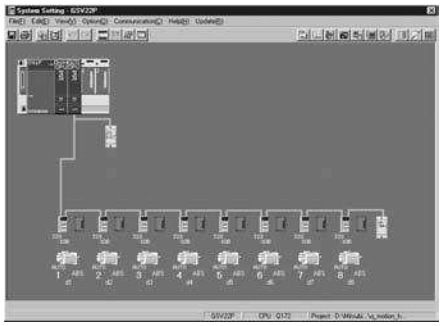


Similar to GX Simulator, any changes or modifications to the design of the GOT screen made in GT Designer2 can be checked and debugged using GT Simulator.

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

Specials

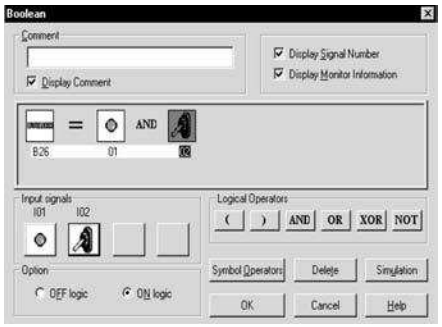
MT Developer



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

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

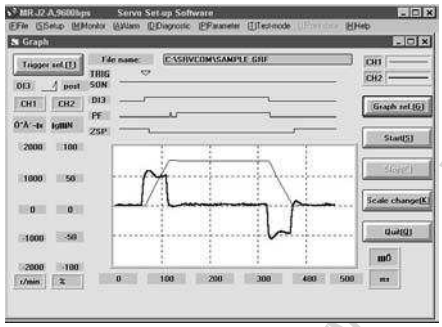
Alpha - ALVLS (AL-PCS/WIN)



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

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

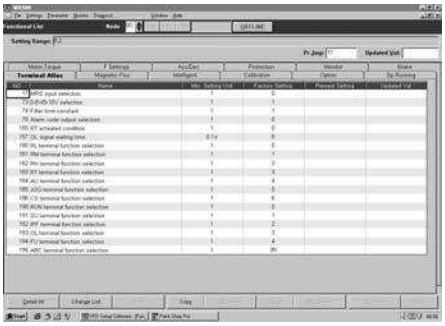
MR Configurator



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

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

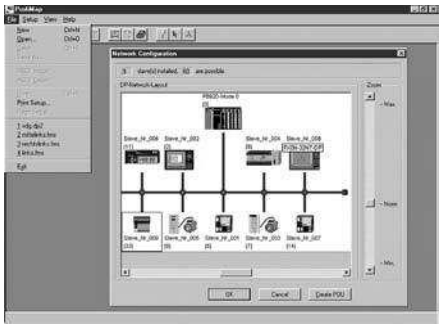
FR Configurator (MX 500)



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

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

GX Configurator DP



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

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

FX Configurator FP

SSCNET
SERVO SYSTEM CONTROLLER NETWORK

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

Compatibility Table

Here is a list of our software products, the table shows which operating systems are compatible with which products.

	WINDOWS				
	98	ME	NT	2000	XP
MX4 SCADA A fully scalable Supervisory Control and Data Acquisition (SCADA) software program.Fully compatible with all MX4 software	●	—	●	●	●
MX4 HMI A PC based HMI,fully compatible with all MX4 software	●	—	●	●	●
MX Sheet Excel communication support tool	●	●	●	●	●
MX OPC Server Provides OPC connectivity	—	—	●	●	●
MX Components ActiveX library for communication	●	●	●	●	●
GTWorks2 (SoftGOT) A PC based HMI for the GOT900 Series	●	●	●	●	●
GTWorks2 (GT Designer2) Programming software for the GOT900 and GOT100 Series	●	●	●	●	●
E Designer Programming software for the E Series HMIs	●	●	●	●	●
GX IEC Developer Programming and documentation software based on IEC 1131.3 standard for our entire PLC range	●	●	●	●	●
GX IEC Developer FX Programming and documentation software based on IEC 1131.3 standard specifically for micro FX PLCs	●	●	●	●	●
GX Developer MELSEC PLC programming software	●	●	●	●	●
GX Developer FX FX PLC Programming software	●	●	●	●	●
GX/GT Simulator MELSEC PLC and GOT900/GOT1000 HMI simulation software	●	●	●	●	●
MT Developer Integral start-up support software for Q motion CPU	●	—	●	●	●
MR Configurator Servo system set-up software	●	●	●	●	—
Servo system set-up software Inverter programming and configuration software	●	●	●	●	●
ALVLS Programming software for alpha logic controllers	●	●	●	●	●
GX Configurator DP Setup and configuration software for Profibus DP networks	●	●	●	●	●

Note: Windows Vista will be supported from 2008

NETWORKS

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

Ethernet

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

Modbus/TCP

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

CC-Link (Process Solution/Fieldbus)

From PLCs and Motion Controllers to HMIs and Robots, CC-Link encompasses all areas of Mitsubishi automation products. Although CC-Link is an open network it is still controlled by Mitsubishi and the CC-Link Partner Associztion (CLPA), which allows them to implement a strict control/testing regime of any product which connect onto CC-Link. This helps to guarantee and preserve the CC-Link network integrity.

Profibus (Process Solution/Fieldbus)

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

DeviceNet (Process Solution/Fieldbus)

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

CANopen

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

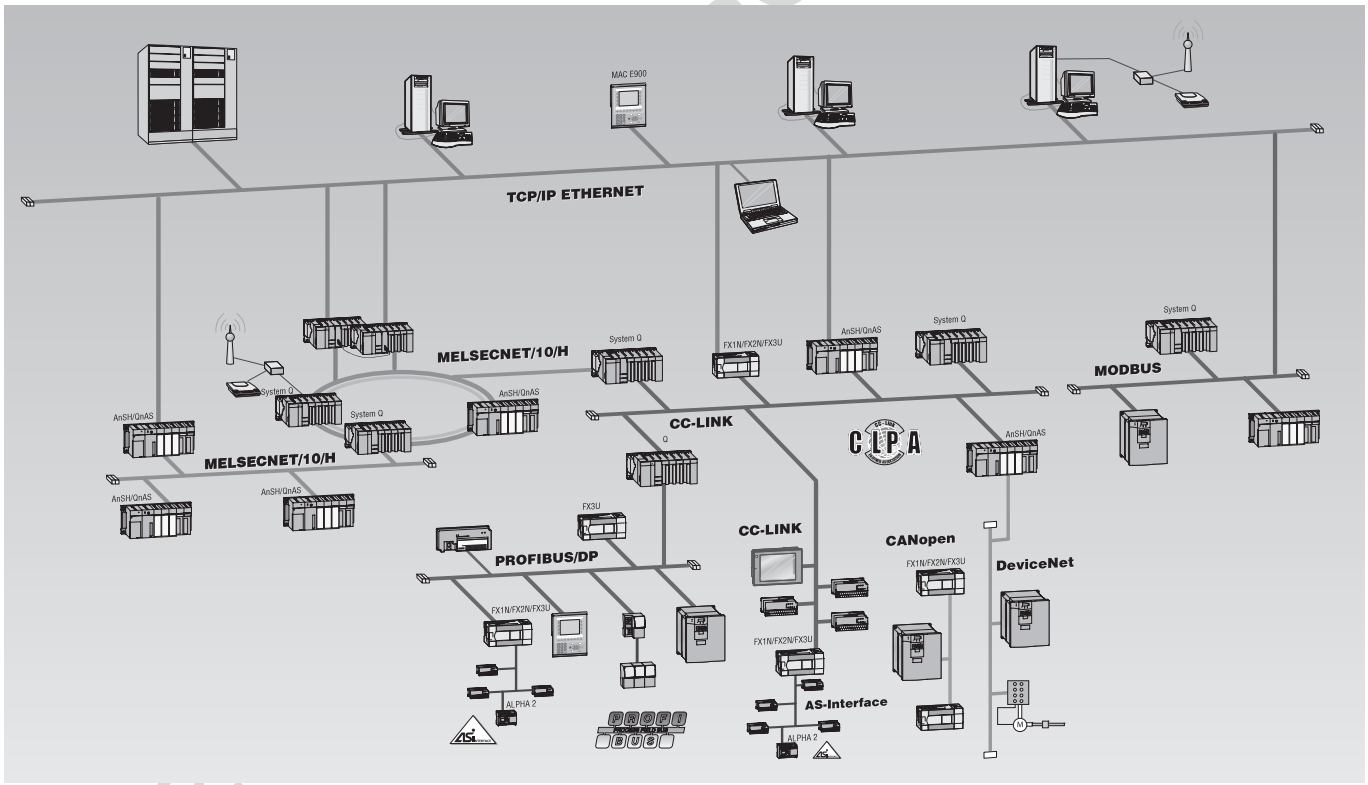
AS-Interface (Actuator - Sensor - interface)

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

MELSECNET/H

This is Mitsubishi's own dedicated, high performance network. MELSECNET/H can have either coaxial bus or a dual loop 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. 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.

Typical Distributed Control Structure



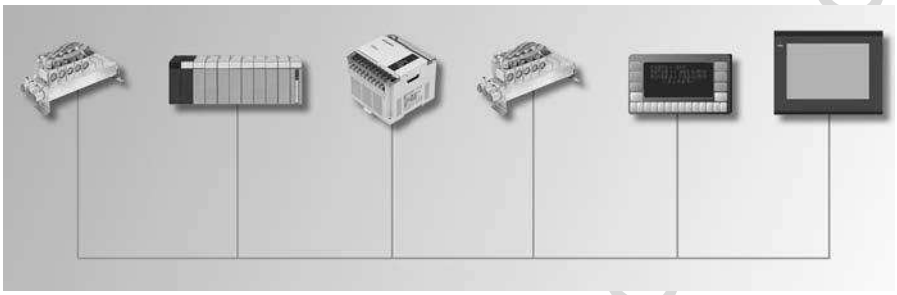
Series	Ethernet	Modbus/TCP	CC Link	Profibus	DeviceNet	AS-Interface	MELSECNET/H	SSCNET	CANopen	Modbus/RTU
Modular PLC	●	●	●	●	●	●	●	●		●
Micro PLC	●		●	●	●	●		●	●	●
HMI	●		●	●						●
Inverter			●	●	●			●	●	●
Alpha						●				
Servo			●	●				●		
Breaker		●	●	●						
Robot	●		●	●						

Ethernet

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

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

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



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

* Not supported by all Ethernet products

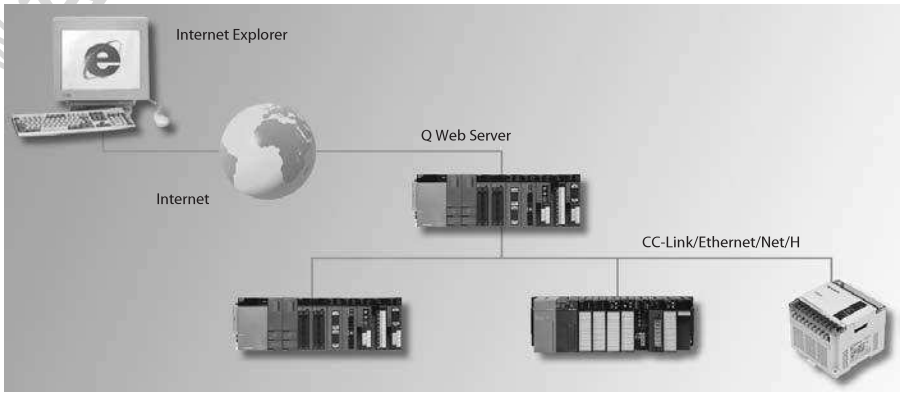
Model type	Series	Module	Description	Art. no.
Interface	Q series	QJ71E71-100	Ethernet interface module,100Mbit/s,100BASETX/10BASE-T	138327
		QJ71E71-B2	Ethernet interface module,10BASE2	129614
		QJ71E71-B5	Ethernet interface module,10BASE5	147287
		QJ71MT91	Modbus/TCP Master and Client 10BASE-T/100BASETX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

Web Server

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

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

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



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

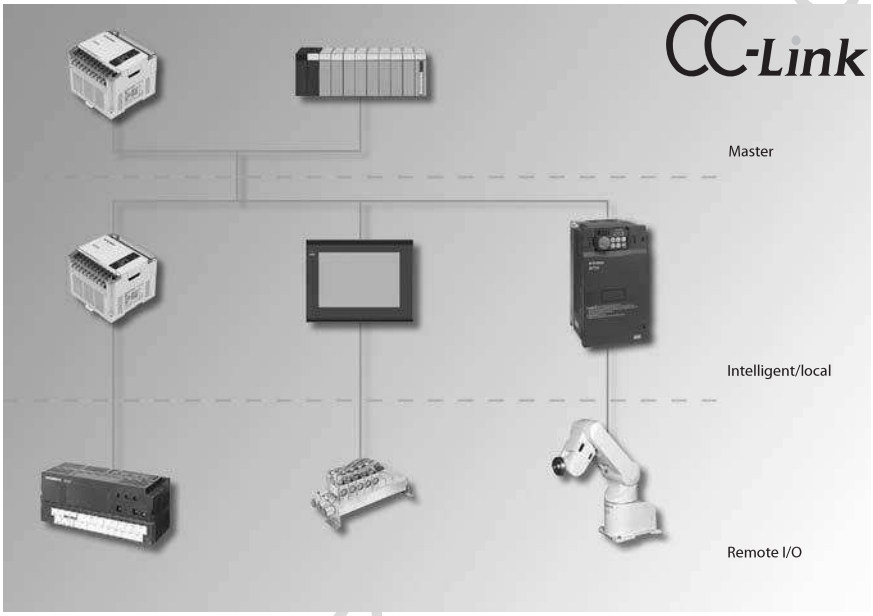
Model Type	Series	Module	Art. no.	Description
Web Server	Q series	QJ71WS96	147115	Q Web Server module

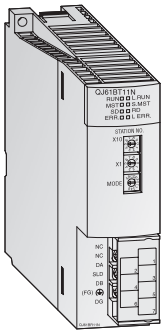
CC-Link

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

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

- Up to 13.2 km network distance
- Monitor / program online with Q series
- Maximum transmission speed of 10 Mbps
- Easy connection for Mitsubishi devices
- No programming needed for set-up with Q series
- Has built-in redundancy functions and excellent error tolerance

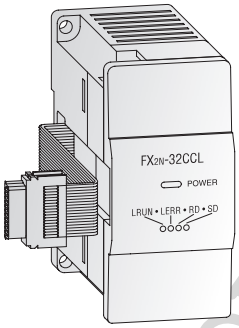




Qn CC-Link Master/local Module QJ61BT11N

MASTER

	Module	Description	Art. no.
Q series	QJ61BT11N	CC-Link master/local module	154748
FX series	FX2N-16CCL-M	CC-Link master	133596



Intelligent Slave for FX2N-32CCL

SLAVE

	Module	Description	Art. no.
Q series	QJ61BT11N	CC-Link master/ local module	154748
FX series	FX2N-32CCL	CC-Link interface (slave)	102961
Inverter	FR-A5NC	CC-Link interface for A500 / F500 inverters	68042
	FR-E5NC	CC-Link interface for E500 inverters	104558
	FR-A7NC	CC-Link interface for A700 and F700 inverters	156778
HMI	GT15-75J61BT13-Z	CC-Link interface for GOT 1000	166310
Breaker	BIF-CC-W	CC-Link interface for SUPER AE air circuit breakers	168571
Robots	2A-HR 575H E	CC-Link interface for Robots for the CR-2,CR-2A and CR-1 controller	129808

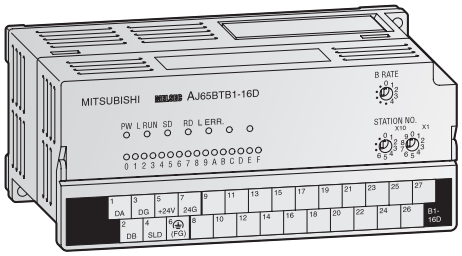
CC-Link Cable

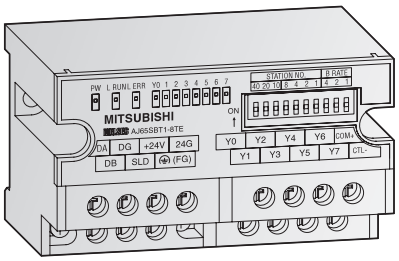
This cable is designed for connecting together CC-Link network devices to create peer-to-peer systems (e.g.Mitsubishi Q series), master/slave systems (e.g. Mitsubishi Q series and Mitsubishi CC-Link Remote I/O) and provide connection with any CC-Link compatible product. It has been tested and certified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

ELECTRICAL CHARACTERISTICS

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

CC-Link Remote Modules



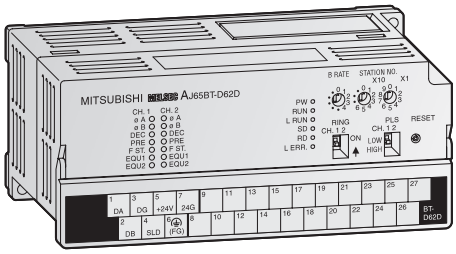


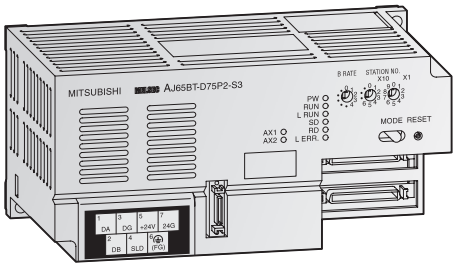
These remote modules are intended to be installed near the control target. The advantages are reduced cabling and the capability of aquiring data and operation results of individual machine modules autonomously.

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

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

Product Range	Module		No. of inputs	No. of outputs	Description	Art. no.
Digital in	AJ65BTB1-16D	Remote module	16	—	DC input (sink/source type)	75447
	AJ65BTB2-16D		16	—	DC input with 8 potential terminals (sink/source type)	75450
	AJ65BTC1-32D		32	—	DC input (sink/source type)	75455
	AJ65SBTB1-8D	Compact remote module	8	—	DC input (sink/source type)	104422
	AJ65SBTB1-16D		16	—	DC input (sink/source type)	136026
	AJ65SBTB1-16D1		16	—	DC input (sink/source type), fast input	140144
	AJ65SBTB1-32D1		32	—	DC input (sink/source type), fast input	140145
	AJ65SBTB1-32D		32	—	DC input (sink/source type)	136025
	AJ65FBTA4-16D	Waterproof remote module	16	—	Protection IP 67, DC input (sink type)	137587
	AJ65FBTA4-16DE		16	—	Protection IP 67, DC input (source type)	137588
Digital out	AJ65BTB1-16T	Remote module	—	16	Transistor output, (sink type)	75449
	AJ65BTC1-32T		—	32	Transistor output, (sink type)	75456
	AJ65BTB2-16R		—	16	Relay output	75453
	AJ65SBTB1-8TE	Compact remote module	—	8	Transistor output (source type), low current consumption	129574
	AJ65SBTB2-8T1		—	8	Transistor output (sink type)	144062
	AJ65SBTB1-16TE		—	16	Transistor output (source type)	129575
	AJ65SBTB1-32T		—	32	Transistor output (sink type)	138957
	AJ65SBTB2N-8R		—	8	Relay output	140148
	AJ65SBTB2N-16R		—	16	Relay output	140149
	AJ65FBTA2-16T	Waterproof remote module	—	16	Protection IP 67, DC output (sink type)	150380
	AJ65FBTA2-16TE		—	16	Protection IP 67, DC output (source type)	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 IP 67, DC output (sink type)	137589
	AJ65FBTA42-16DTE		8	8	Protection IP 67, DC output (source type)	137590
Analog in	AJ65BT-64AD	Remote module	4	—	4 channel input, -2000 to 2000,0-4000, -10 V to 10 V, -20 mA to +20 mA	75444
	AJ65BT-64RD3		4	—	4 channel input, for 3-wire-type Pt100 temperature sensors	88026
	AJ65BT-64RD4		4	—	4 channel input, for 4-wire-type Pt100 temperature sensors	88027
	AJ65BT-68TD		8	—	8 channel thermocouple input	88025
	AJ65SBT-64AD	Compact remote module	4	—	4 channel input, -4096 to +4096, 0-4000, -10 V to 10 V, -20 mA to +20 mA	140146
Analog out	AJ65BT-64DAV	Remote module	—	4	4-channel voltage output, -2000 to 2000, -10 V to 10 V	75446
	AJ65BT-64DAI		—	4	4-channel current output, 0-4000, 4 mA-20 mA	75445
	AJ65SBT-62DA	Compact remote module	—	4	4-channel voltage output, -4096 to +4096, -10 V to 10 V	140147
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 inputs, up to 200 kHz	88028
	AJ65BT-D62D		2 high-speed counter inputs , EIA standard RS-422 connection, up to 400 kHz (low current consumption)	88029
	AJ65BT-D62D-S1		2 high-speed counter inputs , EIA standard RS-422 connection, up to 400 kHz	88030
Interface	AJ65BT-R2	Remote module	Serial interface, RS232C (D-Sub, 9 pole), 1 channel	88003
	AJ65BT-G4-S3		PC interface, RS422, 1 channel	134950
Positioning	AJ65BT-D75P2-S3	Remote module	2 axes positioning module, pulse output, linear and circular interpolation	88002

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

Steve Jones, CLPA Europe

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

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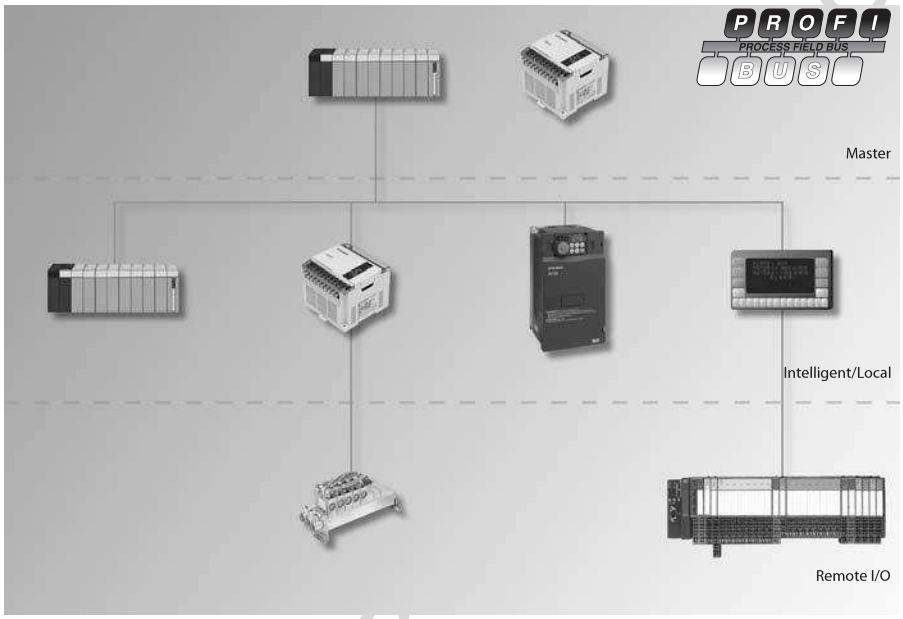
www.clpa-europe.com

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

PROFIBUS/DP

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

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



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

MASTER

Series	Module	Description	Art. no.
Q series	QJ71PB92D	Profibus DP interface master module	134931
	QJ71PB92V	Profibus DP interface master module (DP V1/V2)	165374
QnAS/AnS	A1SJ71PB92D	Profibus DP master module 12MB, for AnS and QnAS PLC's	63393
FX	FX3U-64DP-M	Profibus DP master module for FX3U PLCs	166085

INTELLIGENT SLAVE

Series	Module	Description	Art. no.
Q series	QJ71PB93D	Profibus slave	143545
FX	FX0N-32NT-DP	Profibus DP slave module for FX1N/FX2N and FX3U PLC's	62125
	FX3U-32DP	Profibus DP slave module for FX3U PLC's	194214
AnS	A1SJ71PB93D	Profibus slave	14063
Inverter	FR-A5NP	Profibus interface for A500 and F500 inverters	68045
	FR-E5NP	Profibus interface for E500 inverters	104556
	FR-A7NP	Profibus interface for A700 and F700 inverters	158524
Servo	MR-MG30	Profibus communication option unit for MR-J2S-B servo amplifiers	157643
HMI	IFC-PBDP	Profibus DP slave interface for E300/600/610/615/700/710/900/910 HMI's	76676
Breaker	BIF-PR-W	Profibus interface for SUPER AE air circuit breakers	168572

SLAVE I/O

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

I/O BRIDGE MODULE

Series	Module	Description	Art. no.
FX	FX2N-32DP-IF	Profibus remote I/O using FX2N I/O & Special Function modules; 240 V AC power supply	76676
	FX2N-32DP-IF-D	Profibus remote I/O using FX2N I/O & Special Function modules; 24 V DC power supply	142763

The MELSEC ST Series for PROFIBUS/DP

System description

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

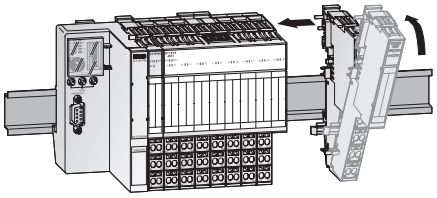
- basic module (head station and bus node for PROFIBUS/DP)
- power supply modules
- digital and analog I/O modules

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

The name "ST" means "Slice-type Terminal" and comes from the physical appearance of the very slim modules (12.6mm). 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.

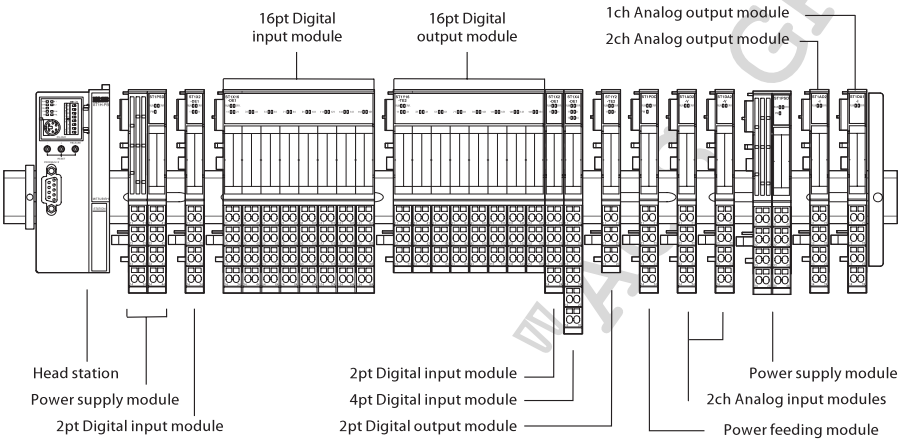


Every electronic module provides LEDs for quick and easy diagnostics and also additional information. Error and status messages are also shown on the basic module.

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 0.5–2.5mm^2, 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 24V DC for actuators/sensors
- Gold contacts for all bus and signal connections
- Electronic modules are coded to prevent an incorrect unit being inserted
- Easy parameter setting with GX Configurator DP

Product range

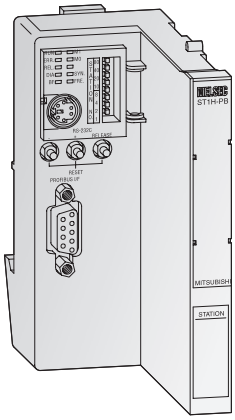


Product range and selection guide

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

Electronic modules	Base modules Spring clamp terminals	Screw clamp terminals
Head station		
ST1H-PB	no need	no need
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-S3Y2	ST1B-E3Y2
ST1Y2-TPE3	ST1B-S3Y2	ST1B-E3Y2
ST1Y16-TPE3	ST1B-S3Y16	ST1B-E3Y16
ST1Y2-R2	ST1B-S4IR2	ST1B-E4IR2
Analog input modules		
ST1AD2-V	ST1B-S4IR2	ST1B-E4IR2
ST1AD2-I	ST1B-S4IR2	ST1B-E4IR2
Analog output modules		
ST1DA2-V	ST1B-S4IR2	ST1B-E4IR2
ST1DA1-I	ST1B-S4IR2	ST1B-E4IR2
Temperature modules		
ST1TD2	ST1B-S4TD2	ST1B-E4TD2
ST1RD2	ST1B-S4IR2	ST1B-E4IR2
Encoder modules		
ST1SS1	ST1B-S4IR2	ST1B-E4IR2

The MELSEC ST Series for PROFIBUS/DP

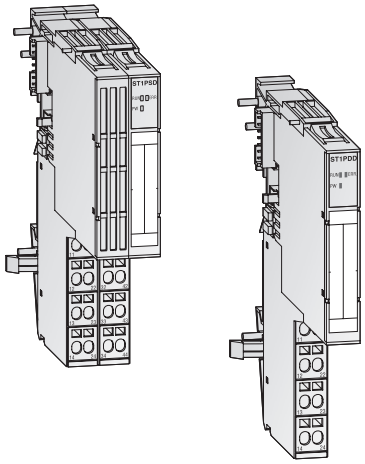


Basic module (head station) of the MELSEC ST series

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

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

Specifications			ST1H-PB
Occupied I/O points			4 / 4
Communications	protocol		IEC 61158/EN50170
	medium		Shielded 2-wire
Interface		type	RS485
Supported operation modes			Sync mode, freeze mode
Max. transmission distance		m	4800 (3 repeaters)
Programming interface			RS232 Mini-DIN socket for diagnostics and programming
Data exchange with master			304 total / 32 / 64 / 128 / 256, selectable mode
Number of addressable slices			max. 63
Addressable I/O points	digital	bit	256
	analog	word	32
Internal power consumption (5 V DC)		mA	530
External power supply			Via ST1PSD
Dimensions (W x H x D)		mm	114.5 x 50.5 x 74.5
Order information		Art. no.	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 24V 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.

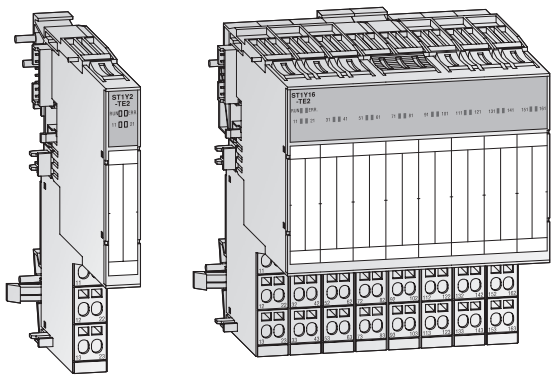
Specifications			ST1PSD	ST1PDD
Module type			Power supply for head station, internal 5V DC backplane bus and 24V DC for I/Os (double function)	Power feeding module
Occupied I/O points			2 / 2	2 / 2
Occupied slice number			2	1
Nominal voltage		V DC	24.0	24.0
Permissible range			24.0 (19.2 – 28.8 (±20%))	24.0 (19.2 – 28.8 (±20%))
System supply		V DC	24.0 for basic module and I/O´s, field supply / 5.0 for internal backplane bus	
Ripple			< 5 %	< 5 %
Internal power consumption (5 V DC)		mA		60
Max. output current (5 V DC)		A	2.0	—
Max. output current (24 V DC)		A	8 (10 with fuse)	8 (10 with fuse)
Dimensions (W x H x D)		mm	25.2 x 55.4 x 74.1	12.6 x 55.4 x 74.1
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 5V DC power consumtion and a rough calculation for the number of needed PSD refresh modules, please refer to the attached table.

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



Digital input modules

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

Digital output modules

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

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

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

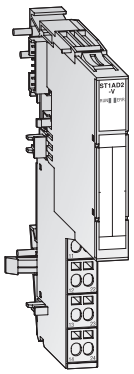
Special features:

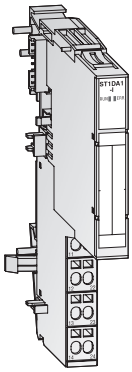
- DIN rail mounting
- LEDs for RUN and ERROR on the modules and also on the basic module
- Connection to the basic module (head station) via integrated backplane bus in the base modules
- Two selectable types of connecting terminals base modules:
  - spring clamp type terminals
  - screw clamp type terminals

Specifications			ST1X2-DE1	ST1X4-DE1	ST1X16-DE1	ST1X1616-DE1-S1
Module type			DC input module, 2 inputs	DC input module, 4 inputs	DC input module, 16 inputs	DC input module, 32 inputs
Occupied I/O points			2 / 2	4 / 4	16 / 16	16 / 16
Occupied slice number			1	1	8	8
Isolation method			Photo coupler	Photo coupler	Photo coupler	Photo coupler
Rated input voltage		V DC	24 (+20/-15%, ripple ratio within 5%)	24 (+20/-15%, ripple ratio within 5%)	24 (+20/-15%, ripple ratio within 5%)	24 (+20/-15%, ripple ratio within 5%)
Rated input current		mA	4	4	4	5
Inputs simultaneous ON			100%	100%	100%	100%
Input resistance		kΩ	5.6	5.6	5.6	4.7
Response time	OFF → ON	ms	0.5 / 1.5 or less (default: 1.5)			
	ON → OFF	ms	0.5 / 1.5 or less (default: 1.5)			
Internal current consumption (5V DC)		mA	85	95	120	200
Dimensions (W x H x D)		mm	12.6 x 55.4 x 74.1	12.6 x 55.4 x 74.1	100.8 x 55.4 x 74.1	100.8 x 55.4 x 74.1
Applicable base module	spring clamp type		ST1B-S4X2, art. no. 152911	ST1B-S6X4, art. no. 152912	ST1B-S4X16, art. no. 152913	ST1B-S6X32, art. no. 169313
	screw clamp type		ST1B-E4X2, art. no. 152921	ST1B-E6X4, art. no. 152922	ST1B-E4X16, art. no. 152923	ST1B-E6X32, art. no. 169314
Connection cable type			3-wire 24 V DC (with shield)	3-wire 24 V DC	3-wire 24 V DC (with shield)	3-wire 24 V DC (with shield)
Order information		Art. no.	152964	152965	152966	169309

Specifications			ST1Y2-TE2	ST1Y16-TE2	ST1Y16-TE8	ST1Y2-TPE3	ST1Y16-TPE3	ST1Y2-R2
Module type			2 transistor outputs	16 transistor outputs	2 transistor outputs	2 transistor outputs	16 transistor outputs	Relay output
Occupied I/O points			2 / 2	16 / 16	2 / 2	2 / 2	16 / 16	2/2
Occupied slice number			1	8	1	1	8	1
Isolation method			Photo coupler	Photo coupler	Photo coupler	Photo coupler	Photo coupler	Relay
Rated load voltage			24 V DC (+20/-15%)	24 V DC (+20/-15%)	24 V DC (+20/-15%)	24 V DC (+20/-15%)	24 V DC (+20/-15%)	24 V DC (+20/-15%); 240 V AC
Max. load current		A	0.5/point; 1.0/common	0.5/point; 4.0/common	2.0/point; 4.0/common	1.0/point; 2.0/common	1.0/point; 4.0/common	2.0 (cos ϕ=1)/point; 4.0/common
Nax. swithing load			—	—	—	—	—	264 V AC/125 V DC
Max. inrush current		A	4.0 (10 ms or less)	4.0 (10 ms or less)	4.0 (10 ms or less)	2.0 (10 ms or less)	4.0 (10 ms or less)	—
Leakage current OFF		mA	0.1 or less	0.1 or less	0.1 or less	0.3 or less	0.3 or less	—
Max. voltage drop at ON			0.2 V DC (TYP) 0.5 A, 0.3 V DC (max.) 0.5 A	0.2 V DC (TYP) 0.5 A, 0.3 V DC (max.) 0.5 A	0.2 V DC (TYP) 2.0 A, 0.3 V DC (max.) 2.0 A	0.15 V DC (TYP) 1.0 A, 0.2 V DC (max.) 1.0 A	0.15 V DC (TYP) 1.0 A, 0.2 V DC (max.) 1.0 A	—
Response time	OFF → ON	ms	max. 1.0	max. 1.0	max. 1.0	max. 0.5	max. 0.5	max. 10
	ON → OFF	ms	max. 1.0 (rated load, resistive load)	max. 1.0 (rated load, resistive load)	max. 1.0 (rated load, resistive load)	max. 1.5 (rated load, resistive load)	max. 1.5 (rated load, resistive load)	max. 12
Protection functions			—	—	—	Thermal protection, short circuit protection (thermal and short circuit protection are activated in increments of 1 points. When the output section protection function is working, LED indicates it and signal is output to head module (automatic reset).		—
Internal current consumption (5V DC)		mA	90	150	95	95	160	90
Dimensions (W x H x D)		mm	12.6 x 55.4 x 74.1	100.8 x 55.4 x 74.1	12.6 x 55.4 x 74.1	12.6 x 55.4 x 74.1	12.6 x 55.4 x 74.1	12.6 x 55.4 x 74.1
Applicable base module	spring clamp type		ST1B-S3Y2, art. no. 152914	ST1B-S3Y16, art. no. 152915	ST1B-S3Y2, art. no. 152914	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-E3Y2, art. no. 152924	ST1B-E3Y2, art. no. 152924	ST1B-E3Y16, art. no. 152925	ST1B-E4IR2, art. no. 152927
Connection cable type			2-wire 24 V DC with shield	2-wire 24 V DC with shield	2-wire 24 V DC with shield	2-wire 24 V DC with shield	2-wire 24 V DC with shield	2 wires (internal connected)
Order information		Art. no.	152967	152968	169408	152969	152970	152971

The MELSEC ST Series for PROFIBUS/DP





Analog input modules

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

Analog output modules

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

Analog temperature input module

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

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

Special features:

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

Specifications			ST1AD2-V	ST1AD2-I	ST1TD2	ST1RD2
Module type			Analog input module	Analog input module	Analog temperature input module	Analog temperature input module
Occupied I/O points			4 / 4	4 / 4	4 / 4	4 / 4
Occupied Slice number			1	1	2	2
Number of input channels			2	2	2	2
Signal input			-10 – +10 V, 0 – +10 V, 0 – 5 V, 1 – 5 V	0–20 mA, 4–20 mA	Thermocouple input: K,T: 0.3 °C; E: 0.2 °C; J: 0.1 °C; B: 0.7 °C; R, S: 0.8 °C; N: 0.4 °C	PT100, PT1000
Resolution			12 bit + sign	12 bit + sign	Microvoltage: 4 µV	0.1 °C
Conversion speed			0.1 ms per channel	0.1 ms per channel	Cold junction temperature compensation setting: not set: 30 ms/channel; set: 60 ms/channel	80 ms per channel
Maximum input voltage			±15 V	—	±4 V	
Micro voltage input range			—	—	-80 – +80 µV (input resistance < 1 MΩ)	—
Maximum input current			—	±30 mA	—	—
Output	temperature conversion		—	—	1-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 (5V DC)		mA	110	110	95	80
Dimensions (W x H x D)		mm	12.6 x 55.4 x 74.1	12.6 x 55.4 x 74.1	12.6 x 55.4 x 77.6	12.6 x 55.4 x 77.6
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	152972	169406

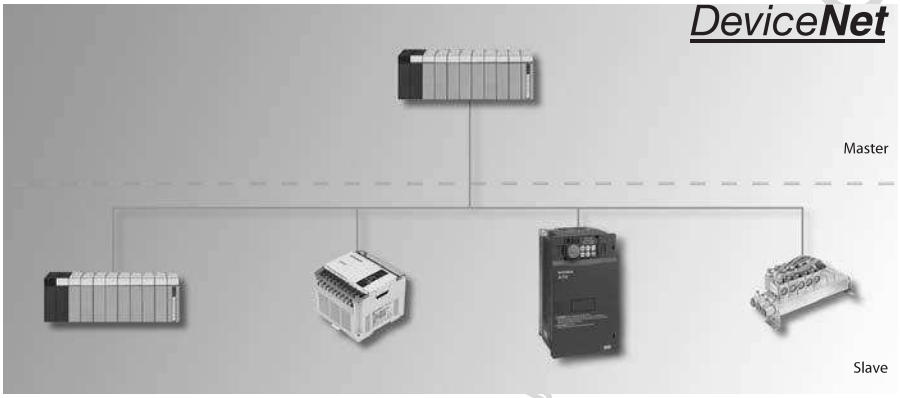
Specifications			ST1DA2-V	ST1DA1-I	ST1SS1
Module type			Analog output module	Analog output module	Absolute encoder interface with SSI (synchronal serial interface)
Occupied I/O points			4 / 4	4 / 4	4 / 4
Occupied slice number			1	1	2
Number of output channels			2	1	1
Signal output range			-10 – +10 V, 0 – +10 V, 0 – 5 V, 1 – 5 V	0–20 mA, 4–20 mA	31 bit binary (0 – 2147483647)
Resolution			12 bit + sign	12 bit + sign	2 to 31 bits
Conversion time			0.1 ms per channel	0.1 ms per channel	125 kHz, 250 kHz, 500 kHz, 1 MHz, 2 MHz
Maximum input voltage			±15 V	—	24 V DC (+20 / -15 %)
Maximum input current			—	±30 mA	12 mA
Total error			±0.8 % (0–55 °C)	±0.8 % (0–55 °C)	±0.8 % (0–55 °C)
Data length			16 bit	16 bit	—
External load resistance value			1.0 kΩ–1.0 MΩ	0–500 Ω	—
Isolation			Photo coupler isolation between the channels and backplane bus	Photo coupler isolation between the channels and backplane bus	Photo coupler isolation between the channels and backplane bus
Internal current consumption (5V DC)		mA	95	95	80
Dimensions (W x H x D)		mm	12.6 x 55.4 x 74.1	12.6 x 55.4 x 74.1	12.6 x 55.4 x 74.1
Applicable base module	spring clamp type		ST1B-S4IR2, art. no. 152916	ST1B-S4IR2, art. no. 152916	ST1B-S4IR2, art. no. 152916
	screw clamp type		ST1B-E4IR2, art. no. 152927	ST1B-E4IR2, art. no. 152927	ST1B-E4IR2, art. no. 152927
Order information		Art. no.	152975	152976	193660

DeviceNet

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

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

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

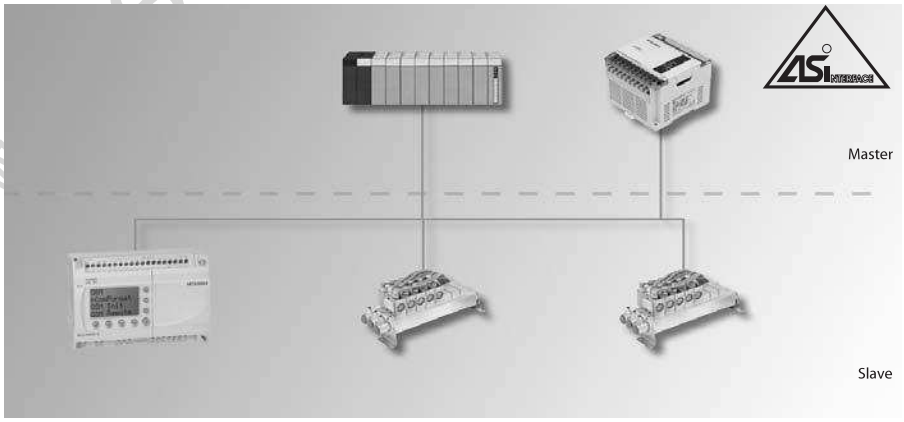


Model type	Series	Module	Description	Art. no.
Master	Q series	QJ71DN91	DeviceNet interface master/slave module	136390
	AnS/QnAS	A1SJ71DN91	DeviceNet master/slave module,for Ans and QnAS PLC's	124373
Intelligent Slave	FX	FX2N-64DNET	DeviceNet interface (slave)	131708
	Inverter	FR-A5ND	DeviceNet interface for A500 and F500 inverters	68043
		FR-E5ND	DeviceNet interface for E500 inverters	104557
		FR-A7ND	DeviceNet interface for A700 and F700 inverters	158525

AS-Interface

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

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



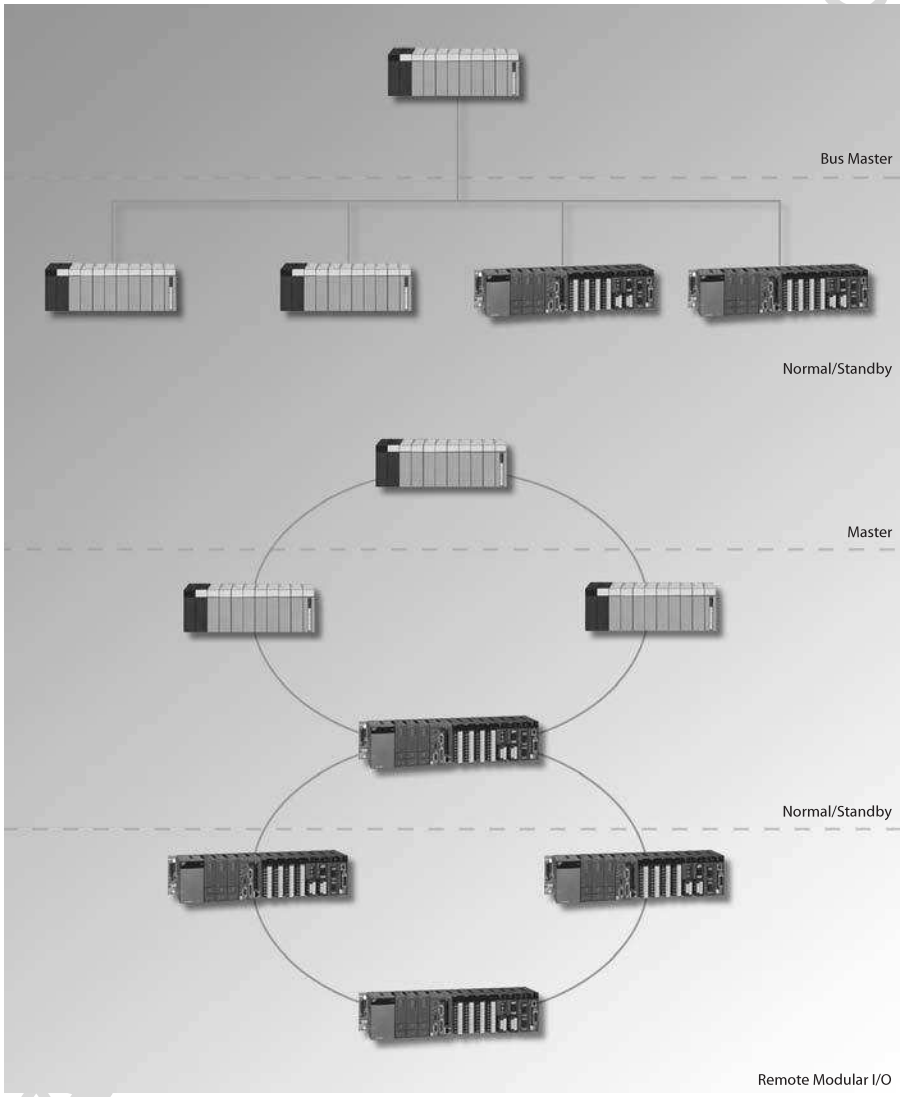
Model type	Series	Module	Description	Art. no.
Master	Q series	QJ71AS92	AS-i interface module,version 2.11,dual network master	143531
	AnS	A1SJ71AS92	AS-i master module for AnS (Double network master)	129936
	FX	FX2N-32ASI-M	AS-i master	103314
Intelligent Slave	Alpha	AL2-ASI-BD	AS-i interface board for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

MELSECNET/H

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

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

- Up to 64 stations per network
- Up to 255 networks (AnS series) or 239 network (System Q) can be joined together
- Floating master give excellent redundancy if master station fails
- Fibre optic (GI or SI cable) and 50 Ω coaxial connection
- Used for peer-to-peer or remote I/O control
- Easy set-up, no programming needed
- Strong diagnostics built into the network interface, PLC CPU and programming software
- Up to 16 k words of data per network
- Maximum transmission speed 50 Mbps (SI fibre only, full duplex communication)
- Maximum transmission distance for single network, 30 km fibre loop or 500 m coaxial



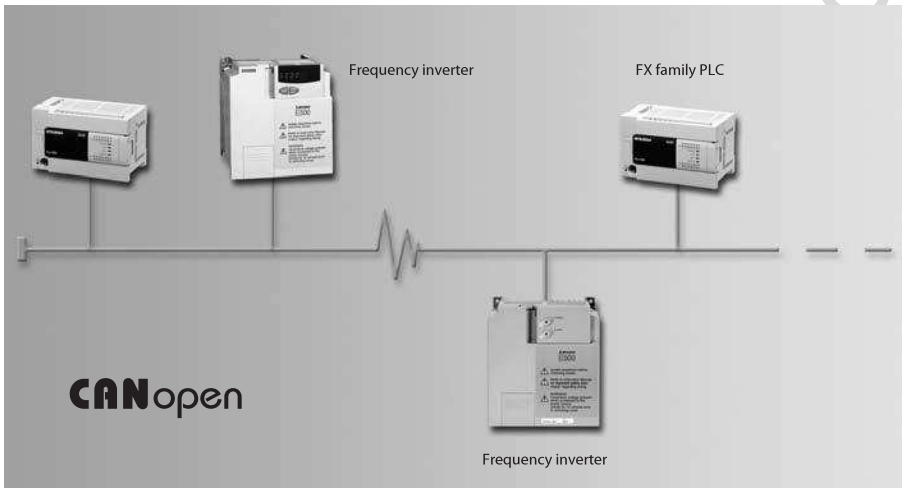
Model type	Series	Module	Description	Art. no.
Master/local	Q series	QJ71BR11	MELSECNET/H master/local,coaxial cable	127592
		QJ71LP21GE	MELSECNET/H master/local,GI 62.5/125 fibre optic cable	138959
		QJ71LP21-25	MELSECNET/H master/local,SI fibre optic cable	136391
	AnS	A1SJ71LP21GE	MELSECNET/10 master/local,GI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

CANopen

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

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

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



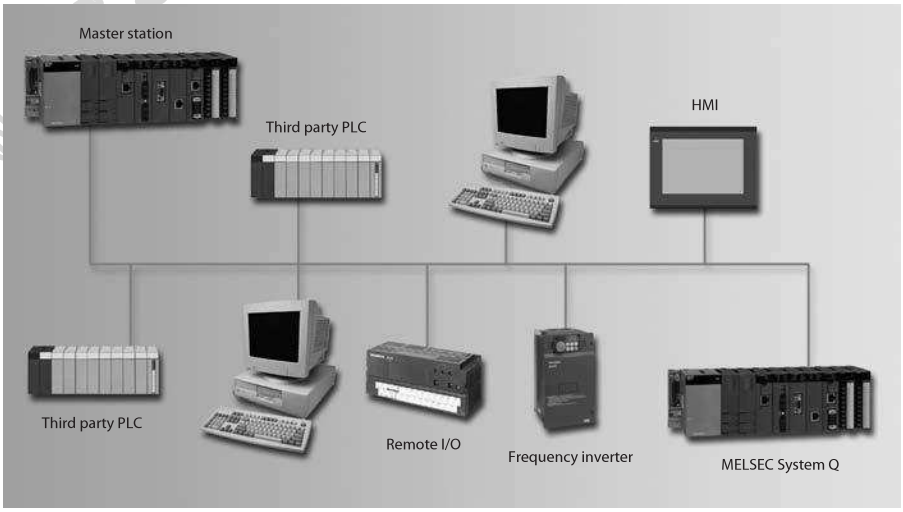
Model type	Series	Module	Description	Art. no.
Local	FX	FX2N-32CAN	Communications module for CANopen	141179
Slave	Inverter	0I-FR-A5NC0	Communications board for FR-A500 series inverter	139377
		0I-FR-E5NC0	Communications board for FR-E500 series inverter	139378
		FR-A7NCA	Communications board for FR-A700 series inverter	191424

MODBUS

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

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

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



Model type	Series	Module	Description	Art. no.
Master/Slave	Q series	QJ71MB91	Serial MODBUS interface master/slave module	167757
		QJ71MT91	MODBUS / TCP interface master/slave module for Ethernet	155603
	FX	FX3U-232ADP-MB	Serial MODBUS RS232C interface master/slave module	165276
		FX3U-485ADP-MB	Serial MODBUS RS485C interface master/slave module	165277
Slave	AnS	A1SJ71UC24-R2-S2	MODBUS slave interface module	54355
		A1SJ71UC24-R4-S2	MODBUS slave interface module with RTU protocol	54354
	Breaker	BIF-MD-W	MODBUS interface for SUPER AE air circuit breakers	168573

MODULAR PLCs

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

- Communication- is a communication hub connecting to fieldbus or data networks including 100 Mbps ethernet
- Scalability- offers Multi CPU solutions on a single backplane
- Flexibility- solutions can combine 4 CPU types as a seamless solution; PLC, Motion, 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
- World Wide Web- via webserver gives Internet service without the need for a PC
- 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

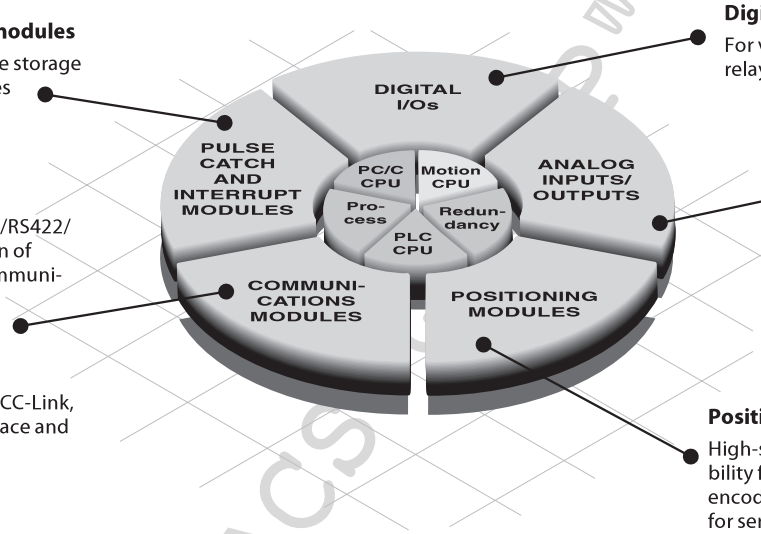
Digital input modules for pulse storage and for processing subroutines

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, Profibus, 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

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.

Migration from AnS to System Q

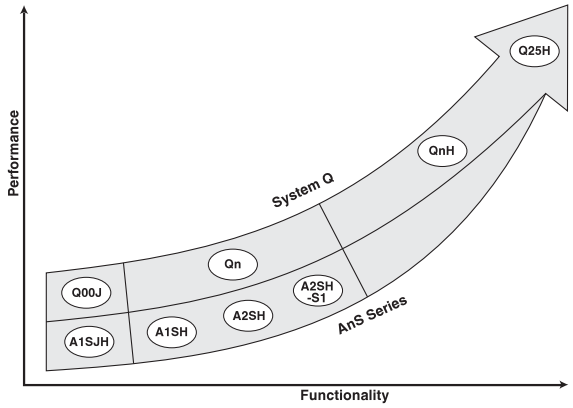
The Q Series is able to apply automation solutions at a higher level and offers a higher level of integration with other automation components. It will also change the way maintenance is carried out by the system initiating the communication by means of text message or email. This means that regular updates or any alarms that are triggered can be sent directly to the members of staff who deal with the maintenance of the PLC. AnS and other systems will not be made redundant as connection with existing systems is part of the System Q concept. There are also less CPUs to choose from compared to previous series, which means picking the correct CPU for the job is made a lot simpler.

When upgrading from a AnS system to a Q system the part naming system is simple. It is a matter of exchanging the AnS prefix and replacing it with a Q for example.

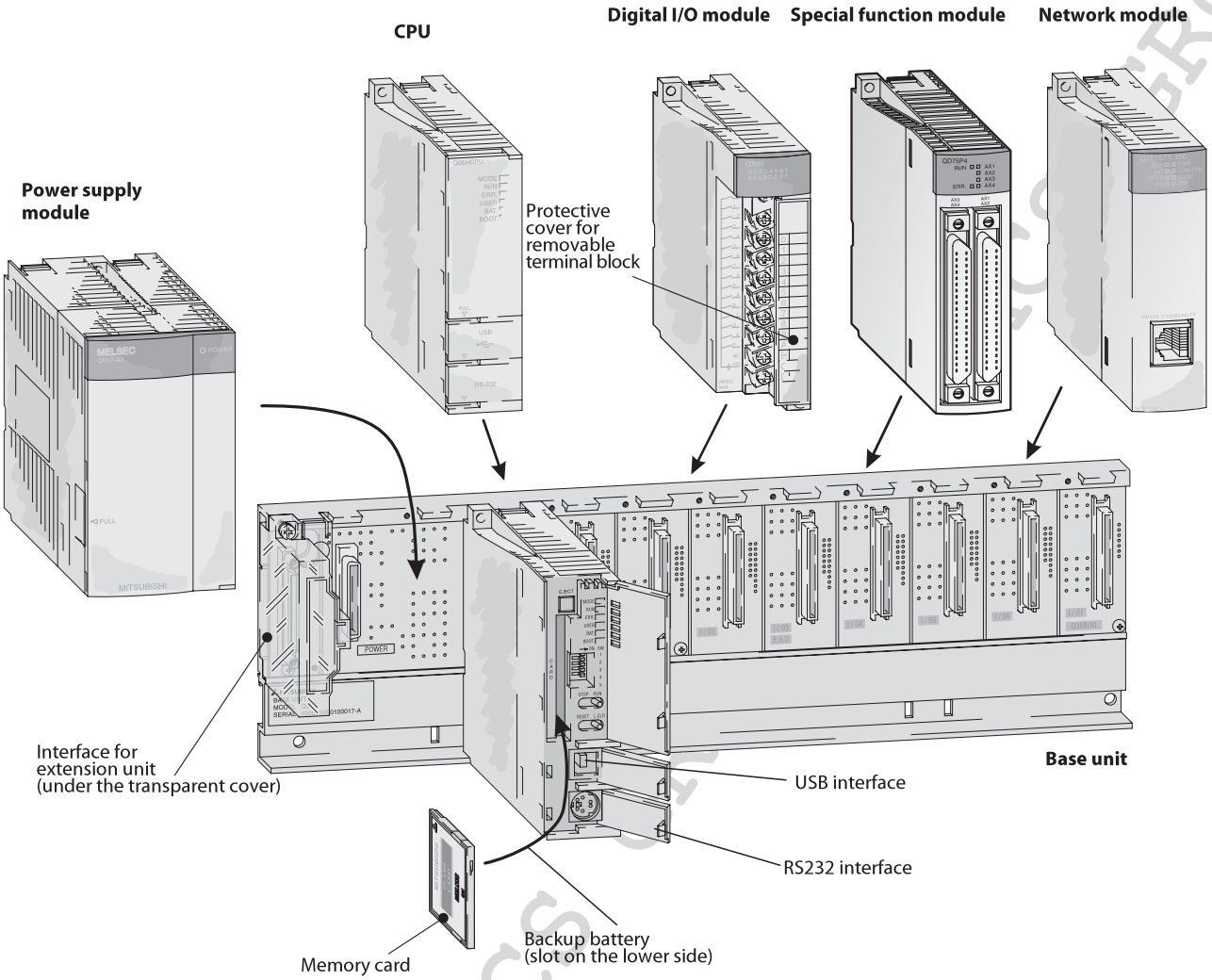
A1SX80 ⇒ QX80

The table below shows which Q CPU's correspond to the AnS CPU's

AnS CPU type	A1SJH	A1SH	A2SH	A2SH-S1	Q2AS	Q2AS-S1
Q CPU type	Q00J	Q00	Q01	Q02	Q02H	Q06H



What a System looks like



System structure

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

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

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

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

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

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

What you need

Base units

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

Power supply

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

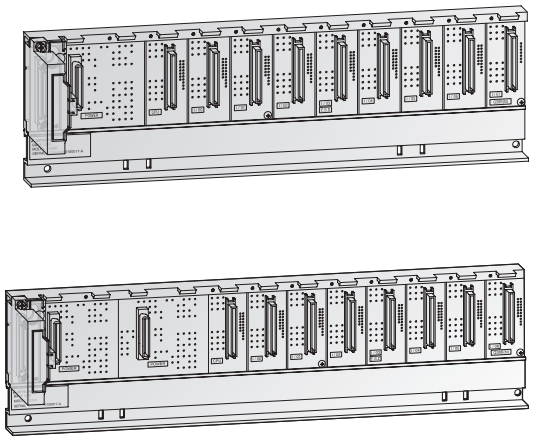
CPU

There are two main types of CPU, basic models (Q00JCPU up to Q01CPU) and advanced models (Q02CPU up to Q25HCPU). Upto 4 CPUs can be used in a single system, which allows a wide range of combinations for optimal system performance. To make selecting a CPU type easier, the number of CPU types has been reduced from 50 (in previous series) to 8, which allows easier selection of the correct CPU type.

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

Extension base units

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

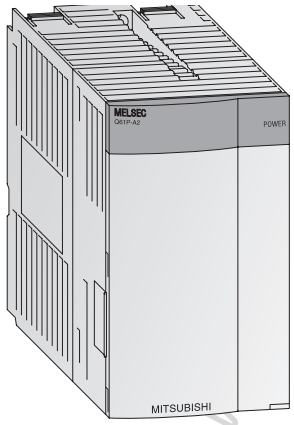
- Q6*B extension units provide a slot for their own power supply module
- A total of max.7 extension units can be connected to a main base unit with up to 64 I/O modules for a single system
- The maximum distance from the first to the last base unit is 13.2 m

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		Main Base Unit					Extension Base Unit						
		Q33B-E	Q35B-E	Q38B-E	Q38RB-E	Q312B-E	Q52B	Q55B	Q63B	Q65B	Q68B	Q68RB	Q612B
Slots for I/O modules		3	5	8	8	12	2	5	3	5	8	8	12
Slots for power supply modules		1	1	1	2	1	—	—	1	1	1	2	1
Installation		All base units provide an installation hole Ø 5 mm and M4 screws.					All base units provide an installation hole Ø 5 mm and M4 screws.						
Dimensions (WxHxD)	mm	189 x 98 x 44.1	245 x 98 x 44.1	328 x 98 x 44.1	439 x 98 x 44.1	439 x 98 x 44.1	106 x 98 x 44.1	189 x 98 x 44.1	189 x 98 x 44.1	245 x 98 x 44.1	328 x 98 x 44.1	439 x 98 x 44.1	439 x 98 x 44.1
Order information	Art. no.	136369	127586	127624	157573	129566	140376	140377	136370	129572	129578	157066	129579
Accessories		Connection cables, adapter for DIN rail mounting											

Power Supply Modules

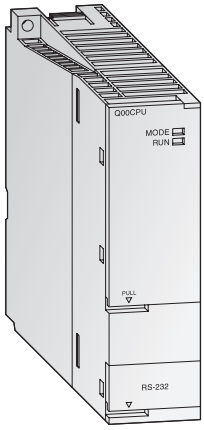


These units power all the modules on the backplane. The choice is dependent on the power consumption of the individual modules (this is especially important when using multiple CPUs).

- 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-A1	Q61P-A2	Q62P	Q63P	Q63RP	Q64P	Q64RP
Input voltage	(+10 %, -15 %)	V AC	100 – 120	200 – 240	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 %)
Inrush current			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			105 VA	105 VA	105 VA	45 W	65 W	160 VA	160 VA
Rated output current	5 V DC	A	6	6	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	≥ 3.3	≥ 5.5	≥ 5.5	≥ 14.4	≥ 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
Efficiency			≥ 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.	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	10	10	20	20
Dimensions (WxHxD)		mm	55.2 x 98 x 90	55.2 x 98 x 90	55.2 x 98 x 90	55.2 x 98 x 90	83 x 98 x 115	55.2 x 98 x 115	83 x 98 x 115
Order information		Art. no.	129564	127593	140379	136371	166091	140718	157065

PLC CPU Modules



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

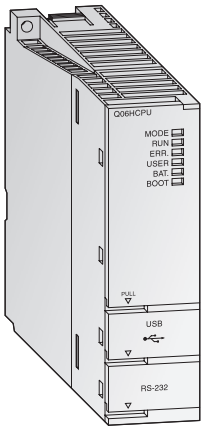
Basic PLC CPUs

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

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

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

Specifications		Q00JCPU-E	Q00CPU	Q01CPU
Type		Combination of CPU module (single processor), 5 slot base unit and power supply	CPU module (single processor)	CPU module (single processor)
I/O device points		256/2048	1024/2048	1024/2048
CPU self-diagnostic functions		CPU error detection, Watch Dog, battery error detection, memory error detection, program check, power supply error detection, fuse error detection		
Battery buffer		All CPU modules are fitted with a lithium-battery with a life expectancy of 5 years.		
Memory type		ROM	RAM, ROM	RAM, ROM
Memory capacity	overall	58 kByte	94 kByte	94 kByte
	max. for PLC program	8 k steps (32 kByte)	8 k steps (32 kByte)	14 k steps (56 kByte)
Program cycle period		0.20 µs/log. instruction	0.16 µs/log. instruction	0.10 µs/log. instruction
No.of instructions		318	327	327
Dimensions (W x H x D)	mm	245 x 98 x 98	27.4 x 98 x 89.3	27.4 x 98 x 89.3
Order information	Art.no.	140378	138323	138324



High-performance PLC CPUs

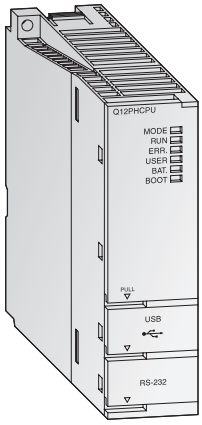
With the high-performance CPUs fast processing speed and expandability are the key features. Flexible system configuration that suits a wide range of applications is possible due to a varied set of functions and a well designed programming, configuration and debugging environment.

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

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

Specifications		Q02CPU	Q02HCPU	Q06HCPU	Q12HCPU	Q25HCPU
Type		Multi processor CPU module				
I/O points		4096/8192	4096/8192	4096/8192	4096/8192	4096/8192
CPU self-diagnostic functions		CPU error detection, Watch Dog, battery error detection, memory error detection, program check, power supply error detection, fuse error detection				
Battery buffer		All CPU modules are fitted with a lithium-battery with a life expectancy of 5 years.				
Memory type		RAM, ROM, FLASH	RAM, ROM, FLASH	RAM, ROM, FLASH	RAM, ROM, FLASH	RAM, ROM, FLASH
Memory capacity	overall	≤ 32 MByte	≤ 32 MByte	≤ 32 MByte	≤ 32 MByte	≤ 32 MByte
	max. for PLC program	28 k steps (112 kByte)	28 k steps (112 kByte)	60 k steps (240 kByte)	124 k steps (496 kByte)	252 k steps (1008 kByte)
Program cycle period		79 ns/ log. instruction	34 ns/ log. instruction	34 ns/ log. instruction	34 ns/ log. instruction	34 ns/ log. instruction
Dimensions (W x H x D)	mm	27.4 x 98 x 89.3	27.4 x 98 x 89.3	27.4 x 98 x 89.3	27.4 x 98 x 89.3	27.4 x 98 x 89.3
Order information	Art.no.	132561	127585	130216	130217	130218

Process CPU Modules

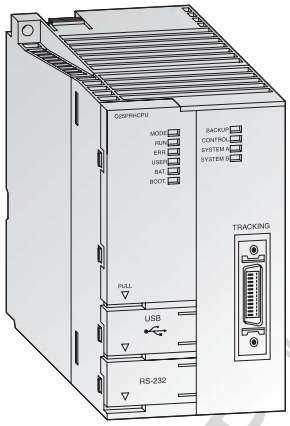


The System Q process CPU allows flexible system design based on off-the-shelf components, which reduces both initial and implementation costs. Using either PX Developer / GX Developer or GX IEC Developer, process applications can be designed, debugged, monitored and maintained. The MELSEC Process Control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

- Simplified control and engineering
- Extensive Loop control
- High-speed Loop control
- Improved reliability and serviceability
- Hot-swap module replacement in run mode
- Works with 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		Q12PHCPU	Q25PHCPU
Type		Process CPU module	
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, 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
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 (W x H x D)	mm	27.4 x 98 x 89.3	27.4 x 98 x 89.3
Order information	Art. no.	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.

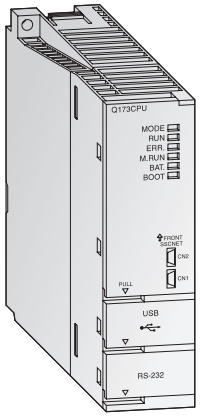
If the control system fails, the standby system takes over without interruption of the process.

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 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 (W x H x D)	mm	52.2 x 98 x 89.3	52.2 x 98 x 89.3
Order information	Art. no.	157070	157071

Motion CPU Modules



The high-speed dynamic motion CPU

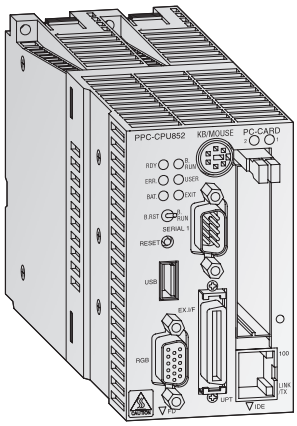
The motion controller CPU controls and synchronises the connected servo amplifiers and servo motors. A motion system requires a motion controller CPU, and a PLC CPU.

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

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

Specifications		Q172CPUN	Q173CPUN
Type		Motion CPU	Motion CPU
I/O points		8192	8192
Interpolation functions		Linear interpolation for up to 4 axes, circular interpolation for 2 axes, helical interpolation for 3 axes	
Programming language		Motion SFC, dedicated instructions, software for conveyor assembly (SV13), virtual mechanical support language (SV22)	
Interfaces		USB, RS232C, SSCNET	
Real I/O points (PX/PY)		256 (these I/Os can be allocated directly to the motion CPU)	
Dimensions (W x H x D)	mm	27.4 x 98 x 114.3	27.4 x 98 x 114.3
Order information	Art. no.	142695	142696

Q-PC Modules



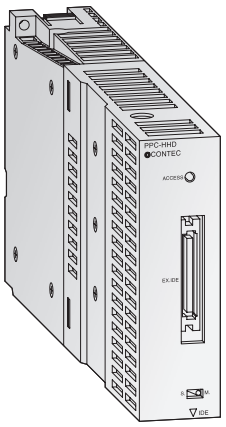
The personal computer for the base unit

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

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

Specifications			PPC-CPU 852(MS)-128
Type			Personal Computer CPU
CPU			Ultra low voltage Intel® Celereon® M processor (FSB 400 MHz)
Processing frequency		MHz	600
Memory			512 MB (main), 2 x 32 kB L1, 1 x 512 kB L2
Video			Integrated graphics board for a maximum resolution of 1280 x 1024 pixels and 16 Mio. colours
Interfaces	serial (RS232C)		2 (1 integrated 9-pin D-SUB connector and 1 optional interface at the extension box which is connnected to "EX I/F")
	parallel		1
	USB		4 (3 x USB 2.0 compliant at front and bottom, 1 x optional USB1.1 interface at the extension box which is connnected to "EX I/F")
	keyboard/mouse		1 x PS/2 connector (keyboard and mouse can be used at the same time with the conversion cable PPC-YCAB-01.)
	LAN		1 x ETHERNET interface (100BASE-TX/10BASE-T)
	monitor		1 x 15-pin HD-SUB
Connections for drives			1 x disk drive, 2 x hard disk (silicon hard disks are supported)
PC card slots			2 x PCMCIA, CardBus
No. of occupied I/O points			4096/8192
Dimensions (W x H x D)		mm	55.2 x 98 x 115
Order information			PPC-SET-Nil Art. no.: 207875 Set with 1 x PC CPU modul; 512 MB RAM, no hard disk, driver PPC-DRV-02, without OS PPC-SET-Win Art. no.: 207876 Set with 1 x PC CPU modul; 512 MB RAM, 20 GB hard disk, driver PPC-DRV-02, OS Windows 2000 Pro
Accessories			Additional hard disks (refer to next page; Soft PLC for the Q PC CPU: SX-Controller for Windows NT/2000 without realtime environment (SX-Controller V0100-1L0C-E, art. no.: 144006)

Disk Drives for Q-PC

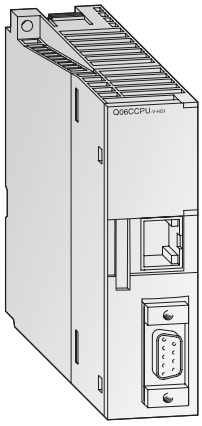


Memory units

Two different disk drives are available for the Q-PC that can be mounted additionally on the base unit directly beside the CPU module. The connection to the CPU is established via a short cable link underneath the modules. Besides a conventional hard disk with a storage capacity of 5 GB, a 1 GB silicon disk is also available for use in applications subject to strong vibrations or shocks.

Specifications		PPC-HDD (MS)-5	PPC-SDD (MS)-1000
Type		Hard disk	Silicon disk
Memory capacity		5120	1024
Order information	Art. no.	140109	139818
Accessories		Hard disk vibration protection PPC-HBR-01; art. no.:140126	

Q-C Controller CPU



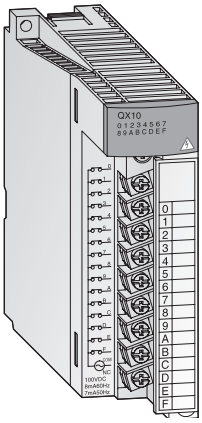
High-level language programming in combination with real time operating system

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

- Integration in a multi CPU - System Q or use as a stand alone system.
- Dedicated development environment for C language using "Tornado" by Wind River Systems
- 1 GB Compact Flash card makes handling for large quantities of data easy
- High performance addition to the existing range of automation products
- Ethernet and RS-232 interface on board
- Real time OS VxWorks and Telnet pre-installed
- Standard C/C++ Code can be embedded
- Remote access via networks and support of FTP
- VxWorks communication library and QBF libraries for easy setup
- CoDeSys compatibility

Specifications		Q06CCPU-V-H01
Memory		Standard ROM: 16 MB (user area: 6 MB); Work RAM: 32 MB (user area: 14 MB); Battery-backed-up RAM: 128 kB
Operating system		VxWorks Version 5.4
Programming language		C or C++, CoDeSys
Development tool		Tornado 2.1 (OS license must be obtained separately from Wind River Systems Alameda, CA, USA), CoDeSys
Communication interfaces		RS232 (1 ch.), 10BASE-T/100BASE-TX (1 ch.)
CF card I/F		1 slot for a TYPE I card (Max. 1 GB CF card is supported)
Number of I/O points		4096 (X/Y0 to X/YFFF)
5 V DC internal current consumption	A	0.71
Dimensions (W x H x D)	mm	27.4 x 98 x 89.3 (Standard CPU size)
Order information	Art. no.	165353

Digital Input/Output 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

Output module - Adapted output technology

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

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

Special features (both):

- 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

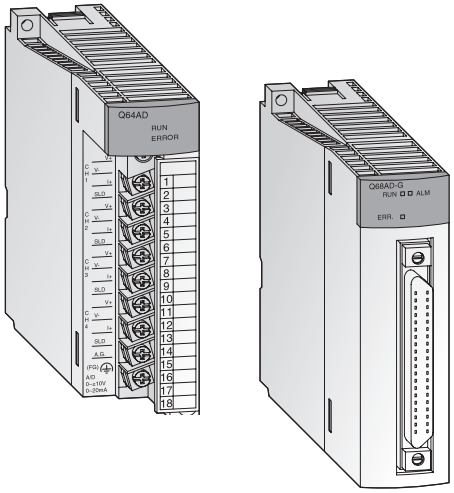
Input Modules

Specifications			QX10	QX28	QX40	QX41	QX42	QX50	QX80	QX81	QX82-S1)
Input points			16	8	16	32	64	16	16	32	64
Rated input voltage			100 – 120 V AC (50/60 Hz)	100 – 240 V AC (50/60 Hz)	24 V DC	24 V DC	24 V DC	48 V DC	24 V DC	24 V DC	24 V DC
Operating voltage range		V	85 – 132	85 – 264	20.4 – 28.8	20.4 – 28.8	20.4 – 28.8	40.8 – 52.8	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)	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	ca. 4	ca. 4	ca. 4
ON	voltage	V	≥ AC 80	≥ AC 80	≥ DC 19	≥ DC 19	≥ DC 19	≥ DC 28	≥ DC 19	≥ DC 19	≥ DC 19
	current	mA	≥ AC 5	≥ AC 5	≥ DC 3	≥ DC 3	≥ DC 3	≥ DC 2.5	≥ DC 3	≥ DC 3	≥ DC 3
OFF	voltage	V	≤ AC 30	≤ AC 30	≤ DC 11	≤ DC 11	≤ DC 11	≤ DC 10	≤ DC 11	≤ DC 11	≤ DC 9.5
	current	mA	≤ AC 1	≤ AC 1	≤ DC 1.7	≤ DC 1.7	≤ DC 1.7	≤ DC 1.7	≤ DC 1.7	≤ DC 1.7	≤ DC 1.5
Load resistance		kΩ	ca. 18 (50 Hz) ca. 15 (60 Hz)	ca. 15 (50 Hz) ca. 12 (60 Hz)	ca. 5.6	ca. 5.6	ca. 5.6	ca. 11.2	ca. 5.6	ca. 5.6	ca. 5.6
Common terminal arrangement			16	8	16	32	32	16	16	32	32 x 2
Connection terminal			18-point removable terminal block	18-point removable terminal block	18-point removable terminal block	40-pin connector	40-pin connector x 2	18-point removable terminal block	18-point removable terminal block	Compact connector 37-pin D-Sub	40-pin connector x 2
No. of occupied I/O points			16	16	16	32	64	16	16	32	64
Dimensions (W x H x D)		mm	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90
Order information		Art. no.	129581	136396	132572	132573	132574	204678	127587	129594	150837

Output Modules

Specifications			QY10	QY18A	QY22	QY40P	QY41P	QY42P	QY50	QY68A	QY80	QY81P
Outputs			16	8	16	16	32	64	16	8	16	32
Output type			Relay	Relay	Triac	Transistor (sink type)	Transistor (sink type)	Transistor (sink type)	Transistor (sink type)	Transistor (sink/source type)	Transistor (source type)	Transistor (source type)
Common terminal arrangement		points	16	18	16	16	32	32	16	All independent	16	32
Rated output voltage			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)	5 – 24 V DC	12 / 24 V DC (source type)	12 / 24 V DC (source 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	4.5 – 28.8 V DC	10.2 – 28.8 V DC	10.2 – 28.8 V DC
Connection terminal			18-point removable terminal block				40-pin connector	40-pin connector x 2	18-point removable terminal block	18-point removable terminal block	18-point removable terminal block	Compact connector 37-pin D-Sub
No. of occupied I/O points			16	16	16	16	32	64	16	16	16	32
Ext. power supply req.	voltage		—	—	—	12 – 24 V DC	12 – 24 V DC	12 – 24 V DC	12 – 24 V DC	—	12 – 24 V DC	12 – 24 V DC
	current	mA	—	—	—	10 (24 V DC)	20 (24 V DC)	20 (24 V DC)	20 (24 V DC)	—	20 mA (24 V DC)	40 mA (24 V DC)
Dimensions (W x H x D)		mm	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90
Order information		Art. no.	129605	136401	136402	132575	132576	132577	132578	136403	127588	129607
Accessories			40-pin connector and ready to use connection cables and system terminals ; Spring clamp terminal block for exchange against the standard screw terminal block ; IDC terminal block adapter for all 32 point I/O modules with 40-pin connector									

Analog Input Modules



Detection of analog process signals

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

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

Channel isolated and high resolution

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

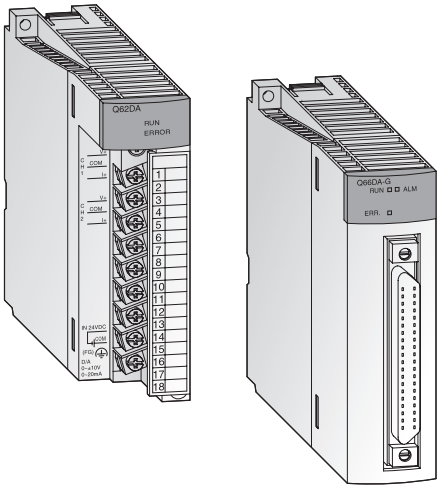
The **Q66AD-DG** additionally features the embedded signal conditioning function, so that signal converters for 2-wire transmitters are not needed.

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

Input Modules

Specifications			Q62AD-DGH	Q64AD	Q64AD-GH	Q66AD-DG	Q68AD-G	Q68ADV	Q68ADI
Input points			2	4	4	6	8	8	8
Analog input	voltage	V	—	-10 V – +10	-10 V – +10	—	-10 – +10	-10 – +10	—
	current	mA	4 – 20	0 – 20	0 – 20	0 – 20 / 4 – 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)
Load resistance	voltage	MΩ	—	1	1	—	1	1	—
	current	Ω	250	250	250	250	250	250	250
Max. input	voltage	V	—	±15	±15	—	±15	±15	—
	current	mA	±30	±30	±30	±30	±30	±30	±30
I/O characteristics	analog input		0 – 20 mA	-10 – +10 V; 0 – 20 mA	-10 – +10 V; 0 – 20 mA	0 – 20 mA	-10 – +10 V; 0 – 20 mA	-10 – +10 V	0 – 20 mA
	digital output		1/ 32000, 1/64000	1/4000, 1/12000, 1/16000; 1/4000, 1/8000, 1/12000	±1/ 32000, ±1/64000; 1/ 32000, 1/64000	1/4000, 1/12000	±1/ 4000; ±1/12000, ±1/ 16000	1/4000, 1/12000, 1/16000	1/4000, 1/8000, 1/12000
Max. resolution	voltage input		—	0.83 mV	62.5 µV	—	0.333 mV	1 mV	—
	current input		0.25 µA	3.33 µA	0.25 µA	1.33 µA	1.33 µA	—	0 – 20 mA/4 – 20 mA
Overall accuracy			±0.05 %	±0.4 % (0 – 55 °C), ±0.1 % (20 – 30 °C)	±0.05 %	±0.1 %	±0.1 %	±0.4 % (0 – 55 °C), ±0.1 % (20 – 30 °C)	±0.4 % (0 – 55 °C), ±0.1 % (20 – 30 °C)
Max. conversion time			10 ms/2 channels	80 µs/channel (+160 µs with temperature drift compensation)	10 ms/4 channels	10 ms/channel	10 ms/channel	80 µs/channel (+160 µs with temperature drift compensation)	80 µs/channel (+160 µs with temperature drift compensation)
Connection terminal			18-point removable terminal block	18-point removable terminal block	18-point removable terminal block	40-pin connector	40-pin connector	18-point removable terminal block	18-point removable terminal block
I/O points			16	16	16	16	16	16	16
Dimensions (W x H x D)		mm	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90
Order information		Art. no.	145036	129615	143542	204676	204675	129616	129617

Analog Output Modules



Output of analog control signals

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

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

Channel isolated and high resolution

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

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

DA modules with isolated external power supply

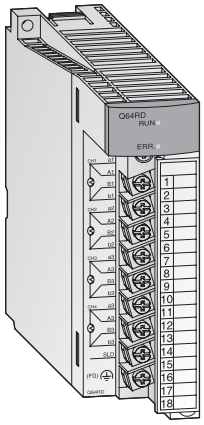
The new analog output modules Q62DAN, Q64DAN, Q68DAVN and Q68DAIN isolate the analog output channel from the external power supply to ensure, that any power fluctuations caused by external noise do not disrupt the analog output.

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

Output Modules

Specifications			Q62DAN	Q62DA-FG	Q64DAN	Q66DA-G	Q68DAVN	Q68DAIN
Output points			2	2	4	6	8	8
Digital input			-16384 – +16383	-16384 – +16383	-16384 – +16383	-16384 – +16383	-16384 – +16383	-16384 – +16383
Analog output			-10 V DC – +10 V DC (0 mA – +20 mA DC)	-10 V DC – +10 V DC (0 mA – +20 mA DC)	-10 V DC – +10 V DC (0 mA – +20 mA DC)	-12 V DC – +12 V DC (0 mA – +22 mA DC)	-10 V DC – +10 V DC	0 mA – +20 mA DC
Load resistance	voltage output		1 kΩ – 1 MΩ	1 kΩ – 1 MΩ	1 kΩ – 1 MΩ	1 kΩ – 1 MΩ	1 kΩ – 1 MΩ	—
	current output		0 – 600 Ω	0 – 600 Ω	0 – 600 Ω	0 – 600 Ω	—	0 – 600 Ω
Max. output	voltage	V	±12	±13	±12	±13	±12	—
	current	mA	21	23	21	23	—	21
I/O characteristics	analog output		-10 – +10 V; 0 – 20 mA	-10 – +10 V; 0 – 20 mA	-10 – +10 V; 0 – 20 mA	-10 – +10 V; 0 – 20 mA	-10 – +10 V; 0 – 20 mA	-10 – +10 V; 0 – 20 mA
	digital input		±1/ 4000; ±1/12000, ±1/ 16000	±1/ 4000; ±1/12000, ±1/ 16000	±1/ 4000; ±1/12000, ±1/ 16000	±1/ 4000; ±1/12000, ±1/ 16000	±1/ 4000; ±1/12000, ±1/ 16000	±1/ 4000; ±1/12000, ±1/ 16000
Maximum resolution	voltage output		0.333 mV	0.183 mV	0.333 mV	0.210 mV	0.333 mV	0.333 mV
	current output		0.83 µA	0.671 µA	0.83 µA	0.95 µA	0.83 µA	0.83 µA
Overall accuracy			±0.1 %	±0.1 %	±0.1 %	±0.1 %	±0.1 %	±0.1 %
Max. concversion time			80 µs / channel	10 ms / 2 channels	80 µs / channel	6 ms/channel	80 µs / channel	80 µs / channel
Connection terminal			18-point removable terminal block	18-point removable terminal block	18-point removable terminal block	40-pin connector	18-point removable terminal block	18-point removable terminal block
I/O points			16		16	16	16	16
Dimensions (W x H x D)		mm	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90
Order information		Art. no.	200689	145037	200690	204677	200691	200692

Analog Modules for Temperature Measurement



Temperature measurement by thermocouple

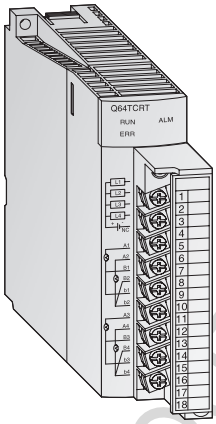
These modules are designed to convert external platinum temperature-measuring resistor input values into16 or 32-bit signed binary temperature measurement values and scaling values.

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

- Temperature of 4 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
Input channels		4	4	4	4
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)
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
Temperature scaling value		16-bit, signed binary: -2.000 – +8.500 32-bit, signed binary: -200.000 – +850.000	16-bit, signed binary: -2.000 – +8.500 32-bit, signed binary: -200.000 – +850.000	16-bit, signed binary: -2.700 – +18.200 32-bit, signed binary: —	16-bit, signed binary: -25.000 – +25.000 32-bit, signed binary: —
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
Cold junction temp. compensation accuracy		—	—	±1.0 °C	±1.0 °C
Max. conversion time		40 ms / channel	40 ms per channel	20 ms / channel	20 ms / channel
Analog inputs		4 channels/module	4 channels/module	4 channels/module + Pt100 connection	4 channels/module + Pt100 connection
Channel isolation		—	—	—	provided
Dimensions (W x H x D)	mm	27.4 x 98 x 90	27.4 x 98 x 112	27.4 x 98 x 90	27.4 x 98 x 90
Order information	Art. no.	137592	154749	137591	143544

Temperature Control Modules



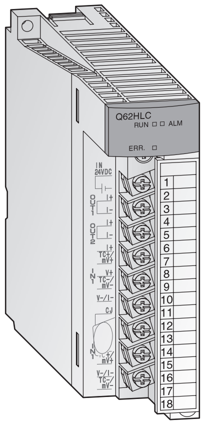
Temperature control modules with PID algorithm

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

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

Specifications		Q64TCRT	Q64TCRTBW	Q64TCTT	Q64TCTTBW
Control output	type	Transistor	Transistor	Transistor	Transistor
Inputs		4 channels per module	4 channels per module / broken wire detection	4 channels per module	4 channels per module / broken wire detection
Supported thermocouples		Pt100 (-200 – +600 °C), JPt100 (-200 – +500 °C)		R, K, J, T, S, B, E, N, U, L, P L II, W5Re/W26Re	
Sampling cycle		0.5 s / 4 channels	0.5 s / 4 channels	0.5 s / 4 channels	0.5 s / 4 channels
Control output cycle	s	1 – 100	1 – 100	1 – 100	1 – 100
Input filter		1 – 100 s (0 s: input filter OFF)	1 – 100 s (0 s: input filter OFF)	1 – 100 s (0 s: input filter OFF)	1 – 100 s (0 s: input filter OFF)
Temperature control method		PID ON/OFF impulse or 2-position control		PID ON/OFF impulse or 2-position control	
Dimensions (W x H x D)	mm	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90
Order information	Art. no.	136386	136387	136388	136389

Loop Control Module



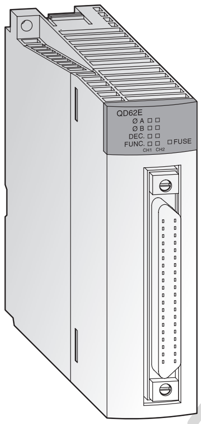
For fast response control

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

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

Specifications				Q62HLC
Input points				2 (2 channels)
Analog input	thermocouple		°C	-200 – +2300 (resolution 0.1 °C)
	microvoltage		mV	-100 – +100 (resolution 0.5 – 10 µV)
	voltage		V	-10 – +10 (resolution 0.05 – 1 mV)
	current		mA	0 – 20 (resolution 0.8 – 1 µA)
Digital output				-2000 – +23000, -10000 – +10000, -10000 – +10000, 0 – 20000
Supported thermocouples				K, J, T, S, R, N, E, B, PL II, W5re/W26Re
Conversion speed				25 ms / 2 channels
No. of occupied I/O points				16
Dimensions (WxHxD)			mm	27.4 x 98 x 112
Order information			Art. no.	200693

High-Speed Counter Modules



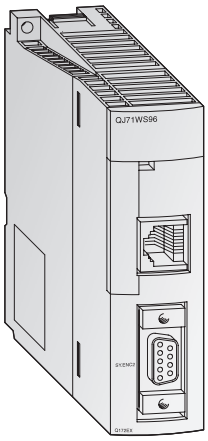
High-speed counter with automatic detection of rotational direction

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
Counter inputs			2	2	2	8
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
Max. counting frequency		kHz	200	200	500 (differential)	30
Max. counting speed	1-phase-input	kHz	200 or 100	200 or 100	500 or 200	30
	2-phase-input	kHz	200 or 100	200 or 100	500 or 200	—
Counting range			32 bits + sign (binary), -2147483648 – +2147483647	32 bits + sign (binary), -2147483648 – +2147483647	32 bits + sign (binary), -2147483648 – +2147483647	16 bits binary: 0 – 32767, 32 bit binary: 0 – 99999999, 32 bit binary: 0 – 2147483647
External digital input points			Preset, function start	Preset, function start	Preset, function start	Preset, function start
I/O points			16	16	16	32
Dimensions (W x H x D)		mm	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90
Order information		Art. no.	132579	128949	132580	145038

MELSEC System Q Web Server Module



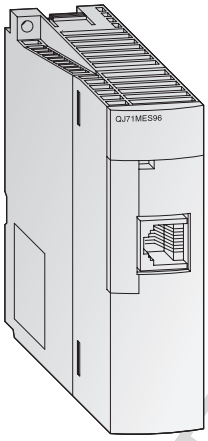
QJ71WS96

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

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

Specifications			QJ71WS96
Module type			Web server, FTP server/client
Communications method			ETHERNET: CSMA/CD
Interface		type	10BASE-T/100BASE-TX
RS-232 communications data	interface		RS232, 9-poles D-SUB
	transfer type		Duplex
	synchronisations method		Start/stop synchronisation
	transfer speed	MBit/s	9.6 / 19.2 / 38.4 / 57.6 / 115.2
	transmission distance	m	Max. 15
	data format		1 start bit, 8 data bits, 1 stop bit
	transfer control		floating control is possible (RS/CS)
Memory capacity		MB	5 (Standard-ROM); expandable with Compact Flash™ Card up to 512
I/O points			32
Internal power consumption (5 V DC)		mA	500
Dimensions (W x H x D)		mm	27.5 x 98 x 90
Order information		Art. no.	147115

MELSEC System Q MES Interface Module



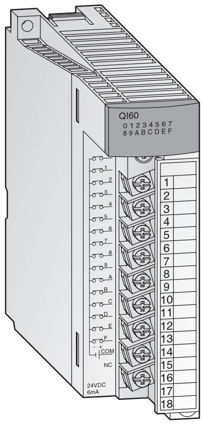
QJ71MES96

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

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

Specifications			QJ71WS96
Module type			MES interface module
Communications method			ETHERNET
Interface		type	10BASE-T/100BASE-TX
DB interface function	general		Interacts with databases via user-defined jobs
	tag function		Collects device data of the PLCs CPU on the network in units of tags.
	trigger monitor function		Monitors the status of conditions (time, tag values, etc.)
	trigger buffering function		The MES module buffers the data and trigger time to internal memory.
	SQL text transmission		Automatically generates the correct SQL message according to requirements.
	arithmetic processing		Formulas can be applied to data before sending from the MES interface module.
	program execution function		Executes programs in the application server computer
Memory capacity			1 Compact Flash™ Card can be installed
I/O points			32
Internal power consumption (5 V DC)		mA	650
Dimensions (W x H x D)		mm	27.5 x 98 x 90
Order information		Art. no.	200698

Interrupt Module



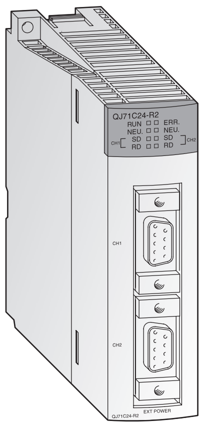
Branching to subroutines

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

Specifications			QI60
Input points			16
Rated input voltage		V DC	24 (sink type)
Operating voltage range		V DC	24
Input	resistance	kΩ	ca. 3.9
	current	mA	ca. DC 4 / 8
ON	voltage	V	≥DC 19
	current	mA	≥DC 4
OFF	voltage	V	≤DC 11
	current	mA	≤DC 1.7
No. of occupied I/O points			16
Dimensions (WxHxD)		mm	27.4 x 98 x 90
Order information		Art. no.	136395

Interface Module



Data exchange with peripheral devices

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

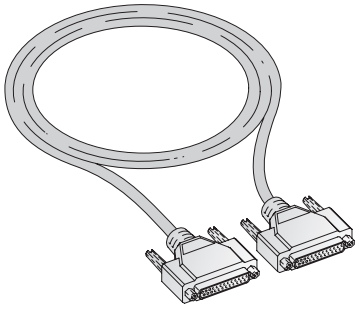
The peripherals are connected point-to-point on a 1:1 basis.

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

Specifications			QJ71C24N	QJ71C24N-R2	QJ71C24N-R4	QJ71MB91
Interface type			RS232 (9-pin Sub-D)	RS232 (9-pin Sub-D)	RS422 / RS485 (screw terminals)	RS232 (9-pin Sub-D)
Communications mode			Full duplex / half duplex	Full duplex / half duplex	Full duplex / half duplex	Full duplex / half duplex
Synchronisation			Asynchronous communications	Asynchronous communications	Asynchronous communications	Master/Slave
Data transfer	rate	bit/s	50 – 230400 (channel 1 only) 115200 (channel 1+2 simultaneously)			300 – 115200
	distance	m	15	15	—	15
Max. no of stations in a multidrop network			no restrictions / 64	—	no restrictions / 64	Master (32 slaves) Slave (242)
Data format			1 start bit, 7 or 8 data bits, 1 or 0 parity bits, 1 or 2 stop bits			Modbus
Error correction			Parity check, checksum	Parity check, checksum	Parity check, checksum	—
DTR/DSR control			YES / NO selectable	YES / NO selectable	—	—
X ON / X OFF (DC1 / DC3)			YES / NO selectable	YES / NO selectable	YES / NO selectable	—
I/O points			32	32	32	32
Dimensions (W x H x D)		mm	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27,4 x 98 x 90
Order information		Art. no.	149500	149501	149502	167757

Accessories

Connection Cables



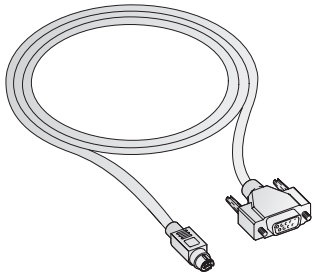
Connection cable for extension units

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

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

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

Programming Cable



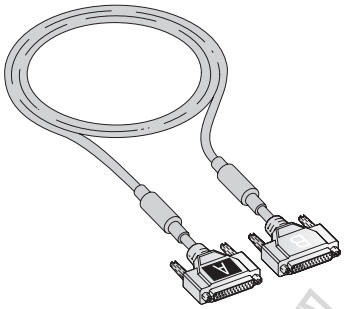
Programming cable for RS232 interface

The programming cables QC30R2 are used for programming a MELSEC system Q CPU via the RS232 CPU port.

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
Connection cable for		Connection between a PCs and a MELSEC system Q PLC via RS232 interface	Connection between a PCs and a MELSEC system Q PLC via USB interface
Length	m	3.0	3.0
Order information	Art. no.	128424	136577
Accessories		Connector disconnection prevention holder Q6HLD-R2	

Tracking Cable



Connection cable for redundant PLCs

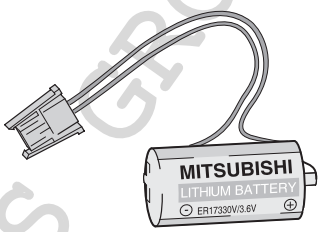
The tracking cable is used for connecting the two PLCs of a redundant system. For connection in a redundant system only the cables QC10TR and QC30TR can be used.

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		A6BAT
Voltage	V DC	3,0
Capacity	mAh	1800
Dimensions (Ø x H)	mm	Ø16 x 30
Order information	Art. no	130376

MICRO CONTROLLERS

Alpha

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.

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 four independent but compatible product ranges.

Depending on your application and control needs, you can choose from the small, attractively priced, "stand-alone" FX1S series, the expandable FX1N series or the more powerful FX2N and FX3U series.

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

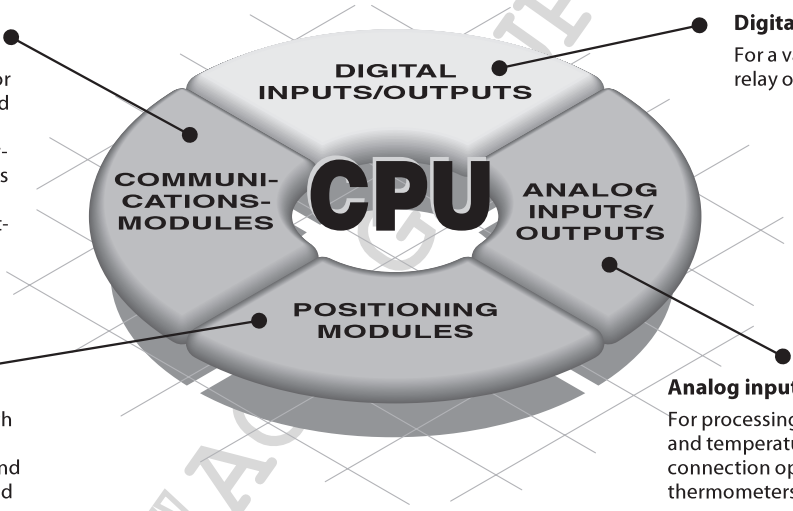
Network integration is also supported, making it possible for your FX controllers to communicate with other PLCs, controllers and HMIs.

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

Equipment Features

Communications modules

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



Digital input/output modules

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

Positioning modules

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

Analog input/output modules

For processing current/voltage signals and temperature registration with a direct connection option for Pt100 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.

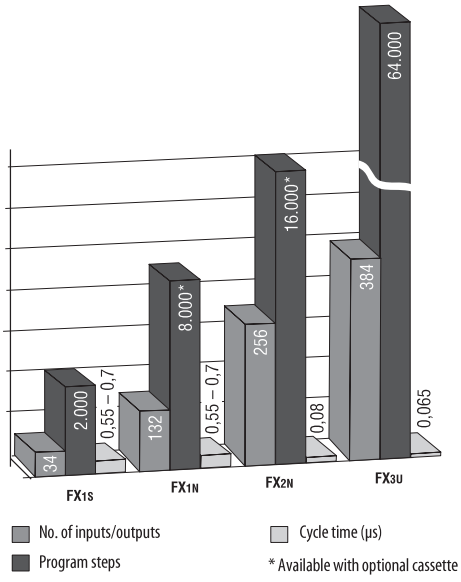
It is the ideal choice, no matter whether you need to install a simple control application requiring up to 34 I/Os (FX1S) or a demanding, complex system with up to 384 I/O points (FX3U).

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 four 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.



What Components Are Required for an FX PLC System?

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

Base units

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

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

Extension boards

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

Extension I/O modules

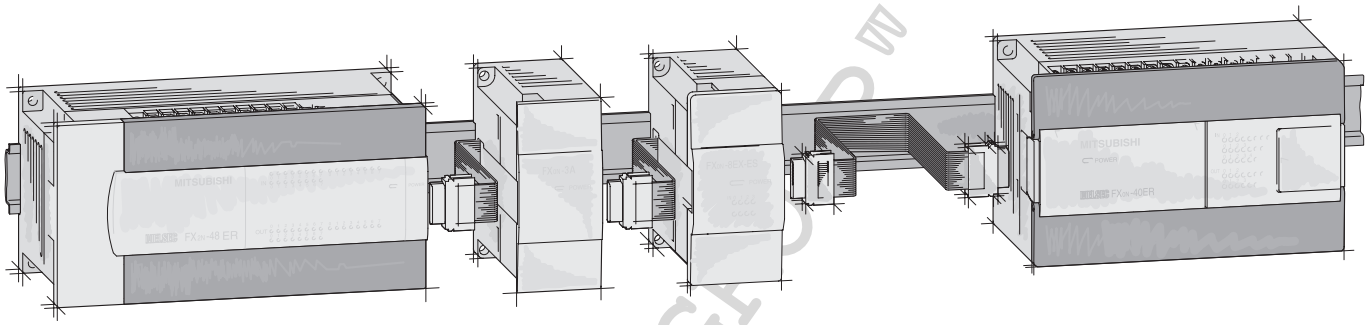
Unpowered and powered extension I/O modules can be added to the FX1N/FX2N and FX3U PLCs. For expansion modules powered by the base unit, the power consumption has to be calculated as the 5 V DC bus can only support a limited number of expansion I/O (for further details please refer to next page – calculation of the power consumption).

Special function modules

A wide variety of special function modules are available for the FX1N, FX2N and FX3U PLCs. They cover networking functionality, analog control, pulse train outputs and temperature inputs.

Peripherals

Each FX PLC has options for memory cassettes, hand held programming units as well as connection to HMI and GOT interfaces.



Expansion possibilities		ALPHA 2	FX1S	FX1N	FX2N	FX3U
Extensions for inside PLC installation	Digital	●	●	●	●	●
	Analog	●	●	●	●	●
Extension modules (installation outside the PLC)	Digital	—	—	●	●	●
	Analog	—	—	●	●	●
	Temperature	●	—	●	●	●
Network modules	AS-Interface	●	—	●	●	●
	Ethernet	—	●	●	●	●
	CC-Link	—	—	●	●	●
	CAN open	—	—	●	●	●
	Profibus/DP	—	—	●	●	●
	DeviceNet	—	—	—	●	●
	Modbus RTU/ASCII	—	—	—	—	●
	SSCNET	—	—	—	—	●
Communications boards	RS232	●	●	●	●	●
	RS422	—	●	●	●	●
	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
FX2N-16/32M□-ES(ESS)	290 mA	250 mA
FX2N-48–128M□-ES(ESS)	290 mA	460 mA
FX2N-32E□-ES(ESS)	690 mA	250 mA
FX2N-48E□-ES(ESS)	690 mA	460 mA
FX3U-16/32M□-ES(ESS)	500 mA	400 mA
FX3U-48–128M□-ES(ESS)	500 mA	600 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 is possible.

Max. residual current values (in mA) for FX2N-16M□-E□□ through FX2N-32M□-E□□, FX2N-32E□-E□□ for the permissible configuration

Number of additional outputs	Number of additional inputs				
	0	8	16	24	32
24	25				
16	100	50	0		
8	175	125	75	25	
0	250	200	150	100	50

Max. residual current values (in mA) for FX2N-48M□-E□□ through FX2N-128M□-E□□, FX2N-48E□-E□□ for the permissible configuration

Number of additional outputs	Number of additional inputs								
	0	8	16	24	32	40	48	56	64
48	10								
40	85	35							
32	160	110	60	10					
24	235	185	135	85	35				
16	310	260	210	160	110	60	10		
8	385	335	285	235	185	135	85	35	
0	460	410	360	310	260	210	160	110	60

Special function modules have to be supplied externally, if the residual current for the service voltage is not satisfying.

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.

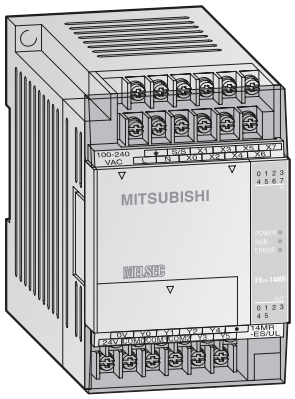
Module	No.	24 V DC calculation		5 V DC calculation	
		Current / module	Calculation	Current / module	Total current
FX2N-80MR-ES	1	460 mA	+460 mA	+290 mA	+290 mA
FX2N-4AD	3	50 mA	-150 mA	30 mA	-90 mA
FX2N-4DA	2	200 mA	-400 mA	30 mA	-60 mA
FX2N-232IF	1	80 mA	-80 mA	40 mA	-40 mA
			-170 mA !!!		**290 – 190 mA**
				Result:	**100 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*	Total current*	Current / module	Total current
FX2N-48MR-ES/UL	1	24	24	—	X = 8 Y = 24 →	+185 mA	290 mA	+290 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
FX0N-3A	1	—	—	8		-90 mA	30 mA	-30 mA
						+95 mA (OK!)		**+260 mA (OK!)**
FX2N-32ER-ES/UL	1	16	16	—	X = 16 Y = 0 →	+150 mA	690 mA	+690 mA
FX2N-16EX-ES/UL	1	16	—	—			—	0 mA
FX2N-4AD	1	—	—	8		50 mA	30 mA	-30 mA
FX2N-1HC	1	—	—	8		0 mA	90 mA	-90 mA
	Result:	**64 + 64 + 24 = 152 ! (< 256) OK!**				**+100 mA (OK!)**		**+570 mA (OK!)**

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

FX1S Series



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

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

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

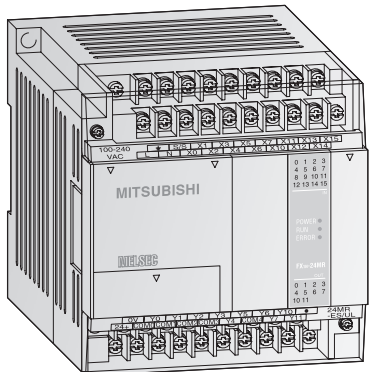
Base Units with 10 – 14 I/Os

Specifications		FX1S-10 MR-DS	FX1S-10 MR-ES/UL	FX1S-10 MT-DSS	FX1S-14 MR-DS	FX1S-14 MR-ES/UL	FX1S-14 MT-DSS
Max. number inputs/outputs		10	10	10	14	14	14
Power supply		24 V DC	100–240 V AC	24 V DC	24 V DC	100–240 V AC	24 V DC
Integrated inputs		6	6	6	8	8	8
Integrated outputs		4	4	4	6	6	6
Output type		Relay	Relay	Transistor (source)	Relay	Relay	Transistor (source)
Power consumption	W	6	19	6	6.5	19	6.5
Dimensions (W x H x D)	mm	60 x 90 x 49	60 x 90 x 75	60 x 90 x 49	60 x 90 x 49	60 x 90 x 75	60 x 90 x 49
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
Dimensions (W x H x D)	mm	75 x 90 x 49	75 x 90 x 75	75 x 90 x 49	100 x 90 x 49	100 x 90 x 75	100 x 90 x 49
Order information	Art. no.	141251	141252	141254	141255	141256	141257

FX1N Series



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

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

- Integrated serial interface for communication between Personal computers and HMI
- Standard programming unit interface
- LEDs for indicating the input and output status
- Detachable terminal blocks for units with 14, 24, 40, and 60 I/Os.
- Slot for memory cassettes
- All DC models with variable voltage from 12 up to 24 V
- Integrated real-time clock
- Exchangeable interface and I/O adapter boards for direct fitting into the base unit

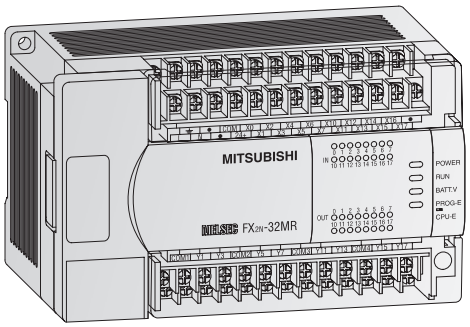
Base Units with 14 – 24 I/Os

Specifications		FX1N-14 MR-DS	FX1N-14 MR-ES/UL	FX1N-14 MT-DSS	FX1N-24 MR-DS	FX1N-24 MR-ES/UL	FX1N-24 MT-DSS
Integrated inputs/outputs		14	14	14	24	24	24
Power supply		12–24 V	100–240 V	12–24 V	12–24 V	100–240 V	12–24 V
Integrated inputs		8	8	8	14	14	14
Integrated outputs		6	6	6	10	10	10
Output type		Relay	Relay	Transistor (source)	Relay	Relay	Transistor (source)
Power consumption	W	13	29	13	15	30	15
Dimensions (W x H x D)	mm	90 x 90 x 75	90 x 90 x 75	90 x 90 x 75	90 x 90 x 75	90 x 90 x 75	90 x 90 x 75
Order information	Art. no.	141254	141259	141260	141261	141262	141263

Base Units with 40 – 60 I/Os

Specifications		FX1N-40 MR-DS	FX1N-40 MR-ES/UL	FX1N-40 MT-DSS	FX1N-60 MR-DS	FX1N-60 MR-ES/UL	FX1N-60 MT-DSS
Integrated inputs/outputs		40	40	40	60	60	60
Power supply		12–24 V DC	100–240 V AC	12–24 V DC	12–24 V DC	100–240 V AC	12–24 V DC
Integrated inputs		24	24	24	36	36	36
Integrated outputs		16	16	16	24	24	24
Output type		Relay	Relay	Transistor (source)	Relay	Relay	Transistor (source)
Power consumption	W	18	32	18	20	35	20
Dimensions (W x H x D)	mm	130 x 90 x 75	130 x 90 x 75	130 x 90 x 75	175 x 90 x 75	175 x 90 x 75	175 x 90 x 75
Order information	Art. no.	141264	141265	141266	141267	141268	141269

FX2N Series



The FX2N series base units are available with 16, 32, 48, 64, 80 or 128 input/output points (expandable to 256 I/O).

It is possible to choose between relay and transistor output type.
Triac output types for 110 V AC for sink/source are also available.

- Exchangeable interface modules for direct mounting into a base unit
- Standard programming unit interface
- LEDs for indicating the input and output status
- Detachable terminal blocks (except for 16 I/O base units)
- Slot for memory cassettes for up to 16 k steps PLC program
- Integrated real-time clock

Base Units with 16 – 128 I/Os

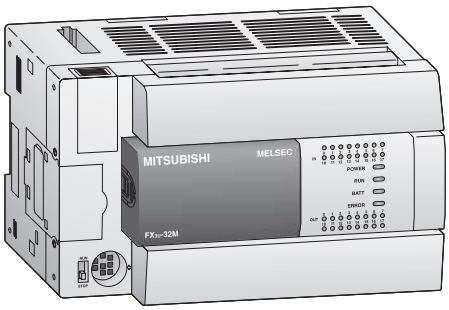
Specifications		FX2N-16 MR-DS	FX2N-32 MR-DS	FX2N-48 MR-DS	FX2N-64 MR-DS	FX2N-80 MR-DS
Integrated inputs/outputs		16	32	48	64	80
Power supply		24 V DC	24 V DC	24 V DC	24 V DC	24 V DC
Integrated inputs		8	16	24	32	40
Integrated outputs		8	16	24	32	40
Output type		Relay	Relay	Relay	Relay	Relay
Power consumption		20 W	25 W	30 W	35 W	40 W
Weight	kg	0.6	0.65	0.85	1.0	1.2
Dimensions (W x H x D)	mm	130 x 90 x 87	150 x 90 x 87	182 x 90 x 87	220 x 90 x 87	285 x 90 x 87
Order information	Art. no.	141270	141273	141277	141281	141286

Specifications		FX2N-16 MT-DSS	FX2N-32 MT-DSS	FX2N-48 MT-DSS	FX2N-64 MT-DSS	FX2N-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		20 W	25 W	30 W	35 W	40 W
Weight	kg	0.6	0.65	0.85	1.0	1.2
Dimensions (W x H x D)	mm	130 x 90 x 87	150 x 90 x 87	182 x 90 x 87	220 x 90 x 87	285 x 90 x 87
Order information	Art. no.	103689	141275	141279	141283	141288

Specifications		FX2N-16 MR-ES/UL	FX2N-32 MR-ES/UL	FX2N-48 MR-ES/UL	FX2N-64 MR-ES/UL	FX2N-80 MR-ES/UL	FX2N-128 MR-ES/UL
Integrated inputs/outputs		16	32	48	64	80	128
Power supply		100–240 V AC	100–240 V AC	100–240 V AC	100–240 V AC	100–240 V AC	100–240 V AC
Integrated inputs		8	16	24	32	40	64
Integrated outputs		8	16	24	32	40	64
Output type		Relay	Relay	Relay	Relay	Relay	Relay
Power consumption		30 VA	40 VA	50 VA	60 VA	70 VA	100 VA
Weight	kg	0.6	0.65	0.85	1.0	1.2	1.8
Dimensions (W x H x D)	mm	130 x 90 x 87	150 x 90 x 87	182 x 90 x 87	220 x 90 x 87	285 x 90 x 87	350 x 90 x 87
Order information	Art. no.	141271	141274	141278	141282	141287	141290

Specifications		FX2N-16 MT-ESS/UL	FX2N-32 MT-ESS/UL	FX2N-48 MT-ESS/UL	FX2N-64 MT-ESS/UL	FX2N-80 MT-ESS/UL	FX2N-128 MT-ESS/UL
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		30 VA	40 VA	50 VA	60 VA	70 VA	100 VA
Weight	kg	0.6	0.65	0.85	1.0	1.2	1.8
Dimensions (W x H x D)	mm	130 x 90 x 87	150 x 90 x 87	182 x 90 x 87	220 x 90 x 87	285 x 90 x 87	350 x 90 x 87
Order information	Art. no.	141272	141276	141280	141284	141289	141292

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.

- Exchangeable interface modules for direct mounting into a base unit
- Standard programming unit interface
- LEDs for indicating the input and output status
- Slot for memory cassettes for up to 64 k steps PLC program
- Integrated real-time clock
- High speed adapter bus for quicker and simpler access to special function adapters

Base Units with 16 – 128 I/Os

Specifications		FX3U-16 MR/ES	FX3U-32 MR/ES	FX3U-48 MR/ES	FX3U-64 MR/ES	FX3U-80 MR/ES	FX3U-128 MR/ES
Integrated inputs/outputs		16	32	48	64	80	128
Power supply		100–240 V AC	100–240 V AC	100–240 V AC	100–240 V AC	100–240 V AC	100–240 V AC
Integrated inputs		8	16	24	32	40	64
Integrated outputs		8	16	24	32	40	64
Output type		Relay	Relay	Relay	Relay	Relay	Relay
Power consumption	W	30	35	40	45	50	65
Weight	kg	0.6	0.65	0.85	1.0	1.2	1.8
Dimensions (W x H x D)	mm	130 x 90 x 86	150 x 90 x 86	182 x 90 x 86	220 x 90 x 86	285 x 90 x 86	350 x 90 x 86
Order information	Art. no.	206136	206137	206138	20139	206140	206141

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 (W x H x D)	mm	130 x 90 x 86	150 x 90 x 86	182 x 90 x 86	220 x 90 x 86	285 x 90 x 86	350 x 90 x 86
Order information	Art. no.	206168	206169	206170	206171	20672	206173

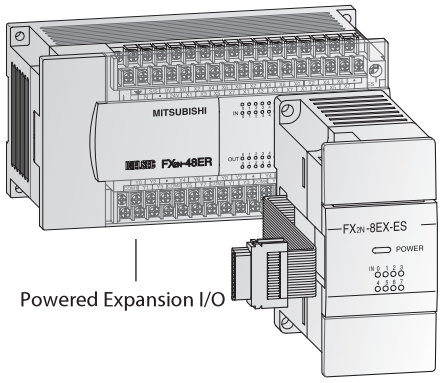
Specifications		FX3U-16 MR/DS	FX3U-32 MR/DS	FX3U-48 MR/DS	FX3U-64 MR/DS	FX3U-80 MR/DS
Integrated inputs/outputs		16	32	48	64	80
Power supply		24 V DC	24 V DC	24 V DC	24 V DC	24 V DC
Integrated inputs		8	16	24	32	40
Integrated outputs		8	16	24	32	40
Output type		Relay	Relay	Relay	Relay	Relay
Power consumption	W	25	30	35	40	45
Weight	kg	0.6	0.65	0.85	1.0	1.2
Dimensions (W x H x D)	mm	130 x 90 x 86	150 x 90 x 86	182 x 90 x 86	220 x 90 x 86	285 x 90 x 86
Order information	Art. no.	206174	206175	206176	206177	206178

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 (W x H x D)	mm	130 x 90 x 86	150 x 90 x 86	182 x 90 x 86	220 x 90 x 86	285 x 90 x 86
Order information	Art. no.	206184	206185	206186	206187	206188

FX Expandability and Functionality

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

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

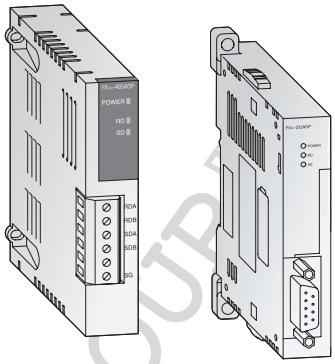


Various unpowered and powered extension units are available for extending the FX1N/FX2N and FX3U base units.

The unpowered units contain only digital inputs/outputs and no separate power supply, while 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
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	—	Relay	Transistor (source)
Switching voltage (max.)			Generally for relay version: < 264 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
Dimensions (W x H x D)		mm	150 x 90 x 87	182 x 90 x 87	43 x 90 x 87	43 x 90 x 87	43 x 90 x 87	43 x 90 x 87	40 x 90 x 87	40 x 90 x 87	40 x 90 x 87
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.



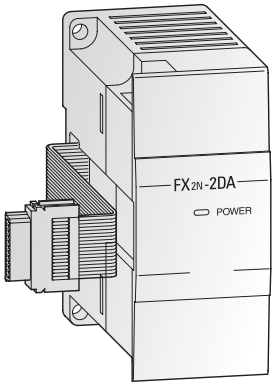
Active data modules (RS485 and RS232)

The addition of active data interface modules permit active communication between the PLC and surrounding devices. With RS232 communications this can include printers, bar code readers, PC's, PLCs etc. Information can be sent and received and is handled by the PLC program with the RS instruction. With RS485 communication can be configured as either 1:N multidrop, parallel link or peer to peer operation.

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

Specifications			FX2NC-232ADP	FX3U-232ADP-MB	FX2NC-485ADP	FX3U-485ADP-MB
Interface			RS232C with 9 pin D-SUB compact plug (photocoupler isolation)	Modbus RS232C	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 (W x H x D)		mm	19.1 x 90 x 83	17.6 x 90 (106) x 74	19.1 x 90 x 78	17.6 x 90 (106) x 74
Order information		Art. no.	149110	206190	149111	206191

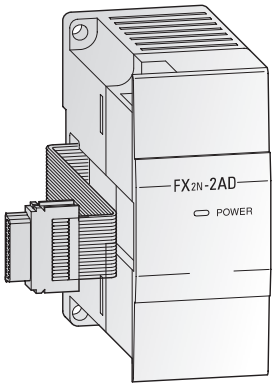
* Speed depends on communication method (Parallel link, N:N Network, No protocol, Dedicated protocol etc.)



Analog output modules

The analog output modules provide the user with 2 to 4 analog outputs. The modules convert digital values from the FX1N/FX2N/FX3U 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 – 1 %
Power supply	5 V DC		30 mA (from base unit)	30 mA (from base unit)	100 mA (from base unit)
	24 V DC		85 mA (from base unit)	200 mA	200 mA
Related I/O points			8	8	8
Dimensions (W x H x D)		mm	43 x 90 x 87	55 x 90 x 87	24.2 x 90 x 89
Order information		Art. no.	102868	65586	169509

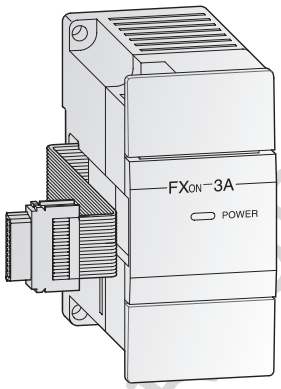


Analog input modules

The analog input modules provide the user with 2 to 8 analog inputs. The module converts analog process signals into digital values which are further processed by the MELSEC FX1N/FX2N/FX3U controller. The actual values or mean values over several measurements may be output.

Specifications			FX2N-2AD	FX2N-4AD	FX3U-4AD	FX2N-8AD
Analog channels	inputs		2	4	4	8
	outputs		—	—	—	—
Analog input range			0 – +10 V DC / 0 – +5 V DC / 0/ 4 – +20 mA	-10 – +10 V DC / -20 – +20 mA / 4 – +20 mA	-10 – +10 V DC / -20 – +20 mA / 4 – +20 mA	-10 – +10 V DC / -20 – +20 mA / 4 – +20 mA
Resolution	voltage		2.5mV, 1.25mV, 4 µA (12 bits)	5 mV (11 bit + sign)	0.32 mV (15 bit+sign)	0.63 mV (14 bit + sign)
	current			20 µA (10 bit + sign)	1.25 µA (14 bit+sign)	2.5 µA (13 bit + sign)
Fullscale overall accuracy			±1 %	±1 %	±0.3 – 0.5 %	±0.3 – 0.5 %
Power supply	5 V DC		20 mA (from base unit)	30 mA (from base unit)	100 mA (from base unit)	50 mA (from base unit)
	24 V DC		50 mA (from base unit)	55 mA	200 mA	80 mA
Related I/O points			8	8	8	8
Dimensions (W x H x D)		mm	43 x 90 x 87	55 x 90 x 87	20.2 x 90 x 89	75 x 105 x 75
Order information		Art. no.	102869	65585	169508	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.

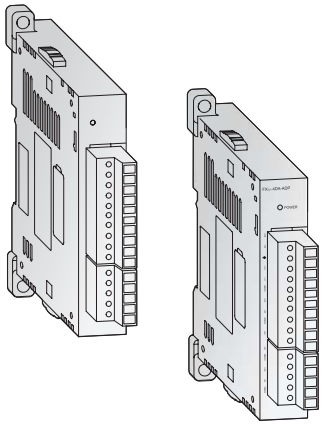


Combined analog I/O modules

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
Analog channels	inputs		2	4
	outputs		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)
	current		0/4 – +20 mA (8 bit)	-20 – +20 mA (14 bit + sign), 0/4 – +20 mA (14 bit)
Resolution (output)	voltage		0 – +10 V (8 bit), 0 – +5 V (8 bit)	-10 – +10 V (12 bit)
	current		4 – +20 mA (8 bit)	0/4 – +20 mA (10 bit)
Power supply	5 V DC		30 mA (from base unit)	70 mA (from base unit)
	24 V DC		90 mA (from base unit)	90 mA (from base unit)
Related I/O points			8	8
Dimensions (W x H x D)		mm	43 x 90 x 87	55 x 90 x 87
Order information		Art. no.	41790	153740



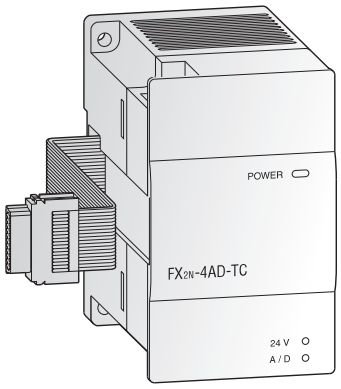
Analog I/O adapters

The FX3U-4AD-ADP adapter module for analog input is a special function adapter to add four analog input points to the FX3U 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 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 (W x H x D)		mm	17.6 x 90 (106) x 89.5	17.6 x 90 (106) x 89.5
Order information		Art. no.	165241	165271

*Dependent on the ambient temperature and signal quality



Analog temperature input modules

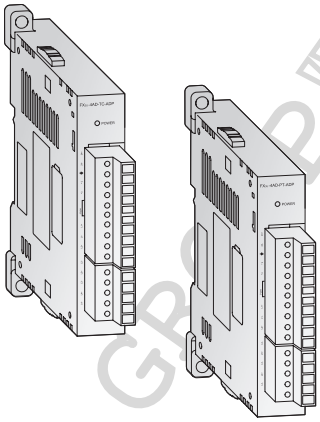
The analog input module for thermocouples FX2N-4AD-TC is used for processing temperatures. It has 4 independent inputs for detecting signals from thermocouples of types J and K. The type of thermocouple can be chosen independently for each point.

The analog input module for Pt100 inputs FX2N-4AD-PT permits the connection of four Pt100 sensors to the FX2N/FX2NC/FX3U 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 points
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)	-1,000 – 6,000 (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 (W x H x D)		mm	55 x 90 x 87	55 x 90 x 87	55 x 90 x 87
Order information		Art. no.	65588	65587	129196

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.



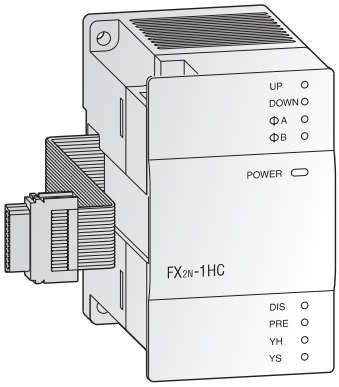
Analog temperature input adapters

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 analog input adapter module for Pt100 inputs FX3U-4AD-PT-ADP permits the connection of four Pt100 sensors to the FX3U series controller.

Specifications			FX3U-4AD-TC-ADP	FX3U-4AD-PT-ADP
Analog inputs			4 (J or K type)	4 (Pt100 sensors)
Compensated temperature range		°C	-100 – +600 (J type) / -100 – +1000 (K type)	-50 – +250
Digital outputs			-1000 – +6000 (J type) / -1000 – +10000 (K type)	-500 – +2500
Resolution		°C	0.3 (J type) / 0.4 (K type)	0.1
Total accuracy			±0.5 % fullscale	±0.5 – 1.0 % fullscale*
Power supply	5 V DC		15 mA (from base unit)	15 mA (from base unit)
	24 V DC		45 mA	50 mA
Related I/O points			0	0
Dimensions (W x H x D)		mm	17.6 x 90 (106) x 89.5	17.6 x 90 (106) x 89.5
Order information		Art. no.	165273	165272

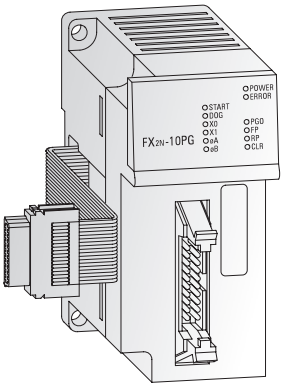
*Dependent on the ambient temperature



High speed counter and pulse train modules

These high speed modules provide additional counting and pulse train output features to the 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 adapter (ADP) module. The FX3U pulse train output module can provide pulse streams up to 200 kHz for use in basic positioning applications.

Specifications			FX2N-1HC	FX3U-4HSX-ADP	FX3U-2HSY-ADP
Signal level			5, 12, 24 V DC / 7 mA	5 V DC	Differential line driver
Counter	inputs		2 (1 phase) or 1 (2 phase)	4	—
	outputs		—	—	2
Max. frequency	inputs	kHz	50	100/200	—
	outputs	kHz	—	—	200
Counting range (Up/down & ring counter)		16 bit	0–65535	—	—
		32 bit	-2147483648 – +2147483647	—	—
Output			5 – 24 V DC; 0.5 A	—	less than 25 mA
Power supply	5 V DC		90 mA (from base unit)	30 mA (from base unit)	30 mA (from base unit)
	24 V DC		—	30 mA (from base unit)	60 mA (from base unit)
Related I/O points			8	0	0
Dimensions (W x H x D)		mm	55 x 90 x 87	17.6 x 90 (106) x 89.5	17.6 x 90 (106) x 89.5
Order information		Art. no.	65584	165274	165275



Positioning modules

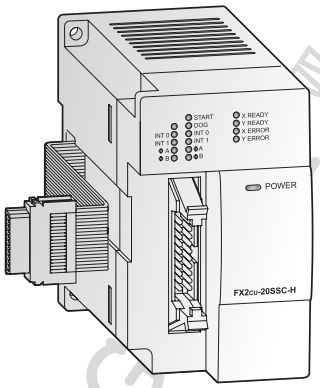
The positioning modules FX2N-1PG-E and FX2N-10PG are extremely efficient single-axis positioningmodules for controlling either step drives or servo drives (by external regulator) with a pulse chain.It is very suitable for achieving accurate positioning in combination with the MELSEC FX series.

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.

- Possibility of absolute or relative positioning
- 7 different operation functions,such as jog mode,zeroing,variable speeds,etc.
- Separate programming units and operator panels are not required.
- The speed increase or decrease can be set either automatically or manually.

Specifications		FX2N-1PG-E	FX2N-10PG
Accessible axes		1	1
Output frequency	pulse/s	10 – 100 000	1 – 1 000 000
Signal level for digital inputs		24 V DC / 40 mA	5 V DC / 100 mA; 24 V DC / 70 mA
Power supply	5 V DC	55 mA (from base unit)	120 mA (from base unit)
	24 V DC	—	—
Related I/O points		8	8
Dimensions (W x H x D)	mm	43 x 90 x 87	43 x 90 x 87
Order information	Art. no.	65583	140113



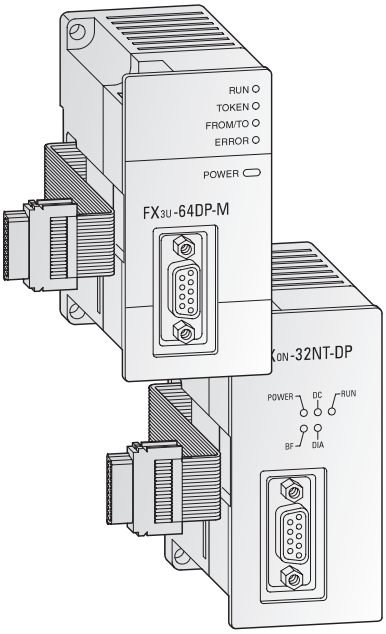
SSCNET III module FX3U-20SSC-H

The SSCNET module FX3U-20SSC-H can be used in combination with a FX3U 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 base unit and a personal computer. For parameter setting, monitoring and testing the easy programming software FX Configurator-FP is available.

Specifications		FX3U-20SSC-H
Accessible axes		2 (independent or interpolation) via SSCNET III (servo bus)
Output frequency		1 Hz to 50 MHz
Communications speed		50 Mbps
Starting time	ms	1.6 (+1.7 SSCNET cycle time)
Max. to PLC connectable modules		Up to 8 can be connected to the FX3U PLC
Power supply	5 V DC	100 mA
	24 V DC	—
Related I/O points		8
Dimensions (W x H x D)	mm	55 x 90 x 87
Order information	Art. no.	206189

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



Master and slave modules for PROFIBUS/DP

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

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

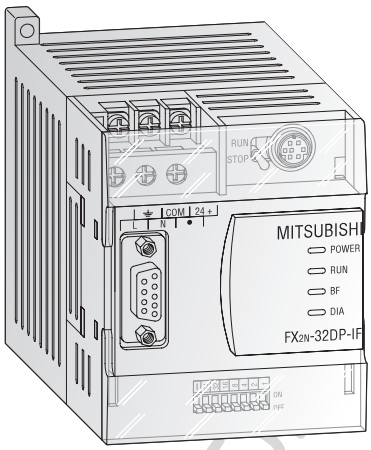
The FX3U Profibus/DP master supplys comprehensive data and alarm processing to the Profibus/DP V1 standard. It is easily set up with the GX Configurator-DP software.

The FX0N-32NT-DP and FX3U-32DP are PROFIBUS/DP slave modules that make it possible to integrate a MELSEC FX1N/FX2N/FX2NC or FX3U in an existing PROFIBUS/DP network.*

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

Specifications			FX3U-64DP-M	FX3U-32DP	FX0N-32NT-DP
Module type			Master	Slave	Slave
Transmission type			Bus network		
Transmission data			32 byte/slave (normal service mode) 244 byte/slave (extended service mode)		
Interface			PROFIBUS/DP (with 9 pole D-SUB connector)		
Max. number of master per configuration			1	—	—
Repeaters			3	—	—
Max. number of slaves			64	—	—
Communications speed			PROFIBUS standard		
Communications distance		m	Max. 1,200 (depends on communication speed)		
Communication cable			PROFIBUS cable with 9-pin D-SUB connector		
Power supply	5 V DC		—	—	Max. 170 mA (from base unit)
	24 V DC		Max. 155 mA (from base unit)	145 mA (from base unit)	60 mA
Related I/O points			8	8	8
Dimensions (W x H x D)		mm	43 x 90 x 87	43 x 90 x 87	43 x 90 x 87
Order information		Art. no.	166085	194214	62125

*Note: The FX3U-64DP-M and FX3U-32DP can only be used in combination with a FX3U series base unit.



Remote I/O Station FX2N-32DP-IF

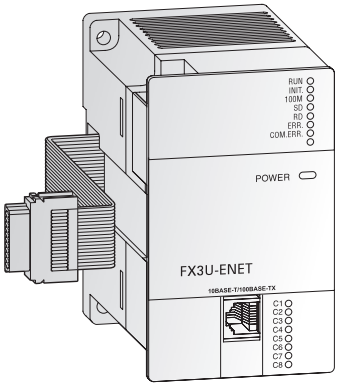
The remote I/O station FX2N-32DP-IF forms an extremely compact communication unit and provides a connection of I/O modules with up to 256 I/O points which can include up to 8 special function modules.

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-20P-E. 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-20P-E	
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 (W x H x D)		mm	75 x 98 x 87	
Order information		Art. no.	103705	142763



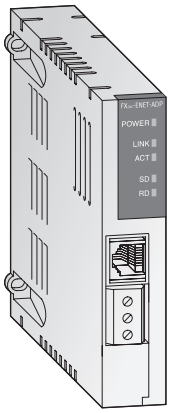
Network Module for Ethernet

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

With the Ethernet module installed an 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. It is easily set-up with the FX Configurator-EN software.

Specifications		FX3U-ENET
Protocol		TCP/IP, UDP
Communication mode		Full-duplex / half-duplex
No. of simultaneous open connections		8
Fixed buffer communication		1023 word x 8
Communication with mail server		SMTP, POP3
Interface		IEEE802.3u (100BaseTX), IEEE802.3 (10BaseT)
Connector		RJ45
Max. transfer rate		100 Mbits/s, 10 Mbit/s
Max. segment length	m	100
Cable		CAT5 STP or 3 STP
Power supply		24 V DC / 240 mA (from base unit)
Related I/O points		8
Dimensions (W x H x D)	mm	55 x 90 x 87
Order information	Art. no.	166086



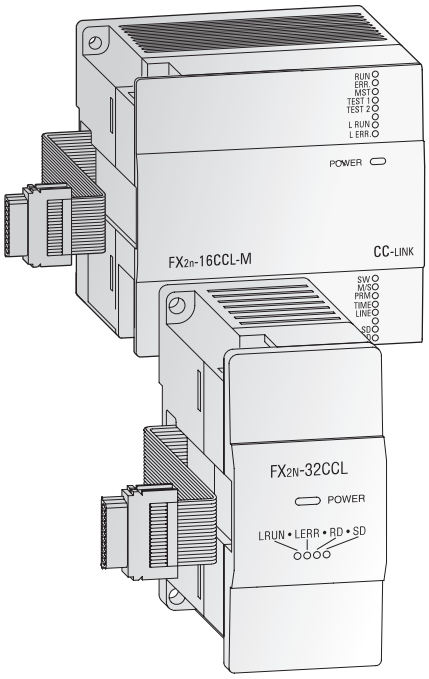
Ethernet Communications Adapter FX2NC-ENET-ADP

The FX2NC-ENET-ADP communications adapter is an Ethernet interface with 10BASE-T specifications for the FX1S, FX1N and FX2N series.

The FX2NC-ENET-ADP enables upload, download, monitor and test sequence of programs via Ethernet from a personal computer (GX Developer or MX Component and the virtual COM port driver installed).

Specifications		FX2NC-ENET-ADP
Protocol		TCP/IP
No. of simultaneous open connections		1
Interface		IEEE802.3u (100BaseTX), IEEE802.3 (10BaseT)
Connector		RJ45 (to Ethernet), 3 screw terminals (to ground)
Max. transfer rate		10 Mbit/s
Cable		CAT5 STP or 3 STP
Power supply	5 V DC	135 mA (from base unit)
	24 V DC	—
Related I/O points		0
Dimensions (W x H x D)	mm	19.1 x 90 x 78
Order information	Art. no.	157447

Note: When connecting this adapter module to a FX1S or FX1N PLC the communications adapter FX1N-CNV-BD is required. When connecting this adapter module to a FX2N PLC the communications adapter FX2N-CNV-BD is required.



CC-Link Master and Slave Modules

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

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

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

Up to 15 remote stations and remote device stations can be connected to the master station as decentralized I/O stations. These remote stations can be up to 7 I/O modules and up to 8 intelligent modules. 2 master modules can be connected to one FX1N or FX2N base unit.

The maximum communications distance is 1200 m without repeater.

The communication module FX2N-32CCL enables the user to connect the FX PLC as a slave on an existent CC-Link network.

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

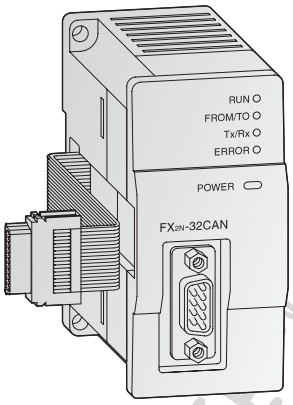
The FX2N-32CCL can be used by FX0N, FX1N, FX2N and FX3U PLCs.

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

Specifications		FX2N-16CCL-M	FX2N-32CCL
Module type		Master station	Remote station
Link points per station	I/O points	32	32
	register	8	8
Max. number of I/O points		128 (with FX1N PLC), 256 (with FX2N PLC), 384 (with FX3U PLC)*	—
Number of connectable modules		Max. 15	—
Power supply	5 V DC	—	Max. 130 mA (from base unit)
	24 V DC	150 mA	50 mA
Related I/O points		8	8
Dimensions (W x H x D)		85 x 90 x 87	43 x 90 x 87
Order information	Art. no.	133596	102961

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

*Including I/O points in PLC and network.



Network Module for CANopen

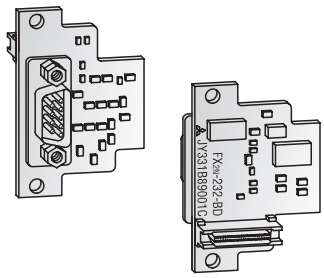
The FX2N-32CAN communications module makes it possible to connect an FX1N, FX2N or FX3U PLC to an existing CANopen network.

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

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

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

Specifications		FX2N-32CAN
Module type		CANopen master
CAN standard		ISO 11898/1993
CANopen standard by CiA		DS-301 version 3.0
Additional CANopen features		NMT, Guarding, and Guarding request based on DS-302 V2.0. network variables based on DS-405 V1.0
Max. nbr. of modules that can be connected to the network		30 without repeater; 127 with repeater
Station numbers		1 – 127
Supported baud rate	kBaud	10, 20, 50, 125, 250, 500, 800, 1000
Power supply	5 V DC	290 mA
	24 V DC	—
Related I/O points		8
Dimensions (W x H x D)	mm	43 x 90 x 88.7
Order information	Art. no.	141179



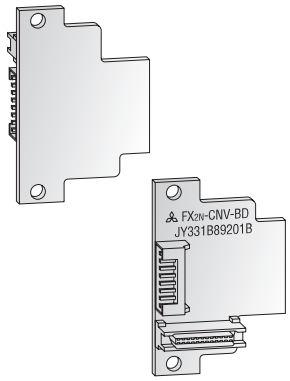
Interface adapters

The FX□□-232-BD interface adapters provide an RS232C interface for serial data communications with the MELSEC FX1S/FX1N/FX2N/FX3U.

The interface adapters FX□□-485-BD provide the controller 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 FX1S/FX1N/FX2N/FX3U systems.

Specifications		FX1N-232-BD	FX2N-232-BD	FX3U-232-BD
Applicable for		Base units FX1S/FX1N	Base units FX2N	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 (W x H x D)	mm	43 x 38.5 x 22	35 x 54 x 22	19.3 x 46.1 x 62.7
Order information	Art. no.	130743	65596	165281

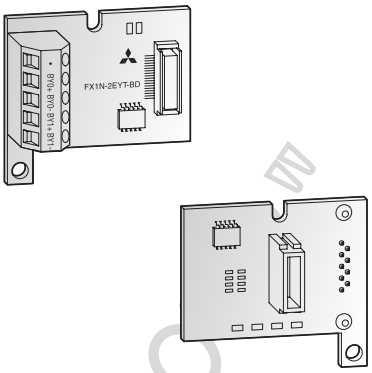
Specifications		FX1N-485-BD	FX2N-485-BD	FX3U-485-BD
Applicable for		Base units FX1S/FX1N	Base units FX2N	Base units FX3U
Interface		RS485 / RS422		
Power supply		5 V DC / 60 mA (from base unit)		5 V DC / 40 mA (from base unit)
Related I/O points		—	—	—
Dimensions (W x H x D)	mm	43 x 38.5 x 22	35 x 54 x 22	19.6 x 46.1 x 69
Order information	Art. no.	130742	65597	165283



Communications adapter

The FX□□-CNV-BD adapters enable connection of the FX□□-□□□ADP special function modules to the left-hand side of the FX□□ base units.

Specifications		FX1N-CNV-BD	FX2N-CNV-BD	FX3U-CNV-BD
Applicable for		Base units FX1S/FX1N	Base units FX2N	Base units FX3U
General specifications		Conforms to FX1N/FX2N base units		Conforms to FX3U base units
Power supply		Not necessary		
Related I/O points		0	0	0
Dimensions (W x H)	mm	43 x 38 x (D) 14	54 x 35	19.6 x 46.1 x 53.5
Order information	Art. no.	130745	65598	165285



Interface, extension and function adapter

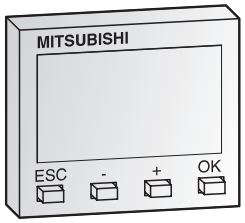
For the FX1S and FX1N PLCs several different interface,extension,and functions adapters are available for the direct installation in the controller.

Specifications		FX1N-4EX-BD	FX1N-2EYT-BD	FX1N-2AD-BD	FX1N-1DA-BD
Applicable for		Base units FX1S/FX1N	Base units FX1S/FX1N	Base units FX1S/FX1N	Base units FX1S/FX1N
Function	kg	4 digital inputs	2 transistor outputs	AD converter	DA converter
Dimensions (W x H x D)	mm	43 x 38.5 x 22	43 x 38.5 x 22	43 x 38.5 x 22	43 x 38.5 x 22
Order information	Art. no.	139418	139420	139421	139422

Power supply module

The power supply module FX3U-1PSU-5V is used to reinforce the built-in 5 V DC power supply of an AC powered FX3U main unit. Up to 2 FX3U-1PSU-5V can be used in one PLC System.

Specifications		FX3U-1PSU-5V
Applicable for		AC powered base units FX3U only
Input power		Rated voltage: 100 – 240 V AC 50/60 Hz , allowed voltage: 85 – 264 V AC, 50/60 Hz; max. 20 W
Output		5 V DC: 1 A at 40 °C (0,8 A at 55 °C); 24 V DC: 0.3 A at 40 °C (0,2 A at 55 °C);
Dimensions (W x H x D)	mm	55 x 90 x 87
Order information	Art. no.	169507

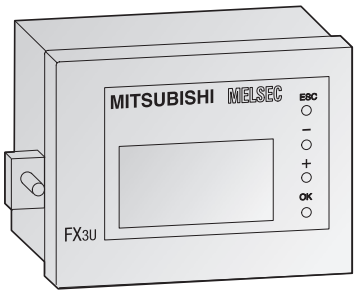


Display module FX1N-5DM

The display module is inserted directly into the FX1S and FX1N series controllers and enables monitoring and editing of the data stored in the PLC.

The display module e.g. can be used instead of digital switches and external 7-segment displays in very confined areas.

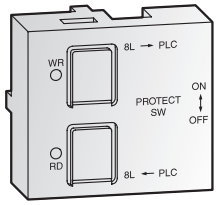
Specifications		FX1N-5DM
Applicable for		Base units FX1S/FX1N
Display		LCD (with backlight)
Power supply		5 V DC ±5 % (from base unit)
Current consumption	mA	110
Dimensions (W x H x D)	mm	40 x 32 x 17
Order information	Art. no.	129197



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

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

Specifications		FX3U-7DM	FX3U-7DM-HLD
Applicable for		Base units FX3U	Base units FX3U
Display		16 letters x 4 lines	—
Resolution		—	—
Power supply		5 V DC (from base unit)	—
Current consumption	mA	20	—
Extension cable		—	Included
Dimensions (W x H x D)	mm	48 x 35 x 11.5	66.3 x 41.8 x 13
Order information	Art. no.	165268	165287

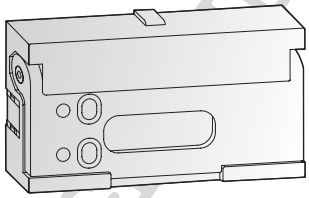


Memory cassettes for FX1S, FX1N and FX2N

All FX1S, FX1N and FX2N 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 FX2N-ROM-E1 memory module simplifies the direct communication between the FX2N and the Mitsubishi Electric frequency inverters of the series FR-S500, FR-E500 and FR-A500. The FX2N-ROM-E1 technically corresponds to the FX-EEPROM-16.

Specifications		FX-EEPROM-8	FX1N-EEPROM-8L	FX-EEPROM-16	FX2N-ROM-E1
Applicable for		Base units FX2N	Base units FX1S/FX1N	Base units FX2N	Base units FX2N
Memory type		EEPROM	EEPROM	EEPROM	EPROM
Size		8,000 steps	2,000/8,000 steps	16,000 steps	16,000 steps
Protect switch		Provided	Provided	Provided	Not provided
Data transfer buttons		Not provided	Provided	Not provided	Not provided
Order information	Art. no.	23826	130746	65600	141528



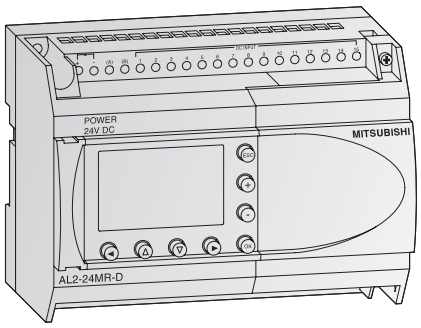
Memory cassettes for FX3U

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

The FX3U-FLROM-64L features additional data transfer buttons.

Specifications		FX3U-FLROM-16	FX3U-FLROM-64	FX3U-FLROM-64L
Applicable for		Base units FX3U	Base units FX3U	Base units FX3U
Number of steps		16,000	64,000	64,000
Memory type		Flash memory	Flash memory	Flash memory
Protect switch		Provided	Provided	Provided
Data transfer buttons		Not provided	Not provided	Provided
Dimensions (W x H x D)	mm	37 x 20 x 6.1	37 x 20 x 6.1	37 x 20 x 6.1
Order information	Art. no.	165278	165279	165280

The ALPHA 2 Series



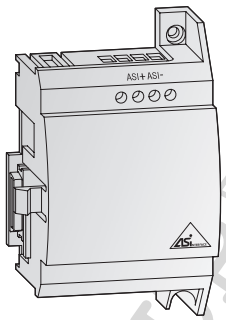
Alpha base units

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

- Expandable
- Analogue out
- GSM options
- Temperature input

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
Digital inputs		6	6	8	8	15	15
Analog inputs		—	6	—	8	—	8
Channels		—	6	—	8	—	8
Integrated outputs		4	4	6	6	9	9
Max. power consumption	W	4.9	4.0	5.5	7.5	7.0	9.0
Typ. power consumption All I/Os ON /OFF	W	3.5/1.85 240 V AC 3.0/1.55 120 V AC	2.5/0.75	4.5/2.0 240 V AC 3.5/1.5 120 V AC	4.0 / 1.0	5.5/2.5 240 V AC 4.5/2.0 120 V AC	5.0 / 1.0
Weight	kg	0.2	0.2	0.3	0.3	0.35	0.3
Dimensions (W x H x D)	mm	71.2 x 90 x 55	71.2 x 90 x 55	124.6 x 90 x 52	124.6 x 90 x 52	124.6 x 90 x 52	124.6 x 90 x 52
Order information	Art. no.	163515	163516	164867	164868	164869	164870
Accessories		Power supply ALPHA POWER 24-1.5 for DIN rail mounting, for DC supply of all 24 V DC modules, art. no.: 149046; IP40 mounting frame AL-FRAME-20-IP40, art. no.: 132333; IP54 mounting frame AL-FRAME-20-IP54, art. no.: 132337 for AL2-14/24 IP40 mounting frame AL-FRAME-6/10-IP40, art. no.: 132332; IP54 mounting frame AL-FRAME-6/10-IP54, art. no.: 132335 for AL2-10					



AS interface module AL2-ASI-BD

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

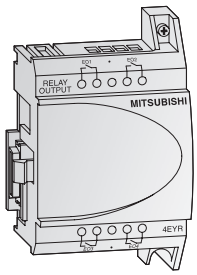
The addresses of the slave devices are assigned either automatically via the master in the network or via a programming device (software).

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

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

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

Specifications		AL2-ASI-BD
Module type		Slave module
Number of I/O points		4 inputs, 4 outputs
External power supply		30.5 V DC (AS interface power supply)
External current consumption	mA	Max. 40
Communications protocol		AS Interface standard
Weight	kg	0.05
Dimensions (W x H x D)	mm	53.1 x 90 x 24.5
Order information	Art. no.	142525



Digital extension modules

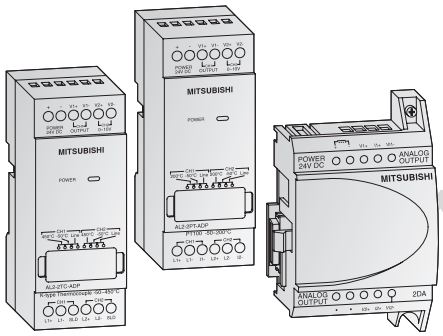
There are 4 different extension modules available for the ALPHA 2, which allow the controller to be extended through additional inputs or outputs. The modules are inserted directly into the ALPHA 2 and therefore do not take up any additional space.

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

All modules feature photocoupler isolation for all I/Os.

Digital extension modules specifications		AL2-4EX-A2	AL2-4EX	AL2-4EYR	AL2-4EYT
Inputs					
Integrated inputs		4	4	—	—
Input voltage		220–240 V AC	24 V DC (+20%, -15%)	—	—
Input current		7.5 mA at 240 V AC (50 Hz), 9.0 mA at 240 V AC (60 Hz)	5.4 mA ±1 mA at 24 V DC	—	—
Outputs					
Integrated outputs		—	—	4	4
Output type		—	—	Relay	Transistor
Switched voltage (max.)	V	—	—	250 V AC, 30 V DC	5–24 V DC
Rated current	A	—	—	2 A per output	1 A per output
Electrical specifications					
Power Supply	AC range (+10 %, -15 %)	220–240 V AC	24 V DC	100–240 V AC	24 V DC
Mechanical specifications					
Dimensions (W x H x D)	mm	53.1 x 90 x 24.5	53.1 x 90 x 24.5	53.1 x 90 x 24.5	53.1 x 90 x 24.5
Order information	Art. no.	142522	142521	142523	142524

Note: EI1 and EI2 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 digital extension 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 into the ALPHA 2.
- The AL2-2PT-ADP connects an external Pt100 sensor to convert temperature readings into analog signals (0 – 10 V).
- The AL2-2TC-ADP connects thermocouple sensors (K type) to convert temperature readings into analog signals (0 – 10 V).

Analog extension modules specifications		AL2-2DA	AL2-2PT-ADP	AL2-2TC-ADP
Analog inputs				
Integrated inputs		—	2	2
Connectable temperature sensors		—	Pt100 sensor Temp. coefficient 3.850 ppm/°C (IEC 751)	Thermocouple (K type), isolated type (IEC 584-1 1977, IEC 584-2 1982)
Compensated range		—	-50 – +200 °C	-50 – +450 °C
Analog outputs				
Integrated outputs		2	—	—
Analog output range	voltage	0 – 10 V DC (5 kΩ – 1 MΩ)	—	—
	current	4 – 20 mA (max. 500 Ω)	—	—
Electrical specifications				
Number of channels		2	2	2
Power Supply		24 V DC (-15 – +10 %), 70 mA	24 V DC (-15 – +20 %), 1 W	24 V DC (-15 – +20 %), 1 W
Mechanical specifications				
Dimensions (W x H x D)	mm	53.1 x 90 x 24.5	35.5 x 90 x 32.5	35.5 x 90 x 32.5
Order information	Art. no.	151235	151238	151239

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

HUMAN MACHINE INTERFACES

HMI Control Units Facilitate Communication Between Operator and Machine

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

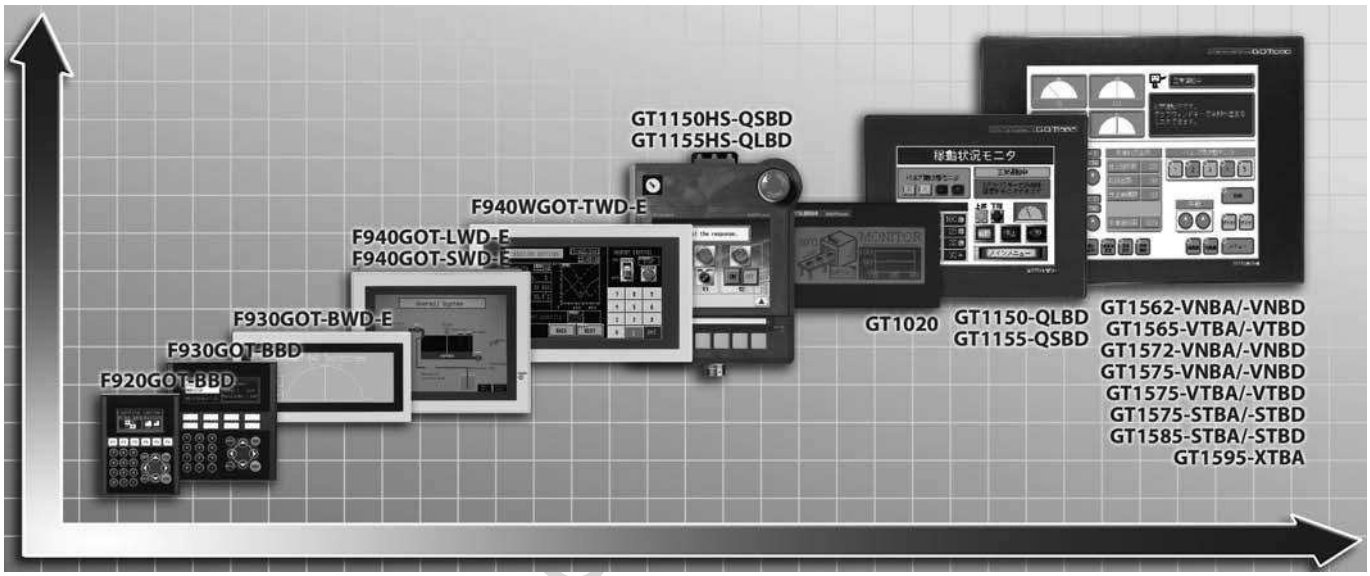
All the information required is at your fingertips, providing maximum transparency for all system processes and with an IP65 rating (IP67 for GOT1000) the HMIs can be used under heavy-duty conditions.

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

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

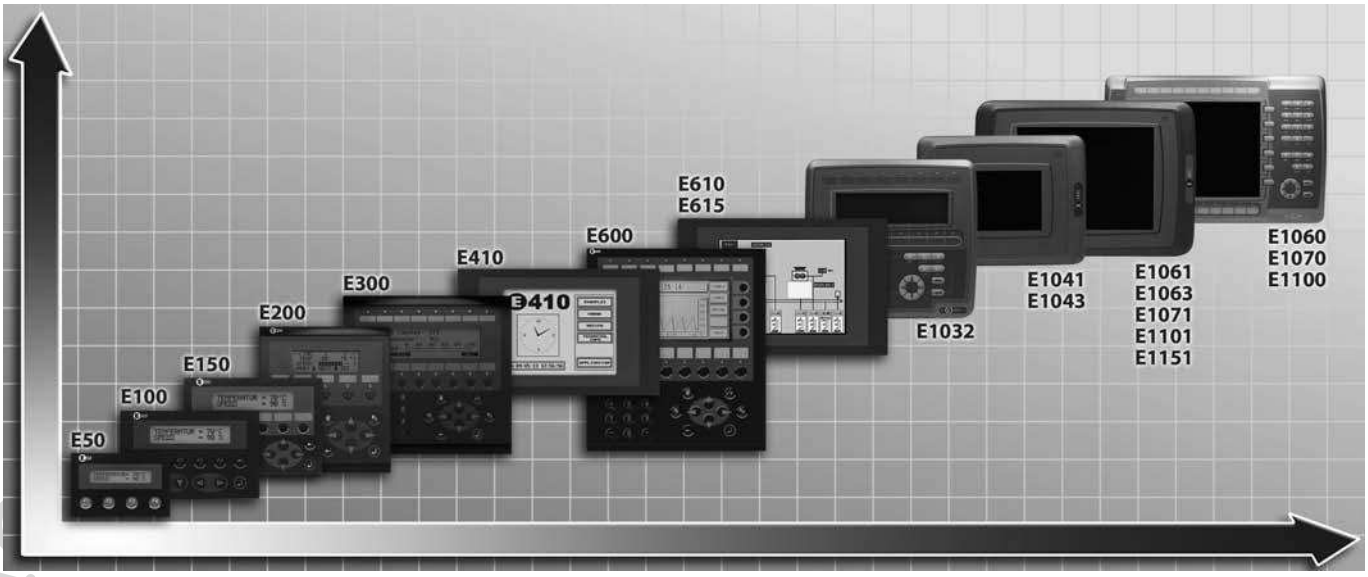
GOT Range

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



E Series Range

The E Series is a superb example of successful industrial design. Users can select between small easy text terminals and high-end touch terminals.



HMI Control Units for Human-Machine Communication

GOT series

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

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

- The high-resolution screens with 256 or even up to 65,536 colours can also display complex graphics
- Fast USB port on the front of the units with transparent mode to MELSEC Controllers, servo amplifiers and frequency inverters
- Compact Flash cards 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 for Ethernet, Melsecnet/10, CC-Link as well as additional RS232C and RS422
- 4-channel multidriver-concept

E series

The most important benefits for the E series include:

- user-friendly text
- control parameters
- data editing
- alarm handling
- recipes
- menu operation

and many more

The following interfaces are possible on E series HMI units

- RS422/RS232C/RS485 (optional)
- Profibus/DP (optional)
- Ethernet TCP/IP

Programming the E Series range of HMIs is done with the E Designer programming software on a PC running Windows 98 or above. For the GOTs, the programming software is GT Designer2, which runs on any standard Windows PC.

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

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

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

GOT series	F920GOT -BBD	F930GOT -BBD	F930GOT -BWD-E	F940GOT -LWD-E	F940GOT -SWD-E	F940GOT -LBD-H-E	F940GOT -SBD-H-E	F940WGOT -TWD-E	GT1020 -LBL/-LBD(2)	GT1150(HS) -QLBD	GT1155(HS) -QSBD
Text blocks	—	—	—	—	—	—	—	—	—	—	—
Touch screen	—	●	●	●	●	●	●	●	●	●	●
Graphic blocks	●	●	●	●	●	●	●	●	●	●	●
Colour display	●	●	—	—	●	—	●	●	—	—	●
3rd party connectivity	●	●	●	●	●	●	●	●	●	●	●
Network capability	—	—	—	—	—	—	—	—	—	—	—

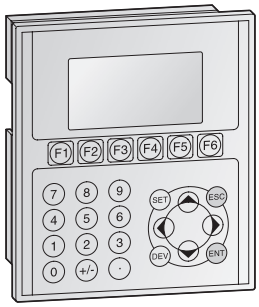
GOT series	GT1550-QLBD	GT1555 -QSBD/-QTBD	GT1562 -VNBA/-VNBD	GT1572 -VNBA/-VNBD	GT1575 -VNBA/-VNBD	GT1565 -VTBA/-VTBD	GT1575 -VTBA/-VTBD	GT1575(V) -STBA/-STBD	GT1585 -STBA/-STBD	GT1595 -XTBA
Text blocks	—	—	—	—	—	—	—	—	—	—
Touch screen	●	●	●	●	●	●	●	●	●	●
Graphic blocks	●	●	●	●	●	●	●	●	●	●
Colour display	—	●	●	●	●	●	●	●	●	●
3rd party connectivity	●	●	●	●	●	●	●	●	●	●
Network capability	○	○	○	○	○	○	○	○	○	○

E series	E50	E100	E150	E200	E300	E410	E600	E610	E615
Text blocks	●	●	●	●	●	●	●	●	●
Touch screen	—	—	—	—	—	●	—	●	●
Graphic blocks	—	—	—	—	●	●	●	●	●
Colour display	—	—	—	—	—	—	—	—	●
3rd party connectivity	●	●	●	●	●	●	●	●	●
Network capability	—	—	—	—	○	●	○	○	○

E series	E1032	E1041	E1043	E1060	E1061	E1063	E1070	E1071	E1100	E1101	E1151
Text blocks	●	—	—	—	—	—	—	—	—	—	—
Touch screen	—	●	●	—	●	●	—	●	—	●	●
Graphic blocks	●	●	●	●	●	●	●	●	●	●	●
Colour display	—	●	—	●	●	—	●	●	●	●	●
3rd party connectivity	●	●	●	●	●	●	●	●	●	●	●
Network capability	○	○	○	○	○	○	○	○	○	○	○

● = available ◯ = optional — = not available

F920GOT-BBD

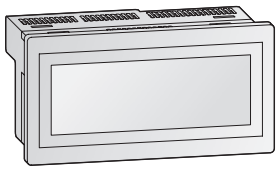


The F920GOT-BBD is a fully graphical 2-colour operation terminal. The combination of a numerical keypad plus definable function keys offers a high degree of functionality. The 128kB of flash memory ensures that all data is secured and saved in the case of power failure.

F930GOT-BBD

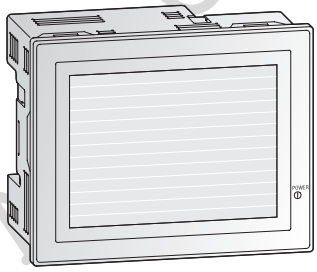
The F930GOT-BBD is a graphical 2-colour operation terminal. The combination of a numerical keypad plus definable function keys offers a high degree of functionality. The 256 kB of flash memory ensures that all data is secured and saved in the case of power failure. The F930GOT-BBD is equipped with an integrated touch display, for those who wish to combine the use of both a keyboard terminal with a touch-screen .

F930GOT-BWD-E



This entry-level F930GOT- BWD-E touch screen offers a simple monochrome graphical display in a compact housing. The combination of touch screen and IP65 design makes the unit easy to keep clean in environments that need a high level of hygiene or cleanliness. User screens can be created using a wide variety of graphical elements and stored in the onboard, 256 kB memory. Other special functions include alarm processing, recipe handling and data sampling.

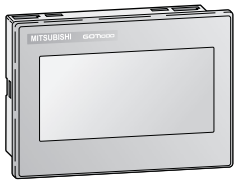
F940GOT-LWD-E/-SWD-E, F940WGOT-TWD-E



Building on the F930 specifications, the F940GOT-□WD-E features a doubling of screen size and resolution making the display crisp and easy to view. The F940GOT-SWD-E provides the additional benefit of a colour screen. The F940WGOT-TWD-E unit offers a bright, clear 256 colour TFT display which can be used in both a split screen configuration and in landscape or portrait mounting positions. The unit also boasts a further doubling of memory, over the standard F940, to 1MB.

Specifications		F920GOT-BBD	F930GOT-BBD	F930GOT-BWD-E	F940GOT-LWD-E / F940GOT-SWD-E	F940WGOT-TWD-E
Display unit	type	STN, 2-colours, backlit	LCD, 2-colours, backlit	STN, monochrome	LCD, monochrome / LCD, 8-colours	TFT, 256 colours, backlit
	dimensions (mm)	60 x 30	117 x 42	117 x 42	115 x 86 (5.7")	155.5 x 87.8
	text (lines x characters)	User definable	User definable	User definable	User definable	User definable
	character height (mm)	User definable	User definable	User definable	User definable	User definable
	graphical resolution (pixels)	128 x 64	240 x 80	240 x 80	320 x 240	480 x 234
Power supply		5 V DC	24 V DC	24 V DC	24 V DC	24 V DC
Internal memory capacity		128 kB	256 kB	256 kB	512 kB	1 MB
Memory card slot		—	—	—	—	—
Keyboard type		Membrane	Membrane/Touch-panel	Touch-panel	Touch-panel	Touch-panel
Function keys	internal	6 (user assignable) +numerical keyboard with 12 keys	6 (user assignable) + numerical keyboard with 12 keys	Touch keys (max. 50 keys/screen)	Touch keys (max. 50 keys/screen)	Touch keys (max. 50 keys/screen)
	external	—	—	—	—	—
LED indicators		—	8 (green)	—	1 (Power ON)	1 (Power ON)
Interfaces	serial	RS232C, RS422	RS232C, RS422	RS232C, RS422	RS232C, RS422	2 x RS232C, 1 x RS422
Interface slot for optional cards		1	1	1	1	—
Real-time clock		Integrated	Integrated	Integrated	Integrated	Integrated
Network communication possibilities	type	Serial	Serial	Serial	Serial	Serial
	max. no. of nodes	4	4	4	4	4
IP Rating (front panel)		IP65	IP65	IP65	IP65	IP65
Dimensions WxHxD (mm)		106 x 134 x 35.5	168 x 183 x 37.5	146 x 75 x 49	162 x 130 x 57	215 x 133 x 70.6
Weight (kg)		0.3	0.6	0.3	1.0	0.8
Order information	Art. no.	146508	146721	128789	113862 / 113841	136797
Accessories		Programming software (refer to page 5), cables and interface adapters (refer to page 69)				

GT1020

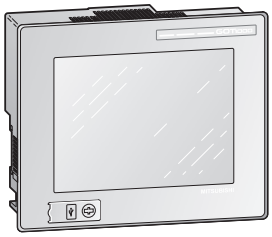


The new GT1020 series has a bright 3.7-inch STN black-and-white liquid crystal display with 3-color backlight for use in a variety of display applications.

Recipe management, alarming and messaging are included as standard. The unit has a built-in memory for up to 4000 16-bit data words which can be used to store or exchange data with a connected PLC.

The GT1020-LBD/-LBL have a RS422 and a RS232 port and the GT1020-LBD2 has a RS232 port only.

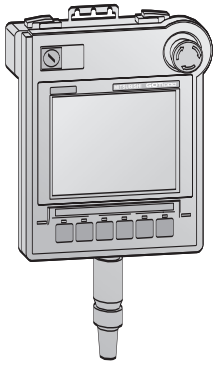
GT1150-QLBD, GT1155-QSBD



The GT11 panels GT1150-QLBD and GT1150HS-QLBD (16 colours) as well as the GT1155-QSBD and GT1155HS-QSBD (256 colours) are the standard models of the GOT1000 series and offer a full array of basic functions for stand-alone use.

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

GT1150HS-QLBD, GT1155HS-QSBD

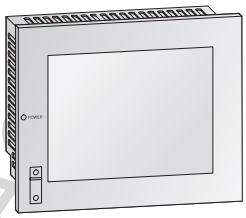


The GT1150HS-QLBD and GT1155HS-QSBD are handsome portable terminals that boast top level quality for medium sized terminals. They share the same functions as all GT11 series terminals.

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

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

GT1550-QLBD/GT1555-QSBD/ GT1555-QTBD



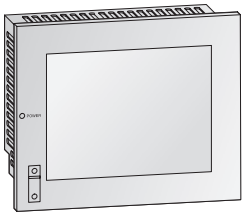
GT1550-QLBD, GT1555-QSBD and GT1555-QTBD have an exceptionally clear display options of 16 shades monochrome, 4096 colour and 65536 full-colour display respectively.

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

The panels can be mounted and used horizontally or vertically.

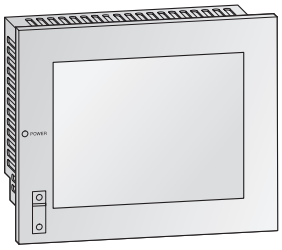
Specifications		GT1020-LBL /-LBD /-LBD2	GT1150-QLBD / GT1150HS-QLBD	GT1155-QSBD / GT1155HS-QSBD	GT1550-QLBD / GT1555-QSBD / GT1555-QTBD
Display unit	type	STN, monochrome	STN, 16 grayscales	STN, 256 colours	STN monochrome / STN 4096 colours / TFT, 65536 colours
	dimensions (mm)	86.4 x 34.5 (3.7")	115 x 86 (5.7")	115 x 86 (5.7")	115 x 86 (5.7")
	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)	160 x 64	320 x 240	320 x 240	320 x 240
Power supply		5 V DC / 24 V DC / 24 V DC	24 V DC	24 V DC	
Internal memory capacity		512 kB	3 MB	3 MB	9 MB
Memory card slot		—	1 (CF card)	1 (CF card)	1 (CF card)
Keyboard type		Touch-panel	Touch-panel	Touch-panel	Touch-panel
Function keys	internal	Touch keys	Touch keys	Touch keys	Touch keys (300 per screen)
	external	—	—	—	—
LED indicators		—	1 (Power ON)	1 (Power ON)	1 (Power ON)
Interfaces	serial	RS232, RS422 / RS232	RS232C, RS422 (1ch) / RS232C, RS422 (2ch)	RS232C, RS422 (1ch) / RS232C, RS422 (2ch)	RS232
	parallel	—	—	—	—
	others	—	USB (front) / USB (top)	USB (front) / USB (top)	USB (at front panel)
Interface slot for optional cards		—	1, for recipes and list editors	1, for recipes and list editors	2
Real-time clock		—	Integrated	Integrated	Integrated
Network communication possibilities	type	Serial	Serial	Serial	Ethernet (TCP/IP), CC-Link, RS422, A-Bus, Q-Bus, MELSECNET/10
	max. no. of nodes	2	2	2	
IP Rating (front panel)		IP67	IP67F	IP67F	IP67F
Dimensions WxHxD (mm)		113 x 74	164 x 135 x 56 / 176 x 220 x 93	164 x 135 x 56 / 176 x 220 x 93	167 x 135 x 60
Weight (kg)		0.2	0,7 / 1.0	0,7 / 1.0	1.1
Order information	Art. no.	200738 / 200491 / 200492	162709 / 170180	162710 / 170181	203472 / 203471 / 203470
Accessories		Programming software (refer to page 5), cables and interface adapters (refer to page 69)			

GT1562-VNBA/VNBD, GT1565-VTBA/VTBD



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.

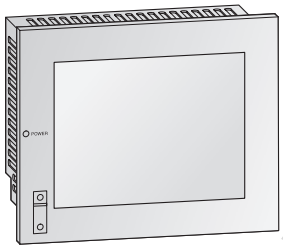
GT1572-VNBA/VNBD, GT1575-VNBA/VNBD



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

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

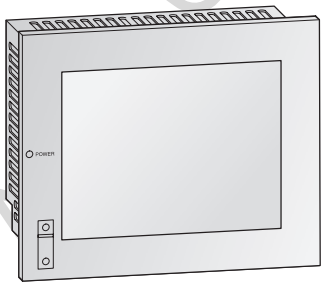
GT1575-VTBA/VTBD, GT1575-STBA/STBD, GT1575V-STBD



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 cruical advantage for manufacturers of serial machines.

In terms of networks, the GT15 are especially powerful with options for MELSECNET/10/H, CC-Link 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).

GT1585-STBA/STBD, GT1595-XTBA/XTBD, GT1585V-STBD



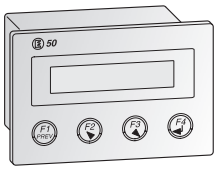
The new Video models GT1585V-STBD and GT1575V-STBD additionally support video/RGB input to monitor images from PC's, cameras and vision sensors directly on the GOT.

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

*Not for the video models

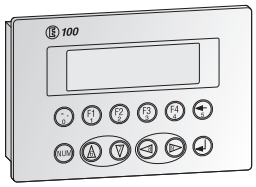
Specifications		GT1562-VNBA / GT1565-VTBA GT1562-VNBD / GT1565-VTBD	GT1572-VNBA / GT1575-VNBA GT1572-VNBD / GT1575-VNBD	GT1575-VTBA / GT1575-STBA GT1575-VTBD / GT1575-STBD, GT1575V-STBD	GT1585-STBA / GT1595-XTBA GT1585-STBD / GT1595-XTBD, GT1585V-STBD
Display unit	type	TFT, 16 colours / 65536 colours	TFT, 16 colours / 256 colours	TFT, 65536 colours (expandable)	TFT, 256 colours (expandable)
	dimensions (mm)	171 x 128 (8.4")	211 x 158 (10.4")	211 x 158 (10.4")	246 x 185 (12.1") / 304 x 228 (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)	640 x 480	640 x 480	640 x 480 / 800 x 600	800 x 600 / 1024 x 768
Power supply	A types	100 – 240 V AC	100 – 240 V AC	100 – 240 V AC	100 – 240 V AC
	D types	24 V DC	24 V DC	24 V DC	24 V DC
Internal memory capacity		VN types: 5 MB (expandable up to 53 MB) VT types: 9 MB (expandable up to 57 MB)	5 MB (expandable up to 53 MB)	9 MB (expandable up to 57 MB)	9 MB (expandable up to 57 MB)
Memory card slot		1 (compact flash 256 MB max.)	1 (compact flash 256 MB max.)	1 (compact flash 256 MB max.)	1 (compact flash 256 MB max.)
Keyboard type		Touch-panel	Touch-panel	Touch-panel	Touch-panel
Function keys	internal	Touch keys	Touch keys	Touch keys	Touch keys
	external	—	—	—	—
LED indicators		1	1	1	1
Interfaces	serial	RS232C	RS232C	RS232C	RS232C
	parallel	—	—	—	—
	others	USB (on panel front)	USB (on panel front)	USB (on panel front)	USB (on panel front)
Interface slot for optional cards		1 / 2	1	2	2
Real-time clock		Integrated	Integrated	Integrated	Integrated
Network communication possibilities	type	Ethernet (TCP/IP), CC-Link, RS422, A-Bus, Q-Bus, MELSECNET/10	Ethernet (TCP/IP), CC-Link, RS422, A-Bus, Q-Bus, MELSECNET/10	Ethernet (TCP/IP), CC-Link, RS422, A-Bus, Q-Bus, MELSECNET/10	Ethernet (TCP/IP), CC-Link, RS422, A-Bus, Q-Bus, MELSECNET/10
IP Rating (front panel)		IP67	IP67	IP67	IP67
Dimensions WxHxD (mm)		241 x 150 x56	303 x 214 x 56	303 x 214 x 56	316 x 242 x 56 / 397 x 296 x 61
Weight (kg)		1.9	2.3	2.3 / 2.4	2.8 / 4.9
Order information	Art. no.	166240 / 162705 169480 / 169481	166241 / 166242 169482 / 169483	162706 / 162707 / 169484 / 169485, video model 203496	162708 / 169464 / 169486 / 203469, video model 203495
Accessories		Programming software (refer to page 5), cables and interface adapters (refer to page 69)			

E50



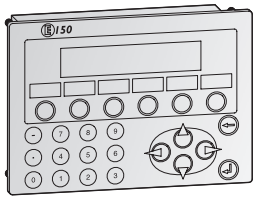
The E50 is a key-oriented HMI unit with four function keys. It can display up to 50 text blocks, which can be paged with the function keys. Values can be edited directly with the unit's keyboard. The RS232C and RS422 ports are both integrated in a 25-pin connector.

E100



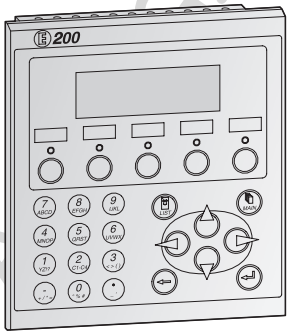
The E100 has programmable function keys with freely definable labels and alternating function assignment. Recipes, passwords and changes can be entered via input keys. The unit has one RS232C port and a RS422 port, which can be connected to either two PLCs or a PLC and a printer, bar code reader or other RS232 devices.

E150



The E150 display features programmable function keys with definable labels and numerical keypad. Recipes, passwords and editing changes can all be entered and edited directly with the units keyboard. The unit has one RS232C port and one RS422 port for flexible communication.

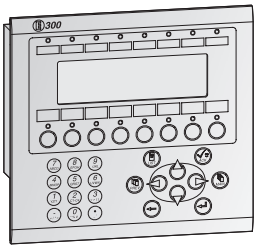
E200



The E200 display offers programmable function keys with freely definable labels and alternating function assignment. LEDs indicate the process status. Recipes, passwords, texts, alarms and changes can be entered via input keys. The E200 posseses one RS232C port and a RS422 port, which can be connected to various other devices.

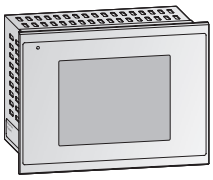
Specifications		E50	E100	E150	E200
Display unit	type	LCD, mono, backlit	LCD, mono, backlit	LCD, mono, backlit	LCD
	dimensions (mm)	55.7 x 100	73.5 x 11.5	73.5 x 11.5	70.4 x 20.8
	text (lines x characters)	2 lines x 16 characters	2 lines x 20 characters	2 lines x 20 characters	2 lines x 20 characters
	character height (mm)	5	5 (user definable)	5 (user definable)	5 (user definable)
	graphical resolution (pixels)	—	—	—	—
Power supply		5 V DC (± 5 %)	5 V DC (± 5 %)	5 V DC (± 5 %)	24 V DC (20 – 30 V)
Internal memory capacity		16 kB	64 kB	64 kB	64 kB
External memory card		—	—	—	—
Keyboard type		Membrane	Membrane	Membrane	Membrane
Function keys	internal	4	4	6 (user assignable) + numerical keyboard with 12 keys	5 (user assignable) + numerical keyboard with 12 keys
	external	—	—	—	—
LED indicators		—	—	—	5 (2 colours: red, green)
Interfaces	serial	RS232C, RS422 (via adapter)	RS232C, RS422	RS232C, RS422	RS232C, RS422
	parallel	—	—	—	—
	others	—	Modbus (via optional adapter)	Modbus (via optional adapter)	Modbus (via optional adapter)
Interface slot for optional cards					
Real-time clock		—	Integrated	Integrated	Integrated
Network communication possibilities (optional)	type	Modbus	Modbus, serial	Modbus, serial	Modbus, serial
	max. no. devices		(serial = 4)	(serial = 4)	(serial = 4)
IP Rating (front panel)		IP65	IP65	IP65	IP65
Dimensions WxHxD (mm)		104 x 69 x 38	142 x 90 x 29	142 x 100 x 29	147 x 163,5 x 38
Weight (kg)		0.2 kg	0.25 kg	0.5 kg	0.7 kg
Order information	Art. no.	129590	88413	135935	69344
Accessories		Programming software E-Designer (refer to page 5), cables and interface adapters (refer to page 69)			

E300



The E300 has a key-oriented user interface with programmable function keys. The graphical screen can display symbols, alarms, graphs and texts in a variety of sizes. Recipes, passwords, texts, alarms, and changes can be entered via input keys. The unit has one RS232C port and a RS422 port as well as an optional slot for communication and expansion cards.

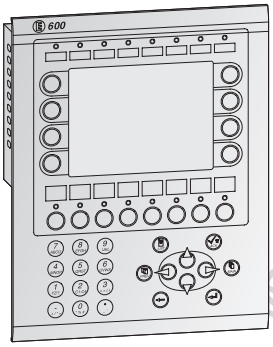
E410



The new E410 offers built-in Ethernet and advanced functionality features, including web technology – yet takes up only a handful of space.

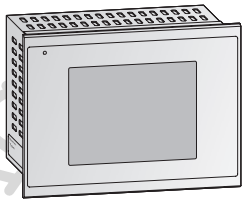
The terminal features a monochrome touch sensitive display with a resolution of 320 x 240 pixels.

E600



The E600 monochrome display with screen-oriented function keys provides user-friendly operation. In addition to historical graphs this controller can also display symbols, alarms and texts. Recipes, texts, and changes can be entered via input keys. The unit has one RS232C port and a RS422 port as well as an optional slot for communication and expansion cards.

E610, E615



The E610 features a touch sensitive display that supports 16 greyscales with a resolution of 320 x 240 pixels. The E615 has a 256 colours graphic display with touch screen.

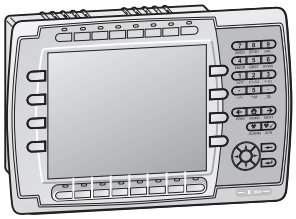
Applications can be programmed to use the display in either horizontal or vertical mode. To handle the communication, there is an RS232C, an RS485 and an RS422 interface on board and one optional slot for communication expansion cards.

Specifications		E300	E410	E600	E610 / E615
Display unit	type	LCD, mono, backlit	LCD, mono, backlit	LCD, mono, backlit	LCD, backlit 16 grayscales / 256 colours
	dimensions (mm)	127.2 x 33.9	79 x 60	120 x 64	115.2 x 86.4
	text (lines x characters)	4 (8) lines x 20 (40) characters	User definable	16 lines x 40 characters	User definable
	character height (mm)	User definable	User definable	User definable	User definable
	graphical resolution (pixels)	—	320 x 240	—	320 x 240
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		400 kB (expandable)	400 kB	400 kB (expandable)	400 kB (expandable)
External memory card		1 (PCMCIA card 4 or 8 MB)	1 (PCMCIA card 4 or 8 MB)	1 (PCMCIA card 4 or 8 MB)	1 (PCMCIA card 4 or 8 MB)
Keyboard type		Membrane	Touch-panel	Membrane	Touch-panel
Function keys	internal	8 (user assignable) +numerical keyboard with 12 keys	—	16 (user assignable) +numerical keyboard with 12 keys	—
	external	Max. 128 (optional with IFC-128/E)	Max. 128 (optional with IFC-128/E)	Max. 128 (optional with IFC-128/E)	Max. 128 (optional with IFC-128/E)
LED indicators		16 (2 colours: red, green)	1 (Power ON)	16 (2 colours: red, green)	1 (Power ON)
Interfaces	serial	RS232C, RS422	RS232C, RS422, RS485	RS232C, RS422	RS232C, RS422, RS485
	parallel	Optional with IFC-PI	Optional with IFC-PI	Optional with IFC-PI	Optional with IFC-PI
	others	Ethernet, Profibus, Modbus (via optional adapter)	Built-in Ethernet	Ethernet, Profibus, Modbus (via optional adapter)	Ethernet, Profibus, Modbus (via optional adapter)
Interface slot for optional cards		1	1	1	1
Real-time clock		Integrated	Integrated	Integrated	Integrated
Network communication possibilities		Ethernet TCP/IP, Modbus, Profibus/DP (all optional) Max. 4 terminals to one PLC	Ethernet TCP/IP integrated, Modbus, Profibus/DP (optional); Max. 4 terminals to one PLC	Ethernet TCP/IP, Modbus, Profibus/DP (all optional); Max. 4 terminals to one PLC	Ethernet TCP/IP, Modbus, Profibus/DP (all optional); Max. 4 terminals to one PLC
IP Rating (front panel)		IP65	IP65	IP65	IP65
Dimensions WxHxD (mm)		212 x 198 x 69	142 x 90 x 43.5	214 x 232 x 69	200 x 150 x 70
Weight (kg)		1.5	1.7	1.6	1.7
Order information	Art. no.	64458	156317	104496	135945 / 135946
Accessories		Programming software E-Designer (refer to page 5), cables and interface adapters (refer to page 69)			

E1032

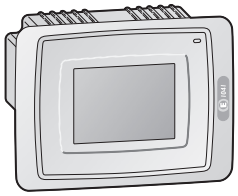
The E1032 is a key-oriented user-friendly interface with programmable function keys. The graphical screen can display symbols, alarms, historical graphs and texts with the use of windows fonts. Recipes, passwords, texts, alarms and changes can be entered via input keys. The unit features two PLC ports, a USB host port to connect mouse, keyboard, printer and USB memory as well as an integrated Ethernet interface. Profibus/DP is available via a separate extension module.

E1060



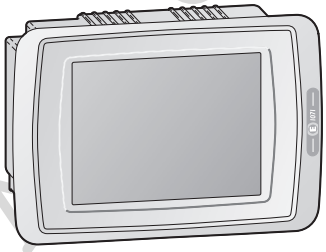
The E1060 colour display with 65,536 colours and screen-oriented function keys provides user-friendly operation. Recipes,text and editing changes are entered via keys. Password levels protect the system against unauthorised access, while sixteen separate alarm groups keep you informed on all-important developments. The unit features two PLC ports, a USB host port to connect mouse, keyboard, printer and USB memory as well as an integrated Ethernet interface. Profibus/DP is available via a separate extension module.

E1041 / E1043



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

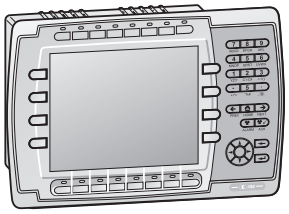
E1061 / E1063



The E1061 and E1063 terminals have a 5.7" STN touch screen (65,536 colours or 16 grayscales). Recipes, text and editing changes are entered via keys. Password levels protect the system against unauthorised access, while sixteen separate alarm groups keep you informed on all-important developments. The unit features two PLC ports, a USB host port to connect mouse, keyboard, printer and USB memory as well as an integrated Ethernet interface. Profibus/DP is available via a separate extension module.

Specifications		E1032	E1060	E1041 / E1043	E1061 / E1063
Display unit	type	TFT monochrome	STN colour	TFT colour / TFT grayscale	STN colour / STN monochrome
	dimensions (mm)	135 x 36	120 x 91 (5.7")	75 x 54 (3.5")	145 x 110 (5.7")
	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)	240 x 64	320 x 240	320 x 240	320 x 240
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	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	Touch-panel
Function keys	internal	8	16	Touch keys	Touch keys
	external	—	—	—	—
LED indicators		16 (8 integrated in keys)	16 (8 integrated in keys)	1 (Power ON)	1 (Power ON)
Interfaces	serial	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
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)		IP 65	IP 65	IP 65	IP 65
Dimensions WxHxD (mm)		202 x 187 x 63	275 x 168 x 63	156 x 119 x 63	201 x 152 x 63
Weight (kg)		0.9	1.1	0.56	0.87
Order information	Art. no.	169297	169300	169298 / 169299	169301 / 169302
Accessories		Programming software (refer to page 5), cables and interface adapters (refer to page 69)			

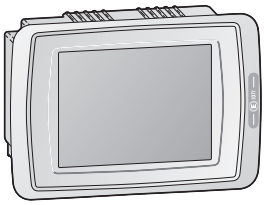
E1070 (Pro+)



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

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

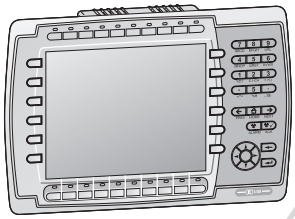
E1071 (Pro+)



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

The operator terminals E1101 and E1151 provide a user-friendly TFT colour touchscreen. The E1101 offers a resolution of 800 x 600 pixels on a 10" screen, the E1151 provides a 15" screen with 1024 x 768 pixels.

E1100 (Pro+)

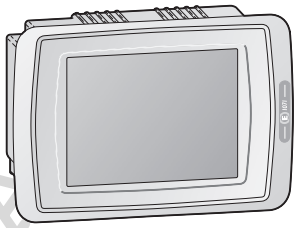


All E1000 operator terminals on this page provide two PLC ports, a USB host port to connect mouse, keyboard, printer and USB memory as well as an integrated Ethernet interface. Profibus/DP is available via a separate extension module.

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/E1151 (Pro+), DT1151

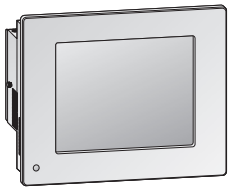


Using an E1000 Pro+ operator terminal gives the user all the functionality of the standard E1000 family but also makes it possible to view external files such as PDF files, HTML pages and PowerPoint presentations directly on the screen of the operator terminal.

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 maximum resolution of 1024 x 768 pixels.

Specifications		E1070 / E1070 Pro+	E1071 / E1071 Pro+	E1100 / E1100 Pro+	E1101 / E1101 Pro+, E1151 / E1151 Pro+, DT1151
Display unit	type	TFT	TFT	TFT	TFT
	dimensions (mm)	134 x 100 (6.5")	134 x 100 (6.5")	211 x 158 (10.4")	211 x 158 (10") , 304 x 228 (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)	640 x 480	640 x 480	800 x 600	800 x 600 , 1024 x 768
Power supply		24 V DC (20 – 30 V)	24 V DC (20 – 30 V)	24 V DC (20 – 30 V)	24 V DC (20 – 30 V)
Internal memory capacity		12 MB (expandable)	12 MB (expandable)	12 MB (expandable)	12 MB (expandable)
Memory card (intern./extern.)		2 (compact flash 4 – 1024 MB)	2 (compact flash 4 – 1024 MB)	2 (compact flash 4 – 1024 MB)	2 (compact flash 4 – 1024 MB)
Keyboard type		Membrane	Touch-panel	Membrane	Touch-panel
Function keys	internal	16 (8 with integrated LEDs)	Touch keys	20 (10 with integrated LEDs)	Touch keys
	external	Max. 64 (optional with MAC-E-Key16)	Max. 64 (optional with MAC-E-Key16)	Max. 64 (optional with MAC-E-Key16)	Max. 64 (optional with MAC-E-Key16)
LED indicators		18	1 (Power ON)	20	1 (Power ON)
Interfaces	serial	RS232C, RS422, RS485	RS232C, RS422, 485	RS232C, RS422, RS485	RS232C, RS422, 485
	parallel	—	—	—	—
	others	USB	USB	USB	USB
Interface slot for optional cards		1	1	1	1
Real-time clock		Integrated	Integrated	Integrated	Integrated
Network communication possibilities		Ethernet TCP/IP, Modbus TCP, MPI (all integrated); Profibus/DP (optional)	Ethernet TCP/IP, Modbus TCP, MPI (all integrated); Profibus/DP (optional)	Ethernet TCP/IP, Modbus TCP, MPI (all integrated); Profibus/DP (optional)	Ethernet TCP/IP, Modbus TCP, MPI (all integrated); Profibus/DP (optional)
IP Rating (front panel)		IP65	IP65	IP65	IP65
Dimensions WxHxD (mm)		285 x 177 x 62	219 x 154 x 61	382 x 252 x 64	302 x 228 x 64 , 398 x 304 x 60
Weight (kg)		1.3	1.1	2.3	2.0 / 3.7
Order information	Art. no.	156096 / 203301	156097 / 203302	156098 / 203303	156099 / 203334 , 156100 / 203225, DT1151: 203326
Accessories		Programming software (refer to page 5), cables and interface adapters (refer to page 69)			

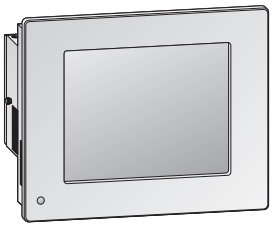
IPC-MC1121



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

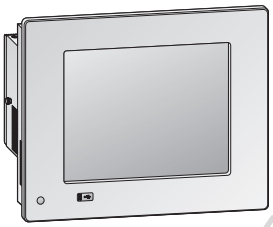
The new IPC1000 line based on ETX technology offers supreme computing performance with processors based on Intel's Celeron/ Pentium® M technology giving extremely low power consumption.

IPC-MC1151



The ETX technology permits scalable CPU performances for a wide range of industrial applications. Ruggedly designed for heavy-duty industrial applications and environments, these PCs feature high quality, fast performance, attractive design and brilliantly legible displays.

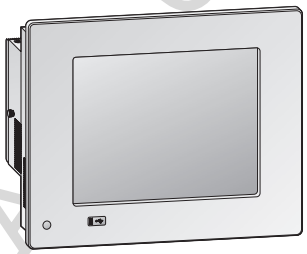
IPC-VP1151



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

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

IPC-VP1171

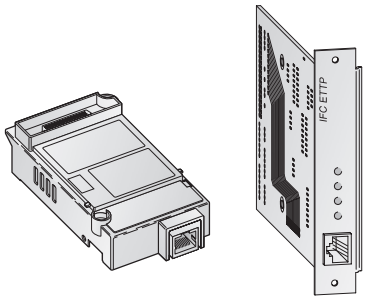


The CANopen, DeviceNet or Profibus field buses can optionally be integrated directly on board of the V panels.

Specifications		IPC-MC1121	IPC-MC1151	IPC-VP1151	IPC-VP1171
Display unit	type	TFT	TFT	TFT	TFT
	dimensions (mm)	12.1"	15"	15"	17"
	graphical resolution (pixels)	800 x 600	1024 x 768	1024 x 768	1280 x 1024
Power supply		24 V DC	24 V DC	24 V DC	24 V DC
Processor type		Intel Celereon 800 MHz	Intel Celereon 800 MHz	Intel Pentium M370 1.5 GHz	Intel Pentium M370 1.5 GHz
Operating system		Windows XP Professional	Windows XP Professional	Windows XP Professional	Windows XP Professional
Internal memory capacity		512 MB RAM	512 MB RAM	512 MB RAM	512 MB RAM
Screen type		Resistive analog touch-panel	Resistive analog touch-panel	Resistive analog touch-panel	Resistive analog touch-panel
Integrated harddisk		40 GB	40 GB	40 GB	40 GB
LED indicators		1 (Power ON)	1 (Power ON)	1 (Power ON)	1 (Power ON)
Interfaces	serial	1 x RS232C	1 x RS232C	2 x RS232C	2 x RS232C
	others	2 x USB (2 x rear side)	2 x USB (2 x rear side)	5 x USB (1 x front; 4 x rear side)	5 x USB (1 x front; 4 x rear side)
LAN network interface		1 x 10/100	1 x 10/100	1 x 10/100, 1 x 100/1000	1 x 10/100, 1 x 100/1000
Free card slots		—	—	2 x PCI, PCMCIA slot optional	2 x PCI, PCMCIA slot optional
Cooling		Fanless	Fanless	Fanless	Fanless
Field busses		CANopen or DeviceNet or Profi bus	CANopen or DeviceNet or Profi bus	CANopen or DeviceNet or Profi bus	CANopen or DeviceNet or Profi bus
Internal Drives		CompactFlash, HDD optional	CompactFlash, HDD optional	CompactFlash, HDD optional	CompactFlash, HDD optional
IP Rating		IP65 (front)	IP65 (front)	IP65 (front)	IP65 (front)
Operating temperature range		0 – 50 °C	0 – 50 °C	0 – 50 °C	0 – 50 °C
Storage temperature range		-20 – +60 °C	-20 – +60 °C	-20 – +60 °C	-20 – +60 °C
Operating humidity range		20 – 85 % (no condensation)	20 – 85 % (no condensation)	20 – 85 % (no condensation)	20 – 85 % (no condensation)
Vibration resistance		1 G: resistant to vibrations from 10 – 500 Hz along all 3 axes (acc. to EN 60068-2-6)			
Dimensions WxHxD (mm)		325 x 252 x 53	380 x 300 x 53	450 x 354 x 163	461 x 399 x 168
Order information	**Art. no.**	204305	204306	204307	204308

Interface Adapters and Cables

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



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. The following table shows an overview of the available cables.

Adapter type (use)	Interface name	Application	Order number
MELSEC A-Bus interface	**GT15-75ABUSSL**	GT15 (1 channel), slim model	166243
	GT15-ABUS	GT15 (1 channel), standard model	169467
	GT15-75ABUS2SL	GT15 (2 channels), slim model	166304
	GT-15ABUS2	GT15 (2 channels), standard model	169468
MELSEC Q-Bus interface	**GT15-75QBUSSL**	GT15 (1 channel), slim model	166305
	GT15-QBUS	GT15 (1 channel), standard model	169465
	GT15-75QBUS2SL	GT15 (2 channels), slim model	166306
	GT15-QBUS2	GT15 (2 channels), standard model	169466
Ethernet (twisted pair)	**MAC-IFC-ETTP**	E300, E600, E610, E615 (also E700, E710, E900T, E900VT, E910T)	104727
Ethernet (coaxial)	**MAC-IFC-ETCX**	E300, E600, E610, E615 (also E700, E710, E900T, E900VT, E910T)	104726
Ethernet RJ45	**GT15-J71E71-100**	GT15	166309
External keyboard extension	**MAC-IFC128/E**	E300, E600, E610, E615 (also E700, E710, E900T, E900VT, E910T)	62486
	MAC-E-KEY-16	E-series range (complete)	148995
PROFIBUS/DP interface	**MAC-IFC-PBDP/E**	E300, E600, E610, E615 (also E700, E710, E900T, E900VT, E910T)	56166
	E1000-EM-Profibus/DP	E1000	169488
Serial interface	**GT15-RS2-9P**	GT15 (serial interface RS232, 9-pin D-Sub)	169469
	GT15-RS2T4-9P	GT15 (converter RS232 -> RS422; 9-pin D-Sub)	166307
	GT15-RS4-9S	GT15 (serial interface RS422/485, 9-pin D-Sub)	169470
	GT15-RS4-TS	GT15 (serial interface RS422/485, screw terminals)	169471
	GT15-RS2T4-25P	GT15 (converter RS232 -> RS422; 25-pin D-Sub)	166308
PCMCIA card interface	**MAC-IFC-MC**	E300, E600, E610, E615 (also E700, E710, E900T, E900VT, E910T)	70120
Parallel printer interface	**MAC-IFC-PI**	E300, E600, E610, E615 (also E700, E710, E900T, E900VT, E910T)	88412
CC-Link interface	**GT15-J61BT13**	GT15	203494
MELSECNET/10	**GT15-75J71 BT13-Z**	GT15 (for coaxial connection)	166311
	GT15-75J71LP23-Z	GT15 (for optical SI cable)	166312
USB	**GT15-PRN**	GT15 (for USB connection to pictbridge compatible printers)	170169

Operator terminal	Interface	Cable name	Connector	Application	Available length (m)	Order number
F900GOT	RS232	**FX-232-CAB1**	D-SUB male connector 9 pin <–> D-SUB male connector 9 pin	Personal Computer	3	124972
F900GOT	A9GT-RS2/RS232	**QC30R2**	D-SUB male connector 9 pin <–> MINI-DIN male connector 6 pin	MELSEC System Q	3	128424
F900GOT	RS422	**FX-40DU-CAB/EN**	D-SUB male connector 9 pin<–> D-SUB male connector 25 pin	MELSEC A/Q series	3	62503
F900GOT	RS422	**FX-50DU-CAB0/EN**	D-SUB male connector 9 pin<–> MINI-DIN male connector 8 pin	MELSEC FX family	3	70451
E series	RS422	**CAB 18 (MAC40 CPU-CAB-R4)**	D-SUB male connector 25 pin<–> D-SUB male connector 25 pin	MELSEC A/Q series	3, 5, 7, 10, 15	146855 (3m)
E series	RS422	**CAB 19 (FX-20P-CAB/EN)**	D-SUB male connector 25 pin<–> MINI-DIN male connector 8 pin	MELSEC FX family	1, 3, 5, 7, 10, 15	146861 (3m)
E series	RS232	**CAB 5(MAC-PC-CAB-R2)**	D-SUB female connector 9 pin<–> D-SUB female connector 9 pin	Personal Computer	2.5	124265
E series	RS232	**CAB16**	D-SUB male connector 9 pin<–> MINI-DIN male connector 6 pin	MELSEC System Q	3	140461
E series	RS422	**CAB17**	D-SUB male connector 25 pin<–> MINI-DIN male connector 6 pin	MELSEC System Q	3	140422
E1000	RS232	**CAB30**	D-SUB female connector 9 pin<–> D-SUB female connector 9 pin	Personal Computer	3	163002
E1000	RS232	**CAB34/3**	D-SUB male connector 9 pin<–> MINI-DIN male connector 6 pin	MELSEC System Q	3	163006 (3m)
E1000	RS422	**CAB36**	D-SUB male connector 25 pin <-> D-SUB male connector 9 pin	Siemens S7/MPI direct	3	205178
GT10	RS232	**GT01-C30R2-6P**	Mini-DIN male connector 6-pin <-> D-SUB male connector 9 pin	Personal Computer	3	163959
GT10	RS422	**GT10-C30R4-8P**	Open terminals <-> MINI-DIN male connector 8 pin	MELSEC FX family	3	200494
GT10	RS232	**GT10-C30R2-6P**	Open terminals <-> MINI-DIN male connector 6 pin	MELSEC System Q	3	200498
GT10	RS232	**GT10-RS2TUSB-5S**	Mini-DIN male connector 6-pin <-> MINI-B USB	PC + GT09-C20USB-5P	3	200500 +166373
GT11, GT15	RS232	**FX-232-CAB1**	D-SUB male connector 9 pin <–> D-SUB male connector 9 pin	Personal Computer	3	124972
GT11, GT15	USB	**GT09-C20USB-5P**	USB <–> USB		2	166373
GT11, GT15	RS232	**GT01-C30R2-6P**	D-SUB male connector 9 pin<–> MINI-DIN male connector 6 pin	MELSEC System Q	3	163959
GT11, GT15	RS232	**GT01-C30R2-9S**	D-SUB male connector 9 pin <–> D-SUB male connector 9 pin	MELSEC FX family	3	163957
GT11, GT15	RS422	**GT01-C□□□R4-8P**	D-SUB female connector 9 pin<–> MINI-DIN female connector 8 pin	MELSEC FX family	1, 3, 10, 20, 30	163948 (3m)
GT15	RS422	**GT01-C□□□R4-25P**	D-SUB female connector 25pin <–> D-SUB female connector 25 pin	MELSEC A/Q series	3, 10, 20, 30	163953 (3m)
GT15	Q(A)nS Bus	**GT15-A1SC□□B**	Special Bus connector	MELSEC (Q)AnS series	0.7, 1.2, 3, 5	166358 (3m)
GT15	A Bus, QnA Bus	**GT15-C□□□NB**	Special Bus connector	GT15 via AnA-/QnA-Bus	0.7, 1.2, 3, 5, 10, 20, 30	166371 (3m)
GT15	System Q Bus	**GT15-QC□□□B**	Special Bus connector	MELSEC System Q	0.6, 1, 3, 5, 10	166348 (3m)

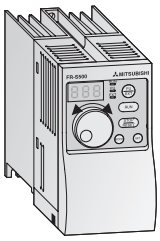
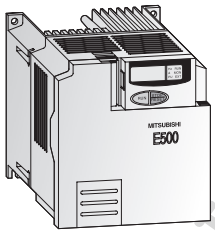
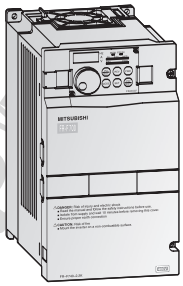
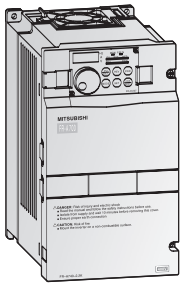
FREQUENCY INVERTERS

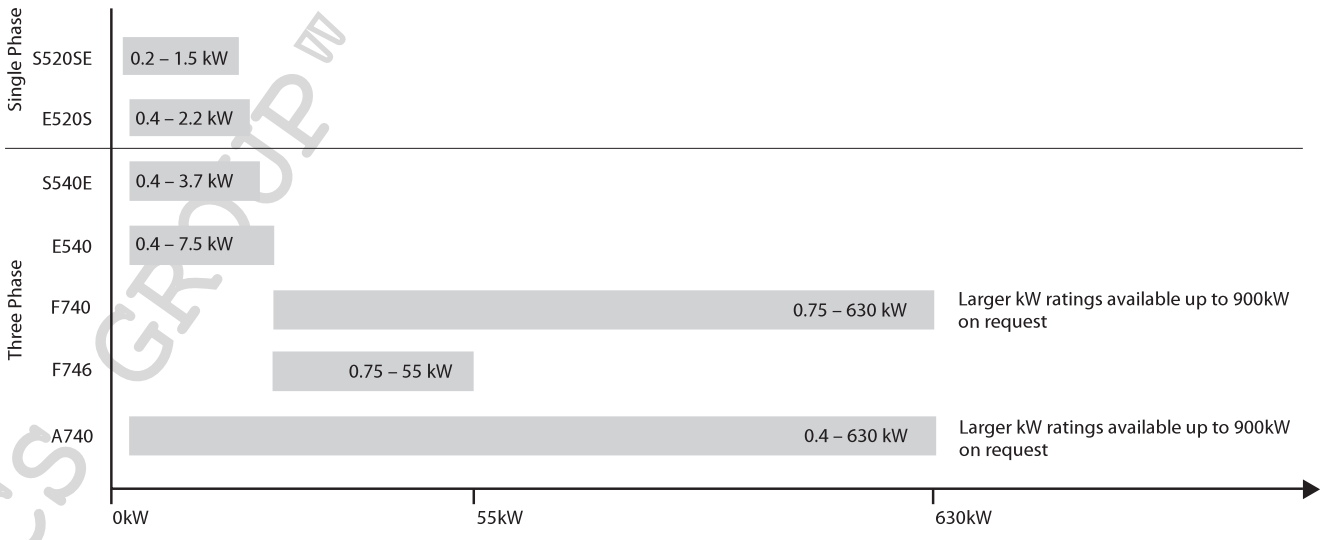
Mitsubishi's comprehensive range of frequency inverters offers a wealth of benefits for the user, making it easy to choose the perfect solution for every drive application. With most Mitsubishi Frequency Inverters an overload capacity of 200 % is standard. This means they deliver double the performance of the competing inverters with the same rating. Mitsubishi Electric inverters also have active current limiting. This provides the perfect response characteristics of the current vector system and gives you the confidence you need for demanding drive applications.

The system instantly identifies over currents and limits them automatically with its fast response, allowing the motor to continue operating normally at the current threshold.

Mitsubishi inverters are also able to communicate with industry standard bus systems like Profibus/DP, DeviceNet, CC-Link, CANopen, LON Network, RS 485/Modbus RTU making it possible to integrate frequency inverters as part of a complete automation system.

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

Feature	FR-S500E	FR-E500	FR-F700	FR-A700
				
Rated motor output range	0.2–3.7 kW	0.4–7.5 kW	0.75–630 kW	0.4–630 kW
Frequency range	0.5–120 Hz	0.2–400 Hz	0.5–400 Hz	0.2–400 Hz
Power supply	Single phase, 200–240 V (-15 %/+10 %) Three-phase, 380–480 V (-15 %/+10 %)	Single phase, 200–240 V (-15 %/+10 %) Three-phase, 380–480 V (-15 %/+10 %)	Three-phase, 380–480 or 500 V (-15 %/+10 %)	Three-phase, 380–480 or 500 V (-15 %/+10 %)
Protection	IP 20	IP 20	FR-F700: IP 00 / IP 20 FR-F746: IP54	IP 00 / IP 20
Special functions	• V/f control	• V/f control • Magnetic flux vector control	• Traverse function • Switch motor to direct mains operation • Advanced PID function (multi pump function) • Regeneration avoidance function • Flying start • V/f control • Simple magnetic flux vector control • Life time diagnostics	• Torque control • Positon control • Real sensorless vector control • Closed loop vector control • Traverse function • Regeneration avoidance function • Integrated PLC function • Easy gain tuning • Life time diagnostics
Specifications	Refer to page 72	Refer to page 73	Refer to page 74	Refer to page 76



Intelligent Motor Control Functions

Compatible with many new applications

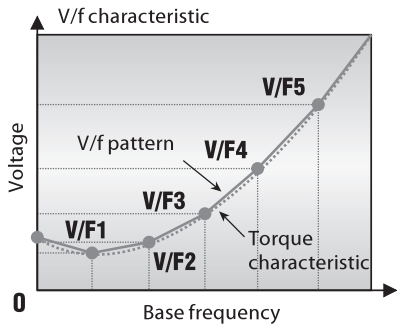
- PID control
  The integrated PID control for example supports a flow control for pumps.
- Torque boost
  Torque boost selection is possible.

Comprehensive protection functions for safe operation

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

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 (except FR-S500E) of the inverters system makes it possible to achieve high torques, even at low motor speeds.

High accuracy/fast response speed operation by vector control can be performed with a general-purpose motor without encoder when the real sensorless vector control of the FR-A700 inverter series is used.

When the FR-A7AP is mounterd 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
- Switch between two sets of motor characteristics by means of a second parameter function
- 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 of the FR-F700 and FR-A700 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.

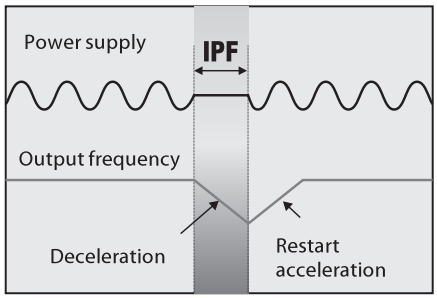
For example, this function can prevent a shutdown with an overvoltage error when the speed of a fan controlled by the inverter is increased by the draft from another fan operating in the same ventilation duct. The function then temporarily increases the output frequency above the setpoint value.

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.

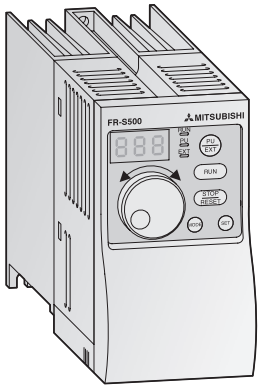
The graphic below shows how the frequency inverter can respond to a brief power outage. Instead of coasting down completely and stopping, the motor is automatically "caught" by the frequency inverter and re-accelerated back up to its previous speed.



Maintenance timer

The maintenance timer function (except FR-E500) can be used to monitor the service life of different components.

FR-S500E Micro Inverters



The FR-S500 Evolution is the latest generation of the popular FR-S500 inverter. It offers all of the past advantages such as the easy to use setting dial but now is enhanced with RS485 communications as standard. Other new features include Automatic restart after power failure, a new maintenance timer and a second electronic thermal function.

These frequency inverters are available with outputs from 0.2 to 1.5 kW for operation with single-phase 200 to 240 V AC power supply (FR-S 520SE EC) or 0.4 to 3.7 kW with three-phase 380 to 480 V AC power supply (FR-S 540E EC).

The ultra-compact frequency inverters FR-S 500E EC can support numerous applications. Typical applications include:

- Material transport systems such as conveyor belts, chain conveyors, feed belts, transport belts and worm conveyors
- Saws, millling cutters, grinding and drilling machines
- Pumps
- Fans
- Door drives

These frequency inverters are available with outputs from 0.2 to 1.5 kW for operation with single-phase 200 to 240 V AC power supply (FR-S 520SE EC) or 0.4 to 3.7 kW with three-phase 380 to 480 V AC power supply (FR-S 540E EC).

Product line			FR-S 520SE EC				FR-S 540E EC				
			-0.2 k	-0.4k	-0.75 k	-1.5 k	-0.4 k	-0.75 k	-1.5 k	-2.2 k	-3.7 k
Output	Applicable motor capacity ① kW		0.2	0.4	0.75	1.5	0.4	0.75	1.5	2.2	3.7
	Rated current A		1.4	2.5	4.1	7.0	1.2 (1.3)*	2.3 (2.5)*	3.7 (4.1)*	5.3 (5.8)*	7.7 (8.5)*
	Overload capacity ②		200 % of rated motor capacity for 0.5 s; 150 % for 1 min. (ambient temperature not higher than 50 °C)								
	Voltage ③		3phase, 0 V up to power supply voltage								
Input	Power supply voltage		1phase, 200–240 V AC, -15 %/+10 %				3phase, 380–480 V AC, -15 %/+10 %				
	Voltage range		170–264 V AC at 50/60 Hz				325–528 V AC at 50/60 Hz				
	Rated input capacity ④ kVA		0.9	1.5	2.5	4.4	1.5	2.5	4.5	5.5	9.5
Control-specifications	Control method		V/f control or automatic torque boost control								
	PWM switching frequency kHz		0.7–14.5, user adjustable								
	Frequency range Hz		0.5–120								
	Possible starting torque		≥ 150 % / 5 Hz (with automatic torque boost)								
	Torque boost		Manual torque boost; selectable between 0–30 %								
	Acceleration / deceleration time		0, 0.1 to 999 s (may be set individually for acceleration and deceleration)								
	Acceleration / deceleration characteristics		Linear or S-pattern acceleration/deceleration mode selectable								
	Braking torque	regenerative	0.2 k: 150 %; 0.4 k and 0.75 k: 100 %; 1.5 k: 50 %; 2,2 k and 3,7 k: 20 %								
		DC braking	Braking time and braking moment adjustable, Operating frequency: 0–120 Hz, operating time: 0–10 s, voltage: 0–15 % (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 control panel (parameter unit), RS-485 or network								
	Input signals	multi-speed selection	Up to 15 speeds can be preset in the range of 0–120 Hz. The current speed can be adjusted during operation via the control panel.								
		2nd function	Selects 2nd function (acceleration time, deceleration time, torque boost, base frequency, electronic overcurrent protection)								
		external thermal input	Stopping the inverter with an externally mounted thermal relay								
		PID control	Select PID control								
	Operation functions		Maximum and minimum frequency setting, frequency jump operation, external thermal input selection, instantaneous power failure restart operation, forward run/reverse run prevention, slip compensation, operation mode selection, PID control, computer link or open network operation								
	Output signals	operation status	1 output type (open collector output) selectable: Inverter running, frequency reached, frequency detection, overload warning, zero current detection, output current detection, maximum PID, minimum PID, PID forward run, PID reverse run, operation ready, current average value monitor signal, maintenance timer alarm, minor failure and error. Instead of the open collector output type 1 relay contact can be selected for the output (230 V AC; 0.3 A / 30 V DC; 0.3 A).								
		analog signal	One of the following output types can be selected: Output frequency, motor current, analog output (0–5 V DC with 1 mA full scale).								
Others	Dimensions (WxHxD)		128x68x80.5	128x68x142.5	128x68x162.5	128x68x155.5	128x68x129.5	128x68x129.5	128x68x135.5	128x68x155.5	128x68x165.5
Order information		Art. no.	158459	158460	158461	158462	158463	158464	158465	158466	158467

Remarks:

① The specifications of the rated motor capacity are related to a motor voltage of 230 V for 1phase output and 440 V for 3phase output (max. ambient temperature of 50 °C).

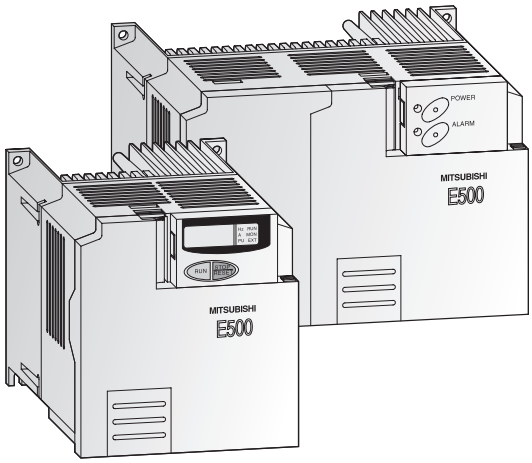
② The overload capacity indicated in % is the ratio of the overload current to the inverters rated current. For repeated duty, allow time for the inverter and motor to return to or below the temperature and 100 % load.

③ The maximum output voltage cannot exceed the input voltage. The maximum output voltage may be programmed individually, but it must be input voltage.

④ The input capacity changes with the values of the power supply side inverter impedances (including those of the input reactor and cables).

* The values in brackets indicatye the values for an ambient temperature up to 40 °C without restriction of PWM..

FR-E500 Compact Inverters



Due to its versatility and compact dimensions, the FR-E500 EC is a frequency inverter that can solve most of your individual drive tasks. Its extensive functions make it a flexible solution for applications such as:

- Textile machines such as spinning machines, knitting machines, weaving looms
- Material transport systems such as chain, belt, and screw conveyors
- Door and gate drives
- Machines for working of metal, stone, wood, and plastics
- Palettisers, material-handling technology
- Pumps and ventilating

The inverters are available for a performance range of 0.4 to 2.2 kW (1 phase) and of 0.4 to 7.5 kW (3 phase).

The output frequency ranges from 0.2 to 400 Hz.

Product line			FR-E 520S EC				FR-E 540 EC						
			0.4 k	0.75 k	1.5 k	2.2 k	0.4 k	0.75 k	1.5 k	2.2 k	3.7k	5.5 k	7.5 k
Output	Rated motor capacity [kW] ①	150 % overload capacity ❶	0.75	1.1	2.2	3	0.75	1.1	2.2	3	4	7.5	11
		200 % overload capacity ❷	0.4	0.75	1.5	2.2	0.4	0.75	1.5	2.2	4	5.5	7.5
	Rated current [A] ⑤	150 % overload capacity ❶	3.6	5	9.6	12	1.8	3	4.9	6.7	9.5	14	21
		200 % overload capacity ❷	2.5	4	7	10	1.6 (1.4)	2.6 (2.2)	4 (3.8)	6 (5.4)	9.5 (8.7)	12	17
	Rated output capacity	kVA	0.95	1.5	2.7	3.8	1.2	2.0	3.0	4.6	7.2	9.1	13.0
	Overload capacity ②	❶	150 % of rated motor capacity for 0.5 s; 120 % for 1 min. (max. ambient temperature = 50 °C)										
		❷	200 % of rated motor capacity for 0.5 s; 150 % for 1 min. (max. ambient temperature = 50 °C)										
	Voltage ③		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				323–528 V AC at 50/60 Hz						
	Rated input capacity ④	kVA	1.5	2.3	4.0	5.2	1.5	2.5	4.5	5.5	9	12	17
Control specifications	Control method		Extended flux vector control with online auto tuning of motor data or V/f control										
	Carrier frequency		0.7–14.5 kHz (user adjustable)										
	Possible starting torque		≥ 150 % / 1 Hz, ≥ 200 % / 3Hz (for vector control oder slip compensation)										
	Torque boost		Manual torque boost; selectable between 0–30 %										
	Acceleration / deceleration time		0.01; 0.1 to 3600 s individual settings										
	Acceleration / deceleration characteristics		Linear or S-form course, user selectable										
	Braking torque	regenerative	0.4 k and 0.75 k: 100 % or more; 1.5 k: 50 % or more; 2.2 k to 7.5 k: 20 % or more										
		DC braking	Braking time and braking moment adjustable, Operating frequency: 0–120 Hz, operating time: 0–10 s, voltage: 0–30 %										
	Motor protection		Electronic motor protection relay (rated current user adjustable)										
Control signals for operation	Frequency setting values		0–5 V DC, 0–10 V DC, 0/4–20 mA, From control panel (parameter unit), RS-485 or network										
	Input signals	multi-speed selection	Up to 15 set speeds (each speed can be set between 0 and 400 Hz; speed can be changed via control panel or during operation)										
	Input signals	2nd function	Selects 2nd function (acceleration time, deceleration time, torque boost, base frequency, electronic overcurrent protection)										
		external thermal input	Stopping the inverter with an externally mounted thermal relay										
	Operation functions		Maximum and minimum frequency setting, frequency jump operation, external thermal input selection, instantaneous power failure restart operation, forward run/reverse run prevention, slip compensation, operation mode selection, off-line auto tuning function, PID control, computer link operation (RS485), open network operation										
	Output signals	operation status	2 output types (open collector output) can be selected: inverter running, frequency reached, frequency detection, overload warning, zero return detection, output current detection, maximum PID, minimum PID, PID forward run, PID reverse run, operation ready, minor failure and error. 1 relay contact can be selected for the output (230 V AC; 0.3 A / 30 V DC; 0.3 A)										
		analog signal	One of the following output types can be selected: output frequency, motor current, output voltage, analog output (0–10 V DC).										
Others	Dimensions (WxHxD)	mm	150 x140x136		150 x140x156		150 x140x116		150 x140x136			150 x140x148	
Order information		Art. no.	102938	102939	102940	102941	69197	69198	69200	69201	69204	102942	102943

Remarks:

① The specifications of the rated motor capacity are related to a motor voltage of 230 V resp. 400 V.

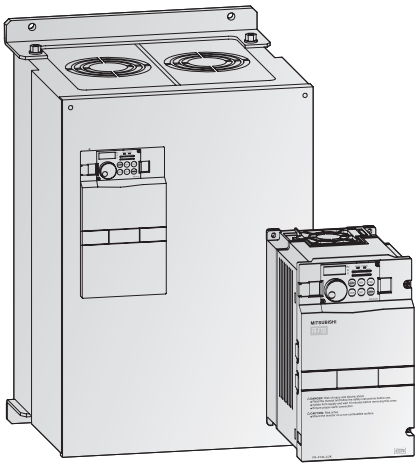
② The overload capacity indicated in % is the ratio of the overload current to the inverters rated current. For repeated duty, allow time for the inverter and motor to return to or below the temperature and 100 % load.

③ The maximum output voltage cannot exceed the power supply voltage. The maximum output voltage may be set as desired below the power supply voltage.

④ The power supply capacity changes with the values of the power supply side inverter impedances (including those of the input reactor and cables).

⑤ 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.

FR-F700 Energy Saving Inverters



Mitsubishi Electric's FR-F 740 series is a completely new range of frequency inverters with truly exceptional power conservation capabilities. These inverters are ideal for pumps, ventilation fans and applications with reduced overload requirements such as:

Air conditioning systems, e.g. in building management

- Air extraction systems
- Fans and blowers
- Hydraulics systems
- Compressors
- Sewage and drains systems
- Ground water pumps
- Heat pumps
- Drive systems with high idling rates

These inverters are very user-friendly and they are available with output ratings matched to users' real needs.

The FR-F 740 is available in versions with outputs from 0.75 – 640 kW.

The FR-F746 with its waterproof structure IP54 is available with outputs from 0.75 – 55 kW.

All the inverters in the series are designed for connection to 3~ 380 – 480 V/500 V (50/60 Hz) power supplies.

The output frequency range is 0.5 – 400 Hz

Series			FR-F740 / FR-F746													
			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 [A] ⑥	120% overload capacity (SLD) ⑤	2.3	3.8	5.2	8.3	12.6	17	25	31	38	47	62	77	93	116
			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
			2.8	4.6	6.2	10	15.1	20.4	30	37.2	45.6	56.4	74.4	92.4	111.6	139.2
		150% overload capacity (LD)	2.1	3.5	4.8	7.6	11.5	16	23	29	35	43	57	70	85	106
			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
			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
	Output capacity [kVA]	SLD ⑤	1.8	2.9	4.0	6.3	9.6	13	19.1	23.6	29.0	35.8	47.3	58.7	70.9	88.4
		LD	1.6	2.7	3.7	5.8	8.8	12.2	17.5	22.1	26.7	32.8	43.4	53.3	64.8	80.8
	Overload current rating ②	SLD	120 % of rated motor capacity for 3s; 110 % for 1 min. (max. ambient temperature 40 °C) – typical for pumps and fans													
		LD	150 % of rated motor capacity for 3s; 120 % for 1 min. (max. ambient temperature 50 °C) – typical for conveyor belts and centrifuges													
	Voltage ③		3-phase AC, 0 V to power supply voltage													
	Frequency range		0.5–400 Hz													
	Control method		V/f control, optimum excitation control or simple magnetic flux vector control													
	Modulation control		Sine evaluated PWM, Soft PWM													
	Carrier frequency		0.7 kHz–14.5 kHz (user adjustable)													
Input	Power supply voltage		3-phase, 380–480 V AC, –15% / +10%													
	Voltage range		323–528 V AC at 50 / 60 Hz													
	Power supply frequency		50 / 60 Hz ±5%													
	Rated input capacity ④ [kVA]	SLD ⑤	2.8	5.0	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	FR-F740	IP20											IP00		
		FR-F746	IP54													
	Power loss [kW]	SLD ⑤	0.06	0.08	0.1	0.16	0.19	0.24	0.34	0.39	0.49	0.58	0.81	1.0	1.17	1.51
		LD	0.05	0.08	0.09	0.14	0.18	0.22	0.31	0.35	0.44	0.52	0.71	0.93	1.03	1.32
	Frequency inverter weight [kg]	FR-F740	3.5	3.5	3.5	3.5	3.5	6.5	6.5	7.5	7.5	13	13	23	35	35
		FR-F746	12.5	12.5	12.5	12.5	12.5	18.5	18.5	21.5	21.5	30	30	30	42	42
Order information FR-F740 ⑧		Frequency inverters	156569	156570	156571	156572	156573	156594	156595	156596	156597	156598	156599			
		Input power frame												169827	169828	169829
		Control card FR-CF70-EC												189878	189878	189878
Order information FR-F746		Art. no.	163796	163797	163798	163799	163800	163801	163802	163803	163804	163805	163806	163807	163808	163809

Remarks:

Explanation for ① to ⑧ see next page.

Series			FR-F740														
			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 [A] ⑥	120% overload capacity (SLD) ⑤	180	216	260	325	361	432	481	547	610	683	770	866	962	1094	1212
			198	238	286	357	397	475	529	602	671	751	847	953	1058	1203	1333
			216	259	312	390	433	518	577	656	732	820	924	1039	1154	1313	1454
		150% overload capacity (LD)	144	180	216	260	325	361	432	481	547	610	683	770	866	962	1094
			173	216	259	312	390	433	518	577	656	732	820	924	1039	1154	1313
			216	270	324	390	487	541	648	721	820	915	1024	1155	1299	1443	1641
	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 current rating ②	SLD	120 % of rated motor capacity for 3s; 110 % for 1 min. (max. ambient temperature 40 °C) – typical for pumps and fans														
		LD	150 % of rated motor capacity for 3s; 120 % for 1 min. (max. ambient temperature 50 °C) – typical for conveyor belts and centrifuges														
	Voltage ③		3-phase AC, 0 V to power supply voltage														
	Frequency range		0.5–400 Hz														
	Control method		V/f control, optimum excitation control or simple magnetic flux vector control														
	Modulation control		Sine evaluated PWM, Soft PWM														
	Carrier frequency		0.7 kHz–6 kHz (user adjustable)														
Input	Power supply voltage		3-phase, 380–500 V AC, –15% / +10%														
	Voltage range		323–550 V AC at 50 / 60 Hz														
	Power supply frequency		50 / 60 Hz ±5%														
	Rated input capacity 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		IP00														
	Power loss [kW]	SLD ⑤	2.7	3.3	3.96	4.8	5.55	6.6	7.5	8.4	9.45	10.65	12.0	13.5	15.0	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	12.0	13.5	15.0	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
Order information ⑧		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 performance figures at the rated motor capacity are based on a motor voltage of 400 V.

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 ($I^2 \times t$), for which 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.

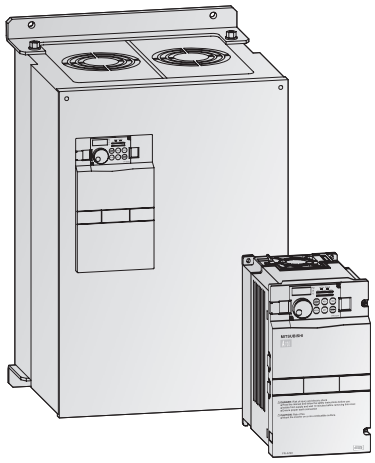
⑥ When operating with carrier frequencies ≥ 2.5 kHz this value is reduced automatically as soon as the frequency inverter exceeds 85% of the rated output current.

⑦ When the cable bushing for the optional expansion cards is broken out the unit has an IP 00 protection rating.

⑧ The inverter types FR-F740-02160 and above are all delivered with PCBs with two coats of protective varnish. For types FR-F740 00023 through 01800 varnished PCBs are standard. The double-coated version is available as an option.

Common specifications FR-F 740/F 746			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) whe1n set to simple magnetic flux vector control and slip compensation
	Acceleration / deceleration time		0; 0.1 to 3600 s (can be set individually)
	Acceleration / deceleration characteristics		Linear or S-form course, user selectable
	DC injection brake		Operating frequency (0–120 Hz), operating time (0–10 s) and operating voltage (0–30 %) can be set individually. The DC brake can also be activated via the digital input.
	Motor protection		Electronic motor protection relay (rated current user adjustable)
Control signals for operation	Input signals		Any of 12 signals can be selected using parameters 178 to 189 (input terminal function selection)
	Output signals	operating state	Any of 7 signals can be selected using parameter 190 to 196 (output terminal function selection)
		when using the FR-A7AY option	In addition to the above operating modes parameters 313-319 (function selection for the additional 7 output terminals) can also be used to assign the following four signals: control circuit capacitor life, main circuit capacitor life, cooling fan life, inrush current limit circuit life
		pulse/analog output	You can also use parameter 54 (assign analog current output) and 158 (assign analog voltage output) to assign the following displays to one or both outputs
Display	Control unit display (FR-PU04/ FR-DU07)	operating state	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-PU04 only), terminal assignment state (FR-PU04 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-PU04 only)

FR-A700 High End Inverters



The new 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 versions with outputs from 0.4 – 640 kW.

All the inverters in the series are designed for connection to 3~ 380 – 480 V/500 V (50/60 Hz) power supplies.

The output frequency range is 0.2 – 400 Hz.

Series			FR-A740														
			00023	00038	00052	00083	00126	00170	00250	00310	00380	00470	00620	00770	00930	01160	01800
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	90
		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	75
		200% overload capacity (ND)	0.4	0.75	1.5	2.2	3.7	5.5	7.5	11	15	18.5	22	30	37	45	55
		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	45
	Rated current [A] ③	120% overload capacity (SLD)	2.3	3.8	5.2	8.3	12.6	17	25	31	38	47	62	77	93	116	180
		150% overload capacity (LD)	2.1	3.5	4.8	7.6	11.5	16	23	29	35	43	57	70	85	106	144
		200% overload capacity (ND)	1.5	2.5	4	6	9	12	17	23	31	38	44	57	71	86	110
		250% overload capacity (HD)	0.8	1.5	2.5	4	6	9	12	17	23	31	38	44	57	71	86
	Output capacity ② [kVA]	SLD	1.8	2.9	4.0	6.3	9.6	13.0	19.1	23.6	29.0	35.8	47.3	58.7	70.9	88.4	137
		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	110
		ND	1.1	1.9	3.0	4.6	6.9	9.1	13.0	17.5	23.6	29.0	33.5	43.4	54.1	65.5	100
		HD	0.6	1.1	1.9	3.0	4.6	6.9	9.1	13.0	17.5	23.6	29.0	33.5	43.4	54.1	80
	Overload current rating 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		0.2 – 400 Hz														
	Control method		Soft-PWM control/high carrier frequency PWM control (selectable from among V/f control, advanced magnetic flux vector control and real sensorless vector control)														
	Regenerative braking torque		100 % torque / 2 % ED							20 % torque / continuous ⑥				20 % torque / continuous			
Input	Power supply voltage		3-phase, 380–480 V AC, −15% / +10%														
	Voltage range		323–528 V AC at 50 / 60 Hz														
	Power supply frequency		50 / 60 Hz ±5%														
	Rated input capacity ⑦ [kVA]	SLD	2.5	4.5	5.5	9	12	17	20	28	34	41	52	66	80	100	137
		LD	2.1	4	4.8	8	11.5	16	20	27	32	37	47	60	73	91	110
		ND	1.5	2.5	4.5	5.5	9	12	17	20	28	34	41	52	66	80	100
		HD	0.8	1.5	2.5	4.5	5.5	9	12	17	20	28	34	41	52	66	80
Others	Cooling		Self cooling			Fan cooling											
	Protective structure ⑨		IP20											IP00			
	Power loss [kW]	SLD	0.06	0.082	0.98	0.15	0.21	0.28	0.39	0.4	0.55	0.69	0.97	1.18	1.36	1.78	2.65
		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	2.0
		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	1.54
		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	1.14
	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	37

Order information	Frequency inverters		169826	169797	169798	169799	169800	169801	169802	169803	169804	169805	169806				
	Input power frame													169827	169828	169829	169830
	Control card FR-CA70-EC													169877	169877	169877	169877

Remarks:
Explanation for ① to ⑨ see next page.

Series			FR-A740													
			02160	02600	03250	03610	04320	04810	05470	06100	06830	07700	08660	09620	10940	12120
Output	Rated motor capacity ① [kW]	120% overload capacity (SLD)	110	132	160	185	220	250	280	315	355	400	450	500	550	630
		150% overload capacity (LD)	90	110	132	160	185	220	250	280	315	355	400	450	500	560
		200% overload capacity (ND)	75	90	110	132	160	185	220	250	280	315	355	400	450	500
		250% overload capacity (HD)	55	75	90	110	132	160	185	220	250	280	315	355	400	450
	Rated current [A] ③	120% overload capacity (SLD)	216	260	325	361	432	481	547	610	683	770	866	962	1094	1212
		150% overload capacity (LD)	180	216	260	325	361	432	481	547	610	683	770	866	962	1094
		200% overload capacity (ND)	144	180	216	260	325	361	432	481	547	610	683	770	866	962
		250% overload capacity (HD)	110	144	180	216	260	325	361	432	481	547	610	683	770	866
	Output capacity ② [kVA]	SLD	165	198	248	275	329	367	417	465	521	587	660	733	834	924
		LD	137	165	198	248	275	329	367	417	465	521	587	660	733	834
		ND	110	137	165	198	248	275	329	367	417	465	521	587	660	733
		HD	84	110	137	165	198	248	275	329	367	417	465	521	587	660
	Overload current rating 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		0.2 – 400 Hz													
	Control method		Soft-PWM control/high carrier frequency PWM control (selectable from among V/f control, advanced magnetic flux vector control and real sensorless vector control)													
	Regenerative braking torque (nax. value / permissible duty)		20 % torque / cont.	10 % torque / continuous												
Input	Power supply voltage		3-phase, 380–500 V AC, -15 % / +10 %													
	Voltage range		323–550 V AC at 50 / 60 Hz													
	Power supply frequency		50 / 60 Hz ±5 %													
	Rated input capacity [kVA]	SLD	165	198	247	275	329	366	416	464	520	586	660	733	833	924
		LD	137	165	198	247	275	329	366	416	464	520	586	659	733	833
		ND	110	137	165	198	248	275	329	367	417	465	521	587	660	733
		HD	84	110	137	165	198	248	275	329	367	417	465	521	587	660
Others	Cooling		Fan cooling													
	Protective structure		IP00													
	Power loss [kW]	SLD	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	2.4	2.9	3.0	3.8	4.2	5.1	5.5	6.4	7.2	8.0	8.6	10.2	11.5	13.20
		ND	1.9	2.4	2.5	3.0	4.0	4.2	5.0	5.5	6.5	7.0	7.3	8.1	9.3	10.5
		HD	1.44	1.9	1.97	2.5	2.57	4.0	4.2	5.0	5.5	6.5	7.0	6.91	8.1	9.3
	Frequency inverter weight [kg]		50	57	72	72	110	110	175	175	175	260	260	370	370	370
	Reactor weight [kg]		22	26	28	29	30	35	38	42	46	50	57	67	85	95
Order information		Frequency inverters														
		Input power frame	169831	169832	169833	169834	169835	169836	169837	169838	169839	169840	169841	169842	169843	169844
		Control card FR-CA70-ECT	190051	190051	190051	190051	190051	190051	190051	190051	190051	190051	190051	190051	190051	190051

Remarks:

① The applicable 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 When operating the inverter of 75K (type 02160) or more with a value larger than 2 kHz set in Pr. 72 PWM frequency selection, the rated output current is max. 85 %.

④ The % value of the overload current rating indicates the ratio of the overload current to the inverter's rated output current. For repeated duty, allow time forthe 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 $\sqrt{2}$ that of the power supply

⑥ For the 11K to 22K capacities (type 00310 to 00620), using the dedicated external brake resistor (FR-ABR) will achieve the performance of 100 % torque/6 % ED.

⑦ The power supply capacity varies with the value of the power supply side inverter impedance (including those of the input reactor and cables).

⑧ When the hook of the inverter front cover is cut off for installation of the plug-in option, the inverter changes to an open type (IP00).

⑨ FR-DU07: IP40 (except for the PU connector)

Common specifications FR-A 740

Refer to next page

Common Specifications FR-A700

FR-A740			Description
Control specifications	Control method		Soft-PWM control/high carrier frequency PWM control (selectable from among V/F control, advanced magnetic flux vector control and real sensorless vector control) / vector control (when used with option FR-A7AP)
	Frequency setting resolution	Analog input	0.015 Hz / 0–50 Hz (terminal 2, 4: 0–10 V / 12 bit) 0.03 Hz / 0–50 Hz / (terminal 2, 4: 0–5 V / 11 bit, 0–20 mA / 11 bit, terminal 1: −10–+10 V / 12 bit) 0.06 Hz / 0–50 Hz (terminal 1: 0–±5 V / 11 bit)
		Digital input	0.01 Hz
	Frequency accuracy		±0.2 % of the maximum output frequency (temperature range 25° ± 10 °C) via analog input; ±0.01 % of the set output frequency (via digital input)
	Voltage / frequency characteristics		Base frequency adjustable from 0 to 400 Hz; selection between constant torque, variable torque or optional flexible 5-point V/f characteristics
	Starting torque		200 % 0.3 Hz (0.4 K to 3.7 K), 150 % 0.3 Hz (5.5 K or more) (under real sensorless vector control or vector control)
	Torque boost		Manual torque boost
	Acceleration / deceleration time		0; 0.1 to 3600 s (can be set individually), linear or S-pattern acceleration/deceleration mode, backlash measures acceleration/deceleration can be selected.
	Acceleration / deceleration characteristics		Linear or S-form course, user selectable
	DC injection brake		Operating frequency (0–120 Hz), operating time (0–10 s) and operating voltage (0–30 %) can be set individually. The DC brake can also be activated via the digital input.
	Stall prevention operation level		Operation current level can be set (0 to 220 % adjustable), whether to use the function or not can be selected
	Motor protection		Electronic motor protection relay (rated current user adjustable)
	Torque limit level		Torque limit value can be set (0 to 400 % variable)
Control signals for operation	Frequency setting values	Analog input	Terminal 2, 4: 0–5 V DC, 0–10 V DC, 0/4–20 mA Terminal 1: 0–±5 V DC, 0–±10 V DC
		Digital input	Input using the setting dial of the operation panel or parameter unit Four-digit BCD or 16 bit binary (when used with option FR-A7AX)
	Start signal		Available individually for forward rotation and reverse rotation. Start signal automatic self-holding input (3-wire input) can be selected.
	Input signals	Common	Any of 12 signals can be selected using parameters 178 to 189 (input terminal function selection): from among multi speed selection, remote setting, stop-on-contact, second function selection, third function selection, terminal 4 input selection, JOG operation selection, selection of automatic restart after instantaneous power failure, flying start, external thermal relay input, inverter operation enable signal (FR-HC/FR-CV connection), FR-HC connection (instantaneous power failure detection), 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, and command source switchover
		Pulse train input	100 kpps
	Output signals	Operating status	Any of 7 signals can be selected using parameter 190 to 196 (output terminal function selection): from among inverter running, up-to-frequency, instantaneous power failure/undervoltage, overload warning, output frequency (speed) detection, second output frequency (speed) detection, third output frequency (speed) detection, regenerative brake prealarm, 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, brake opening request, fan fault output, heatsink overheat pre-alarm , inverter running/start command on, deceleration at an instantaneous power failure, PID control activated, during retry, PID output interruption, 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 failure 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 313-319 (function selection for the additional 7 output terminals) can also be used to assign the following four signals: control circuit capacitor life, main circuit capacitor life, cooling fan life, inrush current limit circuit life (Only positive logic can be set for extension terminals of the FR-A7AR)
		Pulse train output	50 kpps
		Analog output	You can select any signals using Pr. 54 FM terminal function selection (pulse train output) and Pr. 158 AM terminal function selection (analog output) from among output frequency, motor current (steady or peak value), output voltage, frequency setting, operation speed, motor torque, converter output voltage (steady or peak value), electronic thermal relay function load factor, input power, output power, load meter, motor excitation current, reference voltage output, motor load factor, power saving effect, regenerative brake duty ,PID set point, PID measured value, motor output, torque command, torque current command, and torque monitor.
Display	Control unit display (FR-PU07/ FR-DU07)	Operating state	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, cumulative energization time, actual operation time, motor load factor, cumulative power, energy saving effect, cumulative saving power, regenerative brake duty, 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 ③
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, PTC thermistor operation, option alarm, parameter error, PU disconnection, retry count excess, CPU alarm, operation panel power supply short circuit, 24VDC power output short circuit, output current detection value excess, inrush current limit circuit alarm, communication alarm (inverter), USB error, opposite rotation deceleration error, analog input error, fan fault, overcurrent stall prevention, overvoltage stall prevention, regenerative brake prealarm, electronic thermal relay function prealarm, PU stop, maintenance timer alarm ②, brake transistor alarm, parameter write error, copy operation error, operation panel lock, parameter copy alarm, speed limit indication, encoder no-signal ①, speed deviation large ①, overspeed ①, position error large ①, encoder phase error ①

Remarks:

① Only when the option (FR-A7AP) is mounted

② Can be displayed only on the operation panel (FR-DU07).

③ Can be displayed only on the parameter unit (FR-PU07/FR-PU04).

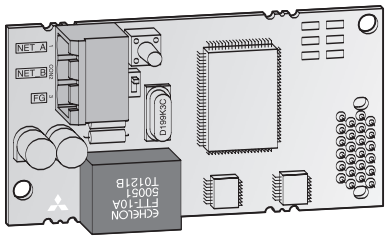
General Operating Conditions for all Inverters

Specifications	FR-S500E	FR-E500	FR-F700	FR-A700
Ambient temperature in operation	-10 °C to +50 °C (non-freezing)	-10 °C to +50 °C (non-freezing) ①	FR-F740: -10 °C to +50 °C; FR-F746: -10 °C to +40 °C (non-freezing) ②	-10 °C to +50 °C (non-freezing)
Storage temperature ③	-20 to +65 °C	-20 to +65 °C	-20 to +65 °C	-20 to +65 °C
Ambient humidity	Max. 90 % (non-condensing)	Max. 90 % (non-condensing)	Max. 90 % (non-condensing)	Max. 90 % (non-condensing)
Altitude	Max. 1000 m above sea level. ④	Max. 1000 m above sea level. ④	Max. 1000 m above sea level.	Max. 1000 m above sea level.
Protective structure	Enclosed type IP 20	Enclosed type IP 20	FR-F740: IP 00 / IP 20 ⑤ FR-F746: IP 54	IP 00 / IP 20
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	0.6 G: resistance to vibrations from 10 to 55 Hz for 2 hours along all 3 axes	0.6 G: resistance to vibrations from 10 to 55 Hz for 2 hours along all 3 axes	Max. 0.6 G (2.9m/s² or less for the 04320 or more.)	Max. 5.9 m/s² or less (2.9 m/s² or less for the models from 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, 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	CE/UL/cUL/DNV/GOST / CCC

Remarks:

① For selection of the load characteristics with variable torque the max. temperature is 40 °C.
② For selection of the load characteristics with a 120 % overload rating the max. temperature is 40 °C (F740) and 30 °C (F746).
③ The product may only be exposed to the full extremes of this temperature range for short periods (e.g. during transportation).
④ After that derate by 3 % for every extra 500 m up to 2500 m.
⑤ When the cable bushing for the optional expansion cards is broken out the unit has an IP 00 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.

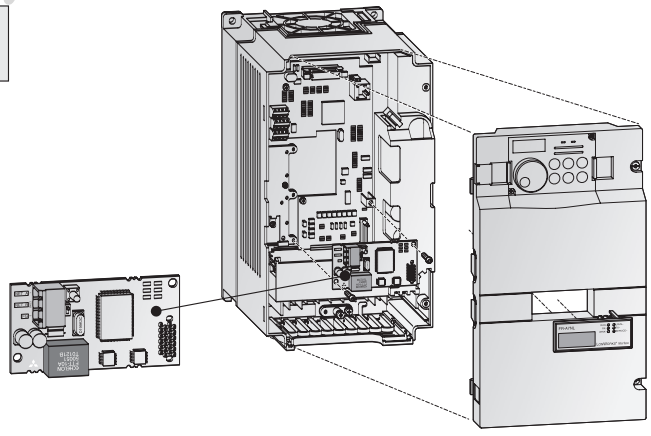
External Options

In addition to the FR-PU07 control panel 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-S500E	FR-E500	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 contro (PLG), Vector control		This option is used for position control and precise speed control.	—	—	—	●
	Communi-cations	SSCNET	Integration of a frequency inverter into a SSCNET.	—	—	—	●
		Profibus/DP	Integration of a frequency inverter into a Profibus/DP network.	—	●	●	●
		DeviceNet™	Integration of a frequency inverter into a DeviceNet.	—	●	●	●
		CC-Link	Integration of a frequency inverter into a CC-Link network.	—	●	●	●
		LonWorks	Integration of a frequency inverter into a LonWorks network.	—	—	●	—
		CANopen	Integration of a frequency inverter into a CANopen network.	—	●	—	●
		Ethernet	Integration of a frequency inverter into a Ethernet network.	—	—	●	●

Option		Description	FR-S500E	FR-E500	FR-F700	FR-A700
External options	Control panel (8 languages)	Interactive control panel 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	For an improvement of the brake capacity. For high inertia loads and active loads. Used in combination with a resistor unit.	●	●	●	●
	External brake resistor	To improve the brake capacity of the inverter. Depending on the inverter type it is used in combination with a brake unit.	●	●	●	●
	DC reactor AC chokes	For increased efficiency, reduction of mains feedback and compensation of voltage fluctuations.	●	●	●	●
	Floor standing unit FSU	IP 20 physical contact protection in a freely-locatable floor-standing unit. Detailed information on request.	—	—	●	●

Mounting example of an internal option



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
Digital output		Selectable of 43 standard output signals of the inverter can be output at the open collector. The outputs are isolated with optocouplers.	Output load: 24V DC; 0.1 A, sink or source logic	FR-A7AY	FR-F700 / FR-A700	156776
Expansion analog output		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, 1 µA at current output, accuracy: ±10%			
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
Vector control and orientation/encoder		Vector control with encoder can be performed.	5 V TTL differential 1024–4096 pulse 11 – 30 V HTL complimentary	FR-A7AP	FR-A700	166133
		The main spindle can be stopped at a fixed position (orientation) in combination with a pulse encoder. The motor speed is sent back and the speed is maintained constant.				
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-E5NC	FR-E500	104558
				FR-A7NC	FR-F700 / FR-A700	156778
	CAN Open	Option board for integration of a frequency inverter in a CAN Open network. Operation, display functions and parameter settings can be controlled by a computer (PC etc.) or a PLC.	Maximum transfer rate: 1 MBaud	OI-FR-E5NC0	FR-E500	139378
				FR-A7NCA	FR-A700	141403
	Ethernet	Option board for integration of a frequency inverter in a Ethernet network. Operation, display functions and parameter settings can be controlled by a computer (PC etc.) or a PLC.	Only NA version	FR-A7NE	FR-A700	on request
	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
	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
			D-Sub9 connection adapter for FR-A7NP	FR-D-Sub9	FR-F700 / FR-A700	191751
			Connection of up to 42 inverters supported.	FR-E5NP	FR-E500	104556
	DeviceNet ™	Option board for the integration of a frequency inverter into a DeviceNet. The operation, display functions, and parameter settings can be controlled by a computer (PC etc.) or a PLC.	Maximum transfer rate: 10 MBaud	FR-A7ND	FR-F700 / FR-A700	158525
				FR-E5ND	FR-E500	104557
	SSCNET III	Option board for the integration of a frequency inverter into the Mitsubishi Electric servo system network SSCNET III. The operation and display functions can be controlled by Motion Controller (Q172H CPU, Q173H CPU).	Maximum transfer rate: 50 MBaud	FR-A7NS	FR-A700	141403

Overview External Options

External options	Description	Remarks/Specifications	Type	Applicable inverter	Art. no.
Control panel (parameter unit)	Interactive standard control panel	Please refer to page 8 for details.	FR-PA02-02	FR-E500	103686
	Interactive control panel with LCD display (8 languages).	Please refer to page 39 for details.	FR-PU04	All	67735
			FR-PU07	All	166134
			FR-DU07	All	157514
Control panel cover	Cover for the backside of the control panel FR-PA02-02 or FR-PU04	Connection adapter integrated.	FR-ESP	FR-E500	125323
Connection cable for remote control panel	Cable for a remote connection of the control panel FR-PU04 or FR-PU07.	Available length: 1; 2.5 and 5 m	FR-A5 CBL	All	1 m: 70727 2.5 m: 70728 5 m: 70729
Adapter	Connection adapter for FR-DU07	Required for remote connection of the FR-DU07 with FR-A5CBL	FR-ADP	All	157515
Interface cable	Communications cable for RS232 or RS485 interface to connect an external personal computer	Length 3 m; can be used for example with the setup/configuration software	SC-FR PC	All	88426
USB-RS232 converter	Port converter adapter cable from RS-232 to USB	USB specification 1.1, 0.35 m long	USB-RS232	FR-F700	155606
VFD setup software	Parameterization and setup software for Mitsubishi Electric inverter.	Please refer to page 42 for details.	—	All 500 series	159746
FR-Configurator	Parameterization and setup software for Mitsubishi Electric inverter.		—	All 700 series	190586
DIN rail mounting set	Adapter for mounting frequency inverters on a DIN rail.	When using the DIN rail adapters, filters can not be footprint mounted.	FR-UDA 01	FR-S500 (<0.75 k)	130833
			FR-UDA 02	FR-S500 (>1.5 k)	130832
EMC noise filter	Noise filter for compliance with EMC directives.	Please ask your distributor for more details	FFR-□□, FR-, FN-□□	All	—
AC chokes	For increased efficiency, reduction of mains feedback and compensation of voltage fluctuations.	Please ask your distributor for more details	FR-BAL-B	FR-E500, FR-A700 / FR-F700	—
DC reactor ①	DC reactor for compensation of voltage fluctuations.	Please ask your distributor for more details	MT-HEL	FR-A700 / FR-F700	—
Brake units	For an improvement of the brake capacity. For high inertia loads and active loads. Used in combination with a resistor unit.	Please ask your distributor for more details	MT-BU 5, BU-UFS	FR-A700 / FR-F700	—
External brake resistors	To improve the brake capacity of the inverter; is used in combination with a brake unit	Please ask your distributor for more details	MT-BR 5, RUFC	FR-E500	—

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	Order number	Applicable noise filter ⑤
		Overload capacity 120 %*		Overload capacity 150 %*		Overload capacity 200 %*				
●		—	—	—	—	1.4	0.2	FR-S 520SE-0,2 k EC	158459	A
●		—	—	—	—	2.5	0.4	FR-S 520SE-0,4 k EC	158460	A
●		—	—	—	—	4.1	0.75	FR-S 520SE-0,75 k EC	158461	A
●		—	—	—	—	7	1.5	FR-S 520SE-1,5 k EC	158462	B
	●	—	—	—	—	1.2 (1.3)	0.4	FR-S 540E-0,4 k EC	158463	C
	●	—	—	—	—	2.3 (2.5)	0.75	FR-S 540E-0,75 k EC	158464	C
	●	—	—	—	—	3.7 (4.1)	1.5	FR-S 540E-1,5 k EC	158465	C
	●	—	—	—	—	5.3 (5.8)	2.2	FR-S 540E-2,2 k EC	158466	D
	●	—	—	—	—	7.7 (8.5)	3.7	FR-S 540E-3,7 k EC	158467	D
●		—	—	3.6	0.75	2.5	0.4	FR-E 520S-0,4 k EC	102938	E
●		—	—	5	1.1	4	0.75	FR-E 520S-0,75 k EC	102939	E
●		—	—	9.6	2.2	7	1.5	FR-E 520S-1,5 k EC	102940	F
●		—	—	12	3	10	2.2	FR-E 520S-2,2 k EC	102941	F
	●	—	—	1.8	0.75	1.6	0.4	FR-E 540-0,4 k EC	69197	G
	●	—	—	3	1.1	2.6	0.75	FR-E 540-0,75 k EC	69198	G
	●	—	—	4.9	2.2	4	1.5	FR-E 540-1,5 k EC	69200	H
	●	—	—	6.7	3	6	2.2	FR-E 540-2,2 k EC	69201	H
	●	—	—	9.5	4	9.5	4	FR-E 540-3,7 k EC	69204	H
	●	—	—	14	7.5	12	5.5	FR-E 540-5,5 k EC	102942	I
	●	—	—	21	11	17	7.5	FR-E 540-7,5 k EC	102943	I
	●	2.3	0.75	2.1	0.75	—	—	FR-F 740-00023 EC	156569	U
	●	3.8	1.5	3.5	1.5	—	—	FR-F 740-00038 EC	156570	U
	●	5.2	2.2	4.8	2.2	—	—	FR-F 740-00052 EC	156571	U
	●	8.3	3.7	7.6	3.7	—	—	FR-F 740-00083 EC	156572	U
	●	12.6	5.5	11.5	5.5	—	—	FR-F 740-00126 EC	156573	U
	●	17	7.5	16	7.5	—	—	FR-F 740-00170 EC	156594	V
	●	25	11	23	11	—	—	FR-F 740-00250 EC	156595	V
	●	31	15	29	15	—	—	FR-F 740-00310 EC	156596	W
	●	38	18.5	35	18.5	—	—	FR-F 740-00380 EC	156597	W
	●	47	22	43	22	—	—	FR-F 740-00470 EC	156598	I
	●	62	30	57	30	—	—	FR-F 740-00620 EC	156599	I
	●	77)	37	70	37	—	—	FR-F 740-00770 EC	156600	II
	●	93	45	85	45	—	—	FR-F 740-00930 EC	156601	III, IX
	●	116	55	106	55	—	—	FR-F 740-01160 EC	156602	IV
	●	180	90	144	75	—	—	FR-F 740-01800 EC	156603	IV
	●	216	110	180	90	—	—	FR-F 740-02160 EC	156604	J
	●	260	132	216	110	—	—	FR-F 740-02600 EC	156605	J
	●	325	160	260	132	—	—	FR-F 740-03250 EC	156606	K
	●	361	185	325	160	—	—	FR-F 740-03610 EC	156607	K
	●	432	220	361	185	—	—	FR-F 740-04320 EC	156608	K
	●	481	250	432	220	—	—	FR-F 740-04810 EC	156609	L
	●	547	280	481	250	—	—	FR-F 740-05470 EC	156610	L
	●	610	315	547	280	—	—	FR-F 740-06100 EC	156611	L
	●	683	355	610	315	—	—	FR-F 740-06830 EC	156612	M
	●	770	400	683	355	—	—	FR-F 740-07700 EC	156613	M
	●	866	450	770	400	—	—	FR-F 740-08660 EC	156614	M
	●	962	500	866	450	—	—	FR-F 740-09620 EC	156615	M
	●	1094	560	962	500	—	—	FR-F 740-10940 EC	156616	N
	●	1212	630	1094	560	—	—	FR-F 740-12120 EC	156617	N

Remarks:
Explanation for ① to ⑧ see next page.

Power supply 3~400 V ②	Rated output current [A] ⑥	Rated motor capacity [kW] ④	Rated output current [A] ⑥	Rated motor capacity [kW] ④	Rated output current [A]	Rated motor capacity [kW] ④	Rated output current [A]	Rated motor capacity [kW] ④	Frequency inverter type	Order number	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-F 746-00023 EC	163796	0
●	3.8	1.5	3.5	1.5	—	—	—	—	FR-F 746-00038 EC	163797	0
●	5.2	2.2	4.8	2.2	—	—	—	—	FR-F 746-00052 EC	163798	0
●	8.3	3.7	7.6	3.7	—	—	—	—	FR-F 746-00083 EC	163799	0
●	12.6	5.5	11.5	5.5	—	—	—	—	FR-F 746-00126 EC	163800	0
●	17	7.5	16	7,5	—	—	—	—	FR-F 746-00170 EC	163801	P
●	25	11	23	11	—	—	—	—	FR-F 746-00250 EC	163802	P
●	31	15	29	15	—	—	—	—	FR-F 746-00310 EC	163803	Q
●	38	18.5	35	18.5	—	—	—	—	FR-F 746-00380 EC	163804	Q
●	47	22	43	22	—	—	—	—	FR-F 746-00470 EC	163805	R
●	62	30	57	30	—	—	—	—	FR-F 746-00620 EC	163806	R
●	77	37	70	37	—	—	—	—	FR-F 746-00770 EC	163807	S
●	93	45	85	45	—	—	—	—	FR-F 746-00930 EC	163808	T
●	116	55	106	55	—	—	—	—	FR-F 746-01160 EC	163809	T
●	2.3	0.75	2,1	0.75	1.5	0.4	0.8	0.25	FR-A 740-00023 EC	169826	U
●	3.8	1.5	3.5	1.5	2.5	0.75	1.5	0.4	FR-A 740-00038 EC	169797	U
●	5.2	2.2	4.8	2.2	4	1.5	2.5	0.75	FR-A 740-00052 EC	169798	U
●	8.3	3.7	7.6	3.7	6	2.2	4	1.5	FR-A 740-00083 EC	169799	U
●	12.6	5.5	11.5	5.5	9	3.7	6	2.2	FR-A 740-00126 EC	169800	U
●	17	7.5	16	7.5	12	5.5	9	3.7	FR-A 740-00170 EC	169801	V
●	25	11	23	11	17	7.5	12	5.5	FR-A 740-00250 EC	169802	V
●	31	15	29	15	23	11	17	7.5	FR-A 740-00310 EC	169803	W
●	38	18.5	35	18.5	31	15	23	11	FR-A 740-00380 EC	169804	W
●	47	22	43	22	38	18.5	31	15	FR-A 740-00470 EC	169805	I
●	62	30	57	30	44	22	38	18.5	FR-A 740-00620 EC	169806	I
●	77	37	70	37	57	30	44	22	FR-A 740-00770 EC	169807	II
●	93	45	85	45	71	37	57	30	FR-A 740-00930 EC	169808	III, IV
●	116	55	106	55	86	45	71	37	FR-A 740-01160 EC	169809	IV
●	180	90	144	75	110	55	86	45	FR-A 740-01800 EC	169810	IV
●	216	110	180	90	144	75	110	55	FR-A 740-02160 EC	169811	J
●	260	132	216	110	180	90	144	75	FR-A 740-02600 EC	169812	J
●	325	160	260	132	216	110	180	90	FR-A 740-03250 EC	169813	K
●	361	185	325	160	260	132	216	110	FR-A 740-03610 EC	169814	K
●	432	220	361	185	325	160	260	132	FR-A 740-04320 EC	169815	K
●	481	150	432	220	361	185	325	160	FR-A 740-04810 EC	169816	L
●	547	280	481	250	432	220	361	185	FR-A 740-05470 EC	169817	L
●	610	315	547	280	481	250	432	220	FR-A 740-06100 EC	169818	L
●	683	355	610	315	547	280	481	250	FR-A 740-06830 EC	169819	M
●	770	400	683	355	610	315	547	280	FR-A 740-07700 EC	169820	M
●	866	450	770	400	683	355	610	315	FR-A 740-08660 EC	169821	M
●	962	500	866	450	770	400	683	355	FR-A 740-09620 EC	169822	M
●	1094	560	962	500	866	450	770	400	FR-A 740-10940 EC	169823	N
●	1212	630	1094	560	962	500	866	450	FR-A 740-12120 EC	169824	N

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.
*(FR-A540L-G and FR-F740 do not have this limitation, the validity is 50 °C max. at 150 % overload capacity)
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) at 50 °C max.
The values for für 250 % overload capacity are valid at 200 % I_{rated} for 60 s,, 250 % for 3 s at 50 °C max.

Remarks:

① Permissible power supply voltage range for 1phase connection: 170–264 V.
② Permissible power supply voltage range for 3phase 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.
⑤ Combination see next page.
⑥ If the carrier of the FR-F 740 is set to 3 kHz or more, the carrier frequency is automatically reduced when the inverter output current exceeds the parenthesized rated output current (= 85 % load).

Filters and Conditioners

Filters and conditioners - a necessary part of today's environment

The need for various filters and conditioning elements, to be added to power circuits, has been driven by legislation and regulation from Europe, the Government and Electricity suppliers.

Mitsubishi Electric offers a range of solutions to help installations meet requirements such as EMC directives through to G5/4 regulations.

Registration with the UK ECA scheme

Many of Mitsubishi Electric's inverters are registered with the UK Governments ECA scheme. More information about the scheme can be found at www.eca.gov.uk . Mitsubishi Electric's company registration number in the scheme is 107, and was first registered 1/4/2003.

EMC information

Ensuring compliance with the EN 61800-3 product standard.

Inverters must be fitted with an appropriate **EMC filter** (see Accessories) to guarantee compliance with the EMC requirements of the EN 61800-3 product standard.

These **EMC filters** are available as optional accessories and are normally installed in the direct vicinity of the inverter.

The guidelines for using and installing Mitsubishi inverters must be observed at all times.

See the applicable technical documentation for your Mitsubishi inverter for more information. All the applicable guidelines and regulations for using and installing the equipment must also be observed at all times.

Please contact your Mitsubishi partner if you require further information.

Definition of terms in EN 61800-3 & A11:

First environment:

An environment including buildings and domestic residential areas that are connected directly to a low-voltage power supply network without an interstage transformer.

Second environment:

Environments containing facilities that are not directly connected to a low-voltage power supply network for buildings in domestic and residential areas.

No.	Frequency inverter	EMC Filter conf. 55011A	Order number	EMC Filter conf. 55022B	Order number
A	FR-S 520SE-0,2 k – 0,75 k EC	FFR-S520S-14A-RF1	152736	FFR-S520-14A-RF1	152736
B	FR-S 520SE-1,5 k EC	FFR-S520S-20A-RF1	152740	FFR-S520-20A-RF1	152740
C	FR-S 540E-0,4 k – 1,5 k EC	FFR-S540-8A-RF100	138425	FFR-S540-8A-RF100	138425
D	FR-S 540E-2,2 k – 3,7 k EC	FFR-S540-13A-RF100	138423	FFR-S540-13A-RF100	138423
E	FR-E 520S-0,4 k – 0,75 k EC	FFR-E520S-14A-SC1	152727	FFR-E520S-14A-SC1	152727
F	FR-E 520S-1,5 k – 2,2 k EC	FFR-E520S-26A-SC1	152730	FFR-E520S-26A-SC1	152730
G	FR-E 540-0,4 – 0,75 k EC	FFR-E540-4,5A-SF1	126654	FFR-E540-4,5A-SF1	126654
H	FR-E 540-1,5 – 3,7 k EC	FFR-E540-15A-SF1	126655	FFR-E540-15A-SF1	126655
I	FR-E 540-5,5 k – 7,5 k EC	FFR-E540-27A-SF1	126656	FFR-E540-27A-SF1	126656
J	FR-A&F 740-02160 – 02600 EC	FN3359-250-28	104663		
K	FR-A&F 740-03250 – 04320 EC	FN3359-400-99	104664		
L	FR-A&F 740-04810 – 06100 EC	FN3359-600-99	104665		
M	FR-A&F 740-06830 – 09620 EC	FN3359-1000-99	104666		
N	FR-A&F 740-10940 – 12120 EC	FN3359-1600-99	130229		
O	FR-F 746-00023 – 00126 EC	FFR-AF-IP54-21A-SM1	166730	FFR-AF-IP54-21A-SM1	166730
P	FR-F 746-00170 – 00250 EC	FFR-AF-IP54-44A-SM1	166731	FFR-AF-IP54-44A-SM1	166731
Q	FR-F 746-00310 – 00380 EC	FFR-AF-IP54-62A-SM1	166732	FFR-AF-IP54-62A-SM1	166732
R	FR-F 746-00470 – 00620 EC	FFR-AF-IP54-98A-SM1	166733	FFR-AF-IP54-98A-SM1	166733
S	FR-F 746-00770 EC	FFR-AF-IP54-117A-SM1	166734	FFR-AF-IP54-117A-SM1	166734
T	FR-F 746-00930 – 01160 EC	FFR-AF-IP54-172A-SM1	166735	FFR-AF-IP54-172A-SM1	166735
U	FR-A&F 740-00023 – 00126 EC	FFR-BS-00126-18A-SF100	193677	FFR-BS-00126-18A-SF100	193677
V	FR-A&F 740-00170 – 00250 EC	FFR-BS-00250-30A-SF100	193678	FFR-BS-00250-30A-SF100	193678
W	FR-A&F 740-00310 – 00380 EC	FFR-BS-00380-55A-SF100	193679	FFR-BS-00380-55A-SF100	193679
I	FR-A&F 740-00470 – 00620 EC	FFR-BS-00620-75A-SF100	193680	FFR-BS-00620-75A-SF100	193680
II	FR-A&F 740-00770 EC	FFR-BS-00770-95A-SF100	193681	FFR-BS-00770-95A-SF100	193681
III	FR-A&F 740-00930 EC	FFR-BS-00930-120A-SF100	193682	FFR-BS-00930-120A-SF100	193682
IV	FR-A&F 740-00930– 01800 EC	FFR-BS-01800-180A-SF100	193683	FFR-BS-01800-180A-SF100	193683

Note:
The frequency inverters of the FR-A740/FR-F740 series are equipped with a built-in EMC filter for industrial environment (2nd environment).
The filters shown in the table above are required for special cases only.

SERVO AND MOTION SYSTEMS

Mitsubishi Electric offers a variety of Servo and Motion system products providing solutions for applications covering point-to-point and synchronised systems. Systems can be built using a single axis or multi axes, for example when using a System Q Motion CPU solution up to 96 axes can be controlled.

With both standard pulse type output modules and SSCNET bus modules specific application needs are easy to meet.

The Super Series of Servo motors and amplifiers takes Mitsubishi Motion Control to new levels of precision with a wide range of motors (all MR-J2S series motors are fitted with 131072 pulse-per-revolution encoders, and all MR-J3 series motors are fitted with 262144 pulse-per-revolution encoders) and wide amplifier range (up to 55 kW).

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

What are the Components of a Servo System?

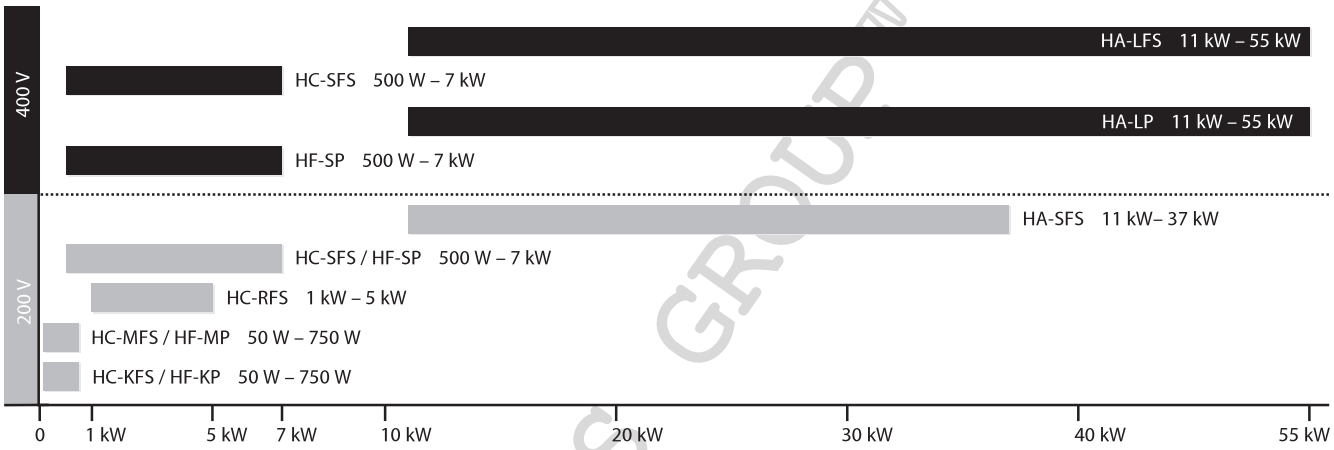
Servo motors

Utilising the most advanced concentrated winding techniques and latest technology, these brushless servo motors are among the most compact on the market.

Mitsubishi Servo Motors are made to high standards and offer a wide range of power, speed and inertia ratings providing a motor for all applications. Ranging from 50 W through to 55 kW and with specialist type motors available (flat "pancake"motors) the new Super Series Servo Motors complete the line-up of products offered by Mitsubishi Electric.

Also, all motors in the Mitsubishi Super Series are fitted with absolute encoders as standard.

Therefore, an absolute system can be created by simply providing power to Servo amplifier via a battery. Once this has been done the super capacitor inside the motor and back-up battery allow the Servomotor position to be constantly monitored.

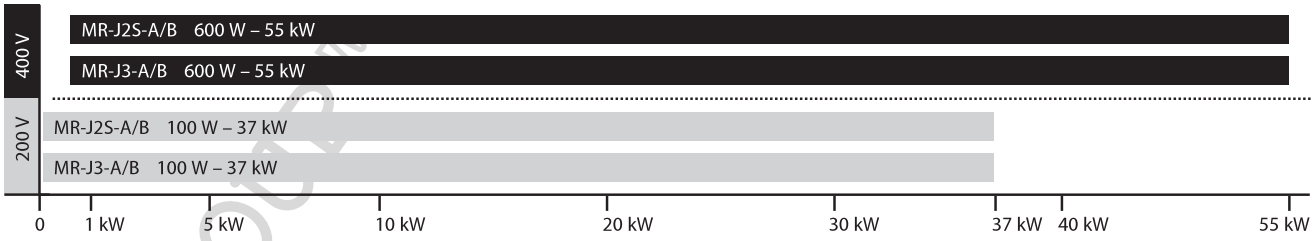


Servo amplifiers

Mitsubishi offer a wide range of Servo amplifiers to meet the demands of all types of applications. From standard digital pulse and analogue controlled amplifiers through to dedicated SSCNET bus type amplifiers, there is a product for all circumstances.

Real Time Adaptive Tuning (RTAT) is a unique Mitsubishi technology, enabling the servo to deliver maximum dynamic performance, even if the load keeps changing, by automatically tuning online (during operation) to the application.

The Super Series digital pulse and analogue units of the MR-J2S and MR-J3 series range from 100W units through to 55kW. The SSCNET bus type amplifiers (type B) offer the user ease of connectivity, via SSCNET.



Positioning controllers

For the compact, cost effective, FX range of PLCs, the FX2N-10PG unit provides single-axis control with in-built positioning tables, fast external start and an output pulse rate of up to 1 MHz. The new module FX3U-20SSC-H is a positioning module for the MR-J3B series. This modules provide a quick and easy, but efficient positoning control system for simpler applications.

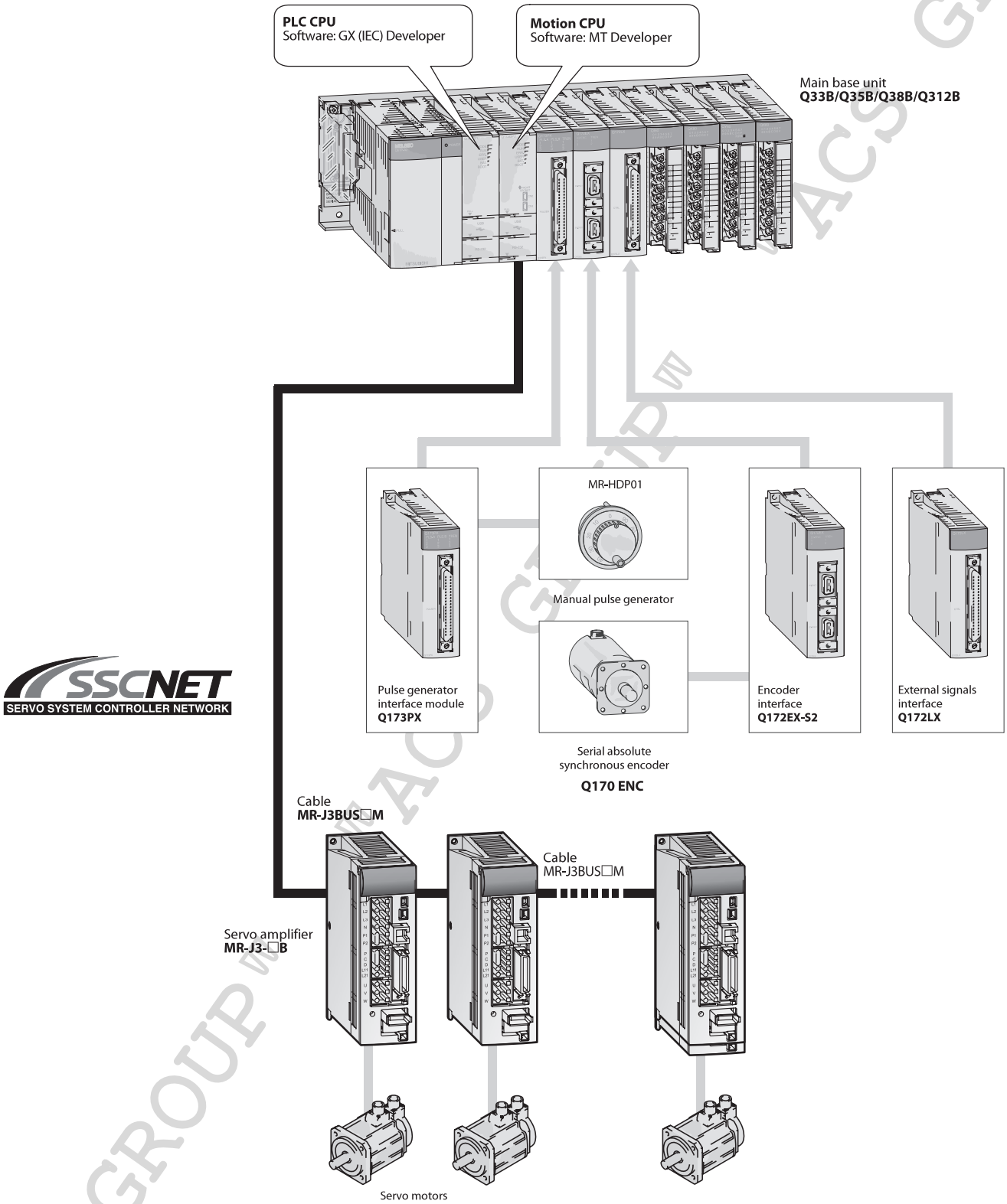
For larger, more complex applications the new powerful Qn PLC range offers three new QD75 Series modules (one, two and four axes).

These are: open-collector output type (QD75P series), Differential output type (QD75D series) and SSCNET bus type (QD75M series). Using the SSCNET system can provide much improved, easier to use positioning system, with reduced wiring and better noise immunity. All QD75 series controllers can provide functionality such as interpolation and speed-position operation etc.

Motion Controllers

For specialist applications requiring the highest level of control and precision, the dynamic servo technology provided by the Q-Motion CPU is combined with the powerful processing power of the Q series PLC CPU, creating a completely new generation of motion controller products.This fully integrated and flexible system has the capability to control up to 96 axes using SSCNET, which is more than capable for handling any motion application.

System Configuration



Notes:

1. The first CPU on the main base unit must always be a PLC CPU (e.g. Q00, Q01, Q02/Q02H/Q06H/Q12H/Q25H).

X-Y Table System Configurations

An X-Y table is a typical two axes servo application, commonly used in industry for pick and place systems such as PCB component insertion machines through to welding machines.

The following information provides two examples of possible X-Y table system configurations, using Mitsubishi automation equipment.

The first is a linear FX2N-10PG based system and the second is a more complex interpolating QD75M (SSCNET) based system.

System 1: FX2N-10PG based system

Products	Function
FX2N-16MR-ES/UL	PLC
FX2N-10PG	Pulse train output module
FX2N-10PG	Pulse train output module
MR-J2S-10A	Servo Amplifier
HC-KFS13	Motor
MR-J2S-60A	Servo Amplifier
HC-SFS52	Motor

The FX2N-10PG is a single axis position control module, therefore two modules are used to control the X and Y axes. The FX2N-10PG uses a differential pulse train output to control the position of the Servo Motors. As a differential pulse train output is given, then the MR-J2S-A Series of Servo amplifiers must be used (these allow control from either a pulse train or analogue source).

One of the disadvantages of using the FX2N-10PG system is that interpolation between the two axes is not possible. This is due to the fact that as the position modules are independent of each other they cannot make combined moves.

Another disadvantage is that the controller (FX PLC) does not know the true position of each of the Servo motors. This may cause problems if a power-down situation occurs or an axis is physically moved.

One major advantage that the FX2N-10PG systems have is that they can be easily integrated into existing FX PLC systems.

- Simple to use
- Widely used
- Cost effective
- Simple functionality

System 2: QD75M based system

Products	Function
Q00J	Q PLC
QD75-M2	Positioning Controller
MR-J2S-10B	Servo Amplifier
HC-KFS13	Motor
MR-J2S-40B	Servo Amplifier
HC-SFS52	Motor
MR-BAT	Servo Amplifier Battery
MR-BAT	Servo Amplifier Battery

The QD75M based system uses the powerful modular Qn PLC Series, providing greater functionality and expandability options. The QD75M system is connected using SSCNET (Servo System Controller Network), which is Mitsubishi's dedicated motion control network. SSCNET simplifies the set-up of the system and reduces the wiring required. SSCNET systems are created by simply plugging an amplifier into the main controller (QD75M) and then "daisy-chaining" each additional axis that is added. SSCNET connectivity requires MR-J2S-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 QD75M module.

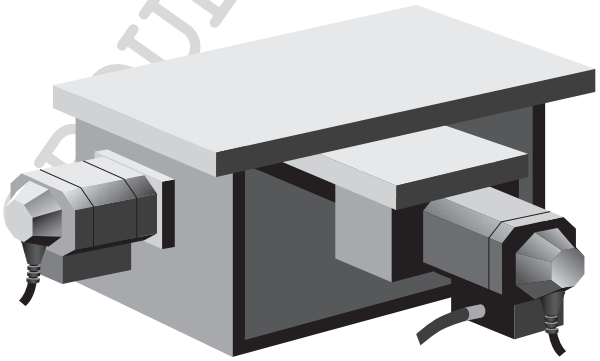
Also, all of the internal Servo parameters can be set from the PLC, again due to the bus system used.

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 (QD75M2), interpolation between the two axes is possible.

- SSCNET capability
- Easy of set-up
- High functionality
- Expandability
- Module Options
- Reduced Wiring

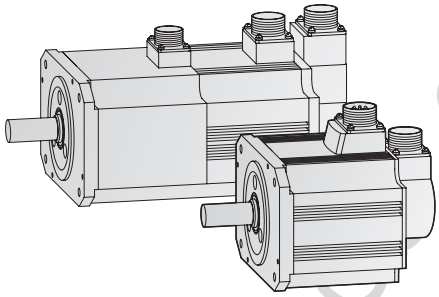
X-Y table control

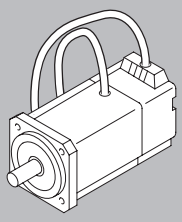
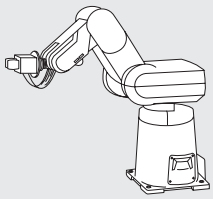
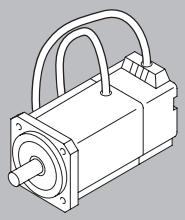
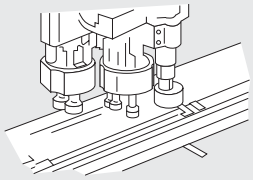
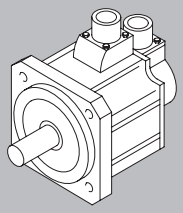
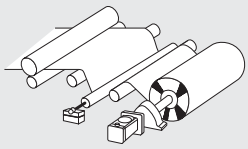
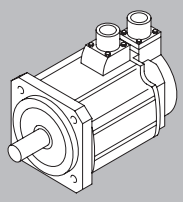
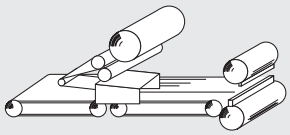


Servo Motor Features and Typical Applications

The recommended combinations of servo amplifiers and servo motors are listed in the tables below.

All servo motors are fitted with an absolute encoder and optionally avalable with an electromagnetic brake.



Model designation	Features	Application example	
K 	**Low inertia** Larger motor inertia moment makes this unit well suited for machines with fluctuating load inertia moment or machines with low rigidity such as conveyors.	● Conveyors ● Food preparation machinery ● Printers ● Small loaders and unloaders ● Small robots and component assembly devices ● Small X-Y tables ● Small press feeders	 Small robots
M 	**Ultra low inertia** Small motor inertia moment makes this unit well suited for high-dynamic positioning operations with extra small cycle times.	● Inserters, mounters, bonders ● Printed board hole openers ● In-circuit testers ● Label printers ● Knitting and embroidery machinery ● Ultra-small robots and robot tips	 Inserters, mounters, bonders
S 	**Medium inertia** Stable control is performed from low to high speeds, enabling this unit to handle a wide range of applications (e.g. direct connection to ball screw components).	● Conveyor machinery ● Specialised machinery ● Robots ● Loaders and unloaders ● Winders and tension devices ● Turrets ● X-Y tables ● Test devices	 Winders and tension devices
R 	**Low inertia** A compact sized low-inertia moment model with medium capacity. Well suited for high-frequency operation.	● Roll feeders ● Loaders and unloaders ● High-frequency conveyor machinery	 Wrapping machinery

Note: Other types of motors are available on request.

Servo Motors Overview

Motors for MR-J2S series servo amplifiers

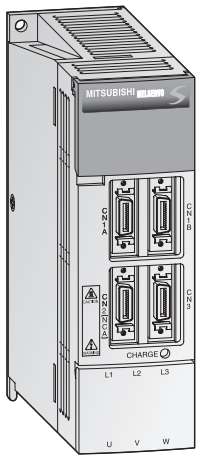
Motor series	Rated speed [r/min]	Rated output capacity [kW]	Servo motor model	Servo motor type: Voltage	Servo motor type: Protective structure	Amplifier pairing MR-J2S: 10A 10B	20A 20B	40A 40B	60A 60B	70A 70B	100A 100B	200A 200B	350A 350B	500A 500B	700A 700B	Art. no.
HC-KFS K	3000	0.05	HC-KFS053	200 V AC	IP55	●										134872
		0.1	HC-KFS13			●										134845
		0.2	HC-KFS23				●									126013
		0.4	HC-KFS43					●								134873
		0.75	HC-KFS73							●						135968
HC-MFS M	3000	0.05	HC-MFS053	200 V AC	IP55	●										134809
		0.1	HC-MFS13			●										134852
		0.2	HC-MFS23				●									134883
		0.4	HC-MFS43					●								134810
		0.75	HC-MFS73							●						134877
HC-SFS S	2000	0.5	HC-SFS52	200 V AC	IP65				●							134811
		1.0	HC-SFS102								●					134864
		1.5	HC-SFS152									●				134865
		2.0	HC-SFS202									●				134866
		3.5	HC-SFS352										●			134867
		5.0	HC-SFS502											●		134868
		7.0	HC-SFS702												●	134869
	2000	0.5	HC-SFS524	400 V AC	IP65				●							151551
		1.0	HC-SFS1024								●					151554
		1.5	HC-SFS1524									●				151555
		2.0	HC-SFS2024									●				151556
		3.5	HC-SFS3524										●			150873
		5.0	HC-SFS5024											●		150875
		7.0	HC-SFS7024												●	151557
HC-RFS R	3000	1.0	HC-RFS103	200 V AC	IP65							●				134853
		1.5	HC-RFS153									●				134854
		2.0	HC-RFS203										●			134855
		3.5	HC-RFS353											●		134856
		5.0	HC-RFS503											●		134857

Motors for MR-J3 series servo amplifiers

Motor series	Rated speed [r/min]	Rated output capacity [kW]	Servo motor model	Servo motor type: Voltage	Servo motor type: Protective structure	Amplifier pairing MR-J3: 10A 10B	20A 20B	40A 40B	60A 60B	70A 70B	100A 100B	200A 200B	350A 350B	500A 500B	700A 700B	Art. no.
HF-KP K	3000	0.05	HF-KP053	200 V AC	IP65	●										161507
		0.1	HF-KP13			●										160211
		0.2	HF-KP23				●									161508
		0.4	HF-KP43					●								161509
		0.75	HF-KP73							●						161510
HF-MP M	3000	0.05	HF-MP053	200 V AC	IP65	●										161515
		0.1	HF-MP13			●										161516
		0.2	HF-MP23				●									161517
		0.4	HF-MP43					●								161518
		0.75	HF-MP73							●						161519
HF-SP S	2000	0.5	HF-SP52	200 V AC	IP67				●							161525
		1.0	HF-SP102								●					161526
		1.5	HF-SP152									●				161527
		2.0	HF-SP202									●				161528
		3.5	HF-SP352										●			161529
		5.0	HF-SP502											●		161530
		7.0	HF-SP702												●	161531

Note: Other types of motors are available on request.

MR-J2S Servo Amplifier Specifications (200 V Type)



The MR-J2S-A are general purpose servo amplifiers with analog inputs and pulse train interface as a standard. The range covers 100 W units (MR-J2S-10A) through to 7 kW (MR-J2S-700A).

The MR-J2S-B (SSCNET bus type) servo amplifiers are designed for use with the Mitsubishi motion controllers of the MELSEC System Q and MELSEC A series. The motion controllers and servo amplifiers can be linked via the high speed SSCNET network.

Connecting the amplifiers to SSCNET guarantees reliable operation and eliminates the need for complex wiring. The range also covers 100 W units (MR-J2S-10B) through to 7 kW (MR-J2S-700B).

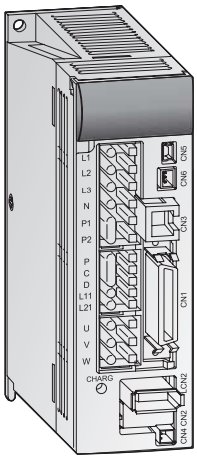
Common specifications MR-J2S-A/B		10A 10B	20A 20B	40A 40B	60A 60B	70A 70B	100A 100B	200A 200B	350A 350B	500A 500B	700A 700B
Power supply	voltage / frequency ①	3-phase 200 – 230 V AC, 50 / 60 Hz; 1-phase 230 V AC, 50 / 60 Hz					3-phase 200 – 230 V AC, 50 / 60 Hz				
	permissible voltage fluctuation	3-phase 200 – 230 V AC: 170 – 253 V AC, 1-phase 230 V AC: 207 – 253 V AC					3-phase 170 – 253 V AC				
	permissible frequency fluctuation	± 5 %									
Control system		Sinusoidal PWM control / current control system									
Dynamic brake		Built-in									
Speed frequency response		550 Hz or more									
Protective functions		Overcurrent shutdown, regeneration overvoltage shutdown, overload shutdown (electronic thermal), servomotor overheat protection, encoder fault protection, regeneration fault protection, undervoltage / sudden power outage protection, overspeed protection, excess error protection.									
Structure		Self-cooling, open (IP00)						Fan-cooling, open (IP00)			
Environment	ambient temperature	Operation: 0 – 55 °C (no freezing), storage: -20 – 65 °C (no freezing)									
	ambient humidity	Operation: 90 % RH max. (no condensation), storage: 90 % RH max. (no condensation)									
	atmosphere	Inside control panel; no corrossive gas, no flammable gas, no oil mist, no dust									
	elevation	1000 m or less above sea level									
	oscillation	5.9 m/s (0.6 G) max.									
Weight [kg]		0.7	0.7	1.1	1.1	1.7	1.7	2.0	2.0	4.9	7.2
Dimensions (W x H x D)	mm	50x168x135	50x168x135	70x168x135	70x168x135	70x168x190	70x168x190	90x168x195	90x168x195	130x250x200	180x350x200
Order information											
A type	Art. no.	134807	134808	134806	134828	134829	134831	134827	134832	135969	135854
B type	Art. no.	134833	134834	134835	134836	134837	134838	134839	134840	135971	135970

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-J2S-A		10A	20A	40A	60A	70A	100A	200A	350A	500A	700A
Position control mode	maximum input pulse frequency	500 kpps (when using differential receiver), 200 kpps (when using open collector)									
	positioning feedback pulse	Resolution per encoder / servo motor rotation (131072 pulses/revolution)									
	command pulse multiple	Electronic gear A/B multiple; A: 1 – 65535 or 131072, B: 1 – 65535, 1/50 < A/B < 500									
	Ppositioning complete width setting	0 – ±10 V DC (command pulse unit)									
	excess error	±10 rotations									
	torque limit input	Set by parameters or external analog input (0 – ± 10 V DC / maximum torque)									
Speed control mode	speed control range	Analog speed command 1:2000, internal speed command 1:5000									
	analog speed command input	0 – ± 10 V DC / rated speed									
	speed fluctuation rate	±0.01 % max. (load fluctuation 0 – 100 %); 0 % (power fluctuation ±10 %) ±0.2 % max. (ambient temperature 25 °C ±10 °C), when using external analog speed command									
	torque limit	Set by parameters or external analog input (0 – ± 10 V DC / maximum torque)									
Torque control specifications	torque command input	0 – ±8 V DC / maximum torque (input impedance 10 to 12 kΩ)									
	speed limit	Set by parameters or external analog input (0 – ± 10 V DC, rated speed)									

Control specifications MR-J2S-B (SSCNET)	10B	20B	40B	60B	70B	100B	200B	350B	500B	700B
Position and speed control	Possible using SSCNET control									
Maximum command input at the position control	Approximately 10 Mpps									

MR-J3 Servo Amplifier Specifications (200 V Type)



The MR-J3-A are general purpose servo amplifiers with analog inputs and pulse train interface as a standard. The range covers 100 W units (MR-J3-10A) through to 7 kW (MR-J3-700A).

The MR-J3-B (SSCNET III bus type) servo amplifiers are designed for use with the Mitsubishi motion controllers of the MELSEC System Q series. The motion controllers and servo amplifiers can be linked via the high speed SSCNET III network.

Connecting the amplifiers to SSCNET guarantees reliable operation and eliminates the need for complex wiring. The range also covers 100 W units (MR-J3-10B) through to 7 kW (MR-J3-700B).

A servo amplifier with built-in positioning (MR-J3-T) is available soon.

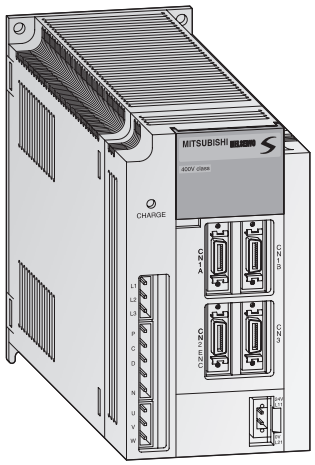
Common specifications MR-J3-A/B		10A 10B	20A 20B	40A 40B	60A 60B	70A 70B	100A 100B	200A 200B	350A 350B	500A 500B	700A 700B
Power supply	voltage / frequency ①	3-phase 200 – 230 V AC, 50 / 60 Hz; 1-phase 230 V AC, 50 / 60 Hz					3-phase 200 – 230 V AC, 50 / 60 Hz				
	permissible voltage fluctuation	3-phase 200 – 230 V AC: 170 – 253 V AC, 1-phase 230 V AC: 207 – 253 V AC					3-phase 170 – 253 V AC				
	permissible frequency fluctuation	± 5 %									
Control system		Sinusoidal PWM control / current control system									
Dynamic brake		Built-in									
Speed frequency response		900Hz									
Protective functions		Overcurrent shutdown, regeneration overvoltage shutdown, overload shutdown (electronic thermal), servomotor overheat protection, encoder fault protection, regeneration fault protection, undervoltage / sudden power outage protection, overspeed protection, excess error protection.									
Structure		Self-cooling, open (IP00)			Fan-cooling, open (IP00)						
Environment	ambient temperature	Operation: 0 – 55 °C (no freezing), storage: -20 – 65 °C (no freezing)									
	ambient humidity	Operation: 90 % RH max. (no condensation), storage: 90 % RH max. (no condensation)									
	atmosphere	Inside control panel; no corrossive gas, no flammable gas, no oil mist, no dust									
	elevation	1000 m or less above sea level									
	oscillation	5.9 m/s (0.6 G) max.									
Weight [kg]		0.8	0.8	1.0	1.0	1.4	1.4	2.3	2.3	4.6	6.2
Dimensions (W x H x D)	mm	40x168x135	40x168x135	40x168x170	40x168x170	60x168x185	60x168x185	90x168x195	90x168x195	130x250x200	172x300x200
Order information											
A type	Art. no.	16020	161485	161486	161487	161488	161489	161490	161491	161492	161493
B type	Art. no.	161497	161498	161499	161500	161501	161502	161503	161504	161505	161506

① Rated output capacity and rated rotation speed of the servo motor used in combination with the servo amplifier are as indicated when using the power voltage and frequency listed. Output and speed cannot be guaranteed when the power supply voltage is less than specified.

Control specifications MR-J3-A		10A	20A	40A	60A	70A	100A	200A	350A	500A	700A
Position control mode	maximum input pulse frequency	1000 kpps (when using differential receiver), 200 kpps (when using open collector)									
	positioning feedback pulse	Resolution per encoder / servo motor rotation (262144 pulses/revolution)									
	command pulse multiple	Electronic gear A/B multiple; A: 1 – 1048576, B: 1 – 1048576, 1/10 < A/B < 2000									
	Ppositioning complete width setting	0 – ±10000 Impulse (command pulse unit)									
	excess error	±3 rotations									
	torque limit input	Set by parameters or external analog input (0 – + 10 V DC / maximum torque)									
Speed control mode	speed control range	Analog speed command 1:2000, internal speed command 1:5000									
	analog speed command input	0 – ± 10 V DC / rated speed									
	speed fluctuation rate	±0.01 % max. (load fluctuation 0 – 100 %); 0 % (power fluctuation ±10 %) ±0.2 % max. (ambient temperature 25 °C ±10 °C), when using external analog speed command									
	torque limit	Set by parameters or external analog input (0 – +10 V DC / maximum torque)									
Torque control specifications	torque command input	0 – ±8 V DC / maximum torque (input impedance 10 to 12 kΩ)									
	speed limit	Set by parameters or external analog input (0 – ± 10 V DC, rated speed)									

Control specifications MR-J3-B (SSCNET III)	10B	20B	40B	60B	70B	100B	200B	350B	500B	700B
Position and speed control	Possible using SSCNET III control									
Comunication speed	50 Mbs									

MR-J2S Servo Amplifier Specifications (400 V Type)



Mitsubishi's 400 V range of servo amplifiers provides the same industry leading functionality as the 200 V range.
The 400 V servo amplifiers are available over a wide range from 600 W rating to the very powerful 22 kW rating. Suitable for all types of automation solutions, the 400 V servo amplifiers also provide sink/source logic selectability.

For amplifiers larger than 22 kW please contact your nearest Mitsubishi office.

Common specifications MR-J2S-A4/B4		60A4 60B4	100A4 100B4	200A4 200B4	350A4 350B4	500A4 500B4	700A4 700B4	11KA4 11KB4	15KA4 15KB4	22KA4 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						External option		
Speed frequency response		550 Hz								
Protective functions		Overcurrent shutdown, regeneration overvoltage shutdown, overload shutdown (electronic thermal), servomotor overheat protection, encoder fault protection, regeneration fault protection, undervoltage / sudden power outage protection, overspeed protection, excess error protection.								
Structure		Self-cooling, open (IP00)								
Environment	ambient temperature	Operation: 0 – 55 °C (no freezing), storage: -20 – 65 °C (no freezing)								
	ambient humidity	Operation: 90 % RH max. (no condensation), storage: 90 % RH max. (no condensation)								
	atmosphere	Inside control panel; no corrossive gas, no flammable gas, no oil mist, no dust								
	elevation	1000 m or less above sea level								
	oscillation	5.9 m/s (0.6 G) max.								
Weight [kg]		2.1	2.2	2.2	5.0	5.0	7.2	15.0	16.0	20.0
Dimensions (W x H x D)	mm	90x168x195	90x168x195	90x168x195	130x250x200	130x250x200	180x350x200	260x400x260	260x400x260	350x400x260
Order information										
A type	Art. no.	151546	151547	151548	150830	150832	151550	150854	150855	150856
B type	Art. no.	154329	154328	154327	154326	154325	154324	150862	150863	150865

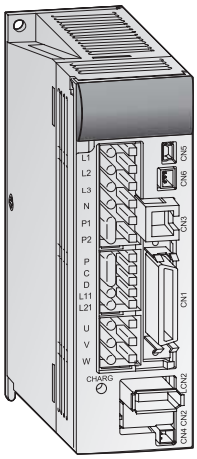
① Rated output capacity and rated rotation speed of the servo motor used in combination with the servo amplifier are as indicated when using the power voltage and frequency listed. Output and speed cannot be guaranteed when the power supply voltage is less than specified.

② For torque characteristics when combined with a servo motor manual.

Control specifications MR-J2S-A4		60A4	100A4	200A4	350A4	500A4	700A4	11KA4	15KA4	22KA4
Position control mode	maximum input pulse frequency	500 kpps (when using differential receiver), 200 kpps (when using open collector)								
	positioning feedback pulse	Resolution per encoder / servo motor rotation (131072 pulses/revolution)								
	command pulse multiple	Electronic gear A/B multiple; A: 1 – 65535 or 131072, B: 1 – 65535, 1/50 < A/B < 500								
	Ppositioning complete width setting	0 – ±10 V DC (command pulse unit)								
	excess error	±10 rotations								
	torque limit input	Set by parameters or external analog input (0 – ± 10 V DC / maximum torque)								
Speed control mode	speed control range	Analog speed command 1:2000, internal speed command 1:5000								
	analog speed command input	0 – ± 10 V DC / rated speed								
	speed fluctuation rate	±0.01 % max. (load fluctuation 0 – 100 %); 0 % (power fluctuation ±10 %) ±0.2 % max. (ambient temperature 25 °C ±10 °C), when using external analog speed command								
	torque limit	Set by parameters or external analog input (0 – ± 10 V DC / maximum torque)								
Torque control specifications	torque command input	0 – ±8 V DC / maximum torque (input impedance 10 to 12 kΩ)								
	speed limit	Set by parameters or external analog input (0 – ± 10 V DC, rated speed)								

Control specifications MR-J2S-B4 (SSCNET)	60B4	100B4	200B4	350B4	500B4	700B4	11KB4	15KB4	22KB4
Position and speed control	Possible using SSCNET control								
Comunication speed	5,6 Mbs								

MR-J3S Servo Amplifier Specifications (400 V Type)



Mitsubishi's 400 V range of servo amplifiers provides the same industry leading functionality as the 200 V range.
The 400 V servo amplifiers are available over a wide range from 600 W rating to the very powerful 22 kW rating. Suitable for all types of automation solutions, the 400 V servo amplifiers also provide sink/source logic selectability.

For amplifiers larger than 22 kW please contact your nearest Mitsubishi office.

Common specifications MR-J3S-A4/B4		60A4 60B4	100A4 100B4	200A4 200B4	350A4 350B4	500A4 500B4	700A4 700B4	11KA4 11KB4	15KA4 15KB4	22KA4 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						External option		
Speed frequency response		900 Hz								
Protective functions		Overcurrent shutdown, regeneration overvoltage shutdown, overload shutdown (electronic thermal), servomotor overheat protection, encoder fault protection, regeneration fault protection, undervoltage / sudden power outage protection, overspeed protection, excess error protection.								
Structure		Self-cooling, open (IP00)		Fan cooling						
Environment	ambient temperature	Operation: 0 – 55 °C (no freezing), storage: -20 – 65 °C (no freezing)								
	ambient humidity	Operation: 90 % RH max. (no condensation), storage: 90 % RH max. (no condensation)								
	atmosphere	Inside control panel; no corrossive gas, no flammable gas, no oil mist, no dust								
	elevation	1000 m or less above sea level								
	oscillation	5.9 m/s (0.6 G) max.								
Weight [kg]		1.7	1.7	2.1	4.6	4.6	6.2	18	18	19
Dimensions (W x H x D)	mm	90x168x195	90x168x195	90x168x195	130x250x200	130x250x200	180x350x200	260x400x260	260x400x260	260x400x260
Order information										
A type	Art. no.	205081	205082	205083	205084	205085	205086	on request	on request	on request
B type	Art. no.	192036	192037	192038	192039	192040	192041	on request	on request	on request

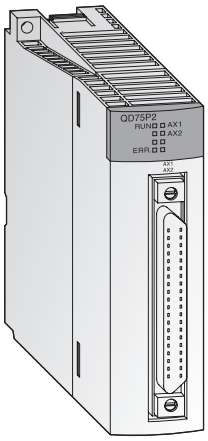
① Rated output capacity and rated rotation speed of the servo motor used in combination with the servo amplifier are as indicated when using the power voltage and frequency listed. Output and speed cannot be guaranteed when the power supply voltage is less than specified.

② For torque characteristics when combined with a servo motor manual.

Control specifications MR-J3S-A4		60A4	100A4	200A4	350A4	500A4	700A4	11KA4	15KA4	22KA4
Position control mode	maximum input pulse frequency	1 Mpps (when using differential receiver), 200 kpps (when using open collector)								
	positioning feedback pulse	Resolution per encoder / servo motor rotation (262144 pulses/revolution)								
	command pulse multiple	Electronic gear A/B multiple; A: 1 – 1048576 or 131072, B: 1 – 1048576, 1/10 < A/B < 2000								
	Ppositioning complete width setting	0 – ±10 V DC (command pulse unit)								
	excess error	±3 rotations								
	torque limit input	Set by parameters or external analog input (0 – ± 10 V DC / maximum torque)								
Speed control mode	speed control range	Analog speed command 1:2000, internal speed command 1:5000								
	analog speed command input	0 – ± 10 V DC / rated speed								
	speed fluctuation rate	±0.01 % max. (load fluctuation 0 – 100 %); 0 % (power fluctuation ±10 %) ±0.2 % max. (ambient temperature 25 °C ±10 °C), when using external analog speed command								
	torque limit	Set by parameters or external analog input (0 – ± 10 V DC / maximum torque)								
Torque control specifications	torque command input	0 – ±8 V DC / maximum torque (input impedance 10 to 12 kΩ)								
	speed limit	Set by parameters or external analog input (0 – ± 10 V DC, rated speed)								

Control specifications MR-J2S-B4 (SSCNET)	60B4	100B4	200B4	350B4	500B4	700B4	11KB4	15KB4	22KB4
Position and speed control	Possible using SSCNET III control								
Comunication speed	50 Mbs								

Positioning Modules



The Qn PLC range offers three QD75 Series modules (one, two and four axes); Open-collector output type (QD75P Series), Differential output type (QD75D Series) and SSCNET bus type (QD75M Series).

The open-collector and differential output controllers can be used with standard type Servo amplifiers (MR-J2S-A/MR-J3-A), whist the QD75M Series controllers should be used with the MR-J2S-B and MR-J3-B (SSCNET bus type) Servo amplifiers. Using the SSCNET system can provide much improved, easier to use positioning system, with reduced wiring and better noise immunity. All QD75 Series controllers can provide functionality such as interpolation and speed-position operation etc.

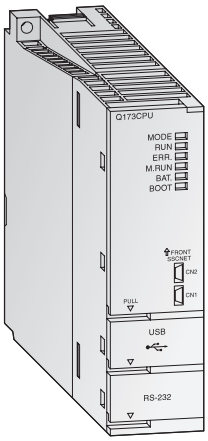
The open-collector output type modules provide positioning with open loop control. The modules generate the travel command via the pulse chain. The speed is proportional to the pulse frequency and the distance travelled is proportional to the pulse length.

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

Specifications		QD75D1	QD75P1	QD75D2	QD75P2	QD75D4	QD75P4
Number of control axes		1	1	2	2	4	4
Interpolation		—	—	2 axis linear and circular interpolation		2, 3, or 4 axis linear and 2 axis circular interpolation	
Positioning data itmes		600 per axis					
Output type		Differential driver	Open collector	Differential driver	Open collector	Differential driver	Open collector
Output signal		Pulse chain	Pulse chain	Pulse chain	Pulse chain	Pulse chain	Pulse chain
Positioning	method	PTP control: absolute data and/or incremental; speed/position swiching control: incremental; locus/speed control: incremental; path control: absolute data and/or incremental					
	units	Absolute data: -2 147 483 648 – 2 147 483 647 pulse -21 4748 364.8 – 214 748 364.7 µm -21 474.83648 – 21 474.83647 inch 0 – 359.99999 degree Incremental method: -2 147 483 648 – 2 147 483 647 pulse -214 748 364.8 – 214 748 364,7 µm -21 474.83648 – 21 474.83647 inch -21 474.83648 – 21 474.83647 degree Speed/position switching control : 0 – 2 147 483 647 pulse 0 – 21 4748 364.7 µm 0 – 21 474.83647 inch 0 – 21 474.83647 degree				
	speed	1 – 1 000 000 pulse/s 0.01 – 20 000 000.00 mm/min 0.001 – 200 000.000 degree/min 0.001 – 200 000.000 inch/min					
	acceleration/deceleration processing	Automatic trapezoidal or S-pattern acceleration and deceleration or automatic S-pattern acceleration and deceleration					
	acceleration and deceleration time	1 – 8388608 ms (4 patterns, each can be set)					
	rapid stop decceleration time	1 – 8388608 ms					
I/O points		32	32	32	32	32	32
Dimensions (W x H x D)	mm	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90
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		QD75M1	QD75MH1	QD75M2	QD75MH2	QD75M4	QD75MH4
Number of control axes		1	1	2	2	4	4
Interpolation		—	—	2 axis linear and circular interpolation		2, 3, or 4 axis linear and 2 axis circular interpolation	
Positioning data itmes		600 per axis					
Output type		SSCNET	SSCNET III	SSCNET	SSCNET III	SSCNET	SSCNET III
Output signal		BUS	BUS	BUS	BUS	BUS	BUS
Positioning	method	PTP control: absolute data and/or incremental; speed/position swiching control: incremental; locus/speed control: incremental; path control: absolute data and/or incremental					
	units	Absolute data: -2 147 483 648 – 2 147 483 647 pulse -21 4748 364.8 – 214 748 364.7 µm -21 474.83648 – 21 474.83647 inch 0 – 359.99999 degree Incremental method: -2 147 483 648 – 2 147 483 647 pulse -214 748 364.8 – 214 748 364,7 µm -21 474.83648 – 21 474.83647 inch -21 474.83648 – 21 474.83647 degree Speed/position switching control : 0 – 2 147 483 647 pulse 0 – 21 4748 364.7 µm 0 – 21 474.83647 inch 0 – 21 474.83647 degree				
	speed	1 – 1 000 000 pulse/s 0.01 – 20 000 000.00 mm/min 0.001 – 200 000.000 degree/min 0.001 – 200 000.000 inch/min					
	acceleration/deceleration processing	Automatic trapezoidal or S-pattern acceleration and deceleration or automatic S-pattern acceleration and deceleration					
	acceleration and deceleration time	1 – 8388608 ms (4 patterns, each can be set)					
	rapid stop decceleration time	1 – 8388608 ms					
I/O points		32	32	32	32	32	32
Dimensions (W x H x D)	mm	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90	27.4 x 98 x 90
Order information	Art.no.	142153	165761	142154	165762	142155	165763
Accessories		40-pin connector and ready to use connection cables and system terminals; Programming software: GX Configurator QP, art. no.: 132219					

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
- Software cam control
- Virtual and real master axes
- Integration in the high-speed SSCNET network for communication with high-performanceservo amplifiers at up to 5.6 Mbit/s

Specifications		Q172CPUN	Q173CPUN	Q172HCPU	Q173HCPU
Type		Motion CPU	Motion CPU	Motion CPU	Motion CPU
I/O points		8192	8192	8192	8192
No. of control axes		8	32	8	32
Interpolation functions		Linear interpolation for up to 4 axes, circular interpolation for 2 axes, helical interpolation for 3 axes			
Positioning	method	PTP (point to point), speed control/speed-position control, fixed pitch feed, constant speed control, position follow-up control, speed switching control, high-speed oscillation control, synchronous control (SV22)			
	acceleration/ deceleration control	Automatic trapezoidal acceleration/deceleration, S-curve acceleration/deceleration			
	compensation	Backlash compensation, electronic gear			
Programming language		Motion SFC, dedicated instructions, software for conveyor assembly (SV13), virtual mechanical support language (SV22)			
Program capacity		14 k steps			
No. of positioning points		3200			
Interfaces		USB, RS232C, SSCNET2		USB, RS232C, SSCNET3	
Real I/O points (PX/PY)		256 (these I/Os can be allocated directly to the motion CPU)			
Dimensions (W x H x D)	mm	27.4 x 98 x 114.3	27.4 x 98 x 114.3	27.4 x 98 x 114.3	27.4 x 98 x 114.3
Order information	Art. no.	142695	142696	162417	162416

Q-Motion System Modules

Servo external signals interface module Q172LX

The Q172LX 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, cam-switching values, limit switching positions, stop positions and operating modes can be easily incorporated into the system.

- 32 address points for 8 axes for each 4 inputs
- Bipolar inputs for positive and negative logic
- Galvanic isolation of the inputs by means of photocoupler
- Shortest response time of < 0.4 ms
- Modular extension possible

Serial absolute synchronous encoder interface module Q172EX and Q172EX-S2

The serial absolute synchronous encoder interface module Q172EX is a Motion systemmodule for receiving and evaluating up to two serial absolute-value encoders. (Incremental encoders cannot be connected.) Via an external encoder (MR-HENC) it is possible to feed a setpoint source to the Motion system, which inturn is programmed as a guide axis.

In addition to the interfaces for the signals of two absolute value encoders, the Q172EX has two digital inputs with ultra-rapid responsetimes.

- Transfer rate of 2.5 Mbit per second
- Resolution of 14 bit
- Voltage-failure security of the absolute values by means of built-in buffer battery
- Shortest response times of < 0.4 ms
- Modular extension possible

Manual pulse generator interface module Q173PX

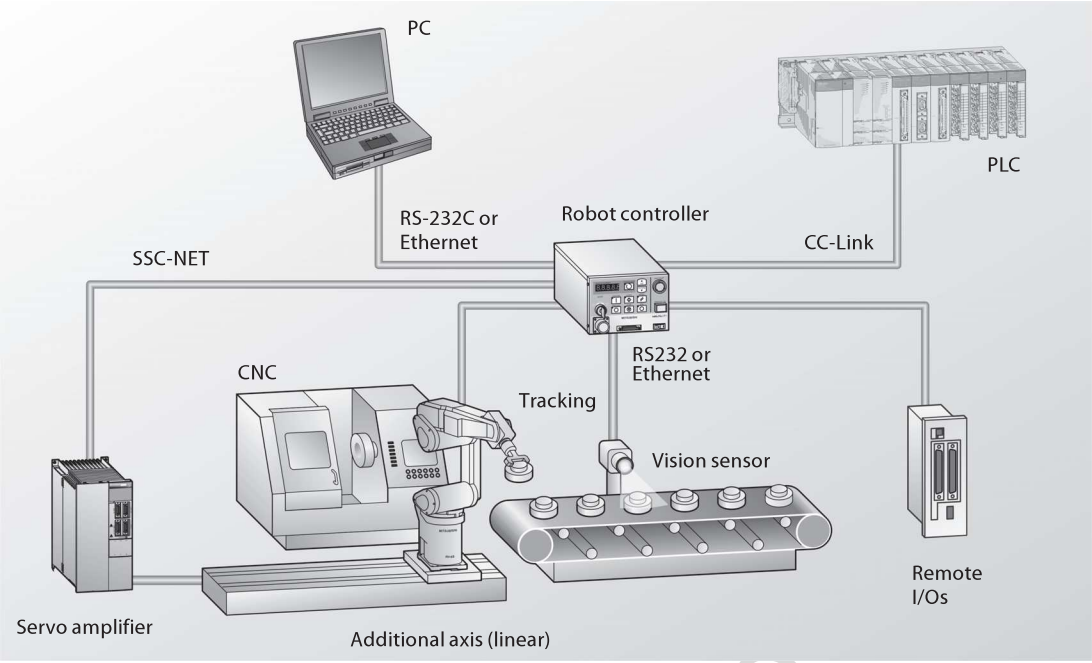
The Manual pulse generator interface module Q173PX is used in a Motion system to receive the signals of up to 3 external incremental encoders or manual impulse generators (hand wheels).

In addition to the inputs for the encoders, the Q173PX has three digital inputs with which the encoder signal counting procedure can bestarted (Encoder start signal).

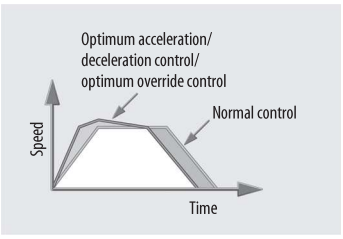
- Bipolar inputs for positive and negative logic
- Galvanic isolation of the inputs by means of photo coupler
- Shortest response times of < 0.4 ms
- Modular extension possible

MELFA ROBOT SYSTEMS

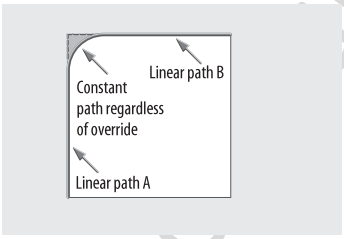
Example of a Robot system configuration



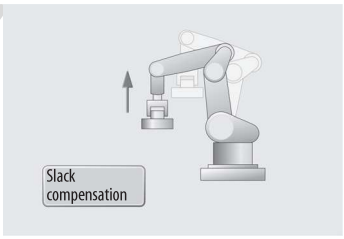
Practical Functions for all Applications



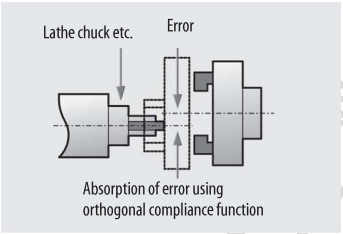
Automatic acceleration and braking ramp optimisation for faster cycle times



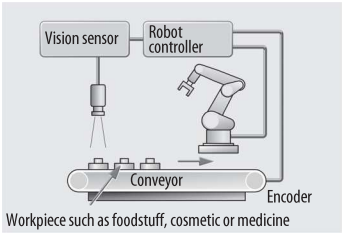
Continuous Path function for faster cycle times



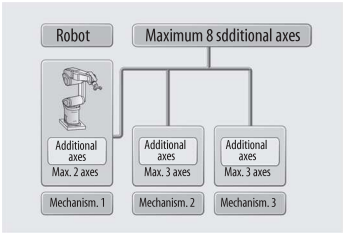
Gravity compensation for greater positioning and palletising precision



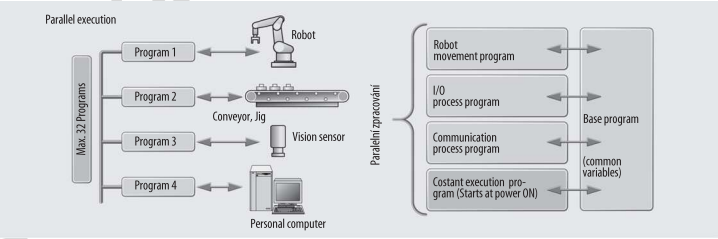
Orthogonal "compliance control" function for interactive response to opposing forces



Object tracking function for faster cycle times



Control functions for up to 8 additional axes



Multitasking function for parallel execution of multiple tasks

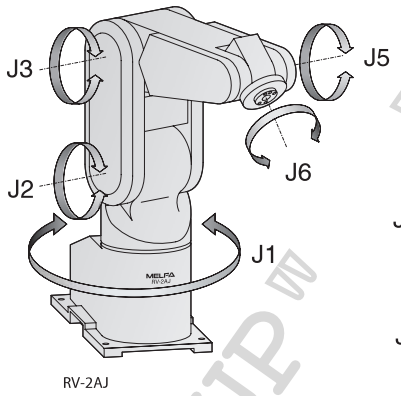
RV-2AJ/RV-1A Articulated-arm Robots – The Powerful Compact Class

The combination of small dimensions and a reach of around 400 mm make these two 5 and 6 DOF robots very popular in applications calling for compact robots that can be installed right next to or even in the system they are serving. They are predestined for handling tasks involving the removal and/or placement of small components. Other applications include quality control and sample handling in laboratories and medical facilities.

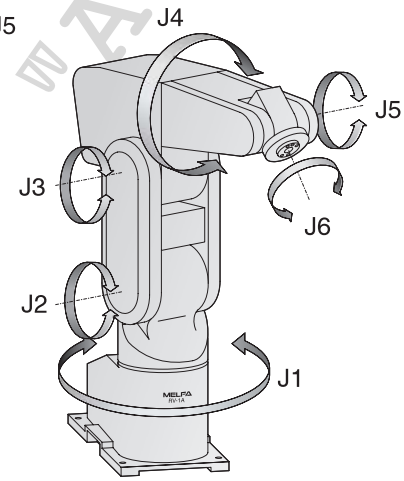
Component handling can be performed with a single electric gripper or up to two pneumatic grippers. Pre-installed pneumatic hoses in the robot arm make connection of the compressed air for the grippers quick and easy.

Need a larger work space combined with compact dimensions? Just like all other Mitsubishi robots this model can be installed on carriage for traversing along a linear axis.

Model		RV-2AJ	RV-1A
Degrees of freedom		5	6
Maximum payload		2 kg	1,5 kg
Gripper flange reach		410 mm	418 mm
Repeatability		±0.02 mm	±0.02 mm
Max. speed		2,100 mm/s	2,200 mm/s
Controller type		CR1	CR1
Operating range	J1	300 (-150 to +150)	300 (-150 to +150)
	J2	180 (-60 to +120)	180 (-60 to +120)
	J3	230 (-110 to +120)	95 (+60 to +155)
	J4	—	320 (-160 to +160)
	J5	180 (-90 to +90)	180 (-90 to +90)
	J6	400 (-200 to +200)	400 (-200 to +200)
Robot weight		17 kg	19 kg
Protection		IP 30	
Order information	Art. no.	129861	134211



RV-2AJ



RV-1A

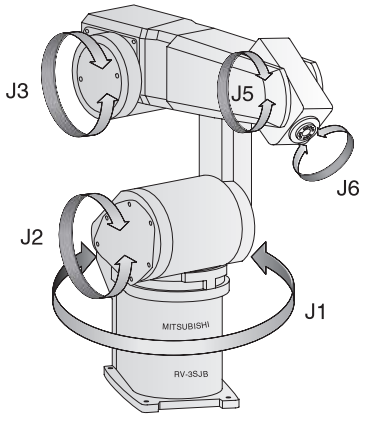
RV-3SJB/RV-3SB Articulated-arm Robots – The Reliable Mid-range Solution

The RV-3S series of robots have been designed to be very simple to integrate into an existing automation cell. Features such as the direct control over 32 local I/Os allows the robot to interact directly with sensors and actuators, speeding up and simplifying system building.

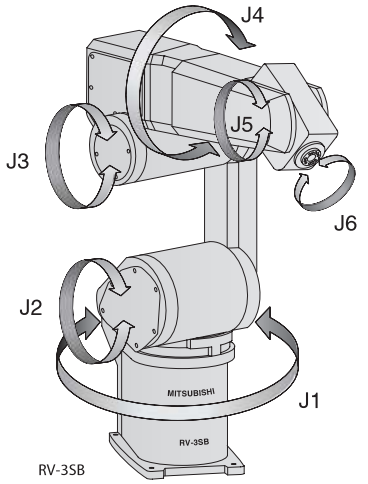
Communicating with other automation plant is an important area of any automation cell. The RV-3S series has been optimised with a choice of three major networking technologies: Ethernet, Profibus/DP and CC-Link.

For complex automation cells where movement is restricted, or there is a large distance between working points, the RV-3S robots can control up to eight additional axes to its standard robot arm configuration. Two of these axis can be interpolated allowing easy and efficient movement around obstructions. The other six axes can be used to control elements such as linear slides to move the robot between work stations.

Model		RV-3SJB	RV-3SB
Degrees of freedom		5	6
Maximum payload		3.5 kg	3.5 kg
Gripper flange reach		641 mm	642 mm
Repeatability		±0.02 mm	±0.02 mm
Max. speed		5,300 mm/s	5,500 mm/s
Controller type		CR2B	CR2B
Operating range	J1	340 (-170 to +170)	340 (-170 to +170)
	J2	225 (-90 to +135)	225 (-90 to +135)
	J3	237 (-100 to +137)	191 (-20 to +171)
	J4	—	320 (-160 to +160)
	J5	240 (-120 to +120)	240 (-120 to +120)
	J6	720 (-360 to +360)	720 (-360 to +360)
Robot weight		33 kg	37 kg
Protection		IP65 rating for full arm	
Order information	Art. no.	163527	163526



RV-3SJB



RV-3SB

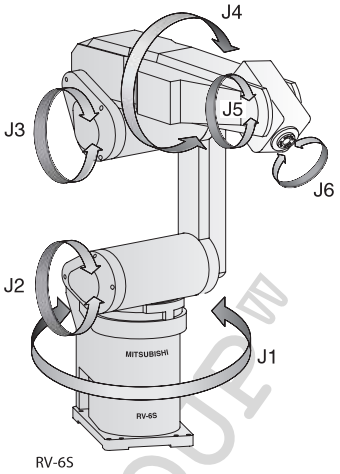
RV-6S/RV-6SL/RV-12SL/RV-12S Articulated-arm Robots – Exceptional Power and Reach

With handling payloads of up to 12 kg, a truly impressive maximum workspace radius of 1,385 mm and exceptional precision (repeatability: ±0.05 mm) the new RV-S series is predestined for handling parts in industrial production and for chaining plant stations. An IP65 protection rating provides the capabilities needed for heavy-duty applications, like those in the motor industry suppliers sector. The state-of-the-art technology used in this series drastically reduces work cycle times. All the new robots complete the 12-inch test in less than a second!

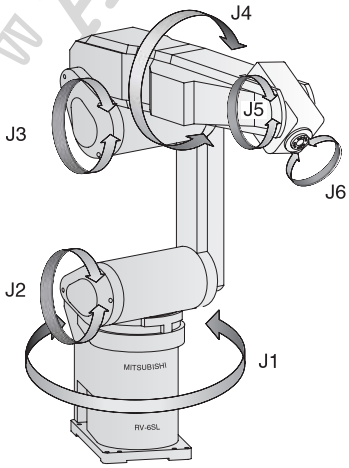
Multifunctional robot controllers

The robots are controlled by the multitasking controllers CR2B or CR3. 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-6S	RV-6SL	RV-12S	RV-12SL
Degrees of freedom		6	6	6	6
Maximum payload		6 kg	6 kg	12 kg	12 kg
Gripper flange reach		696 mm	902 mm	1086	1385 mm
Repeatability		±0.02 mm	±0.02 mm	±0.05 mm	±0.05 mm
Max. speed		9,300 mm/s	8,500 mm/s	9,600 mm/s	9,500 mm/s
Controller type		CR2B	CR2B	CR3B	CR3B
Operating range	J1	340 (-170 to +170)			
	J2	227 (-92 to +135)			
	J3	285 (-107 to +166)	295 (-129 to+166)	290 (-130 to +160)	
	J4	320 (-160 to +160)			
	J5	240 (-120 to +120)			
	J6	720 (-360 to +360) (expandable)			
Robot weight		58 kg	60 kg	93 kg	98 kg
Protection		IP 54 (J1 to J3), IP 65 (J4 to J6)			
Order information	Art. no.	152466	152465	156734	152467



RV-6S

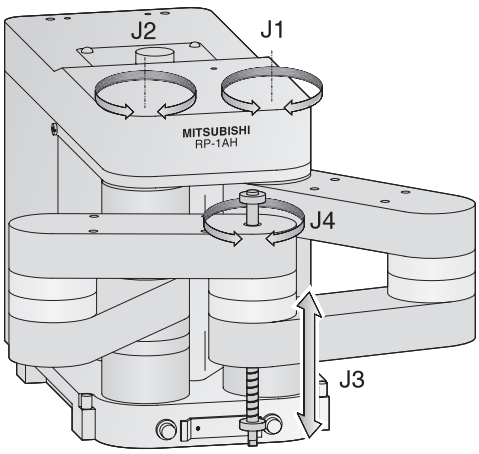


RV-6SL

RP-AH SCARA Robots – Outstanding Speed Plus High Precision

The RP-1AH is in its element in all applications where parts have to be processed quickly and precisely in cramped quarters. It has an installation footprint of just 200 x 160 mm and a reach of 236 mm, and it can place components with a precision of ±0.005 mm. This combination of compact dimensions and great precision predestine the RP robots for micro-handling tasks like micro-assembly and the population and soldering of SMD circuit boards for mobile phones. The robots of this series are incomparably more flexible than traditional automated machines, and this pays off in greatly enhanced efficiency and higher productivity.

Model		RP-1AH	RP-3AH	RP-5AH
Degrees of freedom		4	4	4
Maximum payload		1 kg	3 kg	5 kg
Controller type		CR1	CR1	CR1
Operating limits	W x D (mm)	150 x 105 (A6 size)	210 x 148 (A5 size)	297 x 210 (A4 size)
	J3 vertical motion (mm)	30	50	50
	J4 (deg.)	±200	±200	±200
Repet position accuracy	X-Y surface (mm)	±0.005	±0.008	±0.01
	J3 vertical motion (mm)	±0.01	±0.01	±0.01
	J4 (deg.)	±0.02	±0.03	±0.03
J3-axes travel (in mm)		30	50	50
Robot weight		12 kg	24 kg	25 kg
Order information	Art. no.	134183	131626	131628



RH-SH SCARA Robots – Specialists for Palletising www.aspect-online.de

No reference point travel

Travel and position are measured with absolute encoders, so that the robot can start work as soon as it is powered up without wasting time with reference point traverses. In fact, the robot can even resume at the point where it left off after power failures and emergency shutdowns in the middle of a movement sequence. In most cases, this eliminates the need to reset the entire system.

Optimum gripper connections

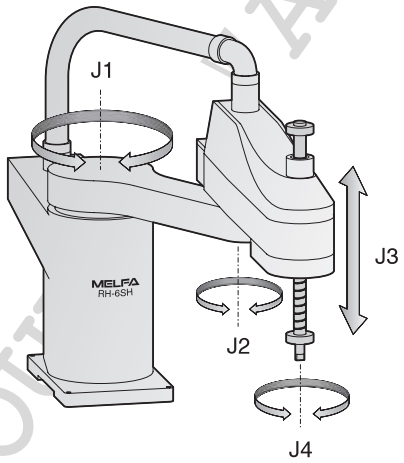
Pneumatic hoses and signal connection lines are routed inside the robot, making it easy to connect grippers and sensors.

Unpack, calibrate, start work

You can start work almost as soon as you have unpacked the robot and installed the arm assembly. You only have to enter the reference point data recorded at the factory, then the robot is ready to execute the first movements.

SCARA robots are ideal for sorting, palletising and component installation. They have a short cycle period of less than 0.5 seconds for a movement sequence of 25 mm vertical lift, 300 mm horizontal traverse and 25 mm vertical lower and return (the 12" test).

Model		RH-6SH	RH-12SH
Degrees of freedom		4	4
Maximum payload		6 kg	12 kg
Controller type		CR2B	CR2B
Gripper flange reach		550 mm	850 mm
Operating range	J1 (deg.)	254 (±127)	280 (±140)
	J2 (deg.)	290 (±145)	306 (±153)
	J3 (Z) (mm)	200 (97–297)	350 (-10–340)
	J4 (0 Axes) (deg.)	720 (±360)	720 (±360)
Repeatability X-Y direction		±0.02 mm	±0.025 mm
Z-axes travel in mm		200	350
Max. speed (mm/s)		7782 (J1, J2, J4) 6003 (J1, J2)	11221 (J1, J2, J4) 6612 (J1, J2)
Robot weight		21 kg	45 kg
Protection		IP 20	
Order information	Art. no.	166053	166054

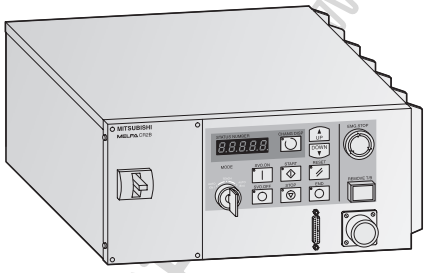


Powerful Controllers CR1, CR2B and CR3

Which controller is used depends on the specific robot model. But the CR1, CR2B and CR3 are all programmed with exactly the same language, no matter which robot is connected to them. You can add special application functions by inserting expansion option cards in the slots in the controllers. For example, there are option cards for connecting the controllers to different networks and for controlling additional robot axes.

A teaching box for defining the robots' working positions can be connected to the controller's RS-422 port. The teaching box can also be used for testing the entire program sequence.

There is also an RS-232C port for connecting a personal computer. This makes it possible to develop programs with a powerful PC software package with a user-friendly interface, and to perform 3D simulations of complete work cells.



Characteristics/Functions		CR1-571	CR2B-574	CR3-535M
Shipped with robot		RV-1A, RV-2AJ, RP-1AH/3AH/5AH	RV-3SB/SJB, RV-6S/6SL, RH-6SH/12SH	RV-12S/12SL
Number of controllable axes		6 robot axes + 2 interpolation axes + 6 independent axes		
Processor type (CPU)		Main CPU: 64 Bit RISC; servo CPU: DSP		
Memory capacity	nbr. of teaching points	Max. 2500 position teaching points		
	nbr. program steps	max. 5000 steps		
	number of programs	88		
External inputs/outputs	general purpose I/Os	16 inputs and 16 outputs	32 inputs and 32 outputs	32 inputs and 32 outputs
	dedicated I/Os	User assigned	User assigned	User assigned
	hand open/close	8 inputs and 0 outputs	8 inputs und 0 outputs	8 inputs und 0 outputs
	emergency stop I/Os	1	2 terminal blocks	2 terminal blocks
	door switch input	1	1	1
Power supply		1~ 90–132 V AC; 50/60 Hz 1~ 180–253 V AC; 50/60 Hz	1~ 90–132 V AC; 50/60 Hz	3~ 400 V AC; 50/60 Hz
Dimensions (W x H x D)	mm	212 x 166 x 290	460 x 200 x 400	450 x 975 x 380

Robots Teach Panel

The R46TB teach panel is a multifunctional control and programming terminal for all Mitsubishi A and S series robots. Its intuitive user interface makes it easy to control robot movements and perform extensive diagnostics and monitoring functions 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, you can write programs with a virtual on-screen keyboard and monitor all system status parameters, inputs and outputs, including those accessed via the network.

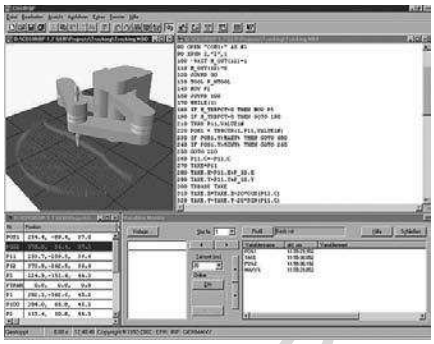
The R46TB's flexible monitoring function enables the display of all important system parameters. Access to production data like the number of work cycles, the average cycle time and many other parameters make it easy to get a quick overview of the production situation.

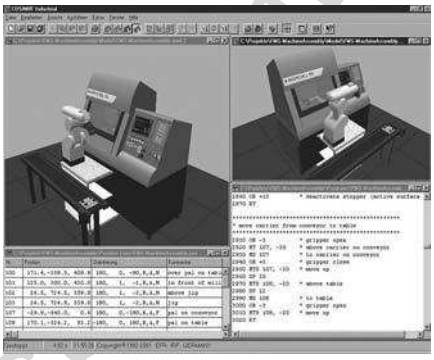
Extensive analysis functions for checking robot workload also make it easy to optimise your robot applications and minimise cycle times.

Screen input templates make it easy to enter the parameters for grippers and workpieces for quick system optimisation. Entering the reference points data when you install the system just takes a few minutes, then the robot is ready for programming.

Teach Panel		R46TB
Compatibility		All Mitsubishi A and S 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
Software		Integrated operating system software with menu-based user interface
Display	type/Dimensions	6.5" TFT display (640 x 480 pixels)
	technology	Touchscreen with backlight
Interfaces		USB, RS-422 for connection to the robot controller
Connection		Direct connection to the robot controller, cable length 7m
Protection Rating		IP54
Weight [kg]		1.25
Order information	Art. no.	193409

Simulation and Programming Software





COSIROP

COSIROP is the programming, configuration, online and diagnostics software package for all Mitsubishi robots. You can use it to develop programs in the MOVEMASTER COMMAND and MELFA BASIC languages and transfer them between the PC and the robot controller.

The programming software package is distributed on a CD containing versions in both German and English.

The update license can only be used if you already have a license for 1, 5 or 10 users.

COSIMIR

COSIMIR is the 3D robot simulation package for all Mitsubishi robots. It can be used for planning your work cell, checking the accessibility of all positions and optimising your layout. You can simulate all movement sequences and handling operations to identify and prevent potential collisions and optimise your cycle times.

After simulating and testing your programs you can then transfer them directly to the robot controller, either via the standard RS-232C port or via the optional Ethernet interface (TCP/IP). If you use the Ethernet interface you can also easily connect to the controller via the Internet and perform program changes and servicing across very large distances.

Software Licences		COSIROP				COSIMIR
Licenze		1 user	5 users	10 users	Update license	1 user
Language		English / German (on one 1 CD)				
Operating system		Microsoft Windows 98/XP/2000				
Order information	Art. no.	170050	170051	170052	170053	51681

Options Overview for All Robots

Option	Marking	RV-2AJ/1A	RV-3SJB/3SB	RV-6S/6SL	RV-12S/12SL	RH-6SH	RH-12SH	RP-1/3/5AH	Art. no.
Robot model name in catalogue	—	A	S	S	S	SH	SH	AH	—
Teaching Box	R28TB	●	●	●	●	●	●	●	124656
Electrical hand set	4A-HM01	●							129874
Pneumatic hand set	4A-HP01E	●							129873
Single valve set	1A-VD01E-RP							●	129780
Double valve set	1A-VD02E-RP							●	129781
Triple valve set	1A-VD03E-RP							●	129792
Quadruple valve set	1A-VD04E-RP							●	129793
Single valve set	RV-E-1E-VD01E	●							47397
Double valve set	RV-E-1E-VD02E	●							47398
Single valve set	1S-VD01E-01				●				153057
Double valve set	1S-VD02E-01				●				153058
Triple valve set	1S-VD03E-01				●				153059
Quadruple valve set	1S-VD04E-01				●				153062
Single valve set	1S-VD01E-02		●	●					153074
Double valve set	1S-VD02E-02		●	●					153075
Triple valve set	1S-VD03E-02		●	●					153076
Quadruple valve set	1S-VD04E-02		●	●					153077
Single valve set	1S-VD01ME-03						●		166278
Double valve set	1S-VD02ME-03						●		166279
Triple valve set	1S-VD03ME-03						●		166280
Quadruple valve set	1S-VD04ME-03						●		166281
Single valve set	1S-VD01ME-04					●			166274
Double valve set	1S-VD02ME-04					●			166275
Triple valve set	1S-VD03ME-04					●			166276
Quadruple valve set	1S-VD04ME-04					●			166277
Ethernet interface	2A-HR533E	●	●	●	●	●	●	●	129809
CC-Link interface	2A-HR575E	●	●	●	●	●	●	●	129808
PROFIBUS interface	2A-RZ577A	●	●	●	●	●	●	●	155317
Serial expansion	2A-RZ581E	●	●	●	●	●	●	●	129807
I/O interface	2A-RZ371	●	●	●	●	●	●	●	124658
Additional axis interface	2A-RZ541E	●	●	●		●	●	●	129801
Pneumatic hand interface	2A-RZ375	●	●	●	●	●	●	●	124657
Electric hand interface	2A-RZ364	●							129875
Curled connection cable	1A-GHCD	●							132101
Hand signal output cable	1A-GR200-RP							●	129778
	1S-GR35S-01		●	●	●				153078
	1S-GR35S-02					●	●		166272
Hand signal input cable	1A-HC20	●							129877
	1A-HC200-RP							●	129779
	1S-HC35C-02		●	●	●	●	●		166273
	1S-HC25C-01		●	●	●	●	●		153079
Gripper output connector	R-SMR-09V-B	●						●	132112
Gripper input connector	R-SMR-10V-N							●	132113
Valve input connect	R-SMR-02V-B	●							143798
Hand signal output connector	S-series Hand OUTPUT		●	●	●	●	●		164814
Hand signal input connector	S-series Hand INPUT		●	●	●	●	●		164815
Valve connection cable	RV-E-1E-GR35S	●							47391
Hand curl tube	RV-E-1E-ST0402C	●	●	●				●	47390
	RV-E-1E-ST0404C	●	●	●				●	47389
Flexible drag chain cable	Cable Flex 5 m	●						●	149006
	Cable Flex 7 m	●						●	149007
	Cable Flex 9 m	●						●	149008
	Cable Flex 11 m	●						●	149009
	Cable Flex 15 m	●						●	149010
Extension cable for fixed installation	1S-05CBL-01			●	●		●		155827
	1S-10CBL-01			●	●		●		155830
	1S-15CBL-01			●	●		●		155665
	1S-05CBL-03		●			●			165967
	1S-10CBL-03		●			●			165968
	1S-15CBL-03		●			●			165969
Extension cable for flexible installation in a drag chain	1S-05LCBL-01			●	●		●		157582
	1S-10LCBL-01			●	●		●		157583
	1S-15LCBL-01			●	●		●		157594
	1S-05LCBL-03		●			●			165970
	1S-10LCBL-03		●			●			165971
	1S-15LCBL-03		●			●			165972
PC connection cable	RV-CAB4	●	●	●	●	●	●	●	55653
Connection cable for I/O interface	RV-E-E/A-Kabel 5	●	●	●	●	●	●	●	47387
	RV-E-E/A-Kabel 15	●	●	●	●	●	●	●	59947
Extension box	CR1-EB3	●						●	129878
Calibration device	RV-E-1E-INST	●							47388
Calibration pin	RH-CAL		●	●	●	●	●		145715

The Complete Solution for Line and Load Side

Mitsubishi offers the whole line from Air Circuit Breakers over Low Voltage Switchgear to Magnetic Contactors and Thermal Overload Relays.

A complete breaker program for complete, all-round protection.

SUPER AE series air circuit breakers

The SUPER AE air circuit breaker family consists of models from 1000 to 6300 A with a broad range of adjustable breaking capacities.

At the lower end of the scale the smallest current setting Ir is 157 A, with the AE1000 model. With the AE6300, the maximum possible setting is a full 6300 A.

Featurs include:

- Complete breaker program
- Frame size from 1000 A to 6300 A
- Wide performance range
- Standard version "SS" from 65 to 130 kA
  High performance version "SH" with 130 kA
- High interrupting capacity
- Growing power demands
- Optimum overload tripping system

WSS series moulded case circuit breakers

The MCCBs of the Mitsubishi breaker series are amongst the smallest compact circuit breakers in the world with electronic overload indication. The system is based, among other things, on the well-known and proven microprocessor technology. The WSS breaker series meets national and international protection ratings according to VDE, EN, and IEC standards for industrial applications as well as for extended shipping demands. The innovative tripping technology guarantees a high reliability and highest protection.

The highlights are

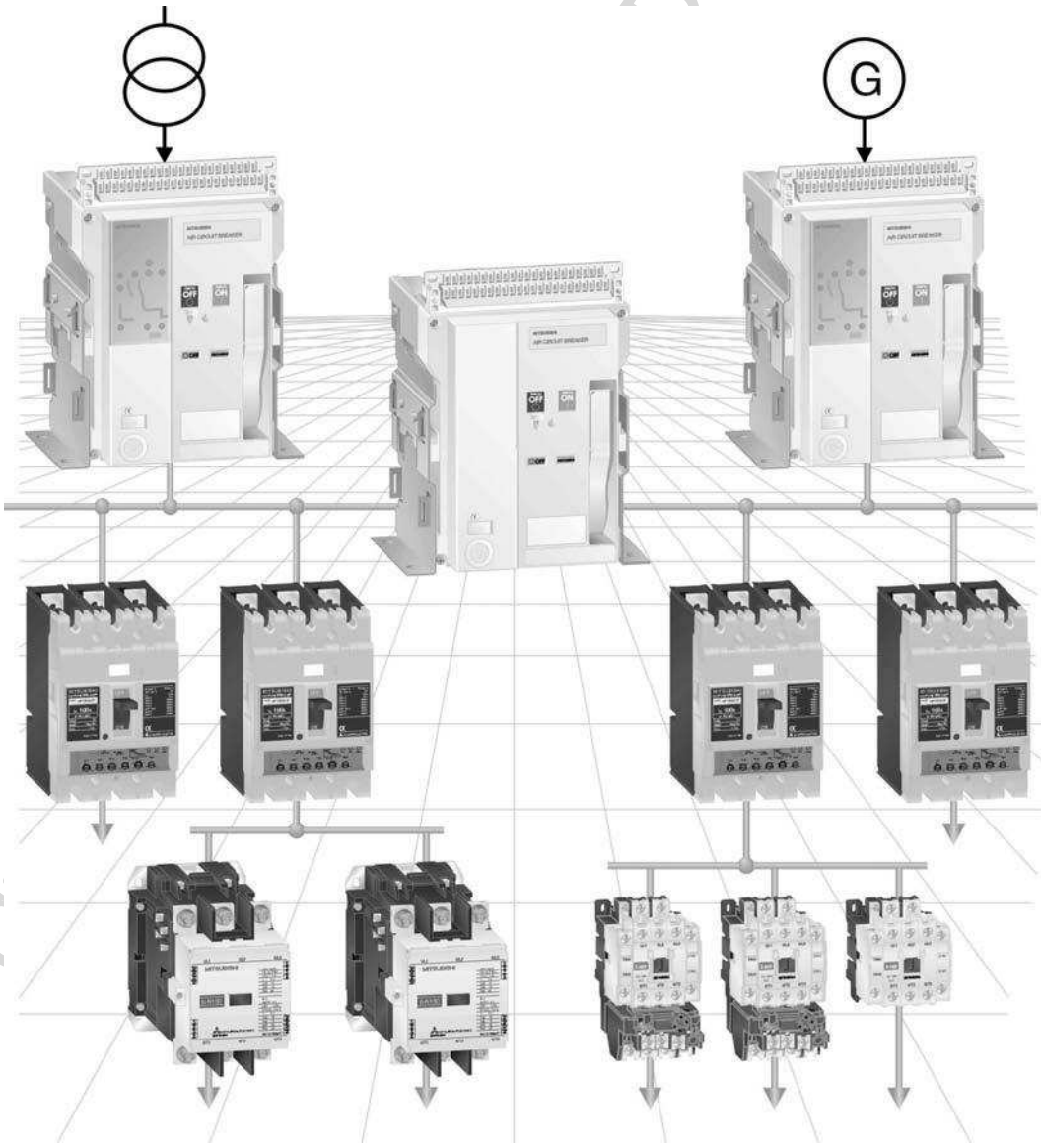
- 16 to 1600 A breaking capacity (3- and 4-pole)
- interchangeable relay unit (thermal type or electronic type)
- available in fixed and slot-in versions
- breaking capacity
  Ics = 100 % Icu, up to 690 V
- additional disconnectors available

MS-N series magnetic contactors and thermal overload relays

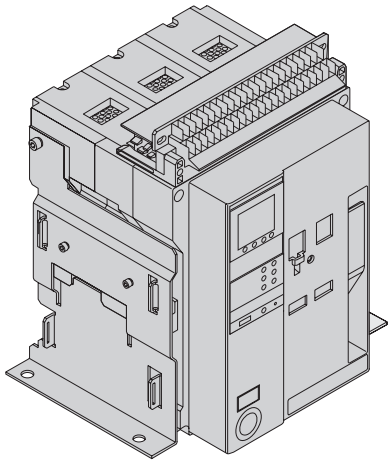
Compact, modular extensions and an energy-saving design – these are the main requirements set by users of contactors and auxiliary contactors.

MS-N meets these requirement plus:

- Easy mounting and wiring
- Easy inspection
- Built-in surge absorber
- Safety and speedy 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 4000 A and are available in both 3 and 4 pole versions with fixed or drawout configurations to suit your individual requirements. There are only two standard sizes, making planning much easier.

The developement target was based on the features:

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

Type		AE1000-SW	AE1250-SW	AE1600-SW	AE2000-SWA	AE2000-SW	AE2500-SW	AE3200-SW	AE4000-SWA	AE4000-SW	AE5000-SW	AE6300-SW
Frame type		1				2				3		
Rated current Iu (A) 40 °C		1000	1250	1600	2000	2000	2500	3200	4000	4000	5000	6000
Max. rated operational voltage Ue (V)		690				690				690		
Rated insulation voltage Ui (V)		1000				1000				1000		
Rated impulse withstand voltage Uimp (kV)		12				12				12		
Suitable for isolation		●				●				●		
Category		B				B				B		
Pollution degree		3				3				3		
Number of poles		3 4	3 4	3 4	3 4	3 4	3 4	3 4	3 4	3 4	3 4	3 4
Rated current Ir (A) adjustment range at 40 °C		500 – 1000	625 – 1250	800 – 1600	1000 – 2000	625 – 2000	1250 – 2500	1600 – 3200	2000 – 4000	2000 – 4000	2500–5000	3150-6300
Rated current of neutral pole (A)		1000	1250	1600	2000	2000	2500	3200	4000	2000	2500	3150
Rated service short-circuit breaking capacity ① Icu (kA, rms) Ics = Icu = 100 %	690 V AC	65				75				85		
	400 V AC	65				85				130		
Rated short-time withstand current (kA rms) Icw	1 s	65				75				100		
Operating cycles ② (ON/OFF)	without rated current	25000				20000				10000 (3P) / 5000 (4P)		
Connecting terminal	horizontal	●			—	●			—		—	
	vertical	● ③			●	● ③			●		●	
	frontal	● ③			—	● ③			—		—	
Outline dimensions (mm) H x W x D	fixed type	3-pole: 410 x 340 x 290 4-pole: 410 x 425 x 290				3-pole: 410 x 475 x 290 4-pole: 410 x 605 x 290				3 pole: 414 x 873 x 290 4 pole: 414 x 1003 x 290		
	draw-out type	3-pole: 430 x 300 x 368 4-pole: 430 x 385 x 368				3-pole: 430 x 435 x 368 4-pole: 430 x 565 x 368			3-pole: 430 x 439 x 368 4-pole: 430 x 569 x 368	3 pole: 480 x 875 x 368 4 pole: 480 x 1005 x 368		
Weight (kg)	fixed type	41 51	41 51	42 52	47 57	60 72	61 73	63 75	81 99	160 180	160 180	160 180
	draw-out type	64 78	64 78	65 79	70 84	92 113	93 114	95 116	108 136	233 256	233 256	240 263
	cradle only	26 30	26 30	26 30	31 35	35 43	35 43	36 44	49 61	118 133	118 133	125 140

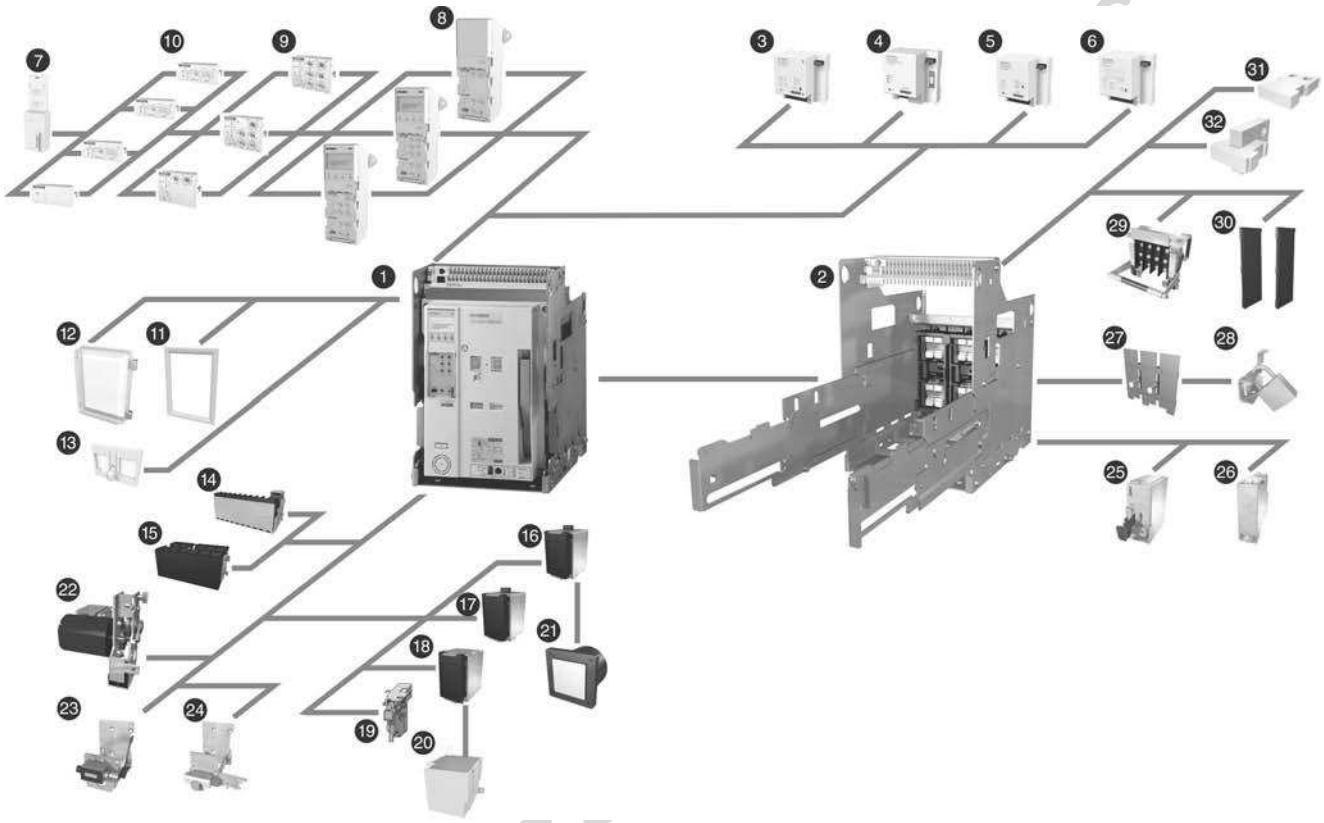
① Conforms to IEC60947-2, EN60947-2

② Number of mechanical operating cycles (on/off).

③ Optional

Product Skeleton of Accessories for SUPER AE Series Air Circuit Breakers

Mitsubishi Electric offers a wide range of accessories for the Air Circuit Breakers to serve almost all variations of applications.



Position	Name
1	Air circuit breaker
2	Cradle
3	CC-Link® Interface unit
4	PROFIBUS-DP Interface unit
5	MODBUS® Interface unit
6	I/O unit
7	Extension module
8	ETR unit
9	Main setting module
10	Optional setting module
11	Door frame (DF)

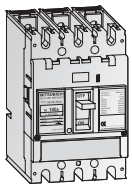
Position	Name
12	Dust cover (DUC)
13	Push button cover (BC-L)
14	Auxiliary switch standard (AX)
15	Auxiliary switch high capacity type (HAX)
16	Shunt trip device (SHT)
17	Closing coil (CC)
18	Under voltage trip device (UVT)
19	Trip coil
20	UVT-controller (U-CON)
21	Condenser trip device (COT)
22	Motor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

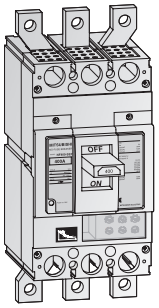
Position	Name
23	Counter (CNT)
24	Cylinder lock (CYL)
25	Door interlock (DI)
26	Mechanical interlock (MI)
27	Safety shutters (SST)
28	Safety shutter lock (SST-LOCK)
29	Cell switch (CL)
30	Interphase Barrier (BA)
31	Horizontal terminal
32	Vertical terminal

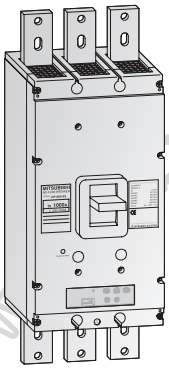
For details on our full range including accessories contact your local distributor

Moulded Case Circuit Breakers WSS Series

Mitsubishi breakers are amongst the smallest compact circuit breakers, with electronic overload indication, in the world.
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 to 250 A in one model size (3- and 4-pole)
- interchangeable relay unit (thermal type or electronic type)
- available in fixed and slot-in versions
- breaking capacities = 100 % Icu, up to 690 V

Progressive series

The progressive series features proven technical know-how and benefit from long experience with microprocessor technology.

The fully enclosed circuit breakers provide an increased safety and at the same time decreased switching times.

- 400 to 800 A
- 2 model sizes (3- and 4-pole)
- electronic trip system
- available in fixed and slot-in versions
- additional disconnectors available

Standard series

The standard series, for a high breaking performance, provides optimum protection for transformer and generator feed in, and output breakers. Circuit breakers can be used as section or disconnecting switch.

- 1000 to 1600 A
- 1 model size (3- and 4-pole)
- electronic trip system
- available in fixed and slot-in versions

Specifications

Specifications PSS Series				NF125-SGW RT	NF125-SGW RE	NF125-HGW RT	NF125-HGW RE	NF125-RGW RT	NF160-SGW RT	NF160-SGW RE
Rated current I_n [A]				125	125	125	125	100	160	160
Rated insulation voltage U [V]			AC	690	690	690	690	690	690	690
Number of poles				3 / 4	3 / 4	3 / 4	3 / 4	3	3 / 4	3 / 4
Rated breaking capacity [kA] (I_{cs} / I_{cu})	IEC 947-2 EN 60 947-2 VDE 0660	AC (50/60 Hz)	690 V	8 / 8	8 / 8	20 / 20	20 / 20	25 / 25	8 / 8	8 / 8
			440 V	36 / 36	36 / 36	65 / 65	65 / 65	125 / 125	36 / 36	36 / 36
			400 V	36 / 36	**36 / 36**	**75 / 75**	**75 / 75**	**125 / 125**	**36 / 36**	**36 / 36**
Dimensions WxHxD			[mm]	105/140x165x86	105/140x165x86	105/140x165x86	105/140x165x86	105x240x86	105/140x165x86	105/140x165x86

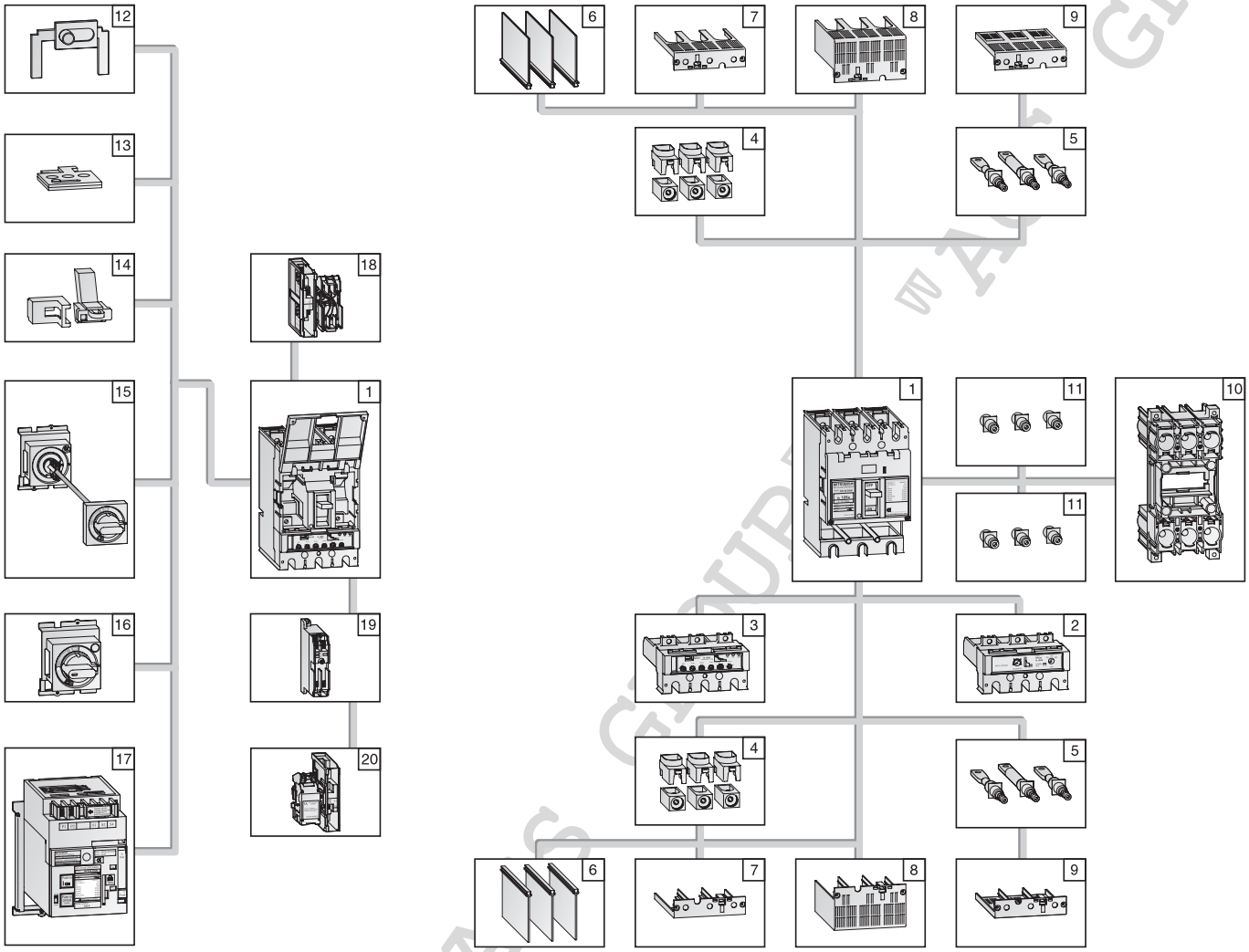
Specifications PSS Series				NF160-HGW RT	NF160-HGW RE	NF250-SGW RT	NF250-SGW RE	NF250-HGW RT	NF250-HGW RE	NF250-RGW RT
Rated current I_n [A]				160	160	250	250	250	250	225
Rated insulation voltage U [V]				690	690	690	690	690	690	690
Number of poles				3 / 4	3 / 4	3 / 4	3 / 4	3 / 4	3 / 4	3
Rated breaking capacity [kA] (I_{cs} / I_{cu})	IEC 947-2 EN 60 947-2 VDE 0660	AC (50/60 Hz)	690 V	20 / 20	20 / 20	8 / 8	8 / 8	20 / 20	20 / 20	25 / 25
			440 V	65 / 65	65 / 65	36 / 36	36 / 36	65 / 65	65 / 65	125 / 125
			400 V	75 / 75	**75 / 75**	**36 / 36**	**36 / 36**	**75 / 75**	**75 / 75**	**125 / 125**
Dimensions WxHxD			[mm]	105/140x165x86	105/140x165x86	105/140x165x86	105/140x165x86	105/140x165x86	105/140x165x86	105x240x86

Specifications PSS Series				NF400-SEW	NF400-HEW	NF400-REW	NF630-SEW	NF630-HEW	NF630-REW	NF800-SEW	NF800-HEW	NF800-REW
Rated current I_n [A]				400	400	400	630	630	630	800	800	800
Rated insulation voltage U [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_{cs} / I_{cu})	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 SS Series				NF1000-SEW	NF1250-SEW	NF1600-SEW
Rated current I_n [A]				1000*	1250*	1600*
Rated insulation voltage U [V]			AC	690	690	690
Number of poles				3 / 4	3 / 4	3 / 4
Rated breaking capacity [kA] (I_{cs} / I_{cu})	IEC 947-2 EN 60 947-2 VDE 0660	AC (50/60 Hz)	690 V	25 / 13	25 / 13	25 / 13
			440 V	85 / 43	85 / 43	85 / 43
			400 V	85 / 43	**85 / 43**	**85 / 43**
Dimensions WxHxD			[mm]	210/280x406x140	210/280x406x140	210/280x406x140

Product Skeleton of Accessories for Moulded Case Circuit Breakers

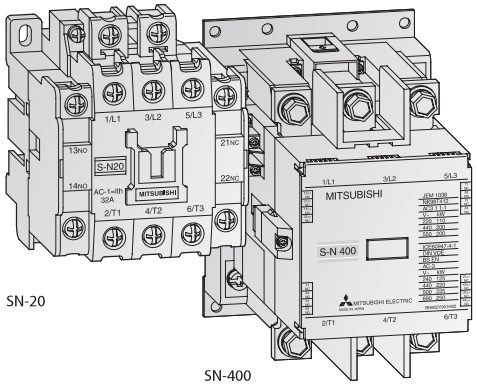
Mitsubishi Electric offers a wide range of accessories for the Moulded Case Circuit Breakers and disconnectors to serve almost all variations of applications.



Position	Name	Description
1	Circuit Breaker	Main breaker unit.
2	Relay unit RT (thermal type)	Interchangeable trip relay, thermal-electrical type.
3	Relay unit RE (electronic type)	Interchangeable trip relay, electronic type.
4	Solderless (box) terminals	Connection accessories, only available for frame sizes 125/160/250 A.
5	Rear connection studs	Used for rear connection
6	Insulating barriers (BA-F)	Used to avoid short-circuits between the terminals, every breaker is equipped with insulating barriers as standard.
7	Small terminal covers (TC-S)	Used to avoid exposure of charged parts, small type.
8	Large terminal covers (TC-L)	Used to avoid exposure of charged parts, large type.
9	Rear teminal covers (BTC)	Used to avoid exposure of charged parts, for rear connection.
10	Plug-in base (PM)	Used for easy connection and exchange.
11	Connections for Plug-in	Special connection accessories for Plug-in base.
12	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.
13	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.
14	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.
15	Variable-depth operating handle, V type	The V-type operating handle is used to operate the breaker which is installed in a cabinet.
16	Rotary operating handle, R type	The R-type operating handle is to be mounted directly on the breaker.
17	Electrical operating device (MDS)	Used to switch the breaker ON and OFF electrically by remote.
18	Alarm and Auxilliary switches (AL, AX)	Indicators for status signals (ON, OFF, Tripped).
19	Under voltage trip device (UVT)	Trips the breaker when voltage drops.
20	Shunt trip device (SHT)	Trips the breaker by remote.

For details on our full range including accessories contact your local distributor

General Purpose Contactors



SN-20

SN-400

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

Requirements that the MS-N series from Mitsubishi Electric fulfill.

The main benefits:

- Easy mounting and wiring
- Easy inspection
- Built-in surge absorber
- Safety and speedy terminal functions
- Thermo plastic improves the barrier strength
- Coil boasts lower coil consumption
- Improvement of Electromagnet (DC electromagnet with AC operation)
- Less noise nor surge from coil
- Conform to IEC947-4-1, EN-Standards
- Wide range for rated continuous current I from 20 A to 1000 A

Handling of the contactors

S-N10CX to S-N65CX units can all be mounted on DIN rail (35 mm wide).

A variety of auxiliary blocks and optional features are available including:

- Standard front clip-on auxiliary contact blocks (4-pole-type and 2-pole-type)
- Low-level signal front-clip-on auxiliary contact blocks
- Side clip-on auxiliary contact blocks
- Surge absorbers (varistor and CR models)
- Surge absorbers with LED operating indicators
- Mechanical interlocks

Compact arc quenching and magnet layout greatly reduces installation space.

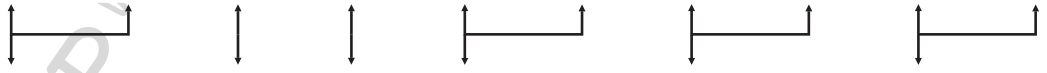
The coil rating is displayed in a location readily visible even after the unit is installed onto the panel.

Contacts are visible when the cover is removed, allowing them to be checked easily.

Three-phase motor ratings IEC category AC3 for Contactors											
Contactor	AC-operated	S-N10CX	S-N11CX	S-N12CX	S-N18CX	S-N20CX	S-N21CX	S-N25CX	S-N35CX	S-N50CX	S-N65CX
	DC-operated	—	SD-N11CX	SD-N12CX	—	—	SD-N21CX	—	SD-N35CX	SD-N50	SD-N65
AC 380–440 V	kW	4	5.5	5.5	7.5	11	11	15	18.5	22	30
Rated continuous current I	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

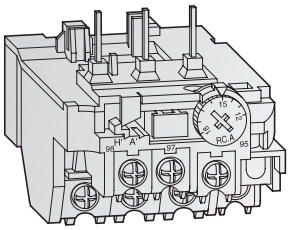
Thermal Overload Relays						
Type	TH-N12KPCX		TH-N18KPCX	TH-N20KPCX	TH-N20TAKPCX	TH-N60KPCX
Setting range	0.1 – 13 A		1 – 18 A	0.2 – 22 A	18 – 40 A	12 – 65 A

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	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

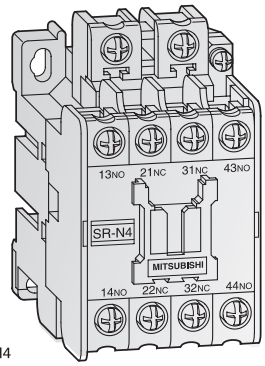
The thermal relay line-up includes the phase failure protection type models (three-element relays).

This array of protection characteristics allows you to choose the units suited to your motor protection needs.

Benefits:

- 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.

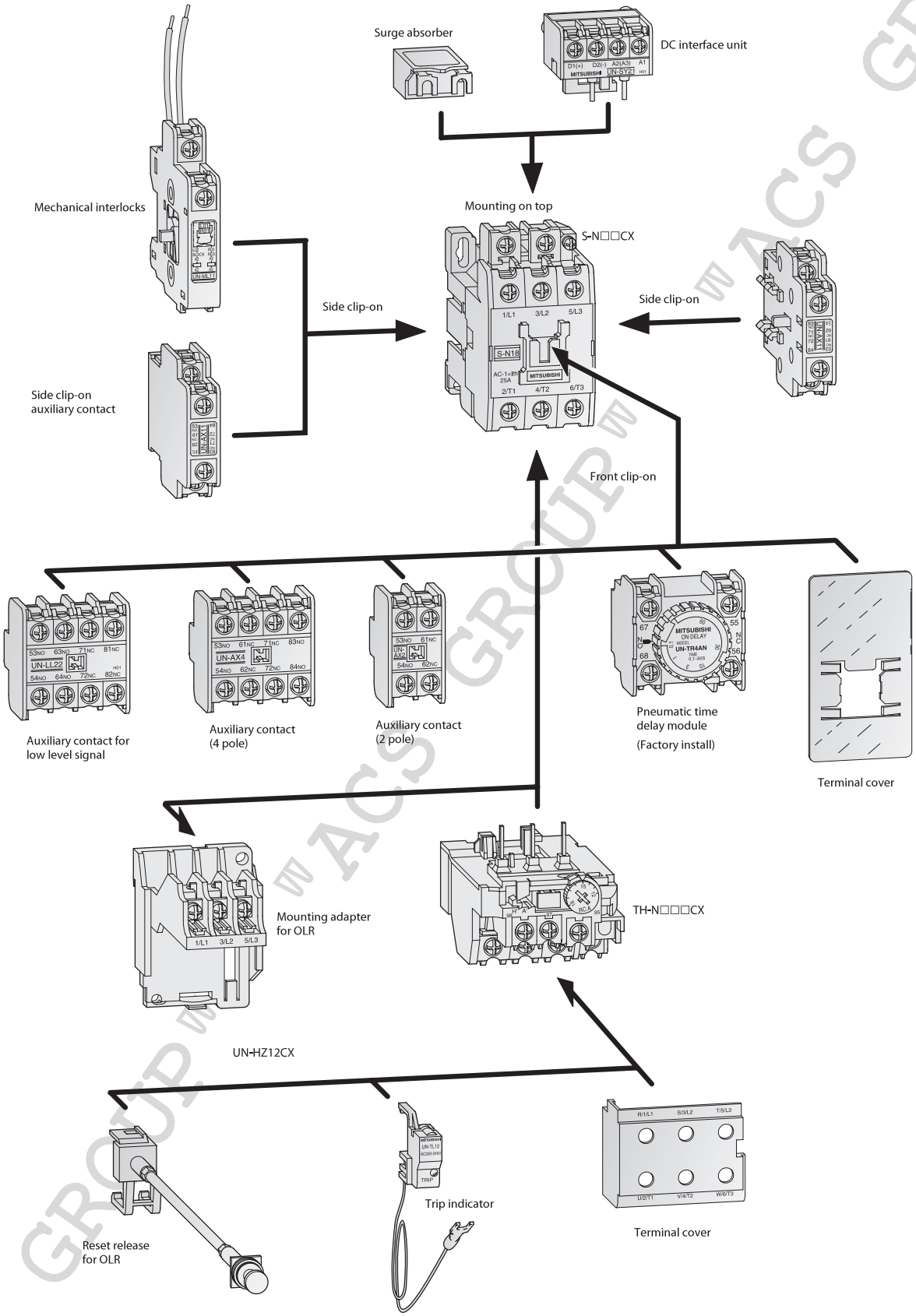
With side clip-on and front clip-on configurations available, a maximum of 8 auxiliary contacts are possible.

The main benefits:

- 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



The Mitsubishi Industrial Automation Internet Portal

The Mitsubishi Automation website

Our website provides a simple and fast way of accessing further technical data and up to the minute details on our products and services. Manuals and catalogues are available in several different languages and can be downloaded for free. The main page is availbalbe under ***www.mitsubishi-automation.com***. The web site is available in more than 10 different languages and the number of languages is still growing. Follow the drop down menu in the upper right corner of the web site to see if your language is already available.

The European Automation portal

MyMitsubishi gives you more

Are you interested in news about products and technologies from Mitsubishi Electric for factory and process automation applications? Do you need an address in your area for a local Mitsubishi distributor? Or are you already a customer and need quick access to the latest technical information? You can already find all this and more on our website, but with MyMitsubishi you can find the information you need even faster and more easily and you also get some valuable additional services. Take advantage of MyMitsubishi – it's your direct channel to Mitsubishi automation technology.

How to register

Click on the *Register Now* link on the MyMitsubishi page to display the registration form. Enter a user name and password of your choice and your contact details, then click on the *Register* button. Shortly after doing this you will receive an email asking you to confirm and complete the registration process. If you ever forget your password just click on the *I forgot my password* link to have it sent to your registered email address. You are in complete control of how we work with you. You can edit, modify or even delete your registration at any time from within your personal profile.

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As a registered user you have free access to many useful additional services that are not available to the general public.

- ***Additional downloads***

In addition to brochures, technical catalogues and manuals, MyMitsubishi members can also download the latest software updates and drivers, CAD, GSD and EDS files and copies of product certifications.

MyMitsubishi offers numerous free downloads.

- ***Graphics database***

MyMitsubishi members also have access to our graphics database with product photos, graphics and illustrations from our brochures and catalogues. If you like, you can also download and use a selection of our wallpaper images to use as your desktop background.

Free access to the comprehensive graphics database.

- ***Newsletter***

Stay up to date: Subscribers to our email newsletter don't miss any events or special promotions. Once a month you will receive the latest news from the world of Mitsubishi automation technology. Topics include product news, case studies on applications realised with Mitsubishi products in all fields of automation, trade show dates, events for customers and special offers.

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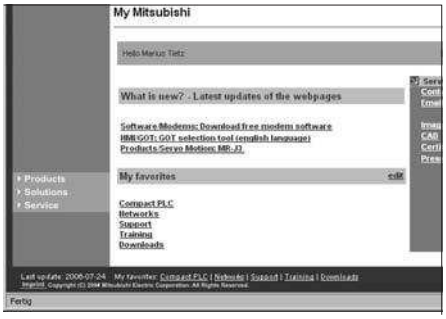

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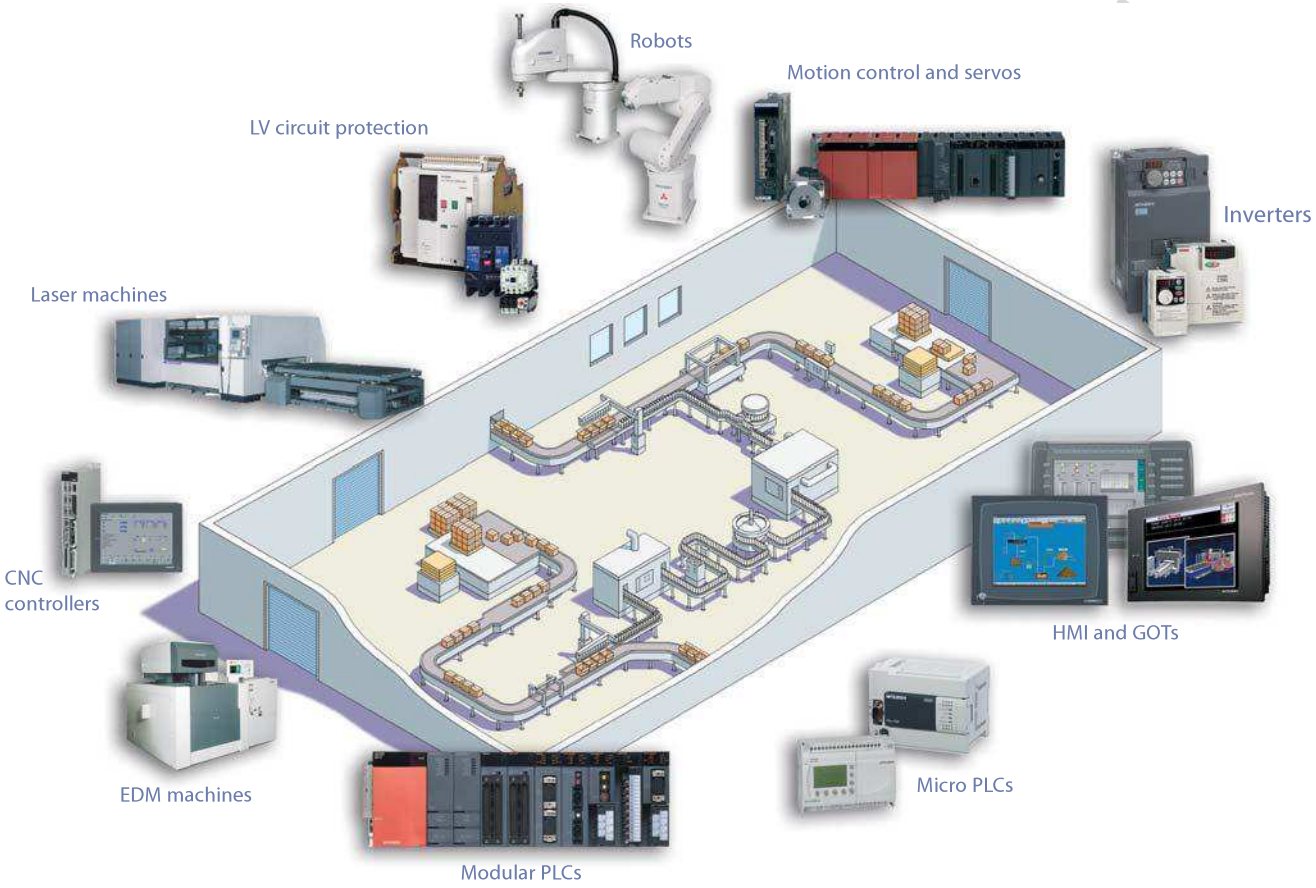
A world of automation solutions



Mitsubishi offer 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 represents 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 automation solution – because we know first hand about the need for reliable, efficient, easy-to-use automation and control.

As one of the world's leading companies with a global turnover of 3.4 trillion Yen (approximately $30.8 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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