HMI
GUIDE

Thank you for purchasing Autonics product.

Before use, be sure to read the safety considerations and use them correctly.

Autonics

CONTENTS

Autonics HMI Selection Guide

GP-A104

Color

10.4 inch | RS232C | RS422 | USB Host | USB Device | Ethernet | CAN | Micro SD | atDesigner

LP-A104

Color

10.4 inch | RS232C | RS422 | USB Host | USB Device | Ethernet | CAN | Micro SD | 32 I/O | atDesigner | atLogic

GP-A070

Color

7 inch | RS232C | RS422 | USB Host | USB Device | Ethernet | atDesigner

LP-A070

Color

7 inch | RS232C | RS422 | USB Host | USB Device | Ethernet | 16 I/O | atDesigner | atLogic

GP-A057

Color

5.7 inch | RS232C | RS422 | USB Host | USB Device | Ethernet | atDesigner

GP-A046

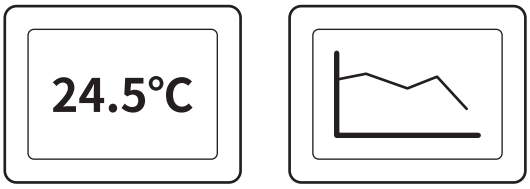
Color

4.6 inch | RS232C | RS422 | USB Host | USB Device | Ethernet | atDesigner

Type of Atonics HMI

■ GP

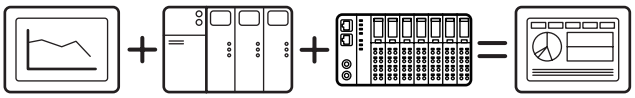
GP (Graphic Panel) is graphic interface device for monitoring variables of a controller such as PLC, and is one kind of HMI(Human-Machine Interface) or MMI(Man-Machine Interface) device.
By connecting GP and controller, you can visually monitor the variables of the controller and set the values.
The variables can be displayed in various way. For example, temperature, which is variable to be monitored, can be displayed in number using numeric display object, and in graph using real-time trend graph to check temperature changes for a period of time.



< Display in number > < Display in graph>

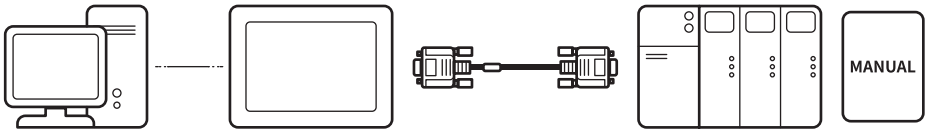
■ LP

LP (Logic Panel) is all-in-one controller device for complicated industrial site, by adding PLC (Programmable Logic Controller) and I/O functions to HMI (Human-Machine Interface).
It provides effectiveness of cost saving, cable reduction, space saving, and easier accessibility by integration of HMI, PLC and I/O.



GP PLC I/O LP

Basic Preparations for Using HMI



PC HMI Communication Cable PLC Manual

■ PC

Required software is different by series of HMI to use.
For detailed information about software, refer to the following table and download from Autonics website (www.autonics.com).

HMI	Required software
GP-A	atDesigner
LP-A	atDesigner, atLogic

■ Communication Cable

Please refer to the 'HMI Communication Cable'.

■ Manual

Download manuals from Autonics website (www.autonics.com).

HMI	Required manual
GP-A	User manual for each series, atDesigner user manual, GP/LP user manual for communication
LP-A	User manual for each series, atDesigner user manual, atLogic user manual, atLogic programing manual, GP/LP user manual for communication

Software

■ atDesigner

atDesigner is the user screen and project data editing program dedicated to GP/LP-A Series.
With atDesigner, user can edit shape, position, property of the object and figure in the user screen and set user account,
security, language, script, or etc before download to the HMI.
It is also available to download a firmware of the HMI with ease.

Item	Minimum spec	Recommended spec
Operating system	Windows 7 / 8.1 / 10	
CPU	Pentium4 1.6 GHz	Over Intel Core i5-2nd gen. 2500
Memory	4 GB	Over 8 GB
Hard disk	Free space 4 GB	Over 8 GB free space
Resolution	1280 × 1024	1920 × 1080

■ atLogic

atLogic is the logic programming and debugging program for the LP Series.
It is easy to use for the personnel who use atLogic at first because of familiar interface similar to Microsoft Windows.
Both ladder program editor and mnemonic program editor are available, so that user can select editor tool or use them simultaneously.

Item	Minimum spec	Recommended spec
Operating system	Windows 7 / 8.1 / 10	
CPU	Pentium4	Over Pentium Dual Core
Memory	512 MB	Over 1 GB
Hard disk	Free space 1 GB	Over 5 GB free space
Resolution	1024 × 768	1280 × 1024

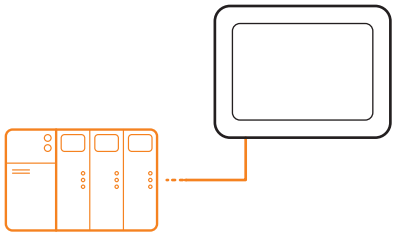
System Configuration

■ STAND ALONE (LP)

LP alone can receive data from input devices and control output device without other controller.

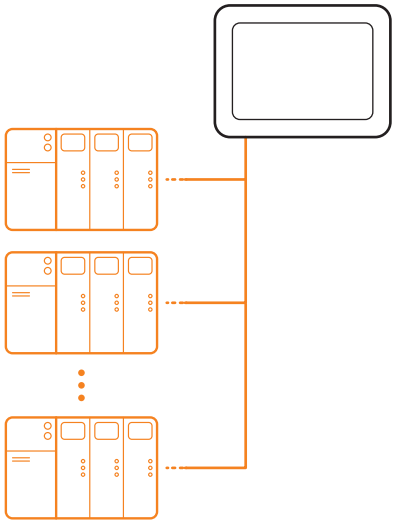
■ 1:1 Communication

A HMI can communicate with a single controller.



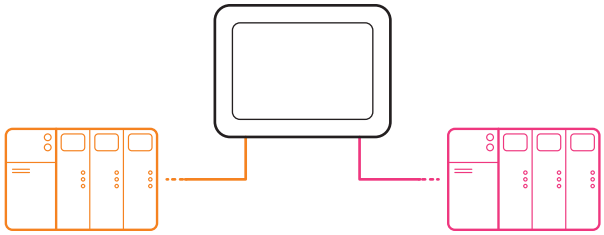
■ 1:N communication of same controllers

A HMI can communicate with the multiple of same controller.
The HMI observes the connected controllers or relay data between controllers.



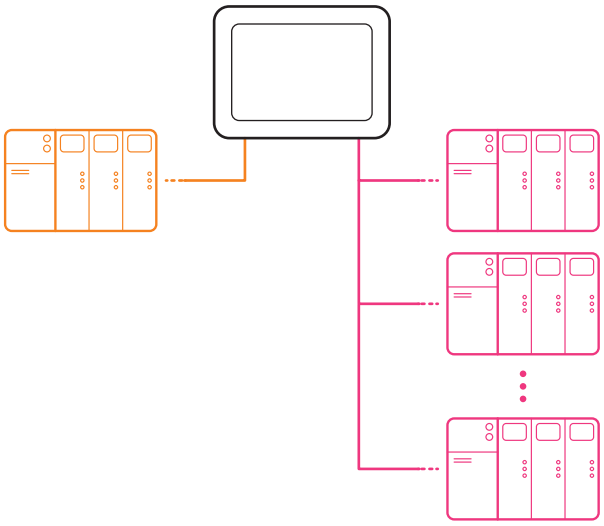
■ 1:1:1 communication of different controllers

A HMI can communicate with a single controller A and a single controller B.
The HMI relays communication between the controller A and B



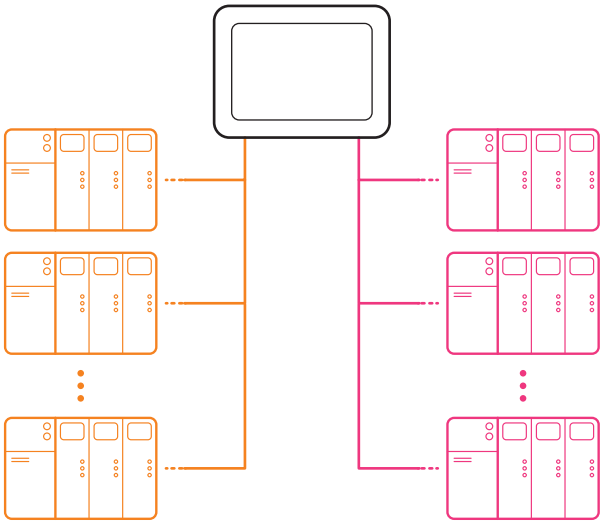
■ 1:1:N communication of different controllers

A HMI can communicate with a single controller A and the multiple of controller Bs.
The HMI relays communication between the controller A and B.
Controller has to be able to set address of each device, and the address should not be duplicated.



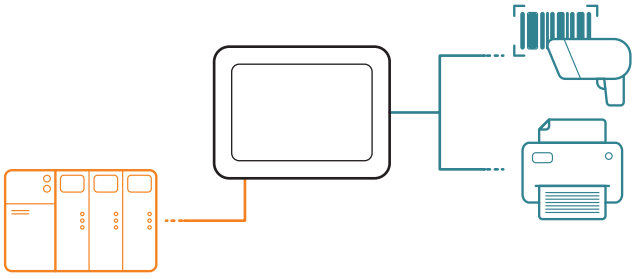
■ N:1:N communication of different controllers

A HMI can communicate with the multiple of controller As and controller Bs.
The HMI relays communication between the controller A and B.



■ Bar-code reader, printer communication

A HMI can communicate with a bar-code reader and printer.



Compatible Device

Manufacturer	Series	Model	Communication method
Autonics	TK	-	Modbus (TYPE A)
Autonics	TM	-	Modbus (TYPE A)
Autonics	TMH	-	Modbus (TYPE A)
Autonics	TZ	-	Dedicated communication
Autonics	THD	-	Modbus (TYPE A)
Autonics	CT	-	Modbus (TYPE A)
Autonics	MT	-	Dedicated communication
Autonics	MT	-	Modbus (TYPE A)
Autonics	MP	-	Dedicated communication
Autonics	DS / DA	-	Modbus (TYPE A)
Autonics	ARM	-	Modbus (TYPE A)
Autonics	ARD 01)	-	DeviceNet
Autonics	LP-S044, LP-S070	-	CPU
Autonics	LP-A070, LP-A104	-	CPU
Autonics	DPU	-	Modbus (TYPE A)
Autonics	KRN50	-	Modbus (TYPE A)
LS	Master-K	MK-10S1	CPU
LS	Master-K	MK-80S	CPU
LS	Master-K	MK-80S	Cnet built-in CPU
LS	Master-K	MK-80S	Cnet unit
LS	Master-K	MK-120S	CPU
LS	Master-K	MK-120S	Cnet built-in CPU
LS	Master-K	MK-120S	Cnet unit
LS	Master-K	MK-200S	CPU
LS	Master-K	MK-200S	Cnet built-in CPU
LS	Master-K	MK-200S	Cnet unit
LS	Master-K	MK-300S	CPU
LS	Master-K	MK-300S	Cnet unit
LS	Master-K	MK-1000S	CPU
LS	Master-K	MK-1000S	Cnet unit
LS	XGT	XGK-CPUU	CPU
LS	XGT	XGK-CPUH	CPU
LS	XGT	XGK-CPUA	CPU
LS	XGT	XGK-CPUS	CPU
LS	XGT	XGK-CPUS	Cnet unit
LS	XGT	XGK-CPUE	CPU
LS	XGT	XGI-CPUU	CPU
LS	XGT	XGI-CPUH	CPU
LS	XGT	XGI-CPUS	CPU
LS	XGT	XGI-CPUE	CPU
LS	XGT	XGR-CPUH / T	CPU
LS	XGT	XGR-CPUH / F	CPU
LS	XGT	XGR-CPUH / S	CPU
LS	XGB	XEC (U)	CPU
LS	XGB	XEC (H)	CPU
LS	XGB	XEC (SU)	CPU
LS	XGB	XEC (E)	CPU
LS	XGB	XBM	Cnet built-in CPU
LS	XGB	XBM	Cnet unit
LS	XGB	XBC	Cnet built-in CPU
LS	XGB	XBC	Cnet unit
LS	Glofa	GM4	CPU
LS	Glofa	GM6	CPU
LS	Glofa	GM7U	CPU
RS Automation (Samsung) OEMax	N70	-	CPU
RS Automation (Samsung) OEMax	N70Plus	-	CPU
RS Automation (Samsung) OEMax	NX7	-	CPU
RS Automation (Samsung) OEMax	NX70	-	CPU
MITSUBISHI	FX	FX1S	CPU
MITSUBISHI	FX	FX1N	CPU
MITSUBISHI	FX	FX2NC	CPU
MITSUBISHI	FX	FX2N	CPU
MITSUBISHI	FX	FX2N-10GM	CPU
MITSUBISHI	FX	FX2N-20GM	CPU
MITSUBISHI	FX	FX3U	CPU
MITSUBISHI	FX	FX3UC	CPU
MITSUBISHI	FX	FX3G	CPU

01) ARD Series is only available with GP/LP-A104 Series through CAN port.

Manufacturer	Series	Model	Communication method
MITSUBISHI	MELSEC-Q	Q00J	Cnet unit
MITSUBISHI	MELSEC-Q	Q00	Cnet unit
MITSUBISHI	MELSEC-Q	Q01	Cnet unit
MITSUBISHI	MELSEC-Q	Q02	CPU
MITSUBISHI	MELSEC-Q	Q02	Cnet unit
MITSUBISHI	MELSEC-Q	Q02H	CPU
MITSUBISHI	MELSEC-Q	Q02H	Cnet unit
MITSUBISHI	MELSEC-Q	Q06H	CPU
MITSUBISHI	MELSEC-Q	Q06H	Cnet unit
MITSUBISHI	MELSEC-Q	Q12H	CPU
MITSUBISHI	MELSEC-Q	Q12H	Cnet unit
MITSUBISHI	MELSEC-Q	Q25H	CPU
MITSUBISHI	MELSEC-Q	Q25H	Cnet unit
MITSUBISHI	MELSEC-Q	Q00UJ	CPU
MITSUBISHI	MELSEC-Q	Q00U	CPU
MITSUBISHI	MELSEC-Q	Q01U	CPU
MITSUBISHI	MELSEC-Q	Q02U	CPU
MITSUBISHI	MELSEC-Q	Q03UD	CPU
MITSUBISHI	MELSEC-Q	Q04UDH	CPU
MITSUBISHI	MELSEC-Q	Q06UDH	CPU
MITSUBISHI	MELSEC-Q	Q10UDH	CPU
MITSUBISHI	MELSEC-Q	Q13UDH	CPU
MITSUBISHI	MELSEC-Q	Q20UDH	CPU
MITSUBISHI	MELSEC-Q	Q26UDH	CPU
MITSUBISHI	MELSEC-Q	Q03UDVCPU	CPU
MITSUBISHI	MELSEC-Q	Q04UDVCPU	CPU
MITSUBISHI	MELSEC-Q	Q06UDVCPU	CPU
MITSUBISHI	MELSEC-Q	Q10UDVCPU	CPU
MITSUBISHI	MELSEC-Q	Q13UDVCPU	CPU
MITSUBISHI	MELSEC-Q	Q20UDVCPU	CPU
MITSUBISHI	MELSEC-Q	Q26UDVCPU	CPU
MITSUBISHI	MELSEC-Q	QJ71E71-100	Ethernet comm. module
MITSUBISHI	MELSEC-Q	QJ71E71-B5	Ethernet comm. module
MITSUBISHI	MELSEC-Q	QJ71E71-B2	Ethernet comm. module
Panasonic NAiS	FP	FP0-C16	CPU
Panasonic NAiS	FP	FP0-C32	CPU
Panasonic NAiS	FP	FP0-T32C	CPU
Panasonic NAiS	FP	FPG-C24R2	CPU
Panasonic NAiS	FP	FPG-C32T	CPU
Panasonic NAiS	FP	FPG-C32T2	CPU
Panasonic NAiS	FP	FP0R-C10	CPU
Panasonic NAiS	FP	FP0R-C14	CPU
Panasonic NAiS	FP	FP0R-C16	CPU
Panasonic NAiS	FP	FP0R-C32	CPU
Panasonic NAiS	FP	FP0R-T32	CPU
Panasonic NAiS	FP	FP0R-F32	CPU
Panasonic NAiS	FP	FP0H-32ET	CPU
Panasonic NAiS	FP	FP0H-C32T	CPU
Panasonic NAiS	FP	FP7	CPU
Panasonic NAiS	FP	FP-SIGMA	Ethernet comm. module
Panasonic NAiS	FP	FP0H	CPU
Panasonic NAiS	FP	FP2/FP2SH	Ethernet comm. module
OMRON	SYSMAC C	CPM1A	CPU & comm. module (Host Link)
OMRON	SYSMAC CS	CS1H	CPU
OMRON	SYSMAC CS	CS1H	Ethernet comm. module
OMRON	SYSMAC CS	CS1G	CPU
OMRON	SYSMAC CS	CS1G	Ethernet comm. module
OMRON	SYSMAC CS	CS1D	CPU
OMRON	SYSMAC CS	CS1D	Ethernet comm. module
OMRON	SYSMAC CJ	CJ2H	CPU
OMRON	SYSMAC CJ	CJ2H	Ethernet comm. module
OMRON	SYSMAC CJ	CJ2M	CPU
OMRON	SYSMAC CJ	CJ2M	Ethernet comm. module
OMRON	SYSMAC CJ	CJ1G	CPU
OMRON	SYSMAC CJ	CJ1G	Ethernet comm. module
OMRON	SYSMAC CJ	CJ1H	CPU
OMRON	SYSMAC CJ	CJ1H	Ethernet comm. module
OMRON	SYSMAC CJ	CJ1M	CPU
OMRON	SYSMAC CJ	CJ1M	Ethernet comm. module
OMRON	SYSMAC CP	CP1E	CPU
OMRON	SYSMAC CP	CP1H	CPU
OMRON	SYSMAC CP	CP1H	Ethernet comm. module
OMRON	SYSMAC CP	CP1L	CPU
OMRON	E5AN	-	Modbus
OMRON	E5AR	-	Modbus
OMRON	E5CN	-	Modbus
OMRON	E5EN	-	Modbus
OMRON	E5ER	-	Modbus

Connectable Device

Manufacturer	Series	Model	Communication method
SIEMENS	SIMATIC S7-200	CPU221	CPU
SIEMENS	SIMATIC S7-200	CPU222	CPU
SIEMENS	SIMATIC S7-200	CPU224	CPU
SIEMENS	SIMATIC S7-200	CPU224XP	CPU
SIEMENS	SIMATIC S7-200	CPU224XPsi	CPU
SIEMENS	SIMATIC S7-200	CPU226	CPU
SIEMENS	SIMATIC S7-300	CPU312	CPU
SIEMENS	SIMATIC S7-300	CPU312C	CPU
SIEMENS	SIMATIC S7-300	CPU313C	CPU
SIEMENS	SIMATIC S7-300	CPU313C-2	CPU
SIEMENS	SIMATIC S7-300	CPU314	CPU
SIEMENS	SIMATIC S7-300	CPU314C-2	CPU
SIEMENS	SIMATIC S7-300	CPU315-2	CPU
SIEMENS	SIMATIC S7-300	CPU317-2	CPU
SIEMENS	SIMATIC S7-300	CPU319-3	CPU
SIEMENS	SIMATIC S7-1200	CPU1211C	comm. module CM1241RS422 / 485
SIEMENS	SIMATIC S7-1200	CPU1212C	comm. module CM1241RS422 / 485
SIEMENS	SIMATIC S7-1200	CPU1214C	comm. module CM1241RS422 / 485
SIEMENS	SIMATIC S7-1200	CPU1215C	comm. module CM1241RS422 / 485
SIEMENS	SIMATIC S7-1200	CPU1217C	comm. module CM1241RS422 / 485
Rockwell Automation Allen-Bradley	MicroLogix	MicroLogix 1000	CPU
Rockwell Automation Allen-Bradley	MicroLogix	MicroLogix 1200	CPU
Rockwell Automation Allen-Bradley	MicroLogix	MicroLogix 1500	CPU
CIMON	BP	CM2-BP16M	CPU
CIMON	BP	CM2-BP32M	CPU
CIMON	CP	CM1-CP3A	CPU
CIMON	CP	CM1-CP3A	Comm. module CM1-SC02A, CM1-SC01A, CM1-SC01B
CIMON	CP	CM1-CP3B	CPU
CIMON	CP	CM1-CP3B	Comm. module CM1-SC02A, CM1-SC01A, CM1-SC01B
CIMON	CP	CM1-CP3P	CPU
CIMON	CP	CM1-CP3P	Comm. module CM1-SC02A, CM1-SC01A, CM1-SC01B
CIMON	CP	CM1-CP4A	CPU
CIMON	CP	CM1-CP4A	Comm. module CM1-SC02A, CM1-SC01A, CM1-SC01B
CIMON	CP	CM1-CP4B	CPU
CIMON	CP	CM1-CP4B	Comm. module CM1-SC02A, CM1-SC01A, CM1-SC01B
CIMON	CP	CM1-CP4C	CPU
CIMON	CP	CM1-CP4C	Comm. module CM1-SC02A, CM1-SC01A, CM1-SC01B
CIMON	CP	CM1-CP4D	CPU
CIMON	CP	CM1-CP4D	Comm. module CM1-SC02A, CM1-SC01A, CM1-SC01B
CIMON	XP	CM1-XP1A	CPU
CIMON	XP	CM1-XP1A	Comm. module CM1-SC02A, CM1-SC01A, CM1-SC01B
CIMON	XP	CM1-XP1R	CPU
CIMON	XP	CM1-XP1R	Comm. module CM1-SC02A, CM1-SC01A, CM1-SC01B
CIMON	XP	CM1-XP2A	Comm. module CM1-SC02A, CM1-SC01A, CM1-SC01B
CIMON	XP	CM1-XP3A	Comm. module CM1-SC02A, CM1-SC01A, CM1-SC01B
DELTA	DTB	-	Modbus
DELTA	DTB	-	Modbus (TYPE A)
DANFOSS	FC200	-	Modbus
DANFOSS	FC200	-	Modbus (TYPE A)
MODBUS MASTER	-	-	Modbus (Master)

The list of connectable device is kept updating.
Before using the HMI, check the version of atDesigner and download newest version of the software via Autonics website (www.autonics.com).

APPENDIX

Safety Certification for Product and Component

- For detailed certification information, visit the website of each certification body.
- For the status of certification on our product, visit the Autonics website.

■ CE

- Country: European Union

CE marking is the conformity marking, meaning that it complies with all Directives of the Council of European Union regarding safety, health, environmental, and consumer protection standards.
If a product judged to be a risk to the consumer's health, safety, and environmental protection, is sold in the European market, the CE mark must be affixed. It is an essential certification for entry into the European market.

■ UL Listed

- Country: United States

UL listing is the American standard for safety. It is a non-mandatory standard, but most States mandate this standard. This certification is highly favored by consumers.
UL Listed Mark means the end product meets standards of safety.

■ UL Recognized

- Country: United States

UL listing is the American standard for safety. It is a non-mandatory standard, but most States mandate this standard. This certification is highly favored by consumers.
UL Recognized Mark means the components intended for use in a complete product or system meet standards of safety.

■ TR CU

- Country: Eurasian Economic Union

The EAC certification is accredited by five member countries of the Eurasian Economic Union (EAEU): Russia, Kazakhstan, Belarus, Armenia, and Kyrgyzstan.
Regulated products without the EAC mark are prohibited to access the markets of 5 members of EAEU.

- Type of certification
  : Certificate of Conformity (CoC),
  Declaration of Conformity (DoC)

■ KC

- Country: Republic of Korea

The KC certification mark must be affixed on an imported or domestically manufactured electrical product that is to be distributed or sold in Korea.
Type of certification: safety certification, EMC certification

- Safety certification: Korean Agency for Technology and Standards (KATS) affixes and manages the KC certification mark for electrical appliances, household goods, and children's products by dividing the steps into safety certification / safety confirmation / supplier's declaration of conformity (SODC) according to the different levels of potential danger.
- EMC certification: Manufacture, sale, or import for equipment that may cause harm to the radio environment and broadcasting communication network, or that may cause or receive significant electromagnetic interference, the KC certification mark is issued through electromagnetic compatibility (EMC) testing.

■ KCs

- Country: Republic of Korea

The Minister of Employment and Labor evaluates the safety of hazardous or dangerous machinery, equipment, facilities, protective devices, and protective equipment based on the 'safety certification standards.' Occupational Safety and Health Agency (Ulsan, in South Korea) certifies safety through comprehensive tests complying with the 'safety certification standards.'
Any person who intends to manufacture, import, or change major structural parts of products subject to safety certification, must obtain this certification.

■ S-Mark

- Country: Republic of Korea

The S-Mark is the optional certification system to prevent industrial accidents.
Korea Occupational Safety and Health Agency (KOSHA) conducts a comprehensive evaluation for the safety and reliability of product, and the capability of quality control in manufacturing.
Due to non-mandatory, there is no regulation or disadvantage on the uncertified product.

■ TUV NORD

• Country: Germany

TUV is a leading German private certification body that has been responsible for many testing and certification tasks related to safety in the industry for a long time.
It is intended to protect people and property from fire and other accidents. Currently, TUV is conducting tests and inspections on safety and quality in various industries such as machinery, electronics and electricity, automobiles, chemical facilities, nuclear power, and aircraft.
It is voluntary standards, and certification is issued complying with various EU Directives and German safety regulations.

■ Metrology Certification

• Country: Russia

Metrology Certification is a certificate for measuring and test equipment. Registration of measuring equipment is currently being revised and implemented following the Russian Federal Law, and is managed and supervised by the measurement authority, which is the subject of the certification.
Measurement authorities review and test measuring equipment to be used in the Russian Federation based on the State System of Measurement (SSM), issue certificates, and manage them in the government's online database for users and buyers to browse.

■ CCC

• Country: China

The China Compulsory Certificate system (CCC) is a compulsory mark for products that met Chinese technical standards and are allowed to be imported by the Chinese government.
Foreign-imported industrial products are examined through CCC certification process whether they meet safety standards or not. The certified products are distributed and sold with the CCC mark or factory code according to the product.
CCC certification is administered by the China Quality Certification Center (CQC).

■ PSE

• Country: Japan

PSE is a compulsory certification administered by the Ministry of Economy, Trade and Industry (METI) and governs by the Electrical Appliances Safety Law in Japan.
The purpose is to minimize the occurrence of harm and damage caused by electrical equipment by regulating the manufacture and sale of electrical appliances and bring an engagement of the private sector to ensure the safety of electrical appliances.
Manufacture, import, and sell electrical appliances in the Japanese market, the technical standards for those products must be satisfied and the PSE certification mark must be displayed.

■ GOST

• Country: Russia

GOST is national technical standards set by the Euro Asian Council for Standardization, Metrology and Certification (EASC). The abbreviation GOST stands for GOsudarstvennyy STandart, which means State Union Standard in Russian.
The current GOST standard includes over 20,000 titles and is widely used in common in the Commonwealth of Independent States (CIS) (12 countries).
All countries of the CIS currently adopt and use the GOST standard, but the certificates issued by each country and the subject of the issuing certification body are different, so each country's GOST certificate can be regarded as a different certificate. The national standards of Russia are the GOST R, those of Kazakhstan are GOST K, etc.

■ China RoHS

• Country: China

China RoHS is the Chinese government regulation to control and eliminate the environmental impact of toxic and hazardous substances and elements in electrical/electronic equipment.
China's Measures for the Administration of the Control of Pollution by Electronic Information Products like the EU RoHS Directive have been enacted, and regulate additional hazardous substances compare to EU RoHS. Marking a logo or label for marking information is mandatory.
In addition, there is a certification system before selling the product to ensure its conformity by conducting test analysis. Products to be exported to China will be screened prior to customs entry. Customs entry is only permitted for products that meet conformance standards.

Communication Standards

• For detailed information on communication, visit the related association's website.

■ EtherNet/IP

EtherNet/IP is an industrial network protocol that conforms Common Industrial Protocol to standard Internet. It is one of the leading industrial protocols in the United States and is widely used in a variety of industries, including factories.
EtherNet/IP and CIP technologies are managed by ODVA, Ind., a global trade and standards development organization founded in 1995 with over 300 corporate members.
EtherNet/IP uses the most widely adopted Ethernet standards - Internet Protocol and IEEE 802.3 - to define functions for the transport, network, data link, and physical layer. CIP uses object-oriented design to provide EtherNet/IP with services and device profiles needed for real-time control and to promote consistent implementation of automation functions across a diverse ecosystem of products.

■ EtherCAT

EtherCAT (Ethernet for Control Automation Technology) is an Ethernet-based fieldbus system developed by Beckhoff Automation. After releasing the technology from ETG (EtherCAT Technology Group) in 2003, it is standardized in IEC 61158 since 2007. It is a communication method that uses the frame according to IEEE 802.3 and physical layer and is an Ethernet protocol-based automation software that requires low jitter, short cycle time, and reduced hardware cost.
EtherCAT supports almost all topologies which have the advantage of flexibility and user-friendly. Due to the high-speed network, EtherCAT is suitable for applications requiring simultaneous operation.

■ DeviceNet

DeviceNet is a digital multidrop network to interconnect industrial controllers and I/O devices. DeviceNet provides users a cost-effective network for distribution at no cost, deploys and manages simple devices across the architecture.
DeviceNet uses CAN (Controller Area Network), a network technology used in automobile vehicles, for its data link layer, and this network is used in almost all industries. DeviceNet is approved by CENELEC for its official standard and is also used as a global standard.

■ HART

HART is the global standard for digital information communication via analog wires between smart devices and control or monitoring systems.
It is the duplex communication protocol and supports various analog I/O modules with HART connection. It sends and receives digital information through 4-20 mA current.
It provides a reliable and long-term solution for plant operators who seek the benefits of smart devices with digital communication while maintaining existing facilities for analog instrumentation and plant wiring. Many sites that have applied the HART protocol can access to many digital process, maintenance and diagnostic information.

■ ProfiNet

PROFINET, designated and announced by PI (PROFIBUS & PROFINET), is the open standard for industrial Ethernet in automation technology. It provides solutions for process automation, factory automation and motion control. It enables the integration of existing fieldbus systems such as PROFIBUS, Interbus and DeviceNet into an open Ethernet-based network. PROFINET, the protocol for communication, configuration and diagnosis in the network, uses Ethernet standard as well as TCP, UDP, IP.
It achieves fast and safe data exchange, enabling the concepts of innovative machine and plant. Thanks to its flexibility and openness, PROFINET offers the users a freedom in building machine and plant architectures and significantly increases plant availability by optimal use of resources available to users.

■ ProfiBus

ProfiBus is the open standard commonly used for process automation in the production site.
• Configuration
- Master: It determines data traffic, transmits messages, and performs as role of Active Station.
- Slave: It means I/O devvices, valves, motor drivers, transmitters, etc. Slave receives a message and transmits the message depending on the Master's request.

Up to 124 slaves and 3 masters can be connected to one communication line, and the communication method uses the half duplex method. Each device is connected to the bus in parallel and each device has its network address, so the installation location is irrelevant. Each device can be moved or removed during the communication.

■ CC-Link

CC-Link is the open field network and the global standard with SEMI certification.
As high-speed field network, CC-Link can process both control data and information data at the same time. With a high communication speed of 10 Mbps, it supports a transmission distance of 100 meters and connects to 64 stations.
It achieved high-speed response of up to 10 Mbps, guaranteeing punctuality. With CC-Link, complex production lines can be simplified and built at low cost. There are advantages of reducing the cost of wiring components, shortening the wiring construction period, and improving maintainability.
CLPA provides a memory map profile that allocates data for each product type. CC-Link compatiable products can be developed based on this profile, and users can use the same program for connection and control even if existing product is replaced to other vendors' one.

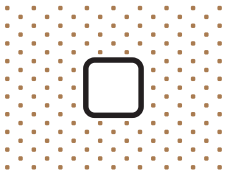
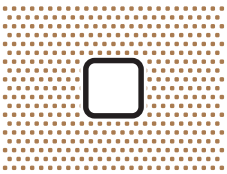
IP Code (protection against dust and water)

■ IEC (International Electro-technical Commission) Standard

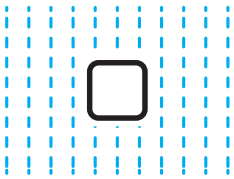
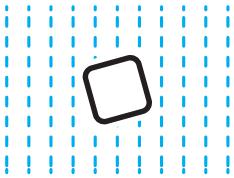
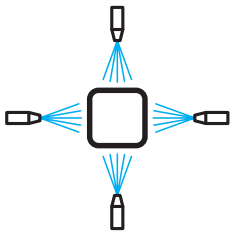
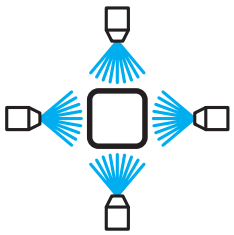
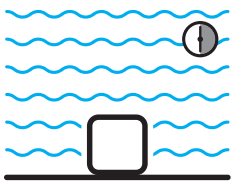
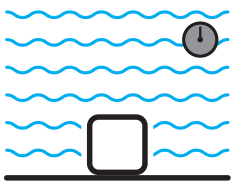
The IP Codes are defined in the IEC standard 60529.

IP	❶	❷

❶ Degree of protection against dust (protected from solid foreign objects)

Numerals	Degree of protection	
0	Non-protected	
1		Protection against the objects with 50 mm diameter or more The object probe, sphere of 50 mm diameter, must not fully penetrate. - Test means : Rigid sphere without handle or guard. - Test force: 50 N ± 10%
2		Protection against the objects with 12.5 mm diameter or more. The object probe, sphere of 12.5 mm diameter, must not fully penetrate. - Test means : Rigid sphere without handle or guard. - Test force: 30 N ± 10%
3		Protection against the objects with 2.5 mm diameter or more. The object probe, sphere of 2.5 mm diameter, must not fully penetrate. - Test means : Rigid steel rod with edges free from burrs. - Test force: 3 N ± 10%
4		Protection against the objects with 1 mm diameter or more. The object probe, sphere of 1 mm diameter, must not fully penetrate. - Test means : Rigid steel rod with edges free from burrs. - Test force: 1 N ± 10%
5		Protection against the dust with or without pressure. - Dust-protected enclosures allow a limited quantity of dust to penetrate; complete protection against contact. Test duration: 8 hours Dust (the talcum powder) : It must be able to pass a square-meshed sieve that its nominal wire with 50 µm diameter; the nominal width of a gap between wires 75 µm. The amount of talcum powder: 2 kg/m³
6		Protection against the dust under pressure. - Dust-tight enclosures do not allow any dust to penetrate. Test duration : 2 hours (a volume of dust: 40 to 60 / hour) 8 hours (a volume of dust: less than 40 / hour Depression : Less than 2 kPa (20 mbar) on the manometer. Dust (the talcum powder) : It must be able to pass a square-meshed sieve that its nominal wire with 50 µm diameter; the nominal width of a gap between wires 75 µm. The amount of talcum powder: 2 kg/m³

❷ Degree of protection against ingress of water (protected from liquids)

Numerals	Degree of protection	
0	Non-protected	
1		Protection against vertically falling water drops. Water drops flow over the whole area of four sides on a fixed and tilting enclosure. - Test duration : 10 min (2.5 min in each of four sides)
2		Protection against vertically falling water drops when the enclosure tilted up to 15° from its normal position. Uniform flow of water drops over the whole area of the enclosure. - A rotation speed of turntable: 1r / min - Test duration: 10 min
3		Protection against spraying water at an angle up to 60° on either side of the vertical. The oscillating tube has spray holes over an arc of 60° either side of the center point. It sprinkles through an angle of 120° and 60° on either side of vertical. Then, the enclosure is turned through a horizontal angle of 90°, and continue the test for 5 min. - Test duration : 10 min (5 min in each of sides) - Mean flow rate per hole: 0.07 L/min
4		Protection against splashing water from any direction. - No harmful effects on the product. The oscillating semicircle tube with spray holes sprinkles through an angle of 360°. - Test duration: 10 min - Mean flow rate per hole: 0.07 L/min
5 [01]		Protection against projecting water in jets from any direction. - No harmful effects on the product. Spraying a stream of water from the test nozzle (internal diameter: Ø 6.3 mm) at all directions. - Test duration: 3 min - Distance from nozzle to enclosure surface : 2.5 to 3 m - Delivery rate: 12.5 L/min ± 5%
6 [01]		Protection against powerfully projecting water in jets from any direction. - The product is hermetically sealed. Spraying a stream of water from the test nozzle (internal diameter: Ø 12.5 mm) at all directions. - Test duration: 3 min - Distance from nozzle to enclosure surface : 2.5 to 3 m - Delivery rate: 100 L/min ± 5%
7 [02]		Protection against temporary immersion in water under defined conditions of pressure and time. - The product is hermetically sealed. Immersion in water under defined conditions - Test duration: 30 min - Water level: 1 m
8 [02]		Complete protection against continuous immersion in water. - The product is hermetically sealed. Immersion in water under defined conditions. - Test duration: more than 8 hours - Water level: 10 m

01) The degree of protection against spraying does not guarantee the effects of immersion.
02) The degree of protection against immersion does not guarantee the effects of spray.

■ DIN (Deutsche Industric Normen) Standard

The DIN standard is defined in the DIN 40050-9.

IP	❶	❷

❶ Degree of protection against dust (protected from solid foreign objects)

Same as IEC standard

❷ Degree of protection against ingress of water (under high temperature and high pressure)

Letters	Degree of protection	
9K	Water resistance under high temperature and high pressure	Protection against high-temperature vapor and high-pressure water at all directions. - No harmful effects on the product.

■ JEM (Japan Electrical Manufacturers' Association) Standard

The JEM standard is defined in the JEM 1030.

IP	❶	❷	❸

❶ Degree of protection against dust (protected from solid foreign objects)

Same as IEC standard

❷ Degree of protection against ingress of water (protected from liquids)

Same as IEC standard

❸ Degree of oil proof / oil resistance

Letters	Degree of protection	
F	Oil proof type	Protection against oil drop and oil powder in all directions - Even of oil penetrates in the product, it operates normally.
G	Oil resistant type	Protection against oil drop and oil powder in all directions - Special coating prevents penetration of oil into the product.

Autonics

www.autonics.com