MITSUBISHI ELECTRIC
Changes for the Better

for a greener tomorrow

MELSENSOR
Vision Sensor

e-F@ctory

MELSENSOR

GLOBAL IMPACT OF MITSUBISHI ELECTRIC

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

Changes for the Better

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

Mitsubishi Electric is involved in many areas including the following

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

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

Home Appliance
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
Maximizing productivity and efficiency with cutting-edge automation technology.

Easily automate inspection and measurement, enabling quality improvement

Mitsubishi Electric vision sensor is light integrated and compact size, realizing "Easy to Use" in various shop floors.

Powered by
COGNEX

This product is manufactured by Cognex Corporation.

The vision sensor is the key device in the shop floor that detects data necessary for e-F@ctory in real-time. Mitsubishi Electric vision sensor VS20 is SLMP*[1]-ready and highly compatible with Mitsubishi Electric factory automation products. Measuring results are seamlessly coordinated with the edge computing level, realizing smooth analysis for reducing TCO*[2].

Integrated lighting and compact size

Camera, lighting, and image processing are integrated in a palm sized device.
External lighting and image processing module are not necessary, allowing installation in a constrained space.

Easy installation and intuitive setting

Equipped with a high-intensity LED ring light, setup of an external light is not required. Even novice users can install the vision sensor easily.
Dedicated software enables intuitive engineering, allowing first-time users to configure highly reliable inspection system for different applications.

Highly compatible with Mitsubishi Electric products

With SLMP, the vision sensor can be easily connected with Mitsubishi Electric factory automation products. Recognition images of the vision sensor are transferred to the GOT (HMI) or IT system via an FTP server, realizing traceability by comparing recognition result and recognition image.

*1. SLMP: Seamless Message Protocol
*2. TCO: Total Cost of Ownership
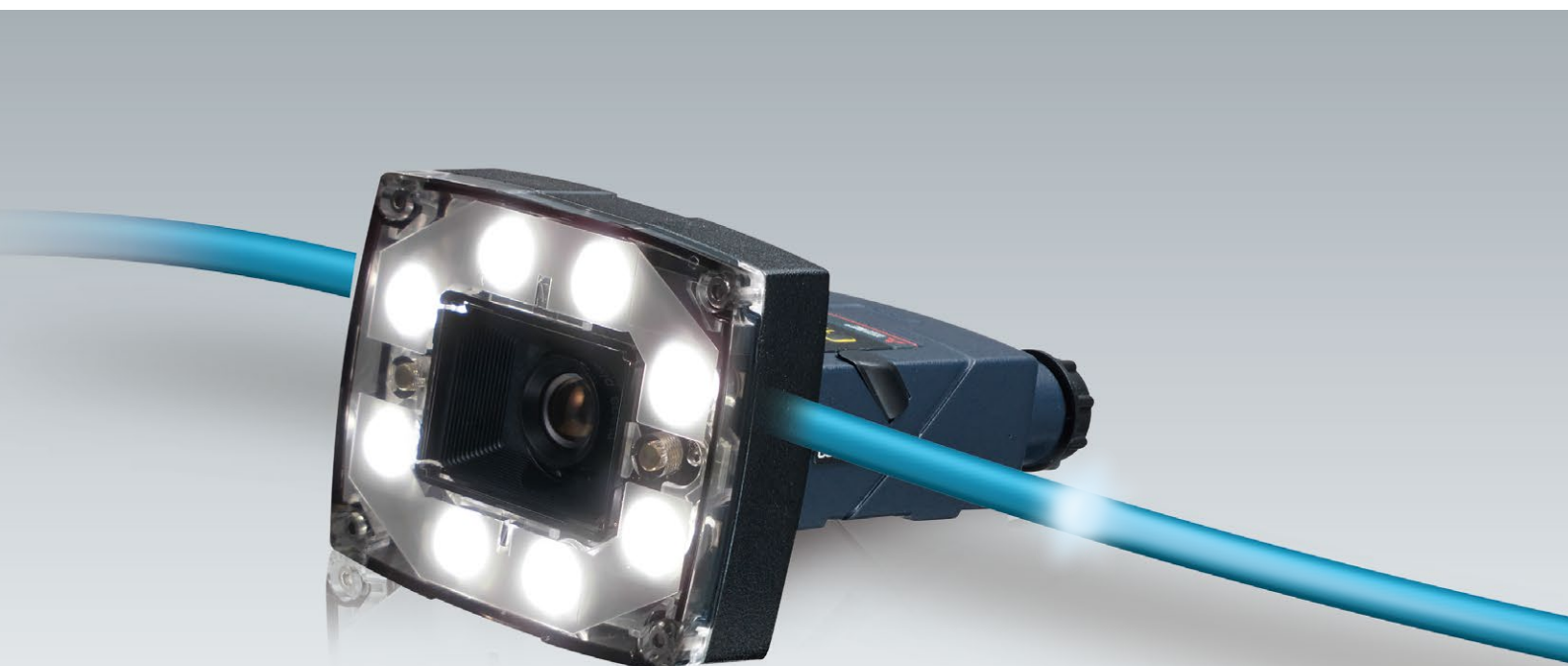
Highly compatible with Mitsubishi Electric factory automation products

MELSENSOR VS20

e-F@ctory is the Mitsubishi Electric solution for improving the performance of any manufacturing enterprise by enhancing productivity, and reducing the maintenance and operations costs together with seamless information flow throughout the plant by using a combination of factory automation and IT technologies.
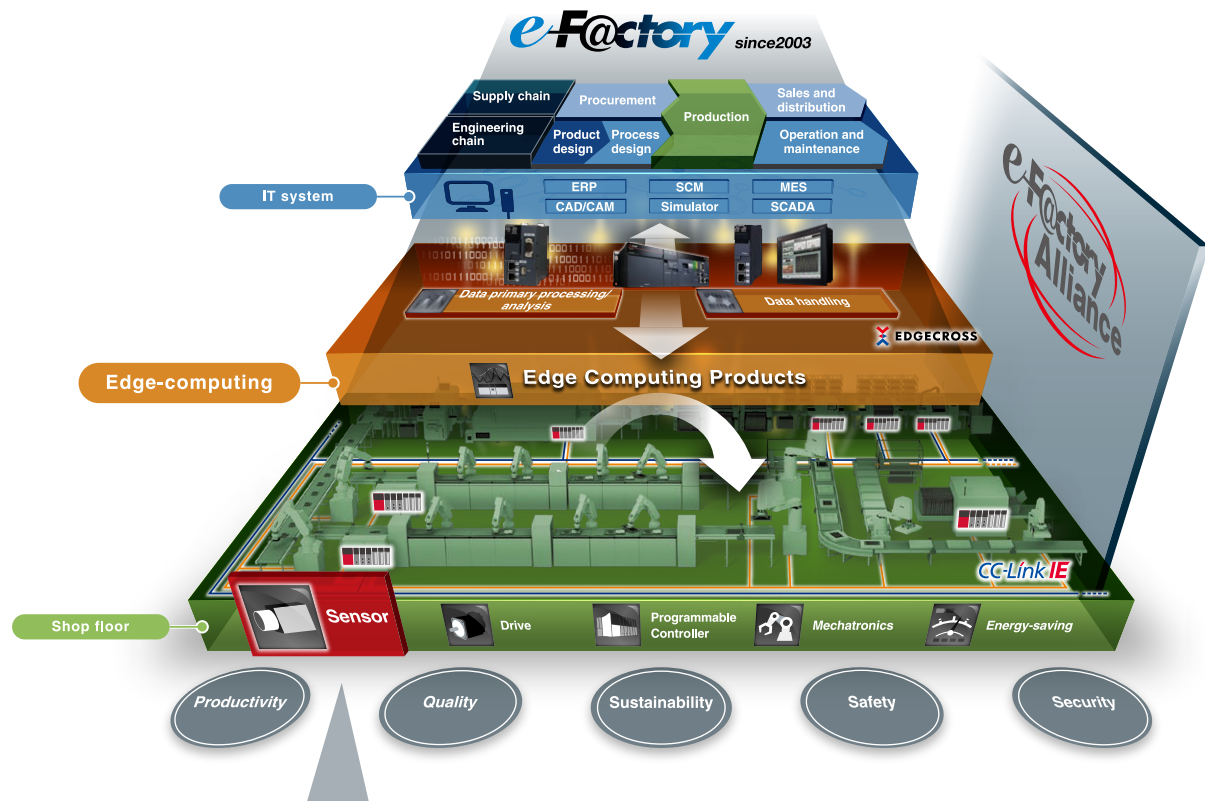
Ideal for simple presence/absence inspection

Vision Sensor VS20

PatMax RedLine®   Waterproof

Integrated lighting   Autofocus

Lens

High-intensity lighting

Ethernet connector

Power supply·I/O·RS-232 connector

Integrated lighting and filter

High-intensity LED ring light can be fitted to the front of the product, eliminating the need for external lighting. Even novice users can install the sensor easily. Integrated dedicated filter saves the trouble of fitting a filter to the lighting/lens.

## Lighting according to measured item characteristics

Lighting can be changed according to measured object and color.

Color	Features	General applications
	Visualizes all wavelength except black. Ideal for color camera.	For color verification. For shooting objects traveling at high speed.
	Wavelength highest in sensitivity.	For shooting red objects.
	Visualizes tiny objects with high scattering rate.	For inspecting blue objects. For finding minor defect at high resolution.

Green
Yellow   Blue
Orange   Purple
Red

Hue circle

Colors that are opposite each other on Hue color are called complementary colors. Lighting complementary color of the item color changes the item color closer to black.
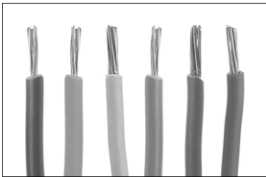
Support color verification

Color sensor model supports presence/absence applications, including color verification.
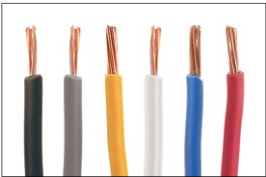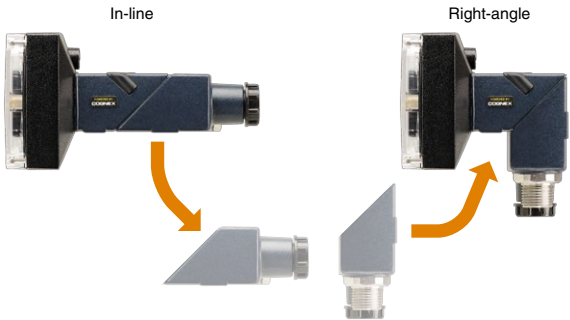
Color model

Monochrome model

Field customizable to your applications

Compact palm-sized

Integrated compact size ideal for installation in space-constrained production lines. The design can be changed according to the installation space.

In-line

Right-angle

Lens/lighting can be selected according to the operating environment

Lens/lighting can be selected from options according to the system.

Product lineup

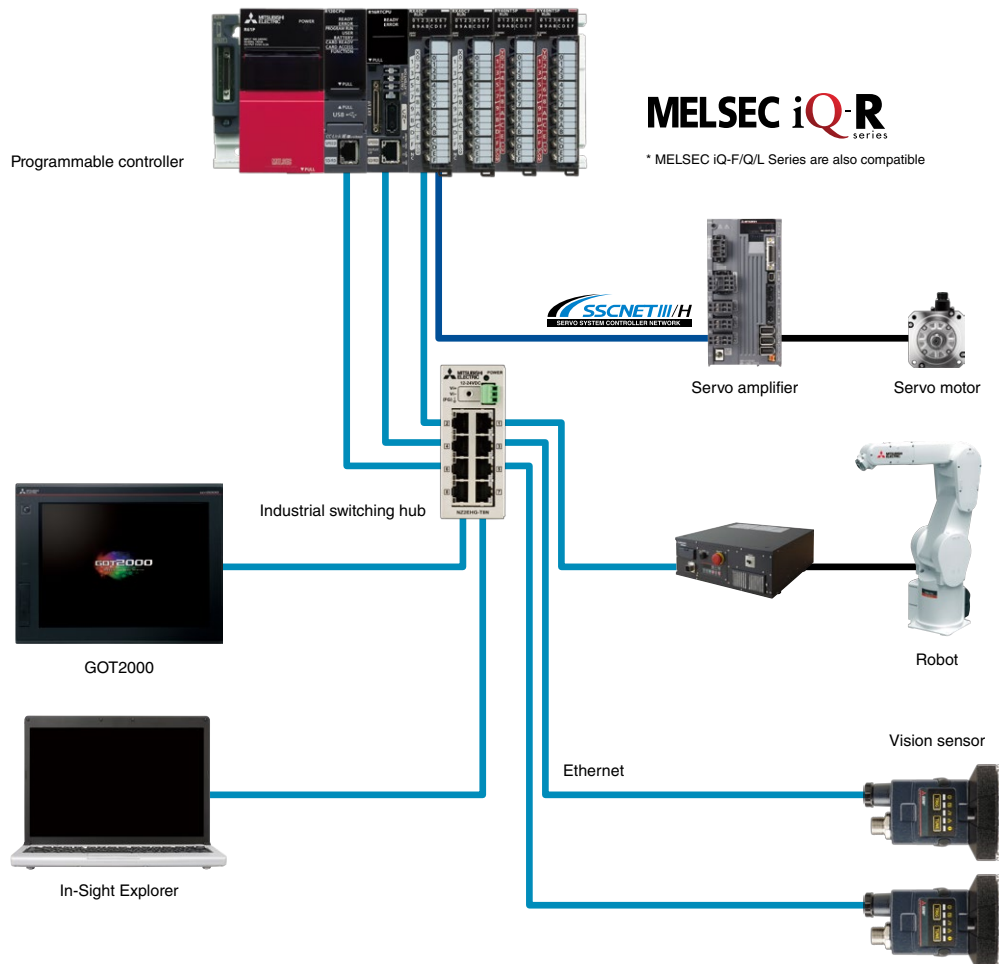Different models according to applications are available.

Item		VS20M-11F310	VS20M-12F410	VS20C-12F410	VS20M-13F410	VS20C-13F410
Imagery		Monochrome	Monochrome	Color	Monochrome	Color
Image resolution (pixel)	640 × 480 (standard)	●	●	●	●	●
	640 × 480 (2 × image magnification)	-	●	●	●	●
	800 × 600 (2 × image magnification)	-	-	-	●	●
Maximum image acquisition speed [frame/s]		40	75	55	75	55
Processor performance*1 [Times]		1	2	2	2	2
Location tools	Pattern	●	●	●	●	●
	Edge, edge intersection, and circle*2	-	-	-	●	●
Presence/absence tools	Pattern	●	●	●	●	●
	Color pixel count, brightness, contrast	-	●	●	●	●
	Edge, circle	-	-	-	●	●
Measurement tools	Distance, angle, and diameter of circle	-	-	-	●	●
Counting tools	Pattern, edge	-	-	-	●	●
Communication		SLMP scanner, SLMP, MODBUS®/TCP, TCP/IP, UDP, FTP, Telnet (native mode), RS-232				
I/O		Opto-isolated image acquisition trigger input 1 point, opto-isolated general input 1 point, opto-isolated high-speed output 4 points				

*1. Considering VS20M-11F310 as 1.
*2. Location information detected can be used for inspection by other tools.

Vision sensor

Configuration tool

Applications

Product list

Specifications

External dimensions

Compatibility with Mitsubishi Electric factory automation products

- The vision sensor is compatible with iQSS and SLMP, enabling easier connection to Mitsubishi Electric products such as programmable controllers, robots, and motion controllers.
- Control/monitoring/parameter setting and result acquisition of the vision sensor can be done from the programmable controller.
- Recognition images of the vision sensor are transferred to the GOT (HMI) or IT system via an FTP server, realizing traceability by comparing recognition result and recognition image.

Programmable controller

MELSEC iQ-R series
* MELSEC iQ-F/Q/L Series are also compatible

SSCNET III/H
SERVO SYSTEM CONTROLLER NETWORK

Servo amplifier   Servo motor

Industrial switching hub

GOT2000

Robot

Vision sensor

Ethernet

In-Sight Explorer

CC-Link IE Field Network Basic compatible [Future support]

CC-Link IE Field Network Basic interface functions are embedded, realizing high-compatibility with the programmable controller such as easier setup. Setting values and judgment results are acquired via network. In addition, settings of the vision sensor can be checked and changed from the programmable controller.

iQSS compatible
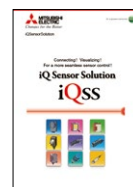
Automatic detection of the vision sensor and linkage with dedicated tools enable reduction in total cost in development/setup/operation/maintenance.

iQSS enables setup and monitoring with engineering tool of the programmable controller
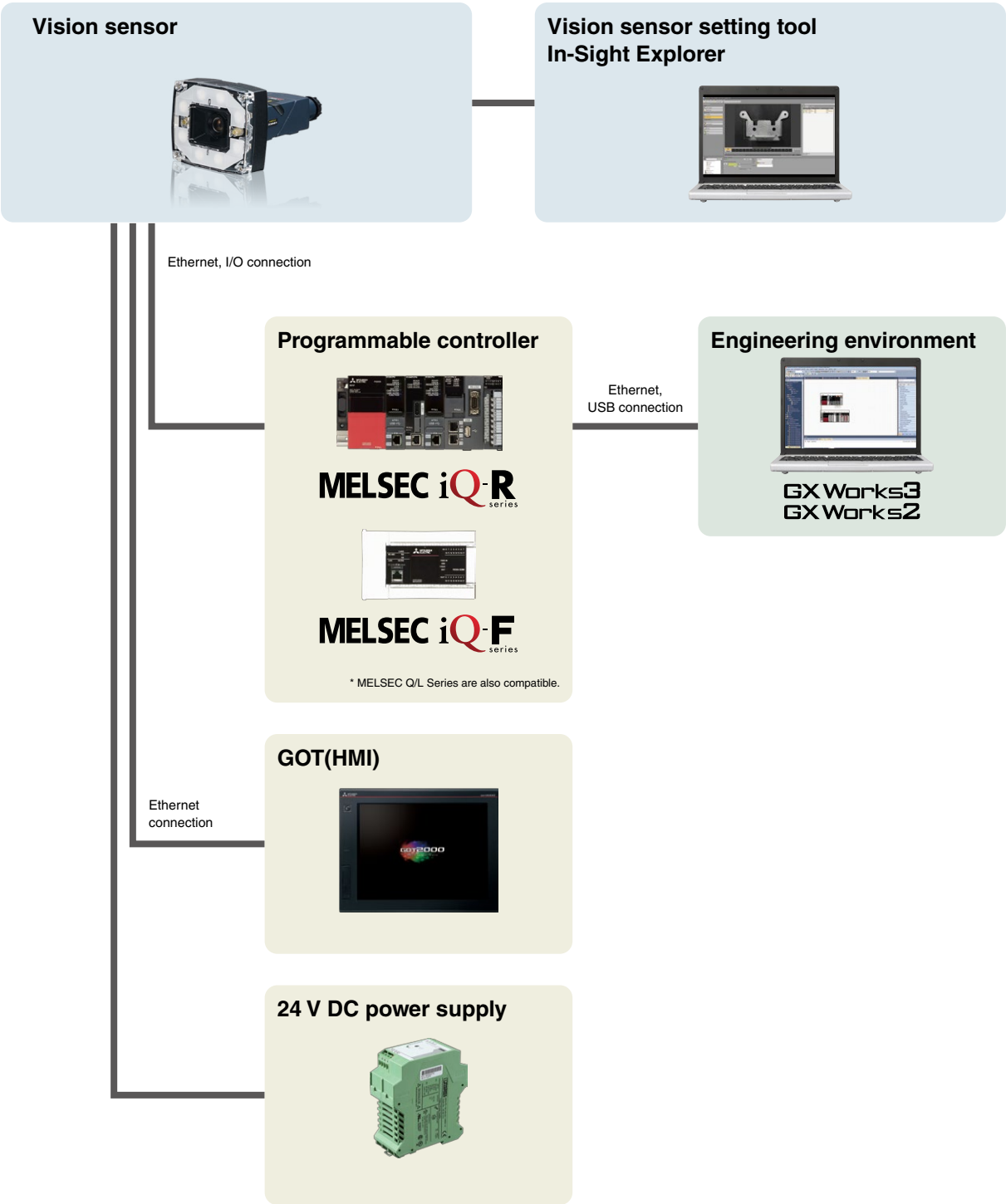
iQ Sensor Solution (iQSS) provides a solution at the sensor level in e-F@ctory.
- Easy setup • Sensor monitor • Dedicated tool linkage

For further details,
"iQ Sensor Solution
L(NA)16029ENG"

System configuration

Vision sensor

**Vision sensor setting tool
In-Sight Explorer**

Ethernet, I/O connection

Programmable controller

MELSEC iQ-R series

MELSEC iQ-F series

* MELSEC Q/L Series are also compatible.

Engineering environment

GX Works3
GX Works2

Ethernet,
USB connection

GOT(HMI)

Ethernet
connection

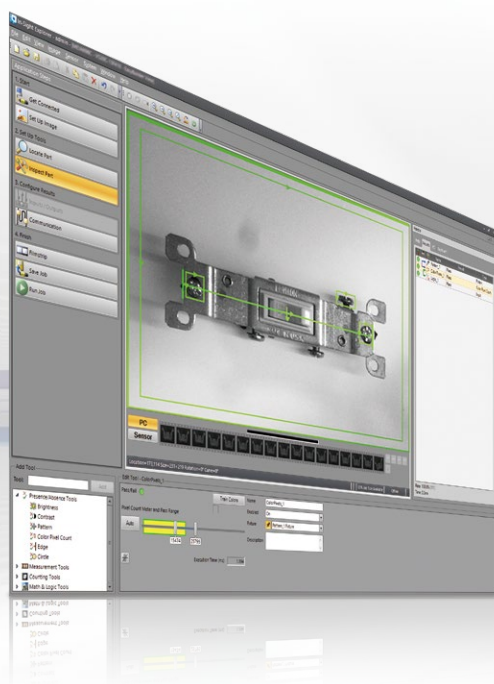**24 V DC power supply**

Vision sensor

Configuration tool

Applications

Product list

Specifications

External dimensions

**High-speed/high-accuracy/
highly-reliable image processing tool
brings innovation to the shop floor**

In-Sight Explorer

for MELSENSOR Vision

Quick intuitive setup

Ease-of-use In-Sight Explorer enables configuration from image acquisition to result output in four steps. Both novice and experienced users can handle the tool easily.
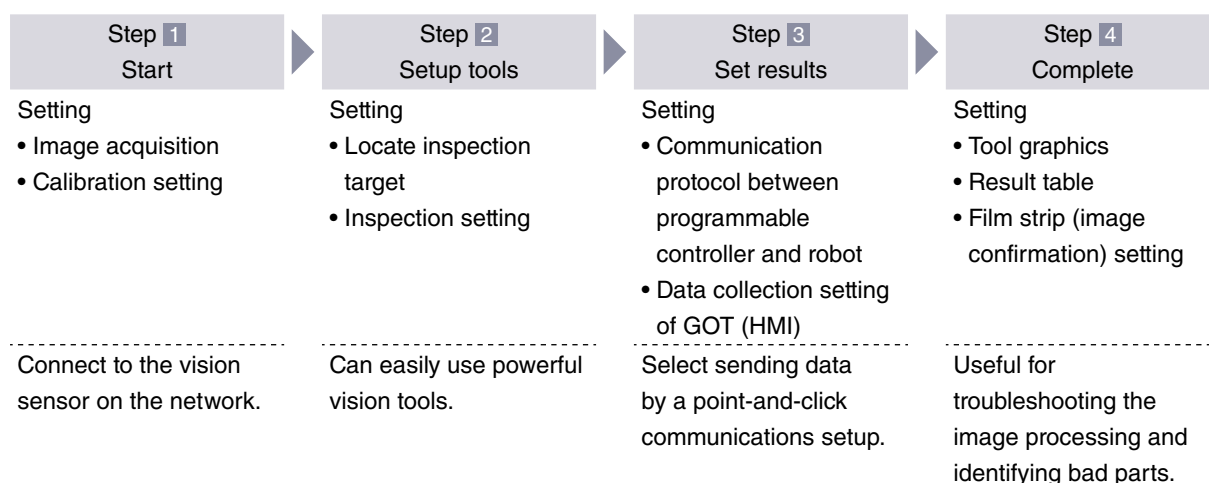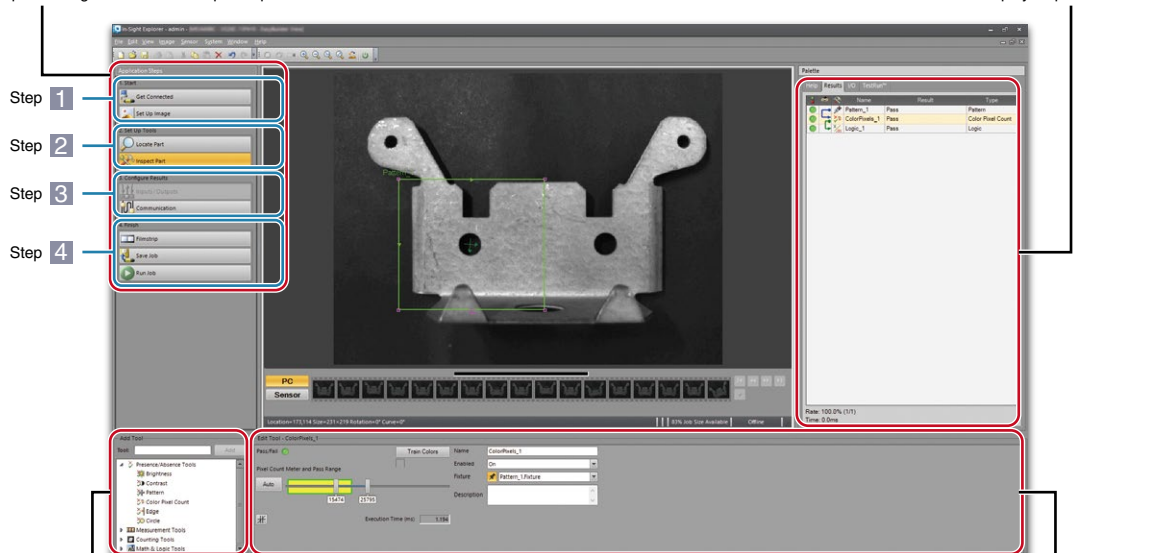
Step 1 Start	Step 2 Setup tools	Step 3 Set results	Step 4 Complete
Setting • Image acquisition • Calibration setting	Setting • Locate inspection target • Inspection setting	Setting • Communication protocol between programmable controller and robot • Data collection setting of GOT (HMI)	Setting • Tool graphics • Result table • Film strip (image confirmation) setting
Connect to the vision sensor on the network.	Can easily use powerful vision tools.	Select sending data by a point-and-click communications setup.	Useful for troubleshooting the image processing and identifying bad parts.

Image processing can be set in simple steps

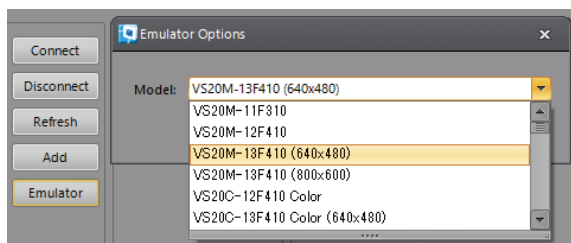Display inspection results

Step 1

Step 2

Step 3

Step 4

Select tools added to inspection from the list

Point-and-click easy setting

Emulation

Even if a vision sensor is not connected, selecting a vision sensor from the list enables operation check and job creation. If the image of inspection target is available, operation check or job change can be done on the spot.


Film strip

Up to 20 images of inspection history can be stored inside the vision sensor, allowing reference any time without affecting inspection. The images can be stored in the external FTP server also.
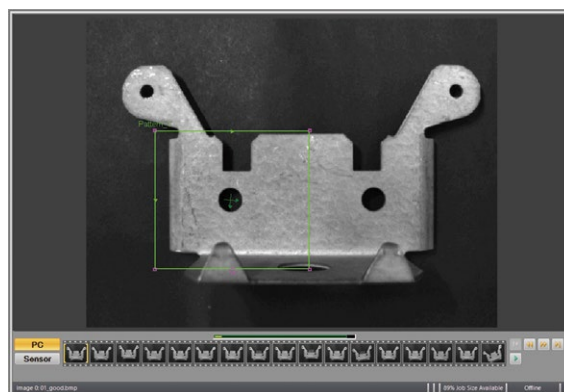
Click to specify measurement area

Image processing can be easily configured with intuitive operation as EasyBuilder[1] automatically extracts possible measurement points.

Simply select possible measurement area automatically extracted with "EasyBuilder"
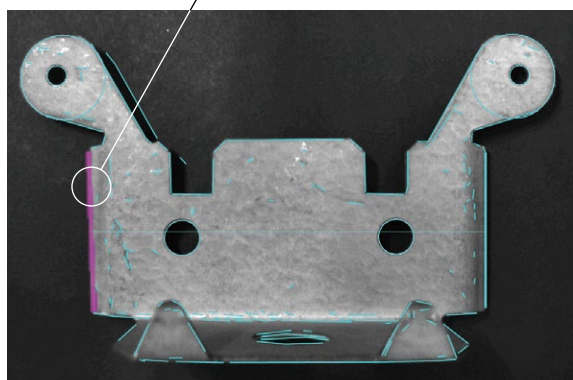

*1. EasyBuilder: Environment where image processing is configured by menu selection without a program

Easy communication setting

Communication with various factory automation products such as programmable controllers, robots, and motion controllers is possible just by selecting a communication target. Communication setting time can be substantially reduced.

Communication target selection
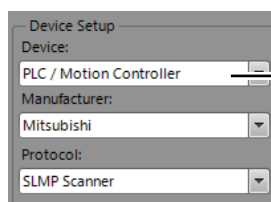
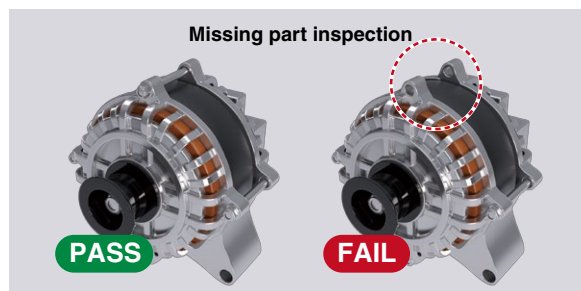Simply select the connection target device

Communication setting

Download   * Free download

URL:www.MitsubishiElectric.co.jp/fa/ref/vs

Vision sensor VS20 is ideal for presence/absence inspection and measurement of the work size.
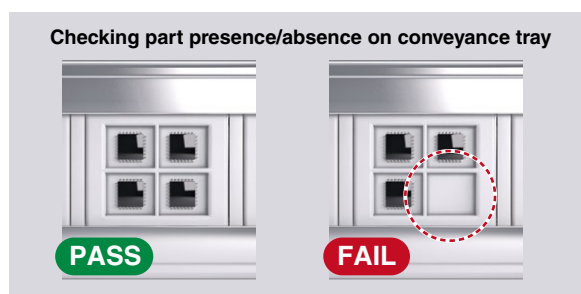
Automotive industry

Scratch and dirt inspection

PASS   FAIL

Missing part inspection

PASS   FAIL

Semiconductor/liquid crystal industry

Missing print inspection

PASS   FAIL

Defective part inspection

PASS   FAIL

Electrical/electronics industry

Inspection of electronic part switch

PASS   FAIL

Checking part presence/absence on conveyance tray

PASS   FAIL

Food/chemical industry

Label misalignment

PASS   FAIL

Missing tablet

PASS   FAIL
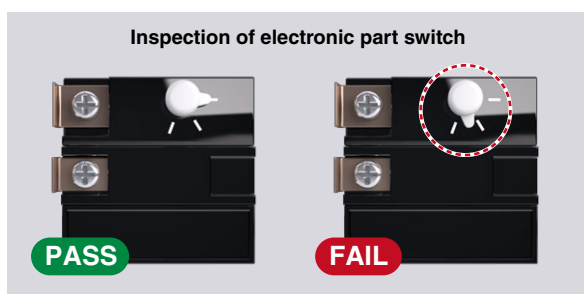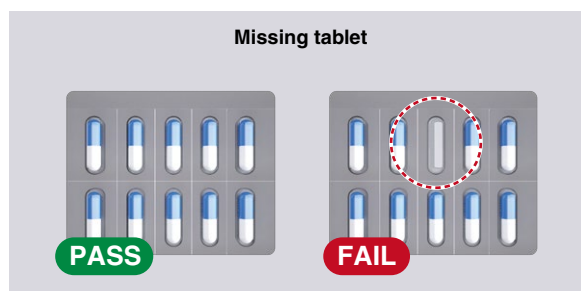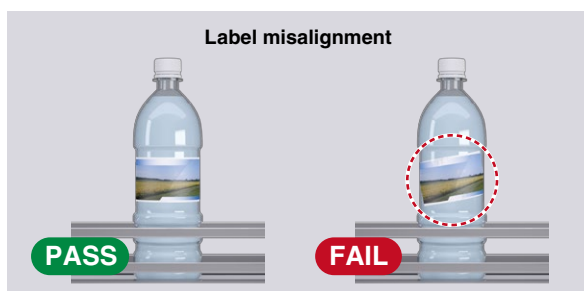
Product list

Vision sensor

Type	Model	Outline
VS20	VS20M-11F310	Monochrome, 640 x 480 (standard), processor performance x 1
	VS20M-12F410	Monochrome, 640 x 480 (standard, 2 x image magnification), processor performance x 2
	VS20C-12F410	Color, 640 x 480 (standard, 2 x image magnification), processor performance x 2
	VS20M-13F410	Monochrome, 640 x 480 (standard, 2 x image magnification)/800 x 600 (2 x image magnification), processor performance x 2
	VS20C-13F410	Color, 640 x 480 (standard, 2 x image magnification)/800 x 600 (2 image magnification), processor performance x 2

Option

*Options are manufactured by Cognex Inc. and other companies.

Product name	Model	Outline
Lens		
S-mount (M12) lens	LM12-03-01	3.6 mm F2.0 fixed aperture lens
	LM12-06-01	6 mm F2 fixed aperture lens
	LM12-08-01-F25	8 mm F2.5 fixed aperture lens
	LM12-12-01	12 mm F1.9 fixed aperture lens
	LM12-16-01	16 mm F2.5 fixed aperture lens
	LM12-25-01	25 mm F2 fixed aperture lens
Spacer		
Lens spacer (M12)	LM12-SPACER-16-01	Use together with 16 mm lens
	LM12-SPACER-25-01	Use together with 25 mm lens
Filter and light cover		
Polarizer	IMPF-2000-POLAR	Polarization plate
Filter	IMRF-2000-BP635	Red bandpass filter
	IMBF-2000-BP470	Blue bandpass filter
	IMIF-2000-BP850	IR bandpass filter
Light cover	IFS-2000-HBRING-CV	Replacement ring light cover
Light		
LED ring light	IFS-2000-HBRING-RD	High-intensity red
	IFS-2000-HBRING-WH	High-intensity white
	IFS-2000-HBRING-BL	High-intensity blue
	IFS-2000-HBRING-IR	High-intensity near infrared
Cable		
Ethernet cable	CCB-84901-2001-02	Cable length 2 m, M12 connector⇔RJ-45 connector, in-line
	CCB-84901-2001-05	Cable length 5 m, M12 connector⇔RJ-45 connector, in-line
	CCB-84901-2001-10	Cable length 10 m, M12 connector⇔RJ-45 connector, in-line
	CCB-84901-2001-15	Cable length 15 m, M12 connector⇔RJ-45 connector, in-line
	CCB-84901-2001-30	Cable length 30 m, M12 connector⇔RJ-45 connector, in-line
	CCB-84901-2002-02	Cable length 2 m, M12 connector⇔RJ-45 connector, right-angle
	CCB-84901-2002-05	Cable length 5 m, M12 connector⇔RJ-45 connector, right-angle
	CCB-84901-2002-10	Cable length 10 m, M12 connector⇔RJ-45 connector, right-angle
Breakout cable	CCB-PWRIO-05(R)	Cable length 5 m, M12 connector⇔12 stranded wires, twisted pair, in-line (right-angle)
	CCB-PWRIO-10(R)	Cable length 10 m, M12 connector⇔12 stranded wires, twisted pair, in-line (right-angle)
	CCB-PWRIO-15(R)	Cable length 15 m, M12 connector⇔12 stranded wires, twisted pair, in-line (right-angle)
Power supply		
Power supply	ACC-24I	24 V DC power supply
Power cord	CBLI-24VDJP	Japanese power cord
	CBLI-24VDUS	North America power cord
	CBLI-24VDUK	United Kingdom power cord
	CBLI-24VDEU	Europe power cord
Mounting bracket		
Mounting bracket	DM100-UBRK-000	Universal mounting bracket
	DM100-PIVOTM-00	Pivot mounting bracket
Plate adapter	BKT-2000-ADAPT-00	Flat surface mounting plate adapter
I/O module		
I/O module	CIO-1400	I/O extension module
I/O module cable	CCB-PWRIO-MOD-02	Cable length 2 m, M12 connector⇔15pin connector (DB15)
	CCB-PWRIO-MOD-05	Cable length 5 m, M12 connector⇔15pin connector (DB15)

Vision sensor

Configuration tool

Applications

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Specifications

External dimensions

Specifications

General Specifications

Item	Specifications
Ambient operating temperature	0…40°C
Ambient storage temperature	-10…60°C
Maximum humidity	Less than 95% RH, non-condensing
Vibration resistance	IEC 60068-2-6: A vibration of 10 G (10 to 500 Hz at 100 m/s² with 15 mm width) was applied to each X, Y, and Z direction for 2 hours.
Shock resistance	IEC 60068-2-27: 1000 half sinusoidal shocks with 11 G in 10 ms were applied.
Operating atmosphere	There is no danger of corrosive gases, flammable gases, and strong alkaline substances to adhere.
Protective structure	IP65 (when all connectors are attached to cables or shielded by a sealing cap)

Performance Specifications

VS20

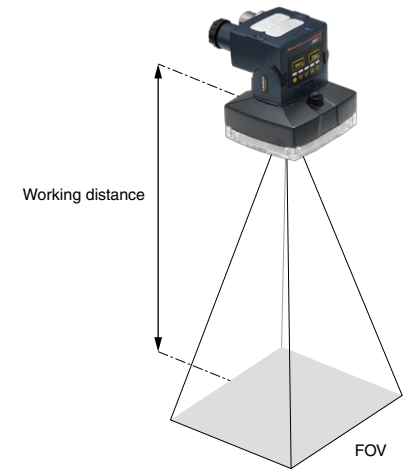| Specifications		VS20M-11F310	VS20M-12F410	VS20C-12F410	VS20M-13F410	VS20C-13F410
Memory			32 MB flash memory — Unlimited storage when storing in the remote network device — Image processing: 128 MB SDRAM			
Imager type		1/3-inch CMOS, 4.80 mm × 3.60 mm (W × H), 3.75 µm sq. pixels				
Imagery		Monochrome	Monochrome	Color	Monochrome	Color
Lens		S-Mount/M12, 8 mm (standard), options: 3.6 mm, 6 mm, 12 mm, 16 mm, 25 mm				
Maximum image resolution (pixels)		640 × 480 (standard)	640 × 480 (standard), 640 × 480 (2 × image magnification mode)		640 × 480 (standard), 640 × 480 (2 × image magnification mode), 800 × 600 (2 × image magnification mode)*1	
Bit depth		256 gray levels (8 bits/pixel)		24-bit color	256 gray levels (8 bits/pixel)	24-bit color
Lighting		Equipped as standard: LED ring light (white), option: LED ring light (red, blue, near-infrared)				
Electronic shutter speed		1µs…1000 ms				
Frames per second*2*3		40 full frames	75 full frames	55 full frames	75 full frames	55 full frames
Power consumption		24 V DC ± 10%, 48 W (2.0 A) maximum when the illumination is ON.				
Trigger		• Opto-isolated image acquisition trigger input × 1 — • Remote software commands via Ethernet				
	Voltage	• ON: 15…24 V DC (standard 24 V DC) — • OFF: 0…5 V DC (standard 0 V DC)				
	Current	• 3.6 mA/12 V DC — • 7.5 mA/24 V DC — • Resistance: Max. 5.48 kΩ				
Discrete inputs		• Opto-isolated general-purpose input × 1 — • General-purpose input × 7: available when connecting a CIO-1400 I/O module and an I/O module cable*3				
	Voltage	• ON: 15…24 V DC (standard 24 V DC) — • OFF: 0…5 V DC (standard 0 V DC)				
	Current	• 3.6 mA/12 V DC — • 7.5 mA/24 V DC — • Resistance: Max. 5.48 kΩ				
Discrete outputs		• Opto-isolated high-speed output × 4 — • High-speed output × 2, general-purpose output × 6: available when connecting a CIO-1400 I/O module and an I/O module cable				
	Voltage	28 V DC maximum through external load				
	Current*4	• ON status: Max. 50 mA (sink or source) — • Leakage current in OFF status: Max. 100 µA — • External load resistance: 240 Ω to 10 kΩ — Each line is rated at a maximum 50 mA and protected against over-current, short circuits, and transients from switching inductive loads. — A protection diode is required for a high inductive load.				
Network communication		SLMP scanners, SLMP, MODBUS®/TCP, TCP/IP, UDP, FTP, Telnet (native mode), DHCP (default at shipment from the factory), fixed and link local IP address setting				
Other communications		RS-232 (R x D, T x D (TIA/EIA-232-F compliant))				
Material		Aluminum housing				
Mounting		M3 screw holes × 4				
Dimensions		In-line configuration: 92 mm × 60 mm × 52 mm, right-angle configuration: 62 mm × 60 mm × 67 mm				
Weight		200 g				

*1. The resolutions of VS20M-13F410 and VS20C-13F410 are 640 × 480 pixels. The resolutions can be set as 800 × 600 pixels in In-Sight Explorer.
   For details, refer to In-Sight Explorer Help.
*2. Maximum frame rate at minimum exposure. No connection of In-Sight Explorer. Image resolution: 640 × 480
*3. For VS20M-12F410/13F410, the speed when 2 x image magnification is ON.
*4. When an I/O module is connected, the high speed output is only sink current up to 50 mA, and the general-purpose output is sink or source current up to 100 mA which can be set by the user.
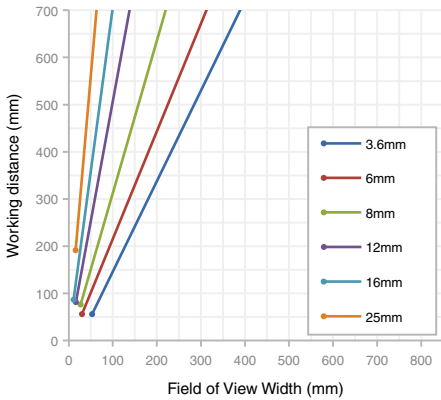
Working distance

Vision sensor

Configuration tool

Applications

Product list

Specifications

External dimensions

Select working distance*¹ and lens in accordance with the field of view referring to the graph below.

Working distance

FOV

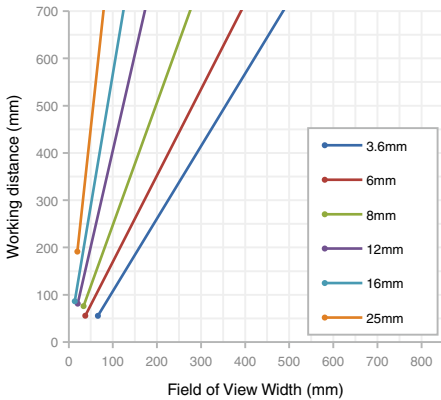*1.   The distance from a lens to an inspection target

Horizontal Field of View
(640 × 480 (default))

Working distance (mm)

Field of View Width (mm)

- 3.6mm
- 6mm
- 8mm
- 12mm
- 16mm
- 25mm
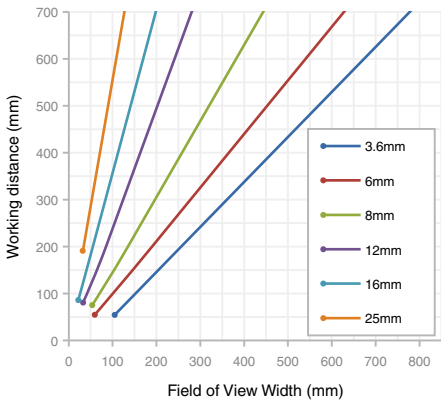
Horizontal Field of View
(640 × 480 (2 × image magnification mode))

Working distance (mm)

Field of View Width (mm)

- 3.6mm
- 6mm
- 8mm
- 12mm
- 16mm
- 25mm

Horizontal Field of View
(800 × 600 (2 × image magnification mode))

Working distance (mm)

Field of View Width (mm)

- 3.6mm
- 6mm
- 8mm
- 12mm
- 16mm
- 25mm

External dimensions

(unit: mm)

VS20

In-line configuration

52.2
22.3
75.2
19.9
91.7
42.4
60.4
57.9
32.0
37.0

Right-angle configuration

52.2
19.9
61.8
35.9
67.1
37.0
42.4
60.4
37.0
60.4
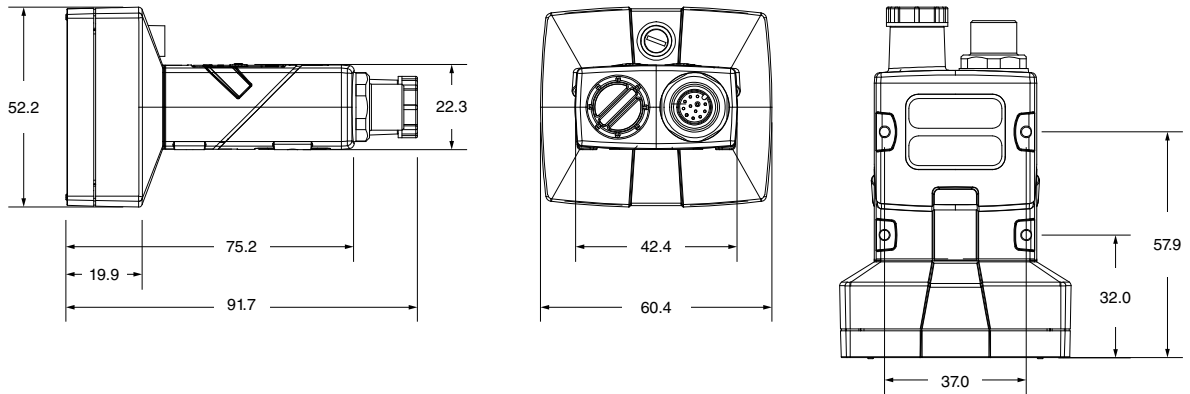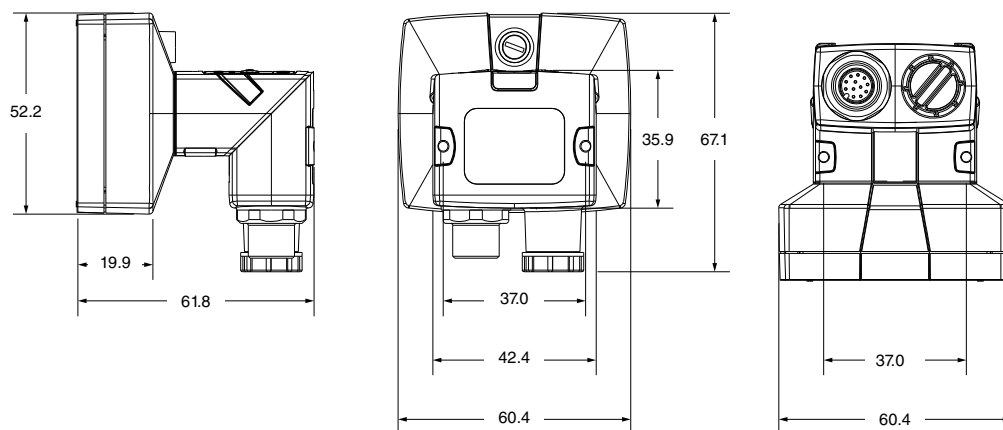
Extensive global support coverage providing expert help whenever needed

■ Global FA centers

MITSUBISHI ELECTRIC
CORPORATION
● Nagoya Works
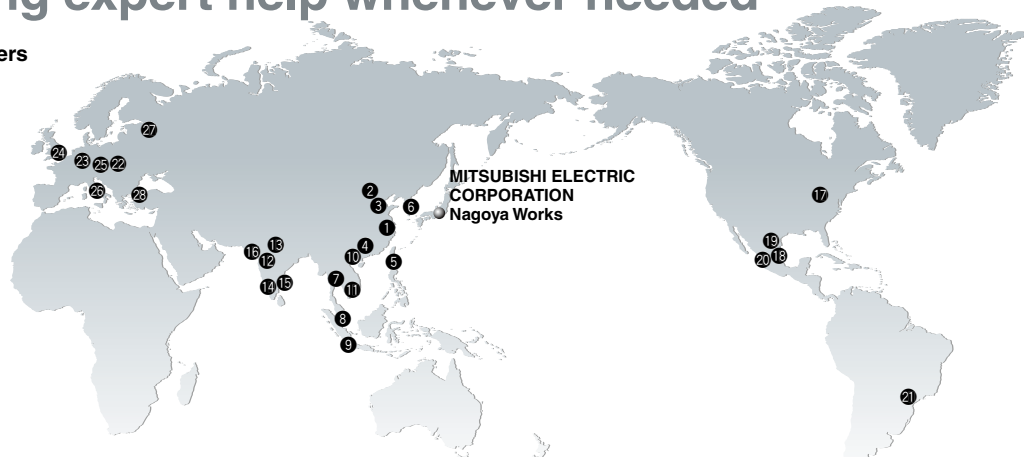
China

❶ Shanghai FA Center
MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD.
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❸ Tianjin FA Center
MITSUBISHI ELECTRIC AUTOMATION (CHINA) LTD.
Tianjin FA Center

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❹ Guangzhou FA Center
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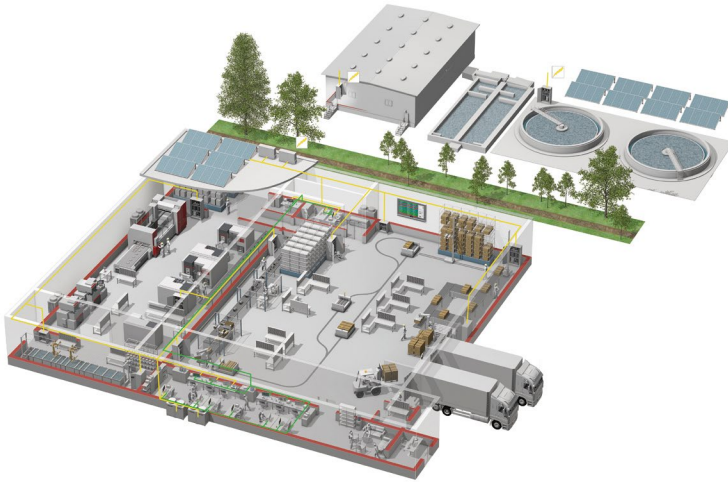
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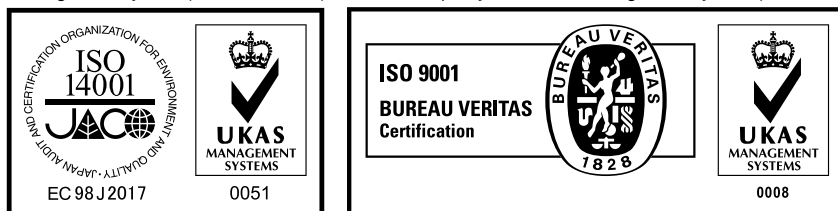
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