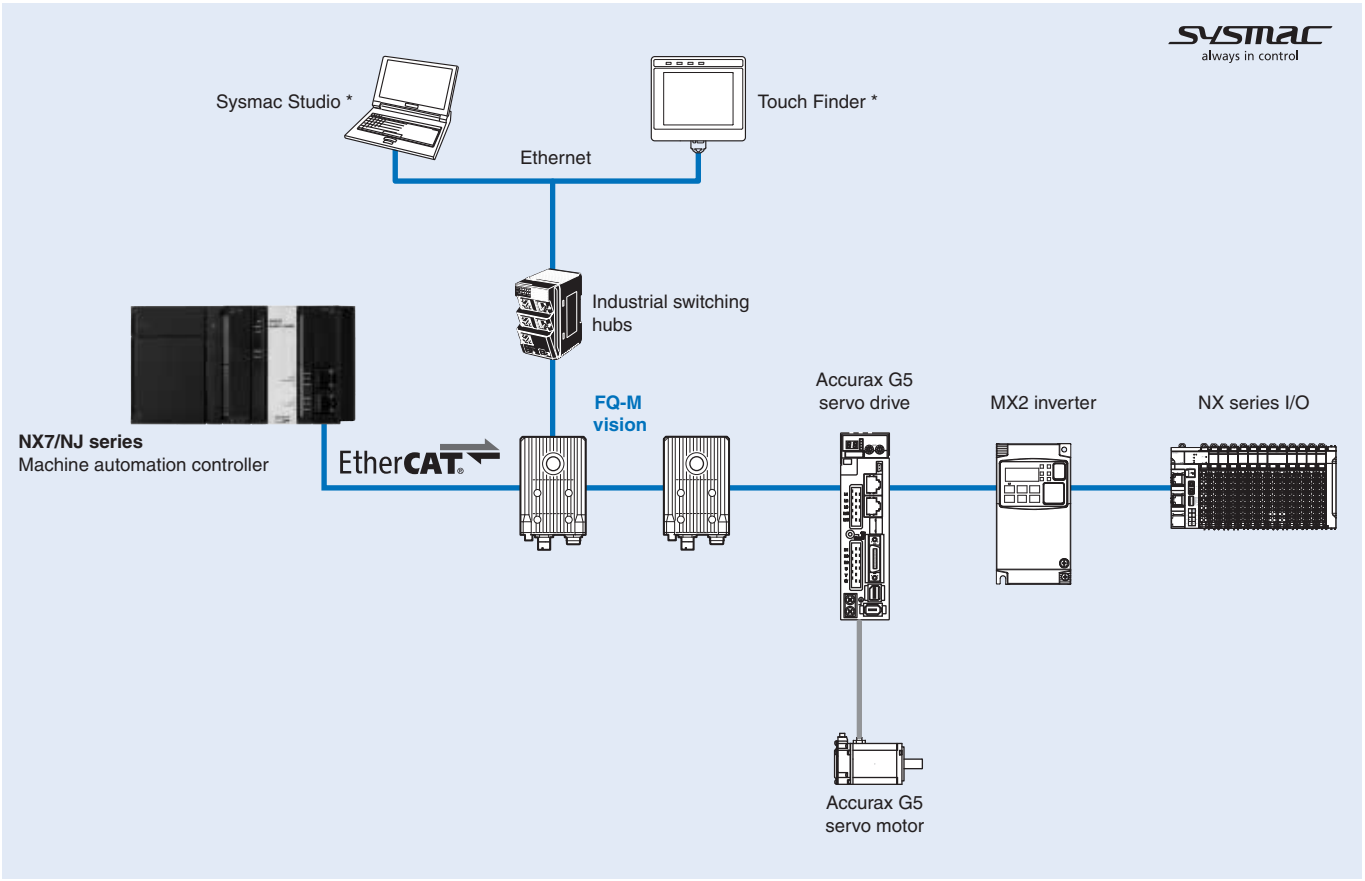
FQ-M series

Designed for object tracking

The FQ-M series is a vision sensor designed specifically for Pick&Place applications.

- Camera, image processing and connectivity in one
- Shape based object detection
- Connectivity with EtherCAT/Ethernet
- Encoder input for object tracking and easy calibration
- Up to 5,000 pieces per minute with 360º rotation
- Flexible data output depending on the output devices

System configuration



* Sysmac Studio and Touch Finder can not be used together. When both are connected, Sysmac Studio will have priority. When you use the Sysmac Studio Standard Edition and connect the FQ-M series and the machine automation controller NX7/NJ-series, connect them with a general-purpose Ethernet cable or a USB cable.

Note: **1.** EtherCAT and Ethernet (PLC Link) can not be used simultaneously.
2. It is not possible to configure and adjust the FQ-M via an NX7/NJ-series controller, when they are connected via an EtherCAT network. For configuration and adjustment of FQ-M, connect the FQ-M and a computer or a Touch Finder via an Ethernet network.

Specifications

Sensor specifications

Item		EtherCAT communication provided	
		Color	Monochrome
Model	NPN	FQ-MS120-ECT	FQ-MS120-M-ECT
	PNP	FQ-MS125-ECT	FQ-MS125-M-ECT
Field of vision, installation distance		Selecting a lens according to the field of vision and installation distance. Refer to "*Optical Chart*" section.	
Main functions	Inspection items	Shape search, Search, Labeling, Edge position	
	Number of simultaneous inspections	32	
	Number of registered scenes	32*1	
Image input	Image processing method	Real color	Monochrome
	Image elements	1/3-inch color CMOS	1/3-inch monochrome CMOS
	Image filter	High dynamic range (HDR) and white balance	High dynamic range (HDR)
	Shutter	Electronic shutter; select shutter speeds from 1/10 to 1/30,000 (sec)	
	Processing resolution	752 (H) x 480 (V)	
	Pixel size	6.0 (μm) x 6.0 (μm)	
	Frame rate (image read time)	60 fps (16.7 ms)	
External lighting	Connection method	Connection via a strobe light controller	
	Connectable lighting	FL series	
Data logging	Measurement data	In sensor: max. 32,000 items*2	
	Images	In sensor: max. 2 images*2	
Measurement trigger		I/O trigger, Encoder trigger, Communications trigger (Ethernet No-protocol, PLC Link or EtherCAT)	
I/O specifications	Input signals	9 signals • Single measurement input (TRIIG) • Error clear input (IN0) • Error counter reset input (IN1) • Encoder input (A±, B±, Z±)*3	
	Output signals	5 signals*4 • OUT0 overall judgment output (OR) • OUT1 control output (BUSY) • OUT2 error output (ERROR) • OUT3 shutter output (SHTOUT) • OUT4 strobe trigger output (STGOUT)	
	Ethernet specifications	100BASE-TX/10BASE-TX	
	EtherCAT specifications	Dedicated protocol for EtherCAT 100BASE-TX	
	Connection method	Special connector cables • Power supply and I/O: 1 special connector I/O cable • Touch Finder, Computer and Ethernet: 1 Ethernet cable • EtherCAT: 2 EtherCAT cable	
LED display	LED display	• OR: Judgment result indicator • ERR: Error indicator • BUSY: Busy indicator • ETN: Ethernet communication indicator	
	EtherCAT display	• L/A IN (Link/Activity IN) x 1 • L/A OUT (Link/Activity OUT) x 1 • RUN x 1 • ERR x 1	
Ratings	Power supply voltage	21.6 to 26.4 VDC (including ripple)	
	Insulation resistance	Between all lead wires and case: 0.5 MΩ (at 250 V)	
	Current consumption	450 mA max. (when the FL series strobe controller and lighting are used. 250 mA max. (when external lighting is not used)	
Environmental immunity	Ambient temperature range	Operating: 0 to 50 °C, Storage: -20 to 65 °C (with no icing or condensation)	
	Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)	
	Ambient atmosphere	No corrosive gas	
	Vibration resistance (destruction)	10 to 150 Hz, single amplitude: 0.35 mm, X/Y/Z directions, 8 min each, 10 times	
	Shock resistance (destruction)	150 m/s^2 3 times each in 6 direction (up, down, right, left, forward, and backward)	
	Degree of protection	IEC 60529 IP40	
Materials		Case: aluminium die casting, Rear cover: aluminium plate	
Weight		Approx. 480 g (sensor only)	
Accessories		Instruction manual	

*1. The maximum number of registered scenes depends on settings due to restrictions on memory.
*2. If a Touch Finder is used, results can be saved up to the capacity of an SD card.
*3. See Encoder input specifications section.
*4. The five output signals can be allocated for the judgements of individual inspection items.

Encoder input specifications

Pulse input specifications (when an open collector type encoder is used)

Item		Specifications		
Input voltage		24 VDC ±10%	12 VDC ±10%	5 VDC ±5%
Input current		4.8 mA (at 24 VDC, typical value)	2.4 mA (at 12 VDC, typical value)	1.0 mA (at 5 VDC, typical value)
NPN	ON voltage*1	4.8 V max.	2.4 V max.	1.0 V max.
	OFF voltage*2	19.2 V min.	9.6 V min.	4.0 V min.
PNP	ON voltage*1	19.2 V min.	9.6 V min.	4.0 V min.
	OFF voltage*2	4.8 V max.	2.4 V max.	1.0 V max.
Maximum response frequency*3		50 kHz (I/O cable: when the FQ-MWD005 or FQ-MWDL005 cable is used) 20 kHz (I/O cable: when the FQ-MWD010 or FQ-MWDL010 cable is used)		
Input impedance		5.1 KΩ		

*1. ON voltage: Voltage to change from OFF to ON state. The ON voltage is the difference of voltages between the GND terminal of the encoder power terminals and each input terminal.
*2. OFF voltage: Voltage to change from ON to OFF state. The ON voltage is the difference of voltages between the GND terminal of the encoder power terminals and each input terminal.
*3. Select maximum response frequency depending on length of the encoder cable and response frequency of the encoder.

Pulse input specifications (when a line-driver output type encoder is used)

Item	Specifications
Input voltage	EIA standard RS-422-A line driver level
Input impedance*1	120 Ω ±5%
Differential input voltage	0.2 V min.
Hysteresis voltage	50 mV
Maximum response frequency*2	200 kHz (I/O cable: when the FQ-MWD005, FQ-MWDL005, FQ-MWD010 or FQ-MWDL010 cable is used)

*1. When terminating resistance function is used.
*2. Select maximum response frequency depending on length of the encoder cable and response frequency of the encoder.

Touch Finder specifications

Item			Model with DC power supply	Model with AC/DC/battery power supply
			FQ-MD30	FQ-MD31
Number of connectable sensors			2 max.	
Main functions	Type of measurement displays		Last result display, last NG display, trend monitor, histograms	
	Type of display images		Through, frozen, zoom-in and zoom-out images	
	Data logging		Measurement results, measured images	
	Menu language		English, Japanese	
Indications	LCD	Display device	3-5-inch TFT color LCD	
		Pixels	320 x 240	
		Display colors	16,777,216	
	Backlight	Life expectancy*1	50,000 hours at 25ºC	
		Brightness adjustment	Provided	
		Screen saver	Provided	
	Indicators	Power indicator (GREEN)	POWER	
		Error indicator (RED)	ERROR	
		SD card access indicator (YELLOW)	SD ACCESS	
		Charge indicator (ORANGE)	-	CHARGE
Operation interface	Touch screen	Method	Resistance film	
		Life expectancy*2	1,000,000 operations	
External interface	Ethernet		100 BASE-TX/10 BASE-T	
	SD card		Omron SD card (model: HMC-SD291/SD491) or a SDHC card of Class4 or higher rating is recommended	
Ratings	Power supply voltage	DC power connection	20.4 to 26.4 VDC (including ripple)	
		AC adapter connection	-	100 to 240 VAC, 50/60 Hz
		Battery connection	-	FQ-BAT1 battery (1 cell, 3.7 V)
	Continuous operation on battery*3		-	1.5 h
	Current consumption		DC power connection: 0.2 A	
	Insulation resistance		Between all lead wires and case: 0.5 MΩ (at 250 V)	
Environmental immunity	Ambient temperature range		Operating: 0 to 50 °C Storage: -25 to 65 °C (with no icing or condensation)	Operating: 0 to 50 °C when mounted to DIN track or panel, 0 to 40ºC when operated on a battery Storage: -25 to 65 °C (with no icing or condensation)
	Ambient humidity range		Operating and storage: 35% to 85% (with no condensation)	
	Ambient atmosphere		No corrosive gas	
	Vibration resistance (destruction)		10 to 150 Hz, single amplitude: 0.35 mm, X/Y/Z directions, 8 min each, 10 times	
	Shock resistance (destruction)		150 m/s^2 3 times each in 6 direction (up, down, right, left, forward, and backward)	
	Degree of protection		IEC 60529 IP20	
Dimensions			95 x 85 x 33 mm	
Materials			Case: ABS	
Weight			Approx. 270 g (without battery and hand strap)	
Accessories			Touch Pen (FQ-XT), Instruction manual	

*1. This is a guideline for the time required for the brightness to diminish to have the initial brightness at room temperature and humidity. No guarantee is implied. The life of the backlight is greatly affected by the ambient temperature and humidity. It will be shorter at lower or higher temperature.
*2. This value is only a guideline. No guarantee is implied. The value will be affected by operating conditions.
*3. This value is only a guideline. No guarantee is implied. The value will be affected by the operating environment and operating conditions.

Battery specifications

Item	FQ-BAT1
Battery type	Secondary lithium ion battery
Nominal capacity	1,800 mAh
Rated voltage	3.7 V
Dimensions	35.3 x 53.1 x 11.4 mm
Ambient temperature range	Operating: 0 to 40 °C Storage: -25 to 65 °C (with no icing or condensation)
Ambient humidity range	Operating and storage: 35% to 85% (with no condensation)
Charging method	Charged in Touch Finder (FQ-MD31) AC adapter (FQ-AC_) is required
Charging time*1	2.0 h
Battery backup life*2	300 charging cycles
Weight	50 g max.

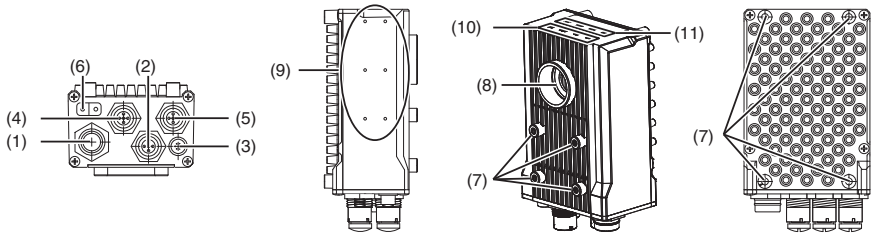
*1. This value is only a guideline. No guarantee is implied. The value will be affected by operating conditions.
*2. This is a guideline for the time required for the capacity of the battery to be reduced to 60% of the initial capacity. No guarantee is implied. The value will be affected by the operating environment and operating conditions.

EtherCAT communication specifications

Item	Specifications
Communication standard	IEC 61158 Type 12
Physical layer	100BASE-TX (IEEE802.3)
Connector	M12 x 2: • E-CAT IN: EtherCAT (IN) • E-CAT OUT: EtherCAT (OUT)
Communications media	Use the cables for FQ-MWN_ or FQ-WN_ series
Communications distance	Use the communication cable within the length of FQ-MWN_ or FQ-WN_ series cables
Process data	Variable PDO Mapping
Mailbox (CoE)	Emergency messages, SDO requests. SDO responses and SDO information
Distributed clock	Synchronization with DC mode 1
LED display	• L/A IN (Link/Activity IN) x 1 • L/A OUT (Link/Activity OUT) x 1 • RUN x 1 • ERR x 1

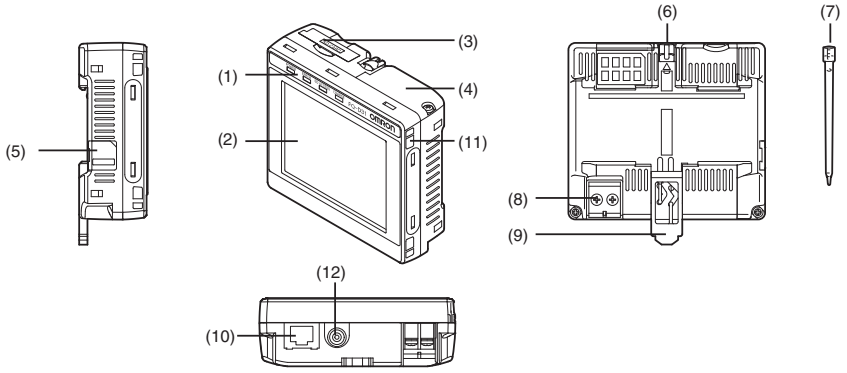
Nomenclature

Sensor



No.	Name	Description
1	I/O cable connector	An I/O cable is used to connect the sensor to the power supply and external I/O.
2	Ethernet connector	An Ethernet cable is used to connect the sensor to external devices such as PLCs, the Touch Finder or computers.
3	Lighting connector	Connect and external lighting (strobe controller).
4	EtherCAT connector (IN)	Connect an EtherCAT compatible device.
5	EtherCAT connector (OUT)	Connect an EtherCAT compatible device.
6	Node address switch	Set the node address for EtherCAT communications.
7	Installation holes	Holes to install and secure the camera.
8	C-mount lens connection part	Install the C-mount lens in this part. Determine the field of view depending on the measurement target and select a suitable CCTV lens (C-mounting lens).
9	Strobe controller connection holes	Install the strobe controller in this part. FL-TCC1 can be mounted.
10	Measurement process operation indicators	OR: Lit in orange while OR signal is ON. ETN: Lit in orange while in Ethernet communications. ERROR: Lit in red when an error occurs. BUSY: Lit in green while the sensor is processing.
11	EtherCAT operation indicators	L/A IN: Lit in green when Link with EtherCAT device is established and flickers in green when communicating (data IN). L/A OUT: Lit in green when Link with EtherCAT device is established and flickers in green when communicating (data OUT). ECAT RUN: Lit in green when EtherCAT communication is available. ECAT ERR: Lit in red when an EtherCAT communication error occurs.

Touch Finder



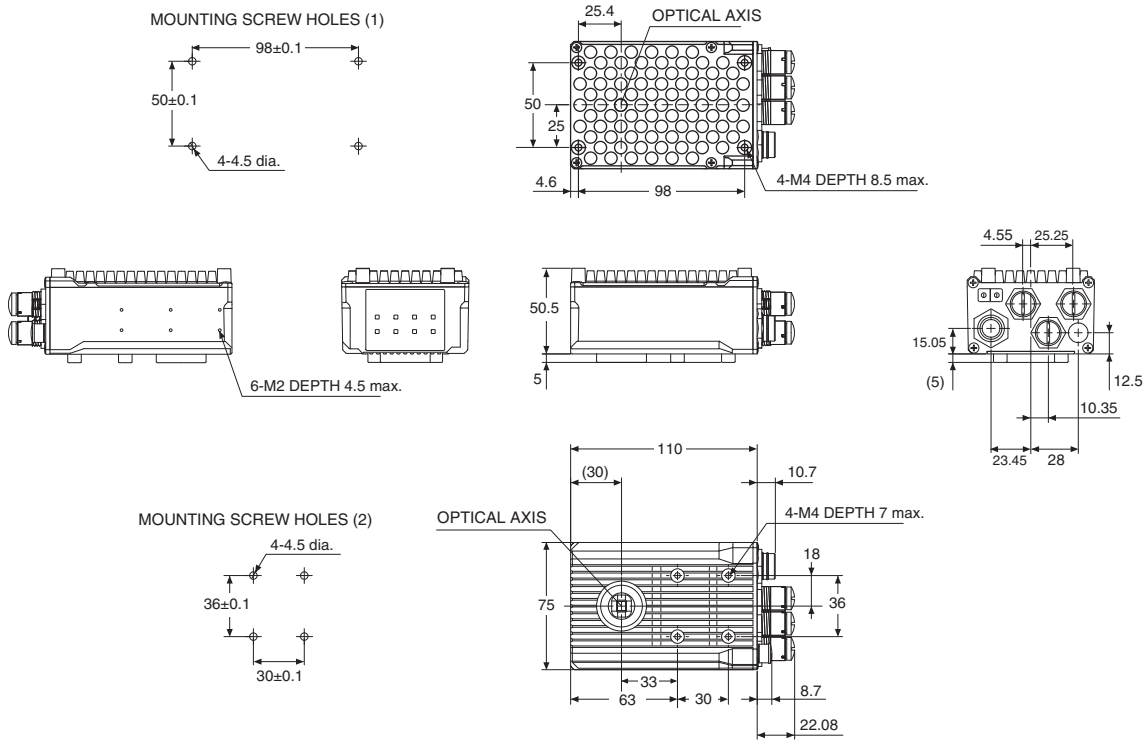
No.	Name	Description
1	Operation indicators	POWER: Lights green when the Touch Finder is turned ON. ERROR: Lights red when an error occurs. SD ACCESS: Lights yellow when an SD card is inserted. Flashes yellow when the SD card is being accessed. CHARGE[*1]: Lights orange when the battery is charging.
2	LCD/touch panel	Displays the setting menu, measurement results and images input by the camera.
3	SD card slot	An SD card can be inserted.
4	Battery cover[*1]	The battery is inserted behind this cover. Remove the cover when mounting or removing the battery.
5	Power supply switch	Turns on the Touch Finder.
6	Touch pen holder	The touch pen can be stored here when it is not being used.
7	Touch pen	Used to operate the touch panel.
8	DC power supply connector	Used to connect a DC power supply.
9	Slider	Used to mount the Touch Finder to a DIN track.
10	Ethernet port	Used when connecting the Touch Finder to the sensor with an Ethernet cable. Insert the connector until it locks in place.
11	Strap holder	This is a holder for attaching the strap.
12	AC power supply connector[*1]	Used to connect the AC adapter.

*1. Applicable only to the FQ-MD31 model.

Dimensions

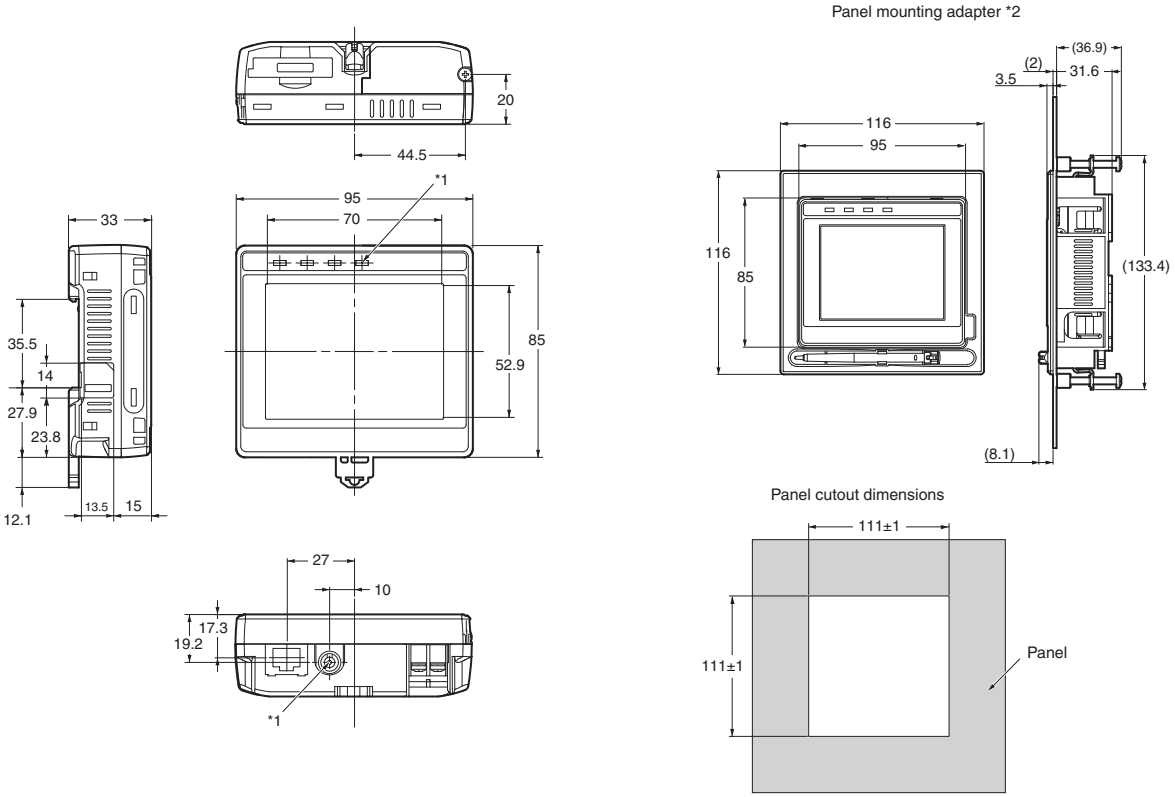
Sensor

FQ-MS12_-ECT/MS12_-M-ECT



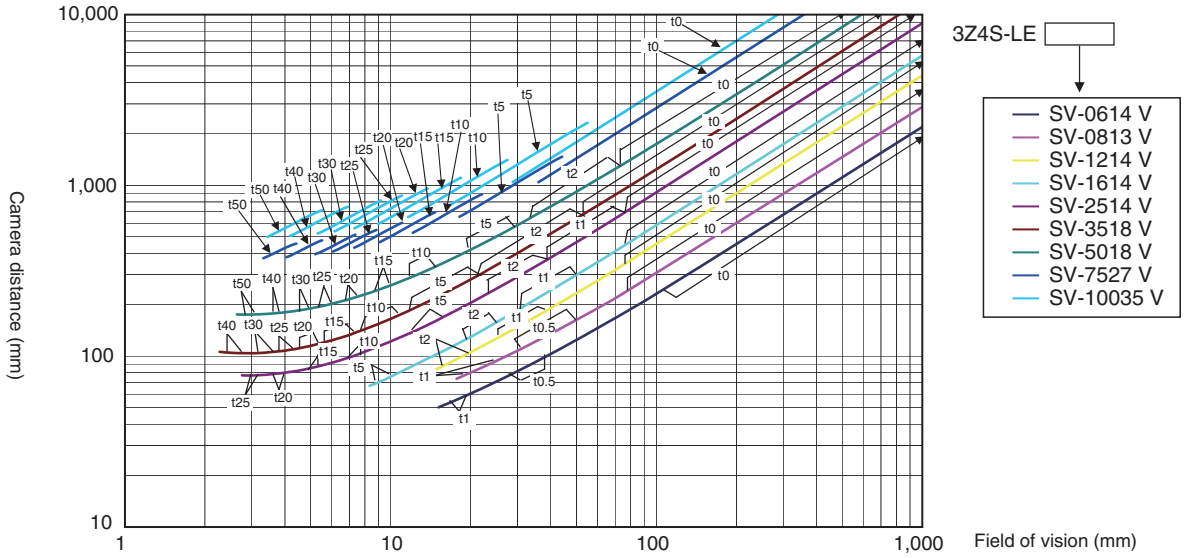
Touch Finder

FQ-MD30/MD31



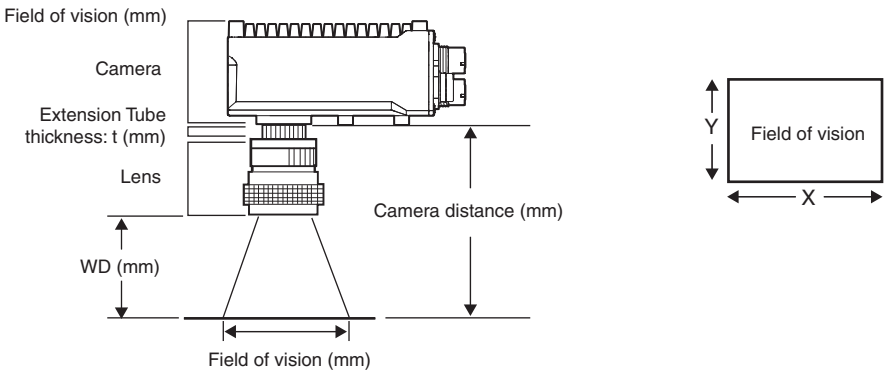
*1. Provided only with the FQ-MD31 model.
*2. The dimensions of the panel mounting adapter does not include that of a FQ-MD_.

Optical chart



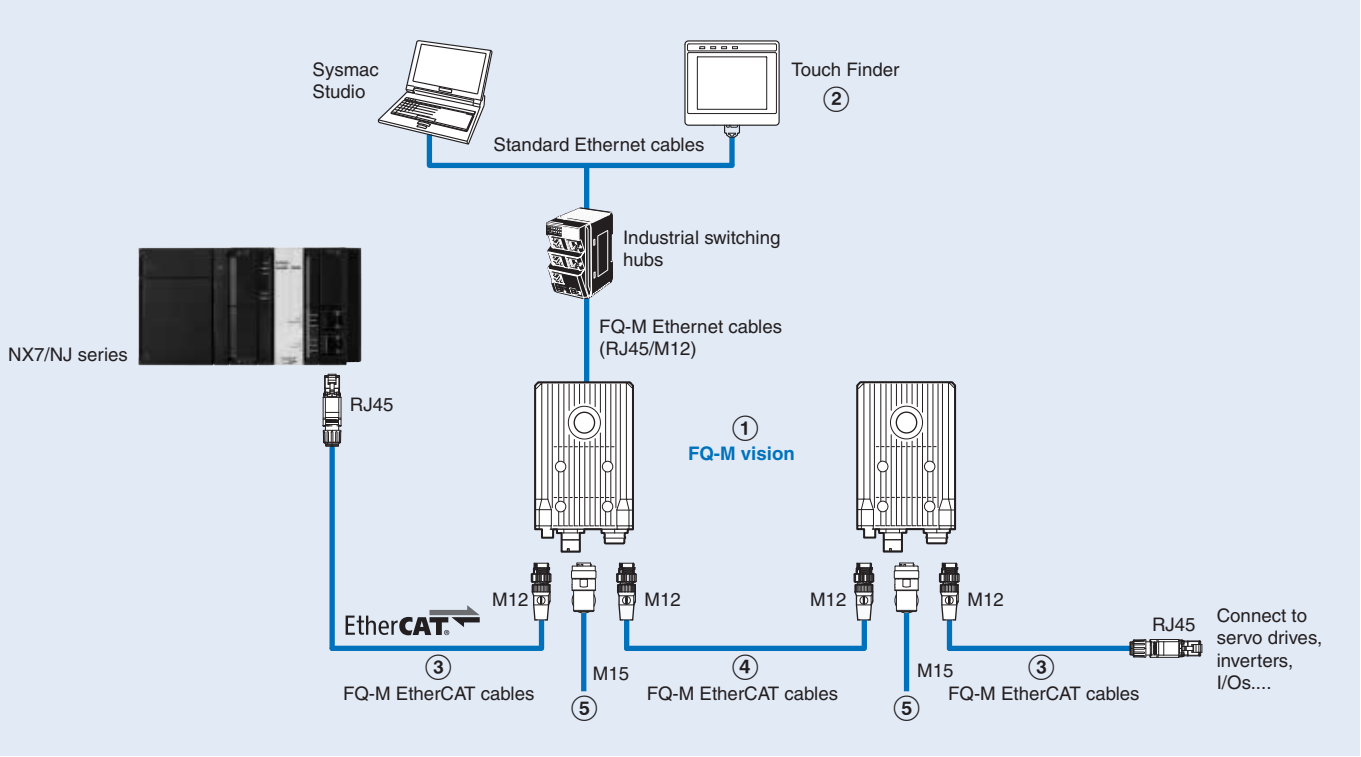
Meaning of optical chart

The X axis of the optical chart shows the field of vision (mm)*1, and the Y axis of the optical chart shows the camera installation distance (mm)*2.



*1. The lengths of the fields of vision given in the optical charts are the lengths of the Y axis.
*2. The vertical axis represents WD for small cameras.

Ordering information



Sensors

Sym-bol	Type			Model	Appearance
①	Color	NPN	EtherCAT communication function provided	FQ-MS120-ECT	
		PNP		FQ-MS125-ECT	
	Monochrome	NPN		FQ-MS120-M-ECT	
		PNP		FQ-MS125-M-ECT	

Touch Finder

Sym-bol	Type	Model	Appearance
②	DC power supply	FQ-MD30	
	AC/DC/battery*1	FQ-MD31	

*1. AC adapter and battery are sold separately.

Bend resistant cables for FQ-M series

Symbol	Type		Cable length	Model	Appearance
③	EtherCAT and Ethernet cable (M12/RJ45)	Angle: M12 / Straight: RJ45	5 m	FQ-MWNL005	
			10 m	FQ-MWNL010	
		Straight type	5 m	FQ-WN005-E	
			10 m	FQ-WN010-E	
④	EtherCAT cable (M12/M12)	Angle type	5 m	FQ-MWNEL005	
			10 m	FQ-MWNEL010	
		Straight type	5 m	FQ-MWNE005	
			10 m	FQ-MWNE010	
⑤	I/O cable	Angle type	5 m	FQ-MWDL005	
			10 m	FQ-MWDL010	
		Straight type	5 m	FQ-MWD005	
			10 m	FQ-MWD010	

Accessories for Touch Finder

Type		Model	Appearance
Panel mounting adapter		FQ-XPM	
AC adapter (for Touch Finder models with DC/AC/battery)	Plug type A, 125 V max. (PSE standard)	FQ-AC1	
	Plug type A, 125 V max. (UL/CSA standard)	FQ-AC2	
	Plug type A, 250 V max. (CCC mark standard)	FQ-AC3	
	Plug type C, 250 V max.	FQ-AC4	
	Plug type BF, 250 V max.	FQ-AC5	
	Plug type O, 250 V max.	FQ-AC6	
Battery (for Touch Finder models with DC/AC/battery)		FQ-BAT1	
Touch pen (enclosed with Touch Finder)		FQ-XT	
Strap		FQ-XH	
SD card	2 GB	HMC-SD291	
	4 GB	HMC-SD491	

Camera peripheral devices

Specifications	Model
CCTV lenses	3Z4S-LE series
External lightings	FLV series
	FL series

Note: Please, refer to the Vision Accessories Catalogue (Cat. No. Q198) for more detailed information about camera peripheral devices.

Computer software

Specifications	Model
Sysmac Studio version 1.01 or higher	SYSMAC-SE2□□□

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. SysCat_Q183-E2-02 In the interest of product improvement, specifications are subject to change without notice.