ROBOT VISION iVY2 RCX340

Easy to use and reduction of work steps.

"Finds and Picks up" and "Pursues and Picks up" without teaching.

Many robot users might think, "We tried vision recognition, but it seemed to take a lot of work" or "we tried it before, but making adjustments was a tough job".
But YAMAHA iVY2 system solves these problems.
Anyone can make the setup easily to contribute to reduction of work steps.

Simplicity

Setup is completed as little as eight minutes after power-on.
Auto-calibration makes setup easy.

Sophistication

With up to five million pixels, a variety of workpieces can be supported.
Improve throughput to 100 CPM with conveyor tracking.

Assurance

Comprehensive support covers everything from camera image acquisition to the operation of the gripper and robot.
With support that only the robot manufacturer can provide, you can relax.

Camera	Number of registered types	Shorter search time	Longer cables usable	Monitoring
Supports from 300,000 to 5 million pixels	Increased to 254 types	Approximately 50 % less	Cables can be as long as 20 m	Monitor output is provided

Note. Time depends on the workpiece.

So, the iVY2 system can solve such problems.

Number of teaching steps needs to be reduced.

Robot teaching work requires a lot of labor and time. The iVY2 system acts as “robot eye”. The final fine positioning can be automated to greatly reduce the teaching time that was required for the conventional models.

Positioning mechanism needs to be simplified.

In the current trend toward small-lot production of multiple models, a larger number of models means that positioning and other aspects of setup will require more time and trouble. Use of the iVY2 system makes it possible to greatly reduce costs necessary for manufacture, management, and replacement of positioning jigs.

Random workpieces need to be handled.

Use of a position detection function of the iVY2 system makes it possible to simply construct operations, such as “workpiece is directly placed from the parts feeder” and “workpiece in the pallet is gripped and transferred”.

Workpiece flowing on the conveyor is picked up.

The iVY2 system is applicable to conveyor tracking. The position of the flowing workpiece is continuously recognized according to the signals from the encoder. The workpiece can be picked up without stopping the conveyor.

Consultation destination is not found if a trouble occurs.

When a generally available image processing unit is combined with the robot, various problems such as being unable to capture images, unable to write data, or position deviation occur. YAMAHA iVY2 system will solve such troubles. The iVY2 system delivers total support for tasks ranging from capturing of images from the camera to operating the robot.

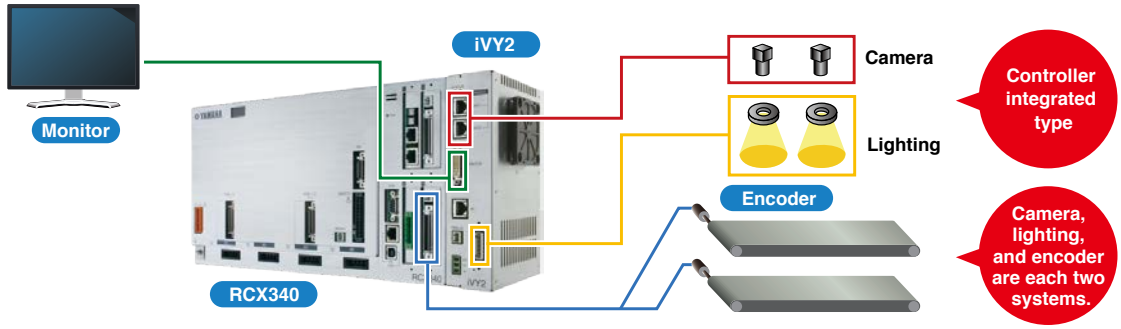
What the iVY2 system can perform.

- **Positioning of products that are taken roughly.**
- **Following up of products that are flown by the conveyor.**
- **Finding and taking of products that are arranged randomly.**
- **Positioning of products that are secured roughly.**

The following can also be performed!
Top/bottom judgement
OK/NG judgement

POINT 1

Robot controller integrated type



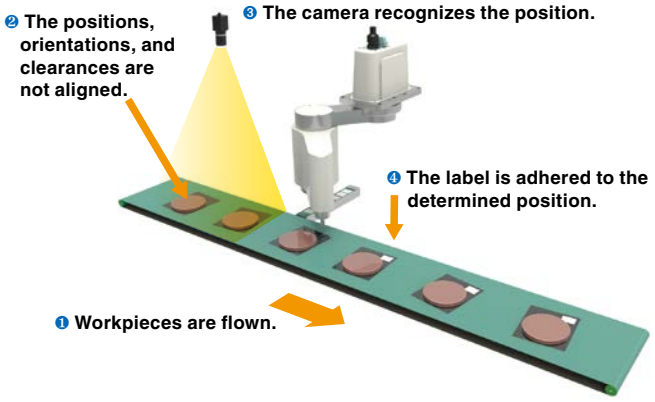
POINT 2

Various application examples

Workpieces are flown randomly.

The workpiece positions are recognized by the camera and the labels are adhered to the determined positions on workpieces. The adhesion position can also be specified for each part type.

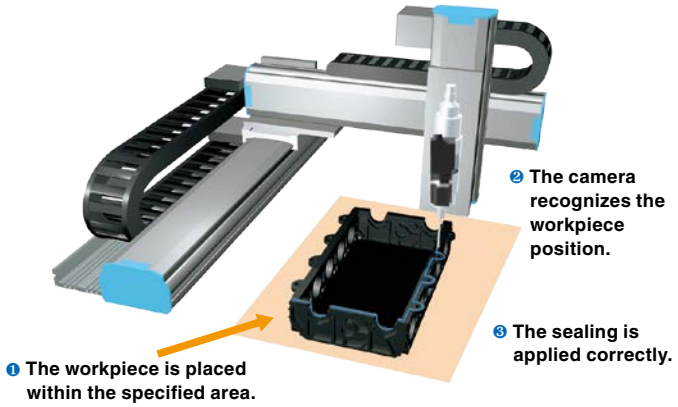
POINT **Even when the positions or orientations of workpieces that are flown are not aligned, the labels are adhered to the same positions.**



The sealing position is corrected.

The placed position is recognized from the workpiece shape correctly. The jig change (setup) is not needed when the part type is changed.

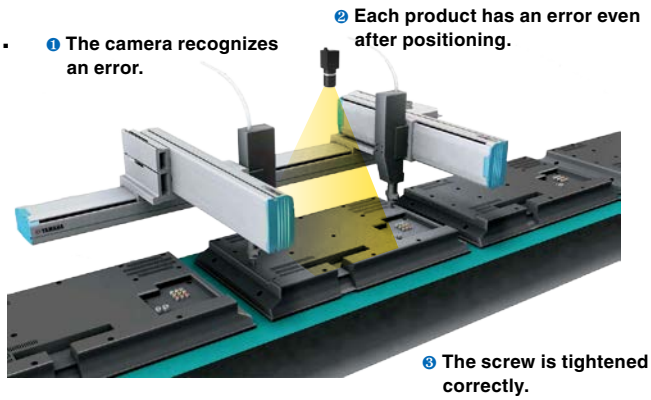
POINT **The workpiece shape is recognized by the camera and the sealing is applied to the correct position.flown are not aligned, the labels are adhered to the same positions.**



The screw tightening position is corrected.

The correct position of even the workpiece whose hole position varies depending on the workpiece is recognized by the camera and the screw can be tightened.

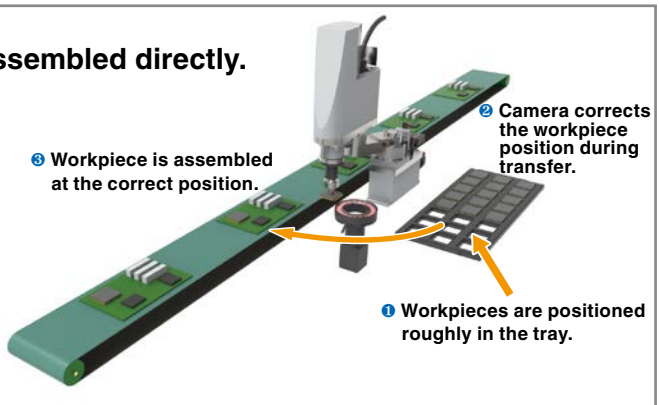
POINT **Even when there are variations in product accuracy such as resin mold product, the products can be assembled correctly.**



Workpiece is picked up from the tray and assembled directly.

Workpiece is picked up from the tray, its position is corrected during transfer, and it is assembled directly. Difficult-to-grip workpiece is centered.

POINT **Use of the upward camera makes it possible to correct the position during transfer.**



POINT 3

Easy for anyone to use, applicable to a wide variety of applications

When the system was upgraded by combining the robot with a generally available image processing unit, it took a long time conventionally to adjust the robot controller and image processing unit, and perform the correction calculation. In YAMAHA "iVY2 system", the vision board is integrated into the robot controller and the functions are limited to the positioning and position correction so as to greatly simplify the operability. This makes the system incredibly easy to use when compared to conventional vision systems. YAMAHA aimed at "a vision system that anyone can easily use". Please try to use YAMAHA's new robot vision.

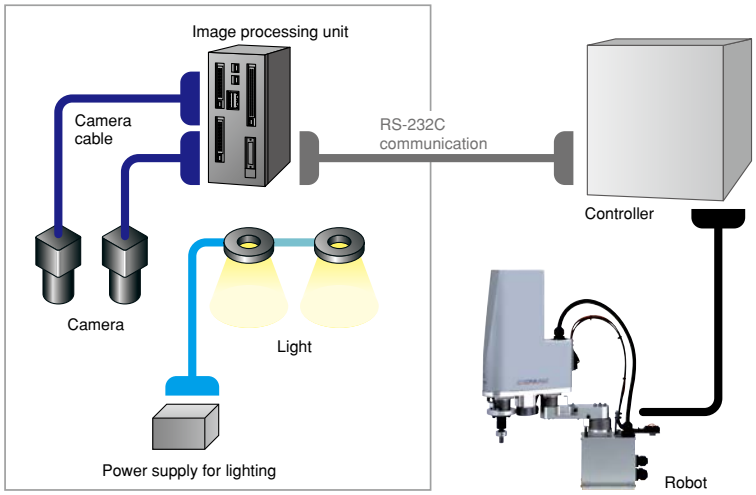
Conventional robot vision

① Alignment with robot coordinates is difficult.
② Correction calculation is needed when the camera moves.
③ Operation deviation between the camera and robot due to comunication time.
④ Adjustment of communication format is needed.

✕
- Difficult to handle.
- Hard to actually operate.
- Installation and setup costs are high.
- Difficult to know emergency contact address.

Special skills are required and many work steps are needed.

Connecting an external camera to the robot controller requires tasks such as coordinate alignment (calibration), and correction programs are needed, so the startup work is difficult. When using for simple applications, many work steps are needed. So, possible applications are limited.



iVY2 system

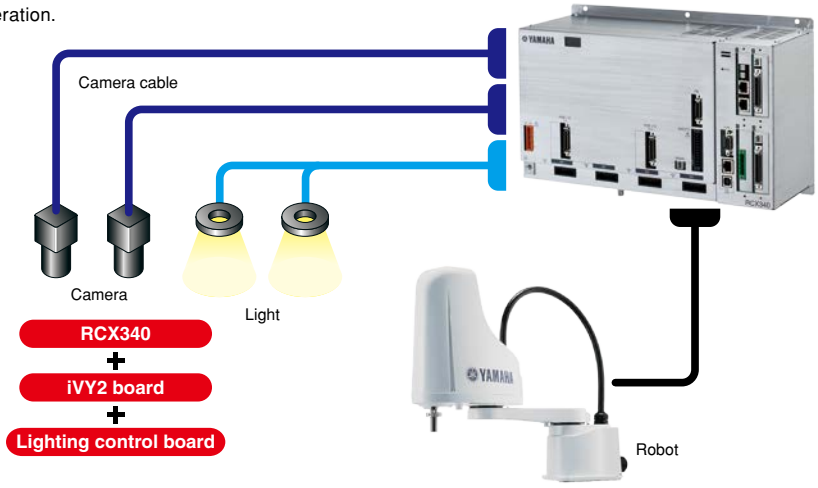
① Simple calibration function is incorporated.
② Coordinates are corrected automatically even when the camera moves.
③ High-speed connections through dedicated bus line.
④ Controller is incorporated to provide the central operation.
⑤ Applicable to all models of YAMAHA robot lineup.

Point

○
- Easy to use
- Various applications are supported using easy operation.
- Cost reduction by reducing work steps.
- YAMAHA gives you total support.

Easy operation extends applications

YAMAHA iVY2 system can be calibrated very simply Furthermore, the coordinates are corrected automatically when a camera is installed on the robot. As iVY2 system can be used, it can be applied to various applications.



POINT 4

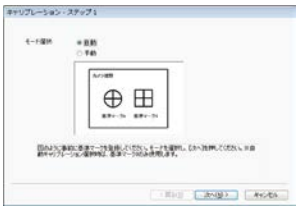
Auto-calibration

Easily complete high-precision calibration just by following a wizard! Even if equipment becomes misaligned, execute auto-calibration and resume operation.

Requires as little as 5 minutes

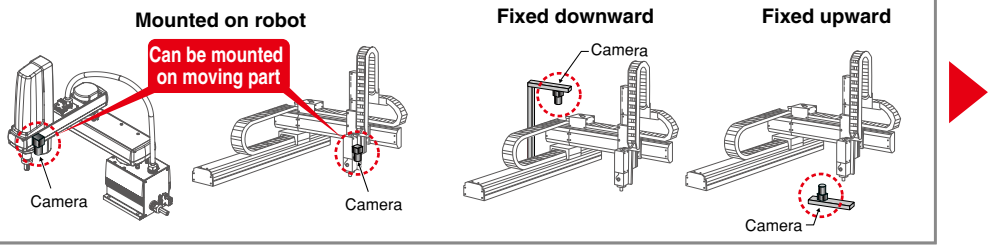
STEP. 1

Register the desired fiducial mark



STEP. 2

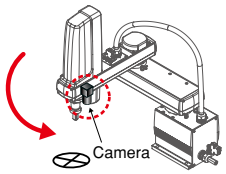
Select the camera mounting method



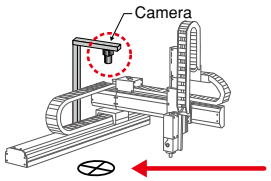
STEP. 3

Align fiducial mark position

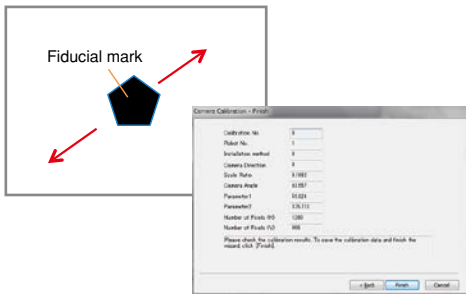
If camera is movable, move the robot



If camera is fixed, attach fiducial mark to robot, and move it



Execute auto-calibration



POINT 5

Easy workpiece registration only with 3 steps

From image acquisition, registration takes just three steps.

Requires as little as 3 minutes

STEP. 1

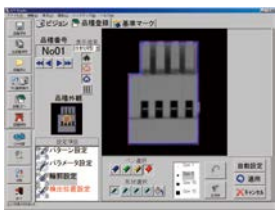
Capture images.

Put the workpiece within the camera field-of-view and specify an image capturing range.

STEP. 2

Set the contour.

Contour is automatically extracted. Paint the necessary contour with a pen tool.



STEP. 3

Register the detection position.

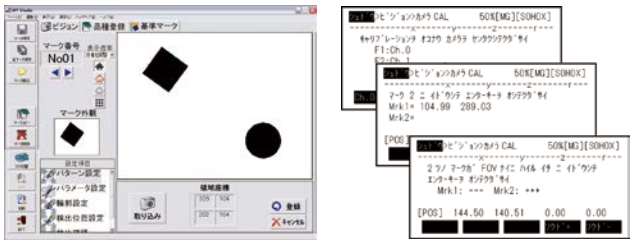
Specify the detection position with the mouse. Desired positions can be set.

Search results

POINT 6

Simple calibration function (coordinate matching alignment work) incorporated

The iVY2 system includes dedicated software "iVY2 Studio". All operations related to the vision, such as registration of fiducial marks used for the calibration or workpieces (edge setting, various parameter setting, and image capturing range setting, etc.), backup, restore, and operation monitor can be performed only with this software.

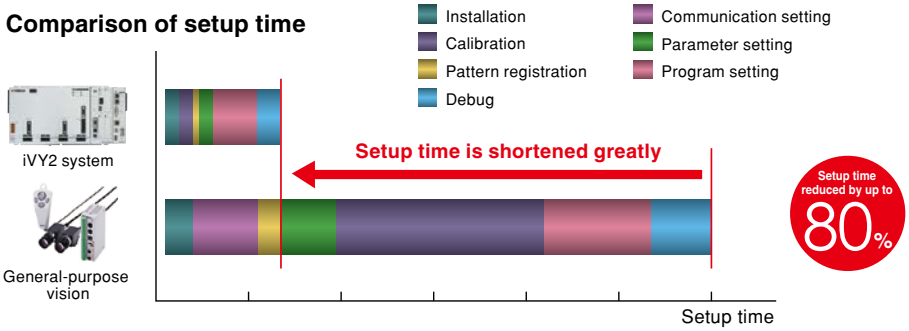


Just follow instructions on Wizards

POINT 7

Setup time reduced greatly

When using a general vision, a coordinate conversion program needs to be created in the robot controller since the robot coordinate data differs from the vision format.
Since the robot controller is integrated into the iVY2 system, the robot coordinate data can be stored into the robot point data using single process. This ensures very simple operation. Additionally, the unified control of the camera control and light control can be performed using the robot program. The control becomes easy and the number of start-up steps can also be reduced.



POINT 8

No need to create a coordinate conversion program.

Dedicated robot language for vision is provided.

General robot vision

MOVE P, P9
OFF LINE
SEND (* *) TO CMU
SEND CMU TO P10
ON LINE
MOVE P, P10

Communication with image processing unit

RS-232C

Program of image processing unit ⟷ Program of host PLC

Camera and robot have separate programs

iVY2 system

MOVE P, P9
VSEARCH 1,2,0 — Searches for workpiece.
P10=VGETPOS(0) — Reads the point.
MOVE P, P10 — Moves to this point.

MERITS

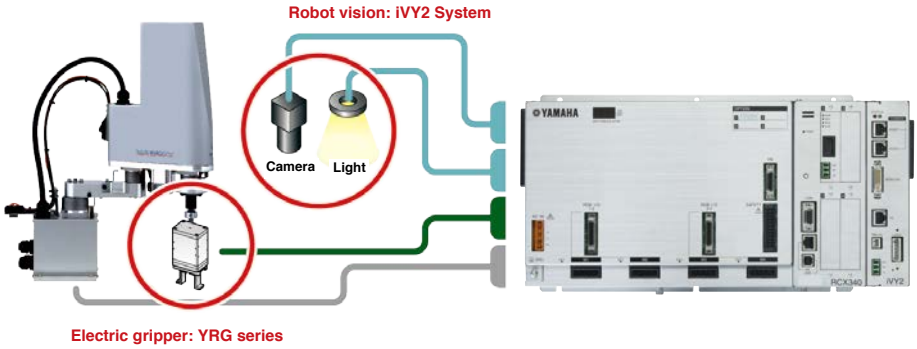
- No communication time lag
- Needs only few command lines.
- Simple and easy to understand

Centralized control using only the robot program

POINT 9

Easy inter-operation with peripheral equipment

The same controller provides unified control of robot, gripper, and lighting.



POINT 10

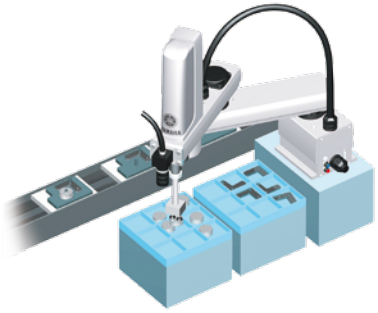
Workpiece handling without teaching

When the robot handles a workpiece, the teaching work to the correct position is absolutely required. If the workpiece position deviates, the correct handling cannot be performed.
Use of iVY2 system makes it possible to detect the correct position through the image recognition after coarse positioning. The workpiece can be transferred without teaching, so the start-up steps are reduced and workpiece can be changed or added flexibly.

POINT 11

Also supports moving camera

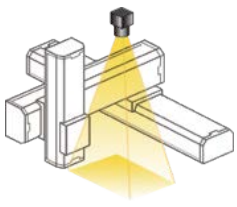
Even if the camera is mounted on the robot, coordinates are automatically converted according to the robot's movement.



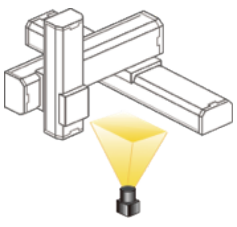
POINT 12

Camera position can be selected in accordance with the application.

Fixed camera

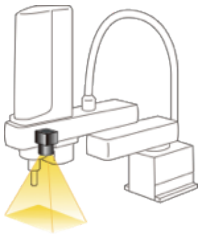


Fixed downward.

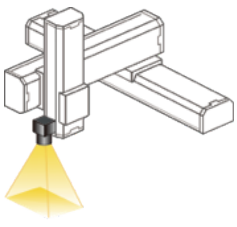


Fixed upward.

Movable camera



SCARA robots



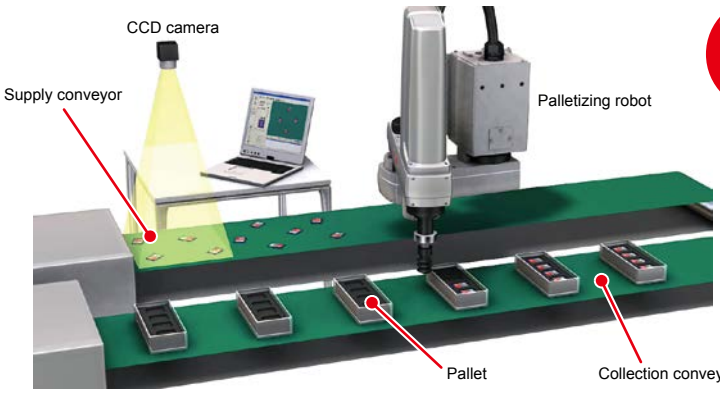
Cartesian robots

Even when the camera is moved, the coordinates are corrected automatically.

POINT 13

Applicable to conveyor tracking

Ideal for high-speed packaging arrangement high-speed transport of multiple types of items such as pharmaceuticals, cosmetics, and food products.
The vision camera detects the position and orientation of parts moving on the conveyor, and the robot picks them up.



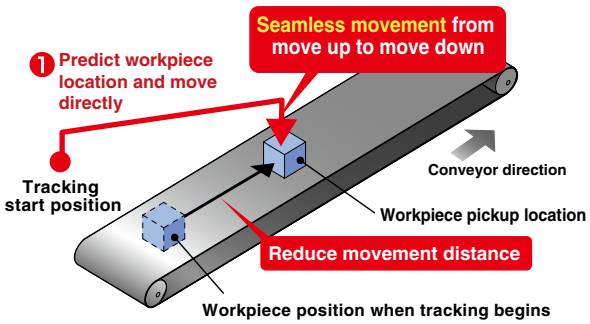
Conveyor tracking reaches 100 CPM per unit

Example program

❶ New CTMOVE CTMOVE (1),Z=0.0,CTZ=10.0

Can be executed with a single command

Unify the move up command, follow workpiece command, move down command



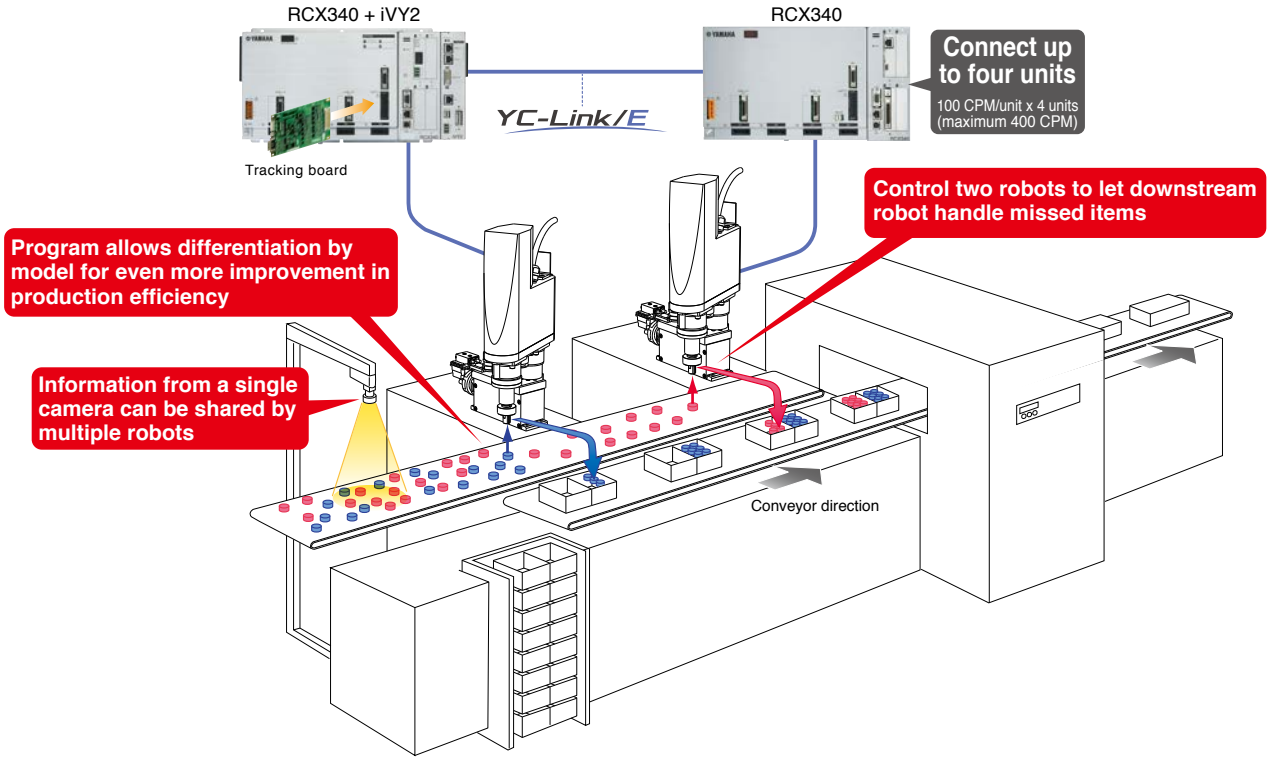
Operating conditions: YK500XG / payload 1 kg (total of workpiece and tool) / horizontal movement 250 mm / vertical movement 1 mm / conveyor speed 100 mm/sec

POINT 14

Control multiple robots for even more improvement in production efficiency.

Shortened cycle time

Improve throughput

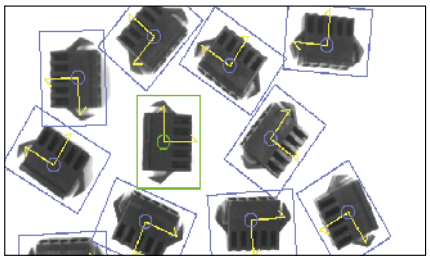


POINT 15

Approximately double the search speed (compared to previous model)

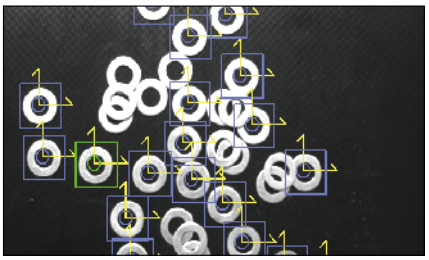
Even a large number of workpieces can be detected at high speed. The search speed is approximately double that of the previous model. This can be used for a wide variety of applications, including molded plastic parts or food items.

Sample workpiece ① Connector-shaped workpiece



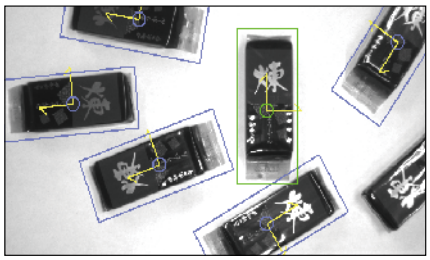
RCX240 + iVY	RCX340 + iVY2
158.7 ms →	83.8 ms

Sample workpiece ② Washer-shaped workpiece



RCX240 + iVY	RCX340 + iVY2
200.2 ms →	91.7 ms

Sample workpiece ③ Food item workpiece



RCX240 + iVY	RCX340 + iVY2
149.8 ms →	91.1 ms

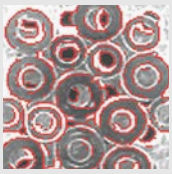
POINT 16

Support for five-megapixel cameras

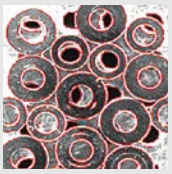
(Choose from 300,000 pixel, 1.3 megapixel, and 2 megapixel, and 5 megapixel)

Detailed edge detection is possible even if workpieces are touching each other or have a complex shape.

● Previous: 300,000 pixel camera ● New: 1.3 megapixel camera



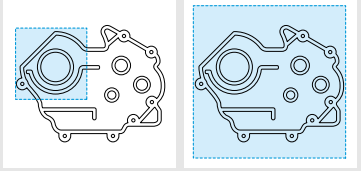
(partial detail illustration)



(partial detail illustration)

A single search allows detection even for a large workpiece, improving takt.

● Previous: 300,000 pixel camera ● New: two-megapixel camera

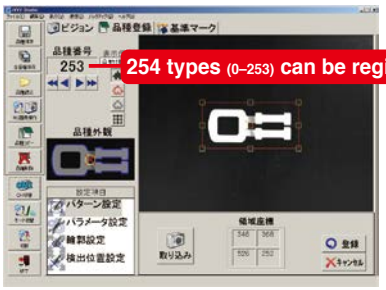


Field of vision

POINT 17

254 types can be registered

Setup changes require only that part numbers be changed. Setup changes are easy.



POINT 18

Monitor output is provided

Monitor the operating status

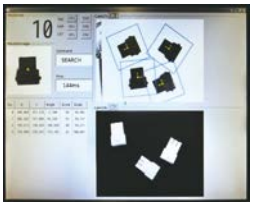
Monitor the search status while making calibration settings or during automatic operation.

Contents of output

- Selected type / Captured image
- Search result (position, score, scale)
- Executed command
- Time required by command

Output method

- DVI-I (supports digital monitor or analog monitor)

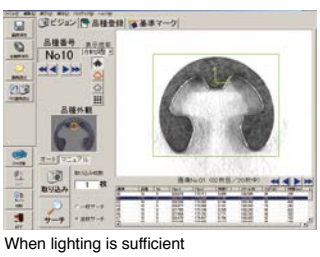


POINT 19

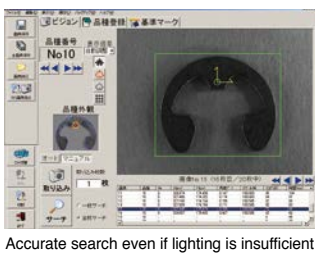
High-precision search even under low light

Edge search engine is built-in

Supports a variety of applications while being minimally affected by the external environment.



When lighting is sufficient



Accurate search even if lighting is insufficient

POINT 20

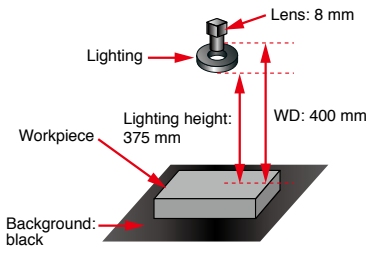
Preparatory evaluation and advice give you peace of mind

We borrow the workpiece from you, evaluate it, and submit an evaluation report.
In addition, we draw on our wealth of experience and evaluation results to provide advice and training regarding selection and installation of robots and peripheral equipment.

Hearing → Workpiece is borrowed → Preliminary evaluation → Advice (evaluation report is submitted) → Robot training → Follow-up after delivery

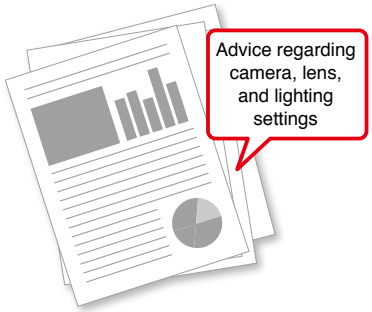
Preliminary evaluation

■ Evaluation conditions (example)



We borrow a workpiece from you and conduct an evaluation.

Advice (evaluation report is submitted)



The results of our preliminary evaluation regarding camera, lens, lighting selection, and setup are summarized as a report and submitted.

Robot training

Training can be performed according to the content of the customer's application.

POINT 21

Choose freely from Yamaha's lineup of robots

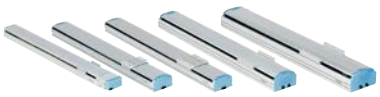
A low-cost and convenient robot vision system can be constructed using the models that are optimal for the customer's application.

■ XY-X Cartesian robots

■ YK-XG/XE SCARA robots

■ YK-TW orbit type robots

■ FLIP-X single-axis robots



Note. The YA series is not supported.

POINT 22

Easy-to-use dedicated software iVY2 Studio

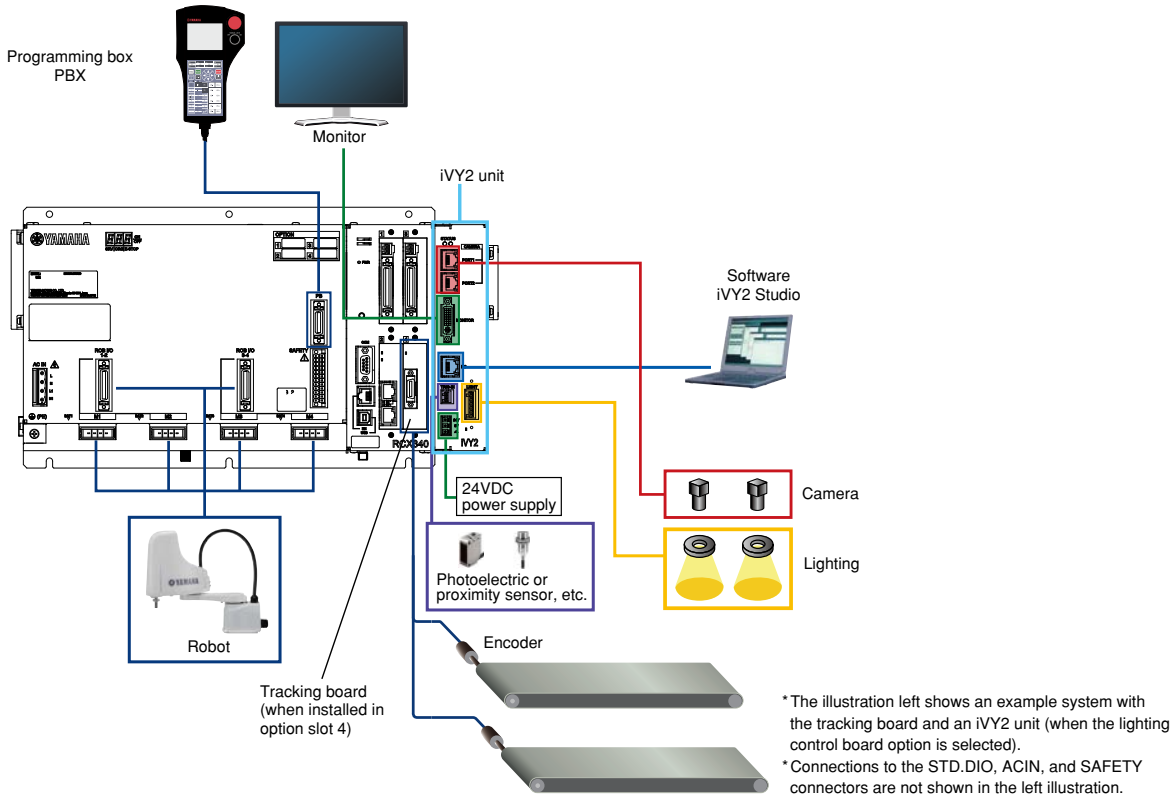
With support software “iVY2 Studio”, all vision related operations such as registration of fiducial marks and workpieces used for calibration (contour settings, various parameter settings, and read range settings), backup, restore operation, and operation monitor can be performed.

Download from website (member site)

Support software iVY2 Studio

- Search trial-run, part type registration
- Reference mark registration (for calibration)
- Up to 40 workpiece types can be registered.
- Workpiece can also be added easily.
- Up to 40 workpieces can be detected at once.
- Data backup
- This software functions as a monitor during program operation.

iVY2 System configuration illustration



* The illustration left shows an example system with the tracking board and an iVY2 unit (when the lighting control board option is selected).
* Connections to the STD.DIO, ACIN, and SAFETY connectors are not shown in the left illustration.

iVY2 System

Applicable controllers ▶ RCX320 / RCX340

Robot with image processing functions

Integrated Robot Vision System with "plug-and-play" simplicity.
Basic specifications have been dramatically enhanced while retaining the current iVY system's ease of use.

Main functions ▶ P.78

Ordering method

RCX320 – [ ] – [ ] – [ ] – [ ] – [ ] – [ ]
Controller – No. of controllable axes – Safety standards – Regenerative unit – Controller option A (OP.A / OP.B) – Vision System – Absolute battery
Vision System: No entry: Non-selection / VY: iVY2 without light / VL: iVY2 with light

RCX340 – [ ] – [ ] – [ ] – [ ] – [ ]
Controller – No. of controllable axes – Safety standards – Controller option A to D (OP.A to D) – Controller option E (OP.E) – Absolute battery
Controller option E (OP.E): No entry: Non-selection / VY: iVY2 without light / VL: iVY2 with light

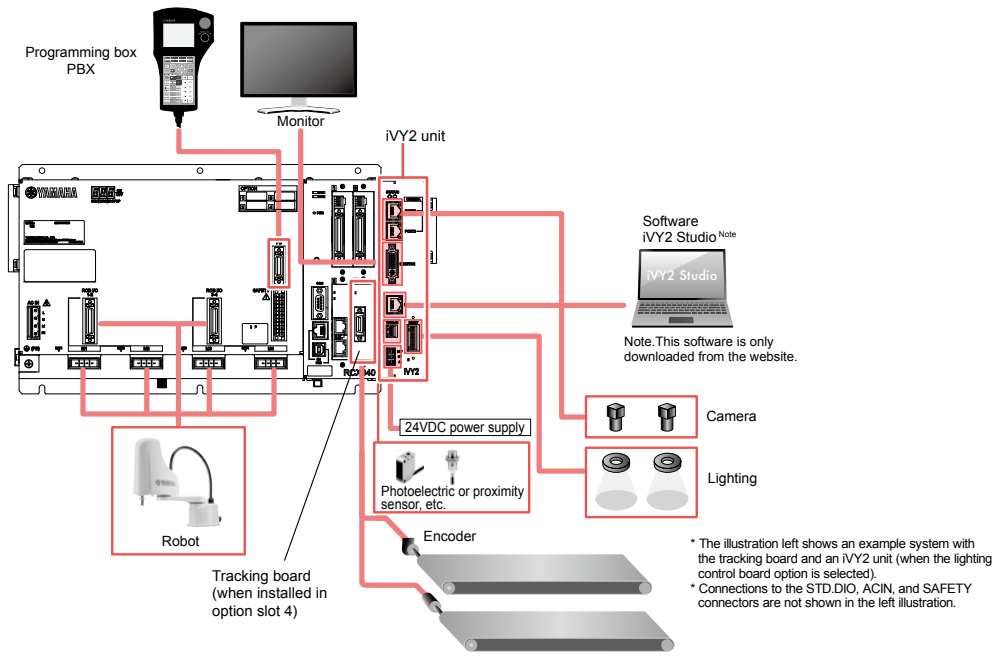
For details on the various selection items
RCX320 ▶ P.548 RCX340 ▶ P.566

Basic specifications

Robot vision basic specifications

Item		iVY2 unit
Basic specifications	Applicable controllers	RCX320 / RCX340
	Number of screen pixels	648(H) × 494(V) (300,000 pixels, VGA) 1280(H) × 966(V) (1,300,000 pixels, SXGA) 1624(H) × 1236(V) (2,000,000 pixels, UXGA) 2592(H) × 1944(V) (5,000,000 pixels, QSXGA)
	Model setting capacity	254 models
	Number of connectable cameras	Max. 2 cameras
	Connectable camera	GigE camera (VGA, SXGA, UXGA) PoE: IEEE802.3af 1 ch up to 7W
	External interface	Ethernet (1000BASE-T) Note. For setting and monitor operations
	External monitor output	DVI-I Note. Also usable with an analog monitor by using a conversion adaptor. Monitor resolution: 1024 × 768
	Power supply	DC24V +/-10% 1.5A Max.
	Dimensions	W45 × H195 × D130 (iVY2 unit only)
	Weight	0.8kg (iVY2 unit only, when the lighting control board option is selected)
Search method		Edge search (correlated edge filter, Sobel filter)
Image capturing	Trigger mode	S/W trigger, H/W trigger
	External trigger input	2 points
Function		Position detection, automatic point data generation
Camera installation position		Fixed to the fixed camera (up, down) or robot (Y-axis, Z-axis). Perpendicular to the workpiece to be captured.
Setting support function		Calibration, image save function, model registration[Note], fiducial mark registration[Note], monitor function[Note] Note. iVY2 Studio function (requires a Windows PC)
Lighting control options	Number of connectable lighting units	Max. 2 lighting units
	Modulated light format	PWM modulated light control (0 to 100%), PWM frequency switchable 62.5 kHz/125 kHz
		Continuous light, strobe light (follows camera exposure)
	Lighting power input	12VDC or 24VDC (external supply shared by both channels)
	Lighting output	For 12VDC supply: Total of less than 40W for both channels. For 24VDC supply: Total of less than 80W for both channels.

System configuration illustration

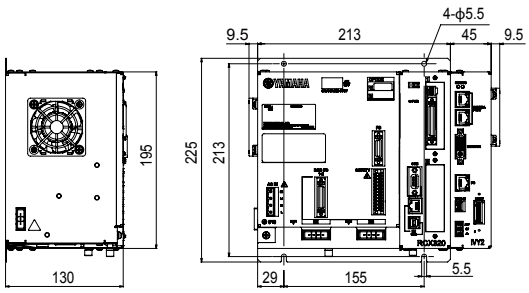


Tracking board basic Specifications

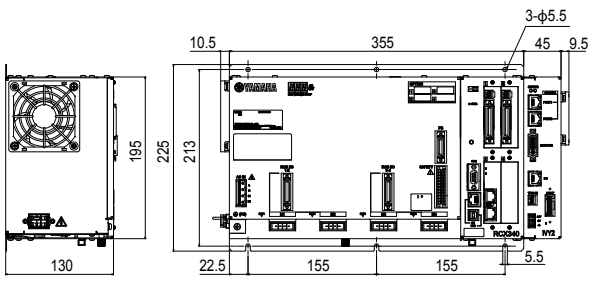
Item		Tracking board
Basic specifications	Applicable controllers	RCX320 / RCX340
	Number of connected encoders	Up to 2 units.
	Encoder power supply	5VDC (2 counters total 500 mA or less) (Supplied from controller)
	Applicable encoder	26LS31/26C31 or equivalent line driver (RS-422 compliance).
	Input phase	A, $\overline{A}$, B, $\overline{B}$, Z, $\overline{Z}$
	Max. response frequency	2MHz or less
	Counter	0 to 65535
	Multiplier	4x
	Other	With disconnection detection function

Dimensional outlines

RCX320+iVY2



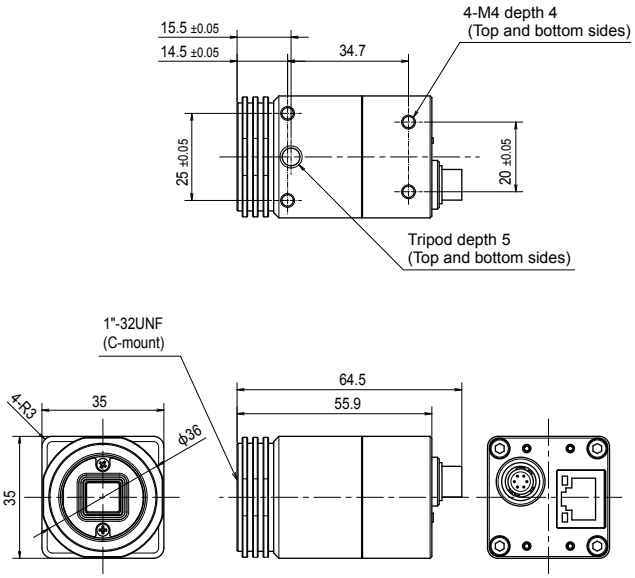
RCX340+iVY2



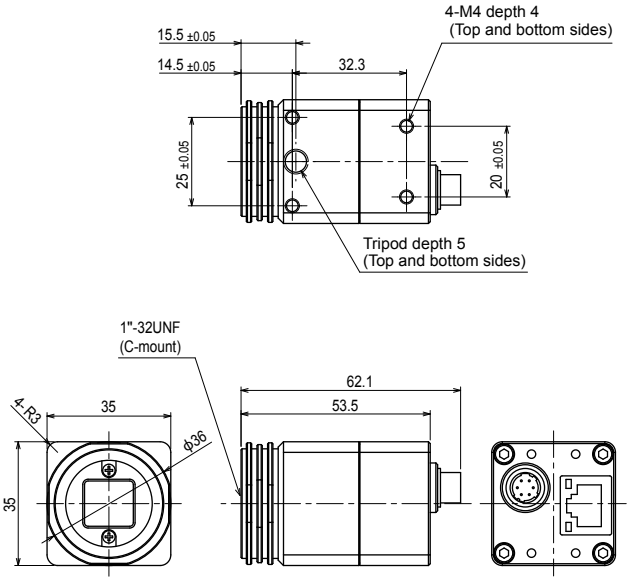
iVY2 System

Dimensional outlines

CCD camera
(300,000 pixels • 1,300,000 pixels • 2,000,000 pixels)

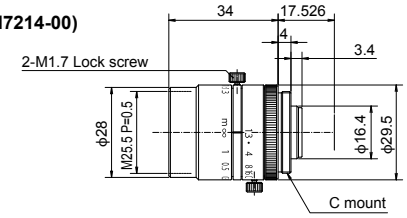


CMOS camera
(5,000,000 pixels)

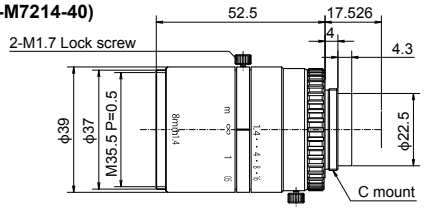


Lenses

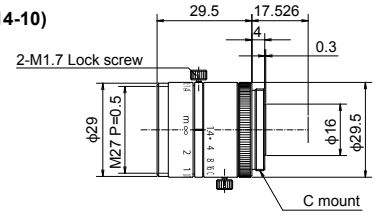
8mm lens
(Model No. : KCX-M7214-00)



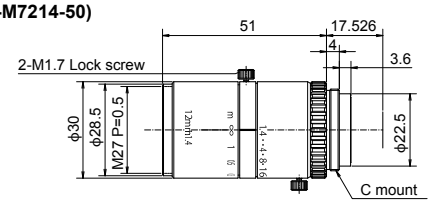
8mm lens (megapixel support)
(Model No. : KCX-M7214-40)



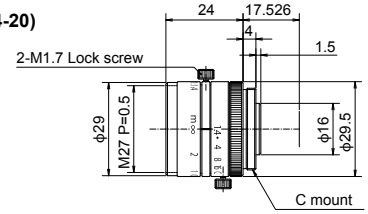
12mm lens
(Model No. : KCX-M7214-10)



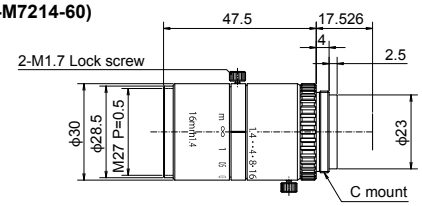
12mm lens (megapixel support)
(Model No. : KCX-M7214-50)



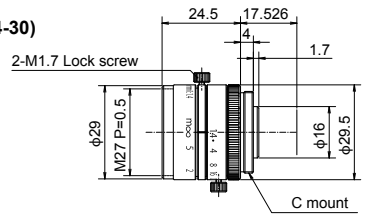
16mm lens
(Model No. : KCX-M7214-20)



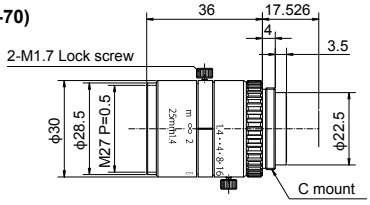
16mm lens (megapixel support)
(Model No. : KCX-M7214-60)



25mm lens
(Model No. : KCX-M7214-30)



25mm lens (megapixel support)
(Model No. : KCX-M7214-70)



Lens characteristics

Lens	Model	Focal length [mm]	Aperture value [F No.]	Angle-of-view (degrees) With 1/3 inch sensor KCX-M6541-00 (300,000 pixel camera) KCX-M6541-10 (1,300,000 pixel camera)		Angle-of-view (degrees) With 1/1.8 inch sensor KCX-M6541-20 (2,000,000 pixel camera)		Closest approach distance [m]
				Vertical	Horizontal	Vertical	Horizontal	
8mm	KCX-M7214-00	8	F1.3–CLOSE	25.21	33.2	37.08	47.59	0.2
12mm	KCX-M7214-10	12	F1.4–CLOSE	16.48	21.86	24.51	31.88	0.3
16mm	KCX-M7214-20	16	F1.4–CLOSE	12.57	16.71	18.77	24.51	0.4
25mm	KCX-M7214-30	25	F1.4–CLOSE	8.18	10.89	12.25	16.06	0.5
8mm (megapixel support)	KCX-M7214-40	8	F1.4–F16	25.36	33.4	37.3	47.86	0.1
12mm (megapixel support)	KCX-M7214-50	12	F1.4–F16	16.65	22.08	24.76	32.2	0.1
16mm (megapixel support)	KCX-M7214-60	16	F1.4–F16	12.68	16.85	18.92	24.72	0.1
25mm (megapixel support)	KCX-M7214-70	25	F1.4–F16	8.24	10.97	12.33	16.16	0.15

Note. This table shows the angle-of-view for Yamaha's standard lenses. If the angle-of-view is greater, there might be more distortion at the edge of the image.

Angle-of-view size, WD, and magnification when close-up ring is used

Close-up ring [mm]			Lens							
			8 mm KCX-M7214-00		12 mm KCX-M7214-10		16 mm KCX-M7214-20		25 mm KCX-M7214-30	
None	WD [mm]		200		300		400		500	
	Angle-of-view size X × Y [mm]	KCX-M6541-00 (300,000 pixels)	96.2 × 126.2		91.4 × 119.9		91.4 × 119.9		71.7 × 94.1	
		KCX-M6541-10 (1,300,000 pixels)	95.4 × 126.4		90.6 × 120		90.6 × 120		71.1 × 94.2	
		KCX-M6541-20 (2,000,000 pixels)	143.2 × 188.1		136 × 178.7		136 × 178.7		106.7 × 140.1	
		KCX-M6541-30 (5,000,000 pixels)	112.6 × 150.1		106.9 × 142.6		106.9 × 142.6		83.9 × 111.9	
	Optical magnification		0.038		0.040		0.040		0.051	
0.5	WD [mm]		69.5	118.6	143	296.8	222	524.1	358.5	1269.4
	Angle-of-view size X × Y [mm]	KCX-M6541-00 (300,000 pixels)	36.6 × 48	59 × 77.4	45.7 × 60	91.4 × 119.9	51.5 × 67.6	118 × 154.7	51.5 × 67.6	182.8 × 239.8
		KCX-M6541-10 (1,300,000 pixels)	36.3 × 48	58.5 × 77.5	45.3 × 60	90.6 × 120	51.1 × 67.7	116.9 × 154.9	51.1 × 67.7	181.1 × 240
		KCX-M6541-20 (2,000,000 pixels)	54.4 × 71.5	87.8 × 115.3	68 × 89.4	136 × 178.7	76.6 × 100.7	175.5 × 230.5	76.6 × 100.7	271.9 × 357.3
		KCX-M6541-30 (5,000,000 pixels)	42.8 × 57.1	69 × 92	53.5 × 71.3	106.9 × 142.6	60.3 × 80.4	138 × 184	60.3 × 80.4	213.8 × 285.1
	Optical magnification		0.100	0.062	0.080	0.040	0.071	0.031	0.071	0.020
1.0	WD [mm]		38.7	53.8	91.3	142.3	152	257.1	280.8	635.9
	Angle-of-view size X × Y [mm]	KCX-M6541-00 (300,000 pixels)	22.6 × 29.6	29.5 × 38.7	30.5 × 40	45.7 × 60	36.2 × 47.5	60 × 78.7	40.2 × 52.7	91.4 × 119.9
		KCX-M6541-10 (1,300,000 pixels)	22.4 × 29.7	29.3 × 38.8	30.2 × 40	45.3 × 60	35.9 × 47.6	59.4 × 78.7	39.9 × 52.8	90.6 × 120
		KCX-M6541-20 (2,000,000 pixels)	33.6 × 44.2	43.9 × 57.7	45.4 × 59.6	68 × 89.4	53.9 × 70.8	89.2 × 117.2	59.8 × 78.6	136 × 178.7
		KCX-M6541-30 (5,000,000 pixels)	26.4 × 35.2	34.5 × 46	35.7 × 47.6	53.5 × 71.3	42.4 × 56.5	70.1 × 93.5	47 × 62.7	106.9 × 142.6
	Optical magnification		0.162	0.124	0.120	0.080	0.101	0.061	0.091	0.040
1.5	WD [mm]				65.4	90.8	114.5	168.1	230.9	424.7
	Angle-of-view size X × Y [mm]	KCX-M6541-00 (300,000 pixels)			22.8 × 29.8	30.3 × 39.7	27.7 × 36.4	39.8 × 52.2	33 × 43.2	61 × 80
		KCX-M6541-10 (1,300,000 pixels)			22.5 × 29.9	30 × 39.7	27.5 × 36.4	39.4 × 52.2	32.7 × 43.3	60.4 × 80
		KCX-M6541-20 (2,000,000 pixels)			33.8 × 44.4	45 × 59.1	41.2 × 54.2	59.2 × 77.7	49 × 64.4	90.7 × 119.1
		KCX-M6541-30 (5,000,000 pixels)			26.6 × 35.5	35.4 × 47.2	32.4 × 43.2	46.5 × 62	38.6 × 51.4	71.3 × 95.1
	Optical magnification				0.161	0.121	0.132	0.092	0.111	0.060
2.0	WD [mm]				50	65.1	91.2	123.6	196.3	319.1
	Angle-of-view size X × Y [mm]	KCX-M6541-00 (300,000 pixels)			18.2 × 23.9	22.8 × 29.8	22.6 × 29.6	30 × 39.4	28.2 × 36.9	46.3 × 60.7
		KCX-M6541-10 (1,300,000 pixels)			18.1 × 23.9	22.5 × 29.9	22.4 × 29.7	29.7 × 39.4	27.9 × 37	45.9 × 60.8
		KCX-M6541-20 (2,000,000 pixels)			27.1 × 35.6	33.8 × 44.4	33.6 × 44.2	44.6 × 58.6	41.9 × 55	68.9 × 90.5
		KCX-M6541-30 (5,000,000 pixels)			21.3 × 28.4	26.6 × 35.5	26.4 × 35.2	35.1 × 46.8	32.9 × 43.9	54.2 × 72.2
	Optical magnification				0.201	0.161	0.162	0.122	0.130	0.079
5.0	WD [mm]								104.2	129
	Angle-of-view size X × Y [mm]	KCX-M6541-00 (300,000 pixels)							14.7 × 19.2	18.4 × 24.1
		KCX-M6541-10 (1,300,000 pixels)							14.5 × 19.2	18.3 × 24.2
		KCX-M6541-20 (2,000,000 pixels)							21.8 × 28.6	27.4 × 36
		KCX-M6541-30 (5,000,000 pixels)							17.2 × 22.9	21.5 × 28.7
	Optical magnification								0.250	0.199

Note. WD is the lens tip reference.

Close-up ring [mm]			Lens							
			8 mm lens for megapixel KCX-M7214-40		12 mm lens for megapixel KCX-M7214-50		16 mm lens for megapixel KCX-M7214-60		25 mm lens for megapixel KCX-M7214-70	
None	WD [mm]		100		100		100		150	
	Angle-of-view size X × Y [mm]	KCX-M6541-00 (300,000 pixels)	52.3 × 68.5		36.6 × 48		26.9 × 35.3		24.6 × 32.2	
		KCX-M6541-10 (1,300,000 pixels)	51.8 × 68.6		36.3 × 48		26.7 × 35.3		24.4 × 32.3	
		KCX-M6541-20 (2,000,000 pixels)	77.7 × 102.1		54.4 × 71.5		40 × 52.6		36.5 × 48	
		KCX-M6541-30 (5,000,000 pixels)	61.1 × 81.5		42.8 × 57.1		31.5 × 42		28.7 × 38.3	
	Optical magnification		0.070		0.100		0.136		0.149	
0.5	WD [mm]		46	113.6	66.1	283.2	77.8	505.4	130.3	1232.2
	Angle-of-view size X × Y [mm]	KCX-M6541-00 (300,000 pixels)	27.7 × 36.4	58.1 × 76.2	25.4 × 33.3	89.2 × 117	22.1 × 28.9	118 × 154.7	21.7 × 28.4	182.8 × 239.8
		KCX-M6541-10 (1,300,000 pixels)	27.5 × 36.4	57.5 × 76.2	25.2 × 33.4	88.4 × 117.1	21.9 × 29	116.9 × 154.9	21.5 × 28.5	181.1 × 240
		KCX-M6541-20 (2,000,000 pixels)	41.2 × 54.2	86.4 × 113.5	37.8 × 49.7	132.7 × 174.3	32.8 × 43.1	175.5 × 230.5	32.2 × 42.3	271.9 × 357.3
		KCX-M6541-30 (5,000,000 pixels)	32.4 × 43.2	67.9 × 90.6	29.7 × 39.6	104.3 × 139.1	25.8 × 34.4	138 × 184	25.4 × 33.8	213.8 × 285.1
	Optical magnification		0.132	0.063	0.144	0.041	0.166	0.031	0.169	0.020
1.0	WD [mm]				47.2	131.9	62.6	243	114.6	607.2
	Angle-of-view size X × Y [mm]	KCX-M6541-00 (300,000 pixels)			19.8 × 26	45.2 × 59.2	18.6 × 24.4	59 × 77.4	19.4 × 25.4	91.4 × 119.9
		KCX-M6541-10 (1,300,000 pixels)			19.6 × 26	44.8 × 59.3	18.4 × 24.4	58.5 × 77.5	19.2 × 25.4	90.6 × 120
		KCX-M6541-20 (2,000,000 pixels)			29.4 × 38.7	67.2 × 88.3	27.7 × 36.3	87.8 × 115.3	28.8 × 37.9	136 × 178.7
		KCX-M6541-30 (5,000,000 pixels)			23.2 × 30.9	52.8 × 70.4	21.8 × 29	69 × 92	22.7 × 30.2	106.9 × 142.6
	Optical magnification				0.185	0.081	0.197	0.062	0.189	0.040
1.5	WD [mm]				35.2	81.4	51.5	155.5	102	398.9
	Angle-of-view size X × Y [mm]	KCX-M6541-00 (300,000 pixels)			16.3 × 21.4	32.7 × 42.9	16.1 × 21.1	39.4 × 51.6	17.5 × 23	61 × 80
		KCX-M6541-10 (1,300,000 pixels)			16.1 × 21.4	32.4 × 42.9	15.9 × 21.1	39 × 51.7	17.4 × 23	60.4 × 80
		KCX-M6541-20 (2,000,000 pixels)			24.2 × 31.8	48.6 × 63.8	23.9 × 31.4	58.5 × 76.9	26.1 × 34.2	90.7 × 119.1
		KCX-M6541-30 (5,000,000 pixels)			19.1 × 25.4	38.2 × 51	18.8 × 25.1	46 × 61.4	20.5 × 27.3	71.3 × 95.1
	Optical magnification				0.225	0.112	0.228	0.093	0.209	0.060
2.0	WD [mm]				26.9	56.2	43	111.7	91.5	294.7
	Angle-of-view size X × Y [mm]	KCX-M6541-00 (300,000 pixels)			13.8 × 18.1	22.5 × 29.5	14.2 × 18.6	29.8 × 39	16 × 21	45.7 × 60
		KCX-M6541-10 (1,300,000 pixels)			13.7 × 18.1	22.3 × 29.5	14 × 18.6	29.5 × 39.1	15.9 × 21	45.3 × 60
		KCX-M6541-20 (2,000,000 pixels)			20.5 × 26.9	33.4 × 43.9	21 × 27.6	44.3 × 58.1	23.8 × 31.3	68 × 89.4
		KCX-M6541-30 (5,000,000 pixels)			16.1 × 21.5	26.3 × 35	16.6 × 22.1	34.8 × 46.4	18.7 × 24.9	53.5 × 71.3
	Optical magnification				0.266	0.163	0.259	0.123	0.229	0.080
5.0	WD [mm]								53.9	107.2
	Angle-of-view size X × Y [mm]	KCX-M6541-00 (300,000 pixels)							10.5 × 13.8	18.3 × 24
		KCX-M6541-10 (1,300,000 pixels)							10.4 × 13.8	18.2 × 24
		KCX-M6541-20 (2,000,000 pixels)							15.6 × 20.5	27.2 × 35.8
		KCX-M6541-30 (5,000,000 pixels)							12.3 × 16.4	21.4 × 28.6
	Optical magnification								0.349	0.200

Note. The above table shows the field of view when the standard lens and close-up ring are used. (Closest distance value is shown in No Close-up Ring column).
Note. If a close-up ring is not used, a WD less than the value shown in this table cannot be used.
Note. If a close-up ring is used, only WD in the region of this value can be used.
Note. Values in this table are for reference only; Actual values may vary.

Accessories and part options

iVY2 System

Standard accessories

iVY2 unit

The iVY2 unit adds robot vision to the RCX320 / RCX340 robot controller.

Model	No lighting	KCX-M4400-V0
	With lighting	KCX-M4400-L0

iVY2 unit accessories

Name	Individual model
Camera trigger input cable connector	KX0-M657K-00
24V power supply connector	KCF-M5382-00

Support software for PC iVY2 Studio

iVY2 Studio is support software for the iVY2 system that allows registering part types and reference marks as well as monitoring the work search status during automatic robot operation by connecting to the robot controller.
When the iVY2 unit is purchased, iVY2 Studio is supplied with it.

Note. This software is only downloaded from the website.

Environment

Software model	KCX-M4988-10
OS	Windows XP (32bit), Vista, 7, 8 / 8.1, 10 (Supported version: V.2.01.01.00 or later)
CPU	Processor that meets or exceeds the suggested requirements for the OS being used.
Memory	Suggested amount of memory or more for the OS being used.
Hard disk capacity	30MB of available space required on installation drive. * Additional vacant space is required for saving images and data.
Display	800 x 600 dot, or higher, 32768 colors (16bit High Color) or higher (recommended)
Communication Port	Ethernet Port of TCP/IP

Note. Windows is the registered trademark of US Microsoft Corporation in U.S.A. and other countries.

Options

Camera

CCD camera	300,000 pixel	648×494 (VGA)	KCX-M6541-00
	1,300,000 pixel	1280×966 (SXGA)	KCX-M6541-10
	2,000,000 pixel	1624×1236 (UXGA)	KCX-M6541-20
CMOS camera	5,000,000 pixel	2592×1944 (QSXGA)	KCX-M6541-30

Lens

Model	8mm	KCX-M7214-00
	12mm	KCX-M7214-10
	16mm	KCX-M7214-20
	25mm	KCX-M7214-30
	8mm (megapixel support)	KCX-M7214-40
	12mm (megapixel support)	KCX-M7214-50
	16mm (megapixel support)	KCX-M7214-60
	25mm (megapixel support)	KCX-M7214-70

Close-up ring

Model	0.5mm	KX0-M7215-00
	1.0mm	KX0-M7215-10
	2.0mm	KX0-M7215-20
	5.0mm	KX0-M7215-30

Lighting control board

This board adds lighting control functionality to the iVY2 system. (Installed in the iVY2 unit when shipped)

Model	KCX-M4403-L0

Lighting control board accessories

Name	Model
Lighting power cable connector	KX0-M657K-10

Tracking board

This board adds conveyor tracking functionality to the RCX320 / RCX340 controller.

Model	KCX-M4400-T0

Tracking board accessories

Name	Single unit model
AB phase input cable connector	KX0-M657K-20

Recommended option cable Note

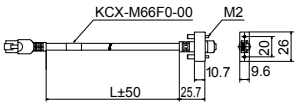
Name	Single unit model
AB phase input cable (10 m, only for counter 1)	KX0-M66AF-00

Note. Not included.
We can provide an option that is pre-wired to the AB phase input cable connector.

Camera cable

Cable for connecting the camera to the iVY2 board.

External diagram of camera cable



Model	5m	KCX-M66F0-00
	10m	KCX-M66F0-10
	15m	KCX-M66F0-20

LAN cable with shield cloth (5 m)

Model	KX0-M55G0-00

Tracking encoder cable (10m)

Model	KX0-M66AF-00