YASKAWA
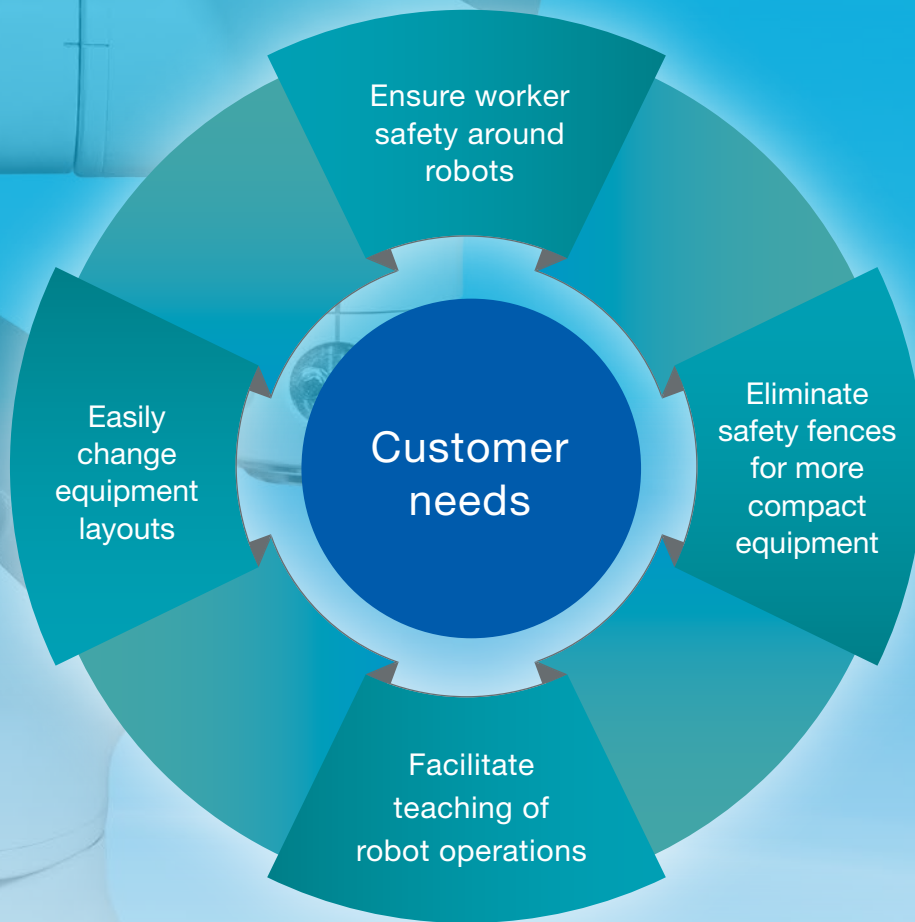
MOTOMAN-HC Series

Robot System Solutions

MOTOMAN-HC Series

Find solutions for integrating robots into your factory with YASKAWA's collaborative robots.
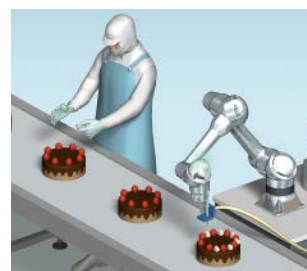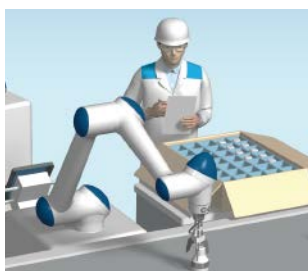
Ensure worker safety around robots

Eliminate safety fences for more compact equipment

Customer needs

Easily change equipment layouts

Facilitate teaching of robot operations

YASKAWA has the answer

We can meet our customers' diverse needs with
a wide range of functions and components.

Application examples	Machine-to-machine transfer, picking and placing/packaging parts, quality inspections/measurements

See application examples on page 8 and 9.

Data Utilization
YASKAWA Cockpit

Manipulator
HC Series

Peripheral Device

MOTOMAN-HC Series
Total Solutions

Programming Pendant
Smart Pendant

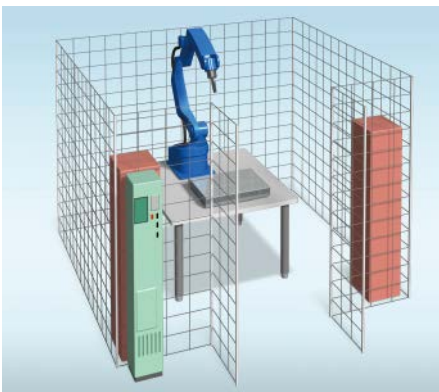**Robot Controller**
YRC1000micro/YRC1000

Is it possible to integrate robots into our factory?

? ?

The MOTOMAN-HC series has the answers to the challenges you are facing in integrating robots into your factory.

Challenge 1 Insufficient space to set up a robot and a safety fence

Q How can we install robots if there is not enough space to set up a safety fence?

A The collaborative robot can be used without a safety fence because it is equipped with optimal safety functions. This makes the installation process easier and eliminates the need to secure large spaces, such as those used for conventional industrial robots.

Challenge 2 Difficulty in changing layouts once the robot is installed

Q Safety fences and other equipment have to be moved when changing the position of an industrial robot that has already been installed. Can this process be simplified?

A The collaborative robot can be easily transported since it can be used without a safety fence. This allows for more flexible changes to layouts according to customers' production plans.
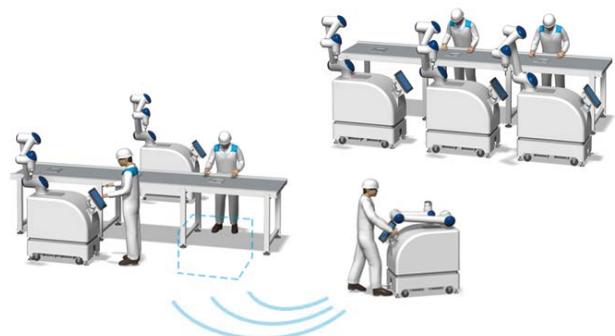
The HC series complies with the international standard ISO 10218-1 (JIS B 8433-1 for Japanese Industrial Standards). The safety function of the robot controller also complies with the international standard ISO 13849-1PLd (Cat.3), and has received safety certification by a third-party certification body. These safety functions allow the HC series systems to be constructed without safety fences. However, in all cases, a risk assessment (→ page 20) must be conducted.

Challenge 3 — Safety of workers performing operations near robots

Q Can the safety of workers be guaranteed when they work close to robots?

A The intrinsically safe design of the HC series robots prevents a worker's fingers and hands from being caught in the robot arm and enables safe operation. The PFL function (→ page 6) allows the robot to stop automatically when it detects a force that exceeds preset limits and minimizes any damage that may be caused by contact between humans and robots.

Challenge 4 — Difficulty teaching because workers are unfamiliar with robot operations

Q Can people who are not familiar with industrial robots or have no specialist knowledge carry out the process of teaching robots?
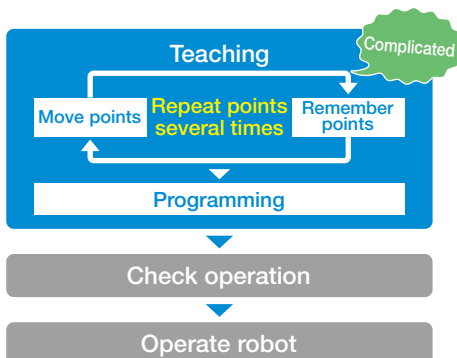
A Conventional teaching requires complicated setting processes, but with the HC series robots, even workers who are unfamiliar with robots can intuitively teach positions for robots using the direct teach function (→ page 6) and the Smart Pendant (→ page 14).

Teaching — Complicated
Move points — Repeat points several times — Remember points
Programming
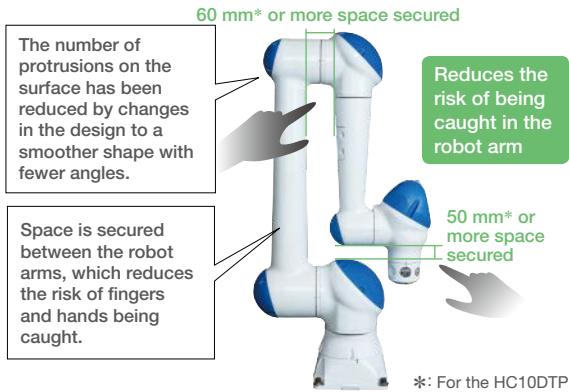Check operation
Operate robot

Direct teach function

Smart Pendant

MOTOMAN-HC Series Features

Safe design and safe operation

Safe design to reduce the risk of fingers and hands being caught

60 mm* or more space secured

The number of protrusions on the surface has been reduced by changes in the design to a smoother shape with fewer angles.

Reduces the risk of being caught in the robot arm

Space is secured between the robot arms, which reduces the risk of fingers and hands being caught.

50 mm* or more space secured

＊: For the HC10DTP

Safety functions for collaborative work

▶ PFL (Power and Force Limiting) function
The PFL function stops the robot when it detects an external force. The robot will automatically stop when it detects an external force exceeding the preset limit value, such as when there is contact or a collision between the robot and a worker or the robot and an object.
[International standard ISO 13849-1PLd (Cat.3) certification has been received from a third-party certification body.]

▶ Escape from clamping function
This function frees a worker or object when they become caught in the robot. Since the robot moves in a rewinding motion, the worker or object can be released smoothly.

Note: The above functions are enabled during collaborative operation mode only.

Achieve both safety and work efficiency

· The HC series can switch between two modes: collaborative operation mode and normal operation mode.
· In collaborative operation mode, the robot moves slowly for safety. If the robot makes contact with a worker or object, the safety functions stop the robot safely. In normal operation mode, the safety functions are disabled to allow high-speed movement in the same manner as a normal robot.
· Used in combination with a presence detection sensor, the robot can switch between collaborative operation mode when workers are nearby and normal operation mode when no workers are around, achieving both safety and work efficiency.

Collaborative operation mode: Low speed

Normal operation mode: High speed

Presence detection sensor
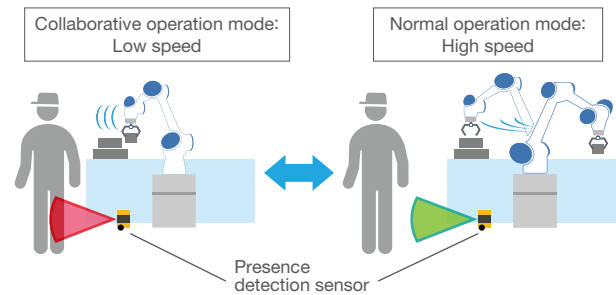
Easy teaching

Direct teach function
· The HC series is equipped with a direct teach function. A worker can use this function to teach positions by directly moving the robot arm by hand. Even people who are unfamiliar with robot operations can easily teach positions.

Direct teach buttons
· The direct teach buttons are built into the tip of the robot arm. The robot positions can be taught by pressing these buttons. This makes teaching easier because a programming pendant does not need to be held when teaching positions.

Dedicated direct teach screens
· There are user-friendly teaching operation screens dedicated to direct teach in the programming pendant and Smart Pendant. The settings related to direct teach can be easily configured on these pages.

Direct teach buttons

【Dedicated direct teach screens】
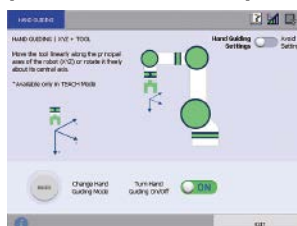
Programming pendant screen

Smart Pendant screen

The HC series complies with the international standard ISO 10218-1 (JIS B 8433-1 for Japanese Industrial Standards). The safety function of the robot controller also complies with the international standard ISO 13849-1PLd (Cat.3), and has received safety certification by a third-party certification body. These safety functions allow the HC series systems to be constructed without safety fences. However, in all cases, a risk assessment (→ page 20) must be conducted.

Lineup of specifications for many applications

■ MOTOMAN-HC Series Lineup

Model	HC10DTP	HC10DT Hand-carry Type	HC10DTP (Dust- and Drip-proof Specification)	HC10DTFP (Food Specification)	HC20DTP (Dust- and Drip-proof Specification)	HC20SDTP (Dust- and Drip-proof Specification)
	10DTP	10DT	10DTP	10DTFP	20DTP	20SDTP
Payload	10 kg	10 kg	10 kg	10 kg	20 kg	20 kg
Maximum Reach	1379 mm	1379 mm	1379 mm	1379 mm	1900 mm	1425 mm
IEC Protection Class	IP20	IP20	IP66/IP67	IP66/IP67	IP66/IP67	IP67

Superior environmental resistance

HC20SDTP
(Dust- and Drip-proof Specification)

Target models 10DTP 10DTFP 20DTP 20SDTP

· The overall protection class of robots with the dust- and drip-proof specification or food specification is IP67, allowing them to be used in environments where they are exposed to liquids, such as water and cutting oil, and dust, such as chips.
· The robots are built with consideration for sanitation management, and designed to be easy to clean and prevent the accumulation of dust and dirt. The robots are also built for safety with the use of food-grade grease.

Special specification for the food industry

HC10DTFP
(Food Specification)

Target models 10DTFP

· The food specification uses a special surface treatment to prevent contamination by foreign objects due to peeling paint. The robots can also be washed with specific cleaning solutions*, which makes the food specification optimal for the food industry that requires strict sanitation management.
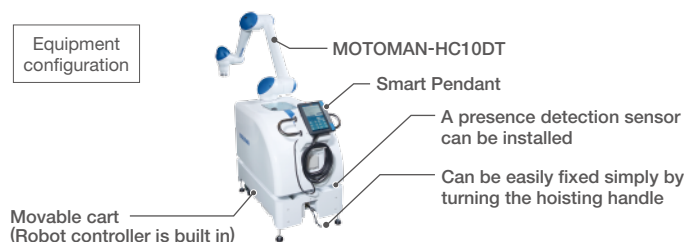
＊Specific cleaning solutions: Alcohol or acidic/alkaline cleaning solutions (make sure to follow specified PH and concentrations).

Easy to move and set up

Target models 10DT

· The hand-carry type features a MOTOMAN-HC10DT mounted on a movable cart, which allows it to be easily moved. Unlike a robot installed in a fixed position, the hand-carry type can be easily moved and set up. This allows it to be moved to the necessary process and support changing layouts, which will improve the flexibility of production processes.
· Since the hand-carry type can be used by simply connecting it to a 100-VAC power supply, it can be used in places other than production sites. (A three-phase, 200-VAC specification is also available.)

Equipment configuration

MOTOMAN-HC10DT

Smart Pendant

A presence detection sensor can be installed

Can be easily fixed simply by turning the hoisting handle

Movable cart
(Robot controller is built in)

Applications

The MOTOMAN-HC series makes production lines more compact by eliminating the need for a safety fence.
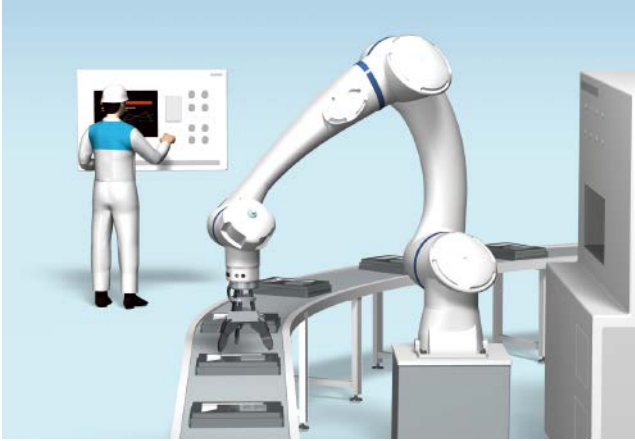
Machine-to-machine transfer

The collaborative robot can be used to transfer parts inside working areas or between machines, without using a safety fence. A dust- and drip-proof specification model can be selected for post-processes which require cleaning or machining processes which use lubricants such as cutting oil. While the robot is in operation, workers check that the robot is operating normally and check the quality of processed parts. In addition to reducing repetitive tasks by workers, the robot can also be set up rapidly on existing production lines since it can be operated without any safety fences. This creates a highly flexible layout that can easily be integrated into customers' equipment.
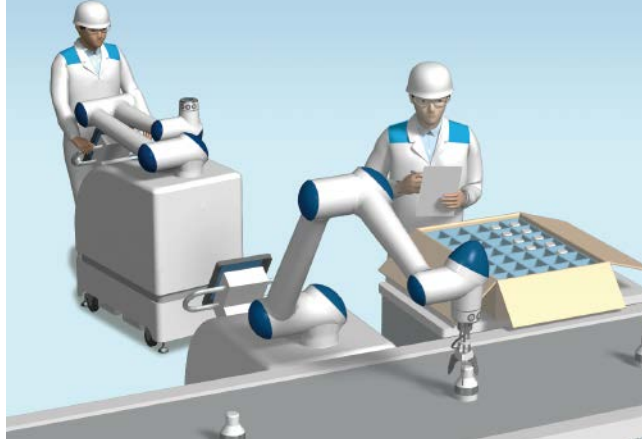

Pick and place, packaging

The collaborative robot can be used to perform tasks such as sorting, picking, placing, and packaging. Workers can install the robot on lines where needed and check the operation status. When the robot is used in combination with a vision sensor, the robot can perform picking operations by detecting parts or products with different shapes. The layout and the position of the robot can be changed according to production status. The robot can also relieve workers from repetitive tasks and correctly pick, place, and package parts or products to improve accuracy and quality.

Quality inspections and measurements

Quality inspections and measurements of parts can be performed side-by-side with workers when the collaborative robot is used in combination with distance measurement sensors and vision sensors. Workers check the entire product and the robot inspects sections of the product where precision is required to ensure consistent quality.
A compact layout can be constructed since collaborative robots can be operated without safety fences. Collaboration between the workers and the robot can reduce workloads and improve production quality.
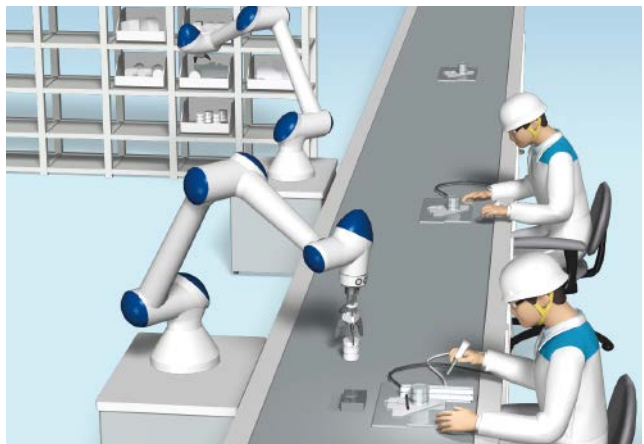
Assembly

The collaborative robot can assemble products together with workers. The robot transports the required parts to workers who assemble products, such as tightening screws and fitting.
The robot can be placed even in limited spaces such as assembly lines since collaborative robots can be operated without safety fences. In addition to reducing the workload of workers, the robot can improve product quality since it not only improves work efficiency, but also helps workers assemble parts in the exact order.

The HC series complies with the international standard ISO 10218-1 (JIS B 8433-1 for Japanese Industrial Standards). The safety function of the robot controller also complies with the international standard ISO 13849-1PLd (Cat.3), and has received safety certification by a third-party certification body. These safety functions allow the HC series systems to be constructed without safety fences. However, in all cases, a risk assessment (→ page 20) must be conducted.
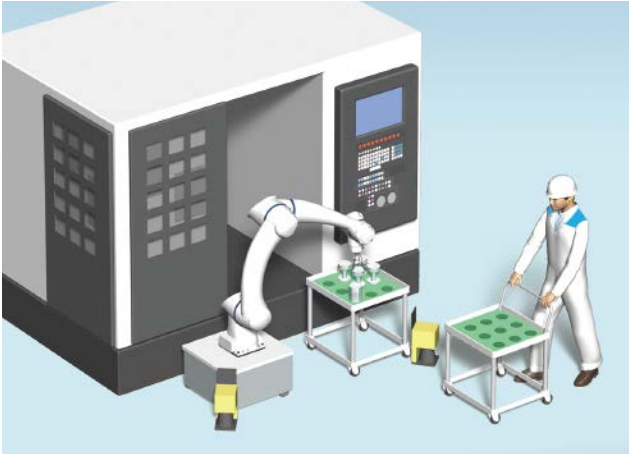
Workpiece loading and unloading for processing machines

A dust- and drip-proof specification model can perform loading and unloading for processing machines (machine tending) instead of workers.
The collaborative robot can automate the repetitive tasks of machine tending and deliver improvements in productivity because it works irrespective of time while handling environments with flying cutting oil (coolant).

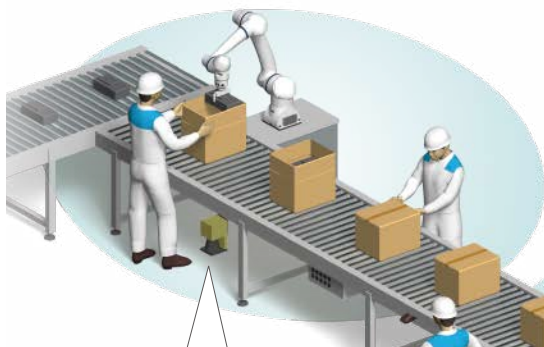## Filling of liquid food products

The MOTOMAN-HC10DTFP features a food-safe surface that prevents paint from peeling and mixing with food. The surface can also be washed with specific cleaning solutions because of its improved resistance to cleaning solutions.
Collaborative robots designed for easy maintenance and sanitation can now be integrated into various processes in food factories. Dividing work roles between robots and workers allows processes once thought difficult to automate to be partially automated, improving both food product quality and productivity.

Packing and palletizing

▶ What is packing?
This is the process of packaging items into containers, such as small boxes. In addition to high-speed picking and transfer of multiple items, the robot is optimal for tasks that require a high degree of accuracy, such as picking, placing, and stacking operations.

▶ What is palletizing?
This is the process of stacking ready-to-ship boxes/bags of various sizes onto pallets.

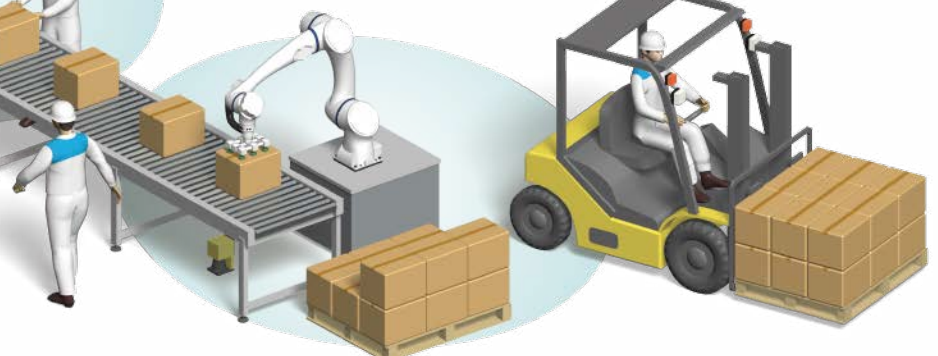The elimination of a safety fence allows a forklift to enter the working area to directly pick and transfer pallets.
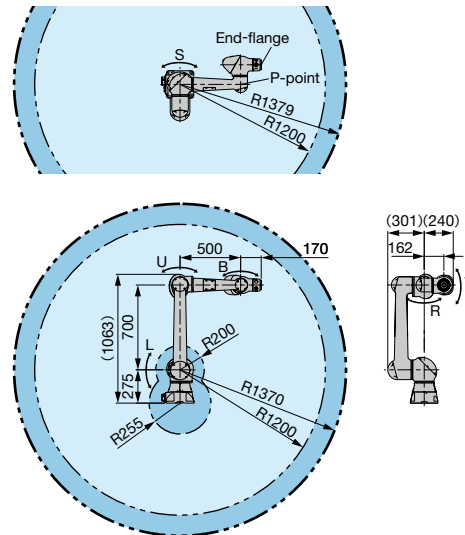
A presence detection sensor monitors the working area, allowing the robot to operate at high speeds when workers are not in the area.

HC10DTP

■**Dimensions** Units: mm 〔 〕: P-point Maximum Envelope 〔 〕: End-flange Maximum Envelope

Note: Refer to individual dimension diagrams for details including the shape of the flange and dimensions.

Model		MOTOMAN-HC10DTP
Type		YR-1-06VXCP10-A00
Controlled Axis		6 (vertically articulated)
Payload		10 kg
Maximum Reach		1379 mm
Repeatability*1		0.05 mm
Range of Motion	S -axis (turning)	−210° - +210°
	L -axis (lower arm)	−180° - +180°
	U -axis (upper arm)	−290° - +290°
	R -axis (wrist roll)	−210° - +210°
	B -axis (wrist pitch/yaw)	−180° - +180°
	T -axis (wrist twist)	−210° - +210°
Maximum Speed*2	S -axis (turning)	2.27 rad/s, 130°/s
	L -axis (lower arm)	2.27 rad/s, 130°/s
	U -axis (upper arm)	3.14 rad/s, 180°/s
	R -axis (wrist roll)	3.14 rad/s, 180°/s
	B -axis (wrist pitch/yaw)	4.36 rad/s, 250°/s
	T -axis (wrist twist)	4.36 rad/s, 250°/s
Maximum Speed of the Tip	Collaborative operation mode	1000 mm/s *5
	Normal operation mode	2000 mm/s
Allowable Moment	R -axis (wrist roll)	27.4 N·m
	B -axis (wrist pitch/yaw)	27.4 N·m
	T -axis (wrist twist)	9.8 N·m
Allowable Inertia (GD²/4)	R -axis (wrist roll)	0.78 kg·m²
	B -axis (wrist pitch/yaw)	0.78 kg·m²
	T -axis (wrist twist)	0.10 kg·m²
Approx. Mass		48 kg
IEC Protection Class		IP20
Ambient Conditions	Temperature	0 ℃ to +40 ℃
	Humidity	20% to 80%RH (non-condensing)
	Vibration	4.9 m/s² (0.5 G) or less
	Altitude	1000 m or less
Power Requirements*3		1.0 kVA
Mounting*4		Floor, ceiling, wall, tilt
Compatible Controller		YRC1000micro, YRC1000

∗1: Repeatability conforms to ISO 9283.
∗2: The maximum speed in this table is the available maximum value and will vary depending on the load, posture, or range of motion.
∗3: The power requirement value is obtained using Yaskawa's in-house measurement conditions and will vary depending on the load, motion pattern, or cycle time.
∗4: When wall- or tilt-mounted, the S-axis motion range is limited.
∗5: A safe speed must be set based on the results of the risk assessment.
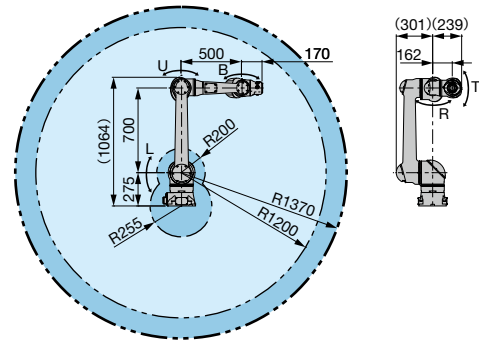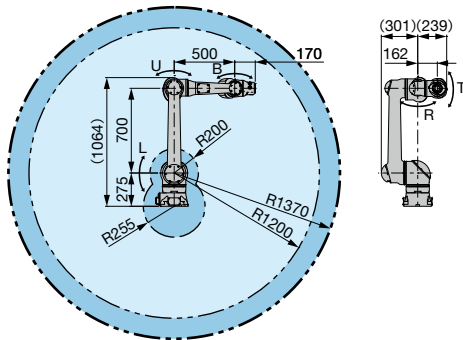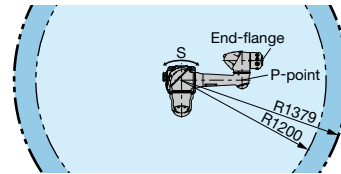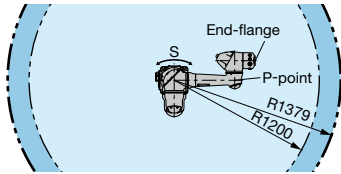
HC10DTP
(Dust- and Drip-proof Specification)

HC10DTFP
(Food Specification)

■ **Dimensions**　Units: mm　⬚: P-point Maximum Envelope　⬚: End-flange Maximum Envelope

Model		MOTOMAN-HC10DTP (Dust- and Drip-proof Spec.)	MOTOMAN-HC10DTFP (Food Spec.)
Type		YR-1-06VXCP10-B00	YR-1-06VXCP10-F00
Controlled Axis		6 (vertically articulated)	6 (vertically articulated)
Payload		10 kg	10 kg
Maximum Reach		1379 mm	1379 mm
Repeatability*1		0.05 mm	0.05 mm
Range of Motion	S -axis (turning)	−210° - +210°	−210° - +210°
	L -axis (lower arm)	−180° - +180°	−180° - +180°
	U -axis (upper arm)	−290° - +290°	−290° - +290°
	R -axis (wrist roll)	−210° - +210°	−210° - +210°
	B -axis (wrist pitch/yaw)	−180° - +180°	−180° - +180°
	T -axis (wrist twist)	−210° - +210°	−210° - +210°
Maximum Speed*2	S -axis (turning)	2.27 rad/s, 130°/s	2.27 rad/s, 130°/s
	L -axis (lower arm)	2.27 rad/s, 130°/s	2.27 rad/s, 130°/s
	U -axis (upper arm)	3.14 rad/s, 180°/s	3.14 rad/s, 180°/s
	R -axis (wrist roll)	3.14 rad/s, 180°/s	3.14 rad/s, 180°/s
	B -axis (wrist pitch/yaw)	4.36 rad/s, 250°/s	4.36 rad/s, 250°/s
	T -axis (wrist twist)	4.36 rad/s, 250°/s	4.36 rad/s, 250°/s
Maximum Speed of the Tip	Collaborative operation mode	1000 mm/s *5	1000 mm/s *5
	Normal operation mode	2000 mm/s	2000 mm/s
Allowable Moment	R -axis (wrist roll)	27.4 N·m	27.4 N·m
	B -axis (wrist pitch/yaw)	27.4 N·m	27.4 N·m
	T -axis (wrist twist)	9.8 N·m	9.8 N·m
Allowable Inertia (GD²/4)	R -axis (wrist roll)	0.78 kg·m²	0.78 kg·m²
	B -axis (wrist pitch/yaw)	0.78 kg·m²	0.78 kg·m²
	T -axis (wrist twist)	0.10 kg·m²	0.10 kg·m²
Approx. Mass		58 kg	58 kg
IEC Protection Class		IP66/IP67	IP66/IP67
Ambient Conditions	Temperature	0 ℃ to +40 ℃	
	Humidity	20% to 80%RH (non-condensing)	
	Vibration	4.9 m/s² (0.5 G) or less	
	Altitude	1000 m or less	
Power Requirements*3		1.0 kVA	
Mounting*4		Floor, ceiling, wall, tilt	
Compatible Controller		YRC1000micro, YRC1000	

*1: Repeatability conforms to ISO 9283.
*2: The maximum speed in this table is the available maximum value and will vary depending on the load, posture, or range of motion.

*3: The power requirement value is obtained using Yaskawa's in-house measurement conditions and will vary depending on the load, motion pattern, or cycle time.
*4: When wall- or tilt-mounted, the S-axis motion range is limited.
*5: A safe speed must be set based on the results of the risk assessment.
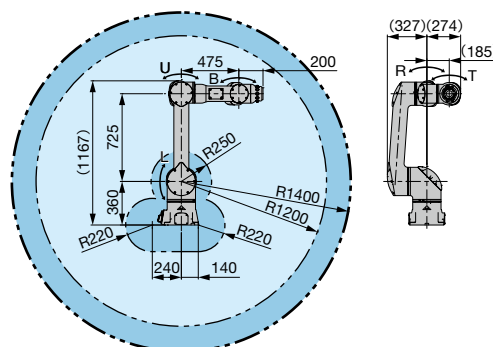
HC20DTP
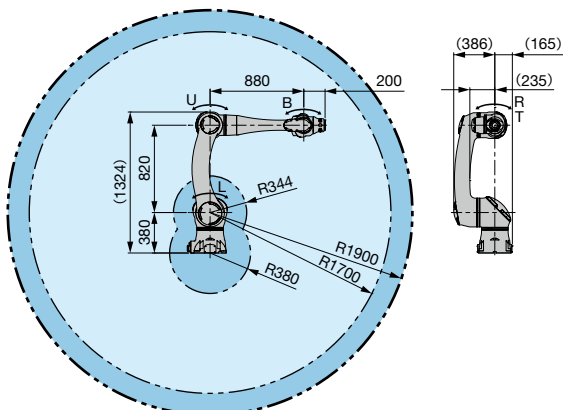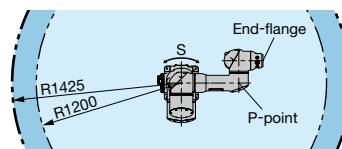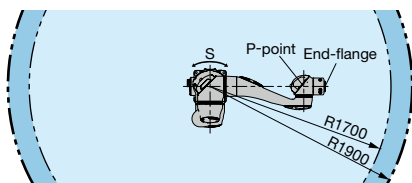(Dust- and Drip-proof Specification)

HC20SDTP
(Dust- and Drip-proof Specification)

■ **Dimensions** Units: mm ⬚ : P-point Maximum Envelope ▨ : End-flange Maximum Envelope

Note: Refer to individual dimension diagrams for details including the shape of the flange and dimensions.

Model		MOTOMAN-HC20DTP (Dust- and Drip-proof Spec.)	MOTOMAN-HC20SDTP (Dust- and Drip-proof Spec.)
Type		YR-1-06VXCP20-B00	YR-1-06VXSCP20-B00
Controlled Axis		6 (vertically articulated)	6 (vertically articulated)
Payload		20 kg	20 kg
Maximum Reach		1900 mm	1425 mm
Repeatability*1		0.05 mm	0.05 mm
Range of Motion	S -axis (turning)	−210° - +210°	−210° - +210°
	L -axis (lower arm)	−180° - +180°	−180° - +180°
	U -axis (upper arm)	− 67° - +247°	−290° - +290°
	R -axis (wrist roll)	−210° - +210°	−210° - +210°
	B -axis (wrist pitch/yaw)	−180° - +180°	−180° - +180°
	T -axis (wrist twist)	−210° - +210°	−210° - +210°
Maximum Speed*2	S -axis (turning)	1.40 rad/s, 80°/s	1.83 rad/s, 105°/s
	L -axis (lower arm)	1.40 rad/s, 80°/s	1.57 rad/s, 90°/s
	U -axis (upper arm)	2.09 rad/s, 120°/s	2.35 rad/s, 135°/s
	R -axis (wrist roll)	2.27 rad/s, 130°/s	2.27 rad/s, 130°/s
	B -axis (wrist pitch/yaw)	3.14 rad/s, 180°/s	3.14 rad/s, 180°/s
	T -axis (wrist twist)	3.14 rad/s, 180°/s	3.14 rad/s, 180°/s
Maximum Speed of the Tip	Collaborative operation mode	1000 mm/s *5	1000 mm/s *5
	Normal operation mode	2000 mm/s	2000 mm/s
Allowable Moment	R -axis (wrist roll)	58.8 N·m	58.8 N·m
	B -axis (wrist pitch/yaw)	58.8 N·m	58.8 N·m
	T -axis (wrist twist)	29.4 N·m	29.4 N·m
Allowable Inertia (GD²/4)	R -axis (wrist roll)	4.0 kg·m²	4.0 kg·m²
	B -axis (wrist pitch/yaw)	4.0 kg·m²	4.0 kg·m²
	T -axis (wrist twist)	2.0 kg·m²	2.0 kg·m²
Approx. Mass		140 kg	97 kg
IEC Protection Class		IP66/IP67	IP67
Ambient Conditions	Temperature	0 ℃ to +40 ℃	
	Humidity	20% to 80%RH (non-condensing)	
	Vibration	4.9 m/s² (0.5 G) or less	
	Altitude	1000 m or less	
Power Requirements*3		1.5 kVA	
Mounting*4		Floor, ceiling, wall, tilt	
Compatible Controller		YRC1000micro, YRC1000	

✱1: Repeatability conforms to ISO 9283.
✱2: The maximum speed in this table is the available maximum value and will vary depending on the load, posture, or range of motion.
✱3: The power requirement value is obtained using Yaskawa's in-house measurement conditions and will vary depending on the load, motion pattern, or cycle time.
✱4: When wall- or tilt-mounted, the S-axis motion range is limited.
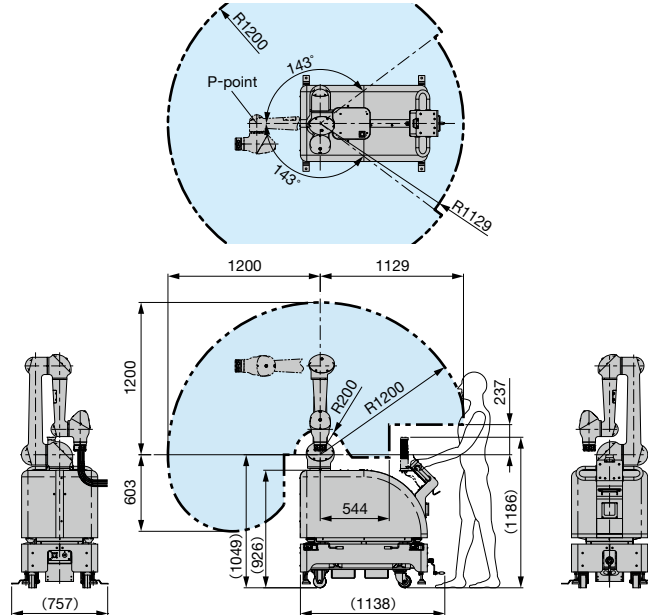✱5: A safe speed must be set based on the results of the risk assessment.

HC10DT
Hand-carry Type

■ Dimensions Units: mm ▢: P-point Maximum Envelope

Note: Refer to individual dimension diagrams for details including the shape of the flange and dimensions.

Model	MOTOMAN-HC10DT Hand-carry Type	
Type	YHT-1-06VXHC10-1	YHT-1-06VXHC10-2
Application	For moving and installing collaborative robots	
Mountable Manipulator	MOTOMAN-HC10DT *3	
Mountable Controller	YRC1000micro	
Mountable Pendant	Smart Pendant *4	
Approx. Mass*1	243 kg	225 kg
Mountable Mass*2	20 kg	
IEC Protection Class	-	
Power Supply	100 VAC, 50 Hz/60 Hz	Three-phase: 200/220 VAC, 50 Hz/60 Hz Single-phase: 200/230 VAC, 50 Hz/60 Hz *5
Length of Cable for Primary Source	4 m	- *6
Ambient Conditions	Temperature	0 ℃ to +40 ℃	
	Humidity	20% to 80%RH (non-condensing)	
	Vibration	4.9 m/s² (0.5 G) or less	
	Altitude	1000 m or less	
Installation Method	Accessory adjuster installation (fastened with anchor bolts)	
Mounting	Floor	

＊1: The mass with the manipulator, controller, pendant, and transformer (only YHT-1-06VXHC10-1) mounted
＊2: The mass excluding the standard components mounted on the cart (manipulator, controller, pendant, and transformer (only YHT-1-06VXHC10-1))
＊3: Contact your Yaskawa representative for the manipulator type.
＊4: A programming pendant can also be used. Contact your Yaskawa representative for details.
＊5: Selectable from three-phase or single-phase
＊6: The primary source cable must be prepared by customers.

Programming Pendant for Collaborative Robot

Smart Pendant

The Smart Pendant is a programming pendant that uses simple operations to teach robots and can be easily used even by people with little to no experience with robots.
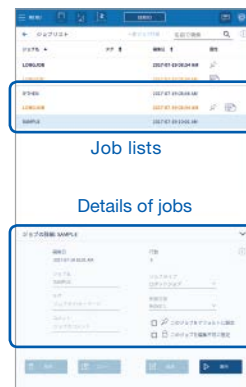
Feature 1: Large touchscreen monitor

· The Smart Pendant is equipped with a large, user-friendly 10.1" touchscreen.

· Operability has been improved as required information can be viewed on an easy-to-understand display.
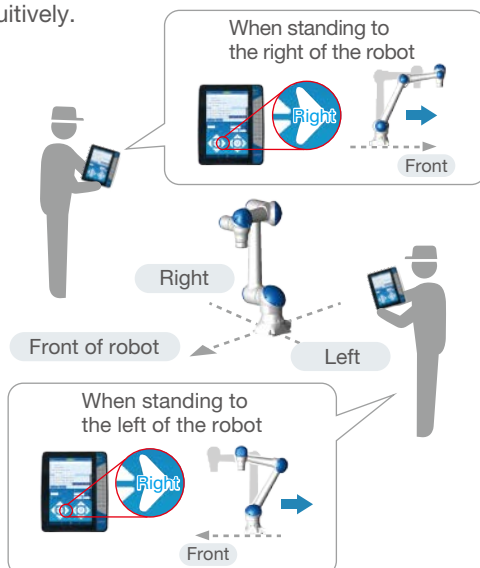
Job list

Job lists

Details of jobs

Tool setting

Advanced tool setting

Feature 2: Smart mode

· The Smart Pendant features smart mode, which matches the operating direction of the robot to the orientation of the worker holding the Smart Pendant, so the direction of robot movement can be understood intuitively.

When standing to the right of the robot

Right

Front

Right

Front of robot

Left

When standing to the left of the robot

Right

Front

Note: The robot can also be operated in the normal manner (without smart mode).

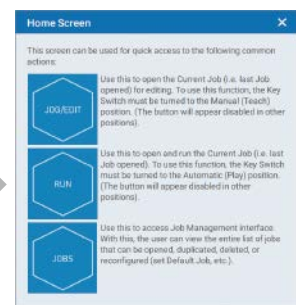## Feature 3: Guidance and help function

· The Smart Pendant is equipped with a guidance and help function for beginners to improve their understanding of the Smart Pendant operations.

Main menu

Common menu bar
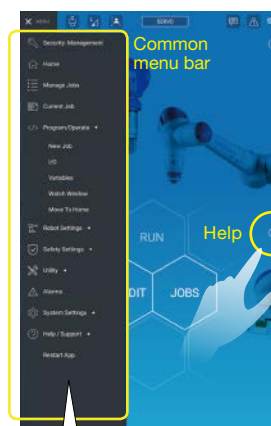
Help

The common menu bar is at the left side which can be displayed at any screen.

Help function

Icons are placed throughout the screen to display explanations of functions.

Robot Controller
YRC1000micro / YRC1000

▲ YRC1000micro
(Japan, Asia, and North America model)

Items	YRC1000micro		YRC1000
	Japan, Asia, and North America model specifications	Europe model specifications	
Configuration	Open structure IP20*²		Dust proof structure IP54 (area of backside duct fan: IP2X)
Dimensions	425 (W)×315 (D)×180 (H) mm, 24 L	425 (W)×315 (D)×250 (H) mm, 33 L	598 (W)×427 (D)×490 (H) mm, 125 L
Approx. Mass	16.5 kg (External axis amplifiers for up to two axes can be built in.)	20 kg (External axis amplifiers for up to two axes can be built in.)	70 kg max. (External axis amplifiers for up to three axes can be built in.)
Cooling System	Direct cooling		Indirect cooling
Ambient Temperature	During operation: 0℃ to +40℃, During storage: −10℃ to +60℃		During operation: 0℃ to +45℃, During storage: −10℃ to +60℃
Relative Humidity	90% max. (non-condensing)		
Altitude	2000 m (with temperature derating) Derating condition of over 1000 m: max. ambient temperature decreases 1% per 100 m.		
Power Supply	Single-phase 200/230 VAC (+10% to −15%), 50/60 Hz (±2%) Three-phase 200/220 VAC (+10% to −15%), 50/60 Hz (±2%) Optional: Single-phase 100/115 VAC, 50/60 Hz*³		Japan: three-phase 200 VAC to 240 VAC (+10% to −15%), 50/60 Hz (±2%) Asia and Europe: three-phase 380 VAC to 440 VAC (+10% to −15%), 50/60 Hz (±2%) (neutral grounding) North America: three-phase 380 VAC to 480 VAC (+10% to −15%), 50/60 Hz (±2%) (neutral grounding)
Grounding	Grounding resistance : 100 Ω or less		Grounding resistance: 100 Ω or less for 200-V class, 10 Ω or less for 400-V class
Digital I/Os*¹	Specialized signals: 7 inputs and 1 output General signals: 5 inputs and 7 outputs (7 transistor outputs) Expanded safety general signals: 6 inputs and 5 outputs (5 transistor outputs)		Specialized signals: 19 inputs and 6 outputs General signals: 40 inputs and 40 outputs (32 transistor outputs, 8 relay outputs)
Positioning System	Serial communications (absolute encoder)		
Programming Capacity	JOB: 200,000 steps, 10,000 instructions CIO ladder: 1,500 steps max.		JOB: 200,000 steps, 10,000 instructions CIO ladder: 20,000 steps max.
Expansion Slots	PCI express: 2 slots		
LAN (Connection to Host)	1 (10BASE-T/100BASE-TX)		2 (10BASE-T/100BASE-TX)
Interface	Not possible		RS-232C: 1ch
Drive Units	SERVOPACK for AC servomotors		

✻1: I/O points are limited to achieve the functions of the MOTOMAN-HC series. Contact your Yaskawa representative for details.
✻2: The YRC1000micro has an open structure (IP20) and must be used in a clean environment (free from electrically-conductive dirt and dust) that meets the standard of pollution degree 2 specified in IEC 60664-1.
✻3: MOTOMAN-HC20DTP is not supported. The external dimensions and mass will differ because the transformer module must be added. Contact your Yaskawa representative for details.

▶ Programming Pendant (optional)

Items	Smart Pendant	Programming Pendant
Dimensions	215 (W)×69 (D)×284 (H) mm	152 (W)×49.5 (D)×300 (H) mm
Approx. Mass	1.120 kg	0.730 kg
Display	10.1 WXGA TFT LCD, 1280×800 pixels, LED backlight, touch panel	5.7 VGA TFT LCD, 640×480 pixels, touch panel
Compatible Controller	YRC1000micro	YRC1000micro, YRC1000

Easily Connect End Effectors and Peripheral Devices

The HC series can support a wide variety of end effectors and peripheral devices. Yaskawa has cooperated with peripheral device manufacturers to make available an extensive lineup of end effectors and peripheral devices that can be easily connected and configured to simplify setup.

▶ Easy connections
Flanges for mounting devices to the robot and cables are available for each manufacturer.

HC series
Mounting flange
End effector

3D Vision Package

MotoSight3D

Bin picking, which used to be impossible with robots, can be automated with the high-performance 3D vision package.

Range of detectable workpieces have increased	Works exceptionally well with metal workpieces

· Greasy parts with high reflection of light can be handled.
· Parts with curved surface or with complicated structure can be handled. ➡ **Optimal for pressed parts for automobile.**
· Target parts size (approx.)
  10×10 mm (when using RV300) to 1,000×1,000 mm (when using RV1100)
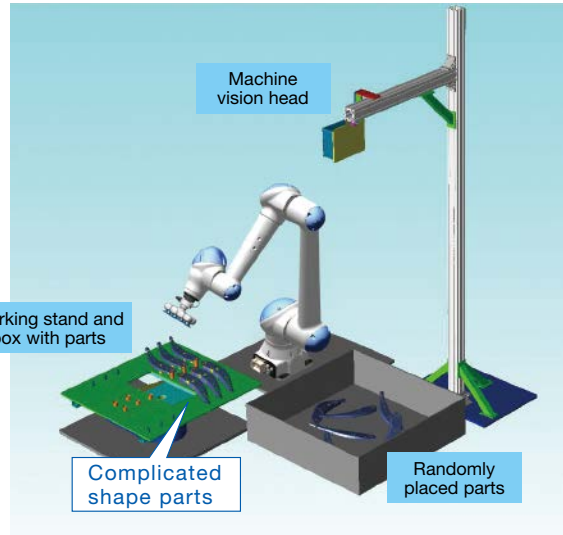
Highly accurate detection capability	Reduces the number of processes

· 3D position posture (6 degree-of-freedom) can be detected with one measurement.
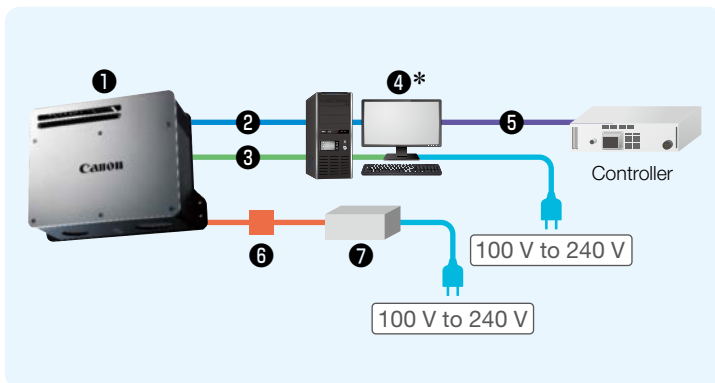· Temporary placing table or other positioning sensors are not needed.

Very simple setting operation	Reduces setup time

· Workpiece can be registered by inputting the CAD data and imaging the piled parts.

Machine vision head

Working stand and box with parts

Complicated shape parts

Randomly placed parts

■System Configuration

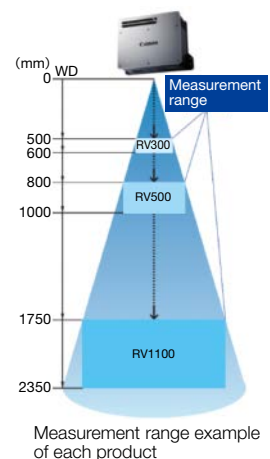Controller

100 V to 240 V

100 V to 240 V

∗: Contact your Yaskawa representative for information on how to select a PC when using a general PC or other PCs.

■Device Composition Table

NO.	Name	Specification
❶	Machine Vision Head	Select from RV1100/RV500/RV300
❷	Communications Cable (PC - sensor)	Cable length: 16 m (optional: 36 m)
❸	Vision Cable (PC - sensor)	Cable length: 16 m (optional: 36 m)
❹∗	PC (optional)	Industrial PC
❺	Communications Cable (PC - YRC1000micro)	Cable length: 10 m
❻	Power Cable (thin)	Cable length: 5 m
❻	Power Cable (thick)	Cable length: 10 m
❼	Power Source Box and Cable	—

■Machine Vision Head Specifications

Items		RV1100	RV500	RV300
Measurement	Measurement distance	1750 mm to 2350 mm	800 mm to 1000 mm	500 mm to 600 mm
	Measurement range	1160 mm × 1160 mm × 600 (H) mm	540 mm × 540 mm × 200 (H) mm	340 mm × 340 mm × 100 (H) mm
	Target minimum workpiece size Note: Necessary projection area	45 × 45 mm	20 × 20 mm	10 × 10 mm
Time	Measurement + recognition time	2.5 s	1.8 s	1.8 s
	Measurement cycle	5.0 s	3.0 s	3.0 s
Recognition	Recognition method	3D CAD matching		
	Repeatability	±0.5 mm	±0.15 mm	±0.1 mm
	Number of types to be registered	200 types		
Function (standard)	Empty pallet judgment function	Function to judge whether the pallet is empty or not		
	Pallet measurement function	Function to measure the position of thrown-in pallet		
	Interference check function	Function to detect interference between the hand and the workpiece or between the hand and the pallet		
	Calibration function	Function to perform the calibration of the robot and the machine vision head		
	Exposure time automatic adjustment function	Function that eliminates gloss of industry components/parts, and halation due to oil adhesion		
Main Unit	Dimensions (Protrusions are not included)	252 (W) × 206 (D) × 124 (H) mm		
	Approx. Mass	6.4 kg		

(mm) WD
0
500
600
800
1000
1750
2350

Measurement range

RV300
RV500
RV1100

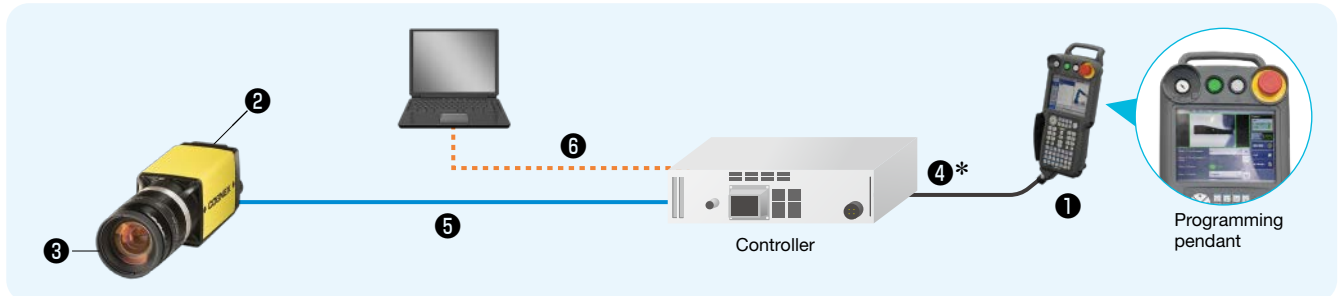Measurement range example of each product

2D Vision Package

MotoSight2D

MotoSight2D is a vision package that enables the operation of vision systems using a programming pendant with YASKAWA's own software.

Note: The Smart Pendant is not compatible with this function.

■ System Configuration

❋: An external box must be installed for the controller.

■ Device Composition Table

NO.	Name	Specification
❶	MotoSight2D (PP application + MotoPlus + macro job)	Settings installed prior to shipping
❷	2D Vision Camera (built-in image processing device)	Select a standard, high-spec, or ultra-high-spec model.
❸	Lens	Focal distance: 4 / 6 / 8 / 12 / 16 / 25 / 35 / 50 / 75 mm
❹	External Box for YRC1000micro for MotoSight2D	With built-in 24-V power supply and PoE hub, wiring of communications cable (Ethernet)
❺	Camera Communications Cable	Connect the camera with the controller Cable length: 5 m (flexible/mobile cable) ❋Total cable length up to 35 m with an optional extension cable.
❻	Cable for PC Connection	Connect the controller with the PC Cable length: 5 m ❋Use PC only during maintenance or detailed settings for camera jobs.

■ 2D Vision Camera Lineup

Model		Application	Resolution	CPU Speed Ratio*	Image Processing Function
Standard Model MS8101	In-Sight 8101M-363-40 or equivalent	Position correction (for automobile parts, electronic parts, etc.)	1280 × 1024 pixels	× 1.0	COGNEX Full tool set
High-spec Model MS8401	In-Sight 8401M-363-50 or equivalent	High-speed processing, including conveyor synchronization (for high-speed picking of food, etc.)	1280 × 1024 pixels	× 4.0	COGNEX Full tool set
Ultra-high-spec Model MS8402	In-Sight 8402M-363-50 or equivalent	High precision and wide field of view (for transfer of automobile glass parts, etc.)	1600 × 1200 pixels	× 4.0	COGNEX Full tool set

❋: Refers to the ratio where the CPU speed of the standard model is "1.0".

6-axis Force Sensing Control Function

MotoFit

Changes in force that robot is subjected to are detected by 6-axis force sensor and fed back to robot movements.

■ Force Sensor Specifications

| Force Sensor Type		200 N/20 N·m
Rated Load	Fx，Fy，Fz	200 N
	Mx，My，Mz	20 N·m
Maximum Static Load	Fx, Fy, Fz	800 N
	Mx, My, Mz	80 N·m
Linearity		±3%FS
Hysteresis		±3%FS
Cross-axis Sensitivity		±5%FS
Protection Rating		IP65
Ambient Conditions	Temperature	0 ℃ to +40 ℃
	Humidity	20% to 80%RH (non-condensing)
Dimensions		90 dia. × 32.5 (H) mm
Mass		560 g

■ System Configuration
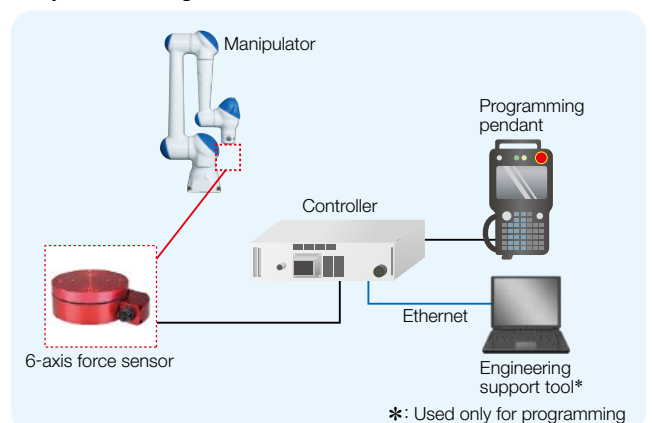
❋: Used only for programming

YASKAWA Cockpit

YASKAWA Cockpit, a core component of the i³-Mechatronics concept, is an original software that performs digital management.

i³-Mechatronics
New value with "i cube", digital data solution

APP component

YCP Platform component
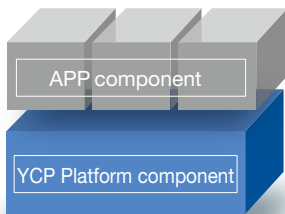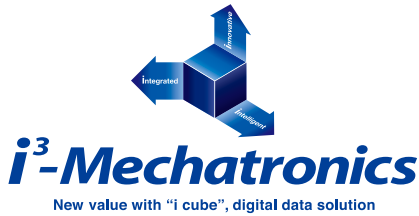
Concept of i³-Mechatronics

The word "mechatronics" was first coined by an engineer at Yaskawa Electric in 1969. This word consists of the term "mechanism", which is short for mechanical engineering, and "electronics", which encompasses the idea of electrical engineering. Our passion for automation is built in to this word.
Yaskawa added three "i"s (integrated, intelligent, and innovative) to the word, "mechatronics" to help identify solutions to business challenges right at the customers' production sites by incorporating the use of data in mechatronics products.
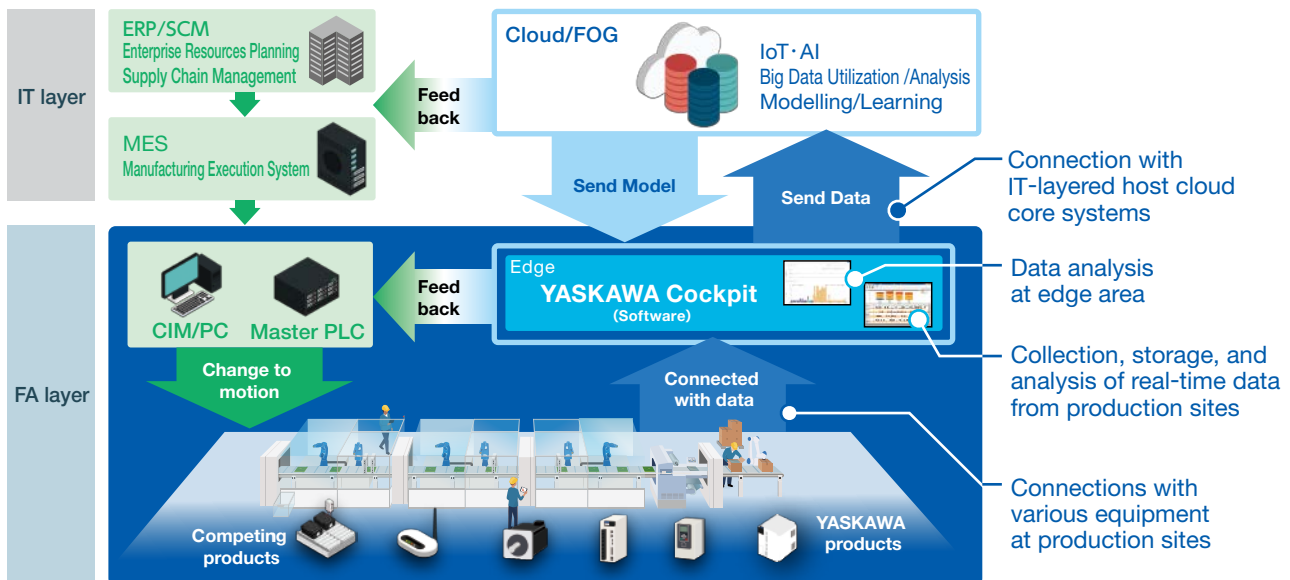
YASKAWA Cockpit

· Collect, store, and analyze real-time data from production sites
· Establish connections with equipment other than YASKAWA products
· Freely customize and add optional functions depending on production sites

Item	Function
APP component	Application software to add functions to YASKAWA Cockpit. Functions can be selected from Yaskawa's lineup or developed and added by customers. APPs will be developed sequentially.
YCP* Platform component	Basic software for YASKAWA Cockpit

✱: Abbreviation of YASKAWA Cockpit
Note: Functions of YASKAWA Cockpit include those that are under development.
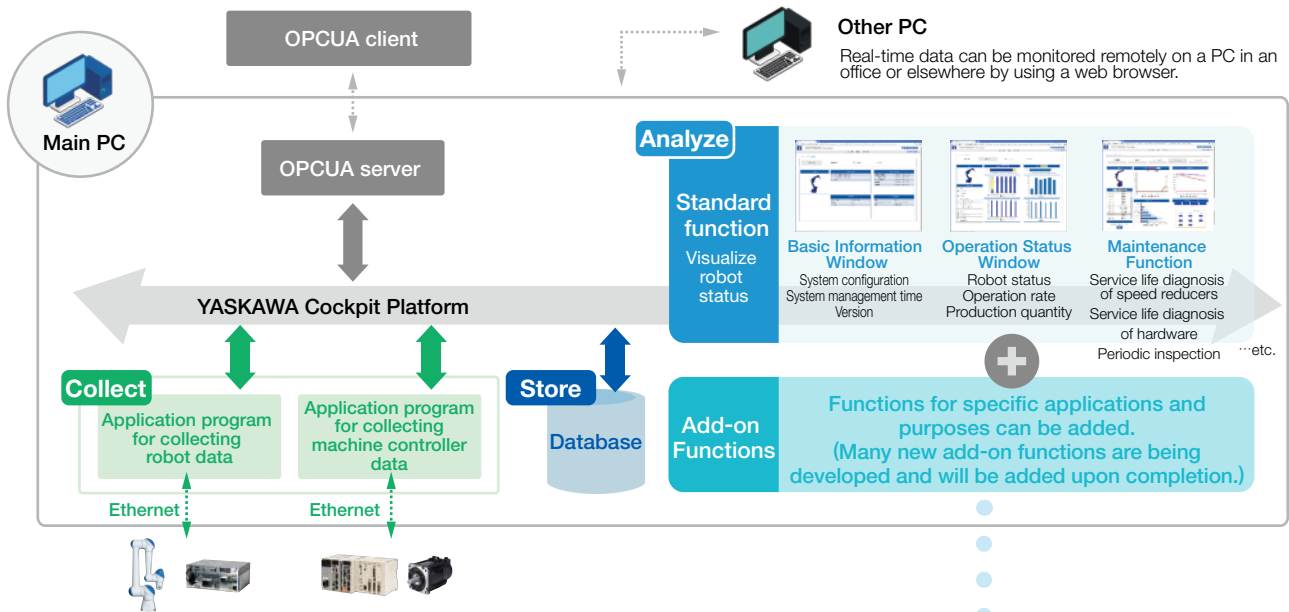　　　Contact your Yaskawa representative for more details.

Complete automation of production sites, integrate and analyze equipment data

Data from production sites that are automated by integrating components and processes is collected and stored in real time using YASKAWA Cockpit. This data is used for AI learning and big data analysis in cooperation with host systems. Production operations can be transformed by learning models and analysis results that are fed back to production sites.


IT layer

ERP/SCM
Enterprise Resources Planning
Supply Chain Management

MES
Manufacturing Execution System

Cloud/FOG

IoT·AI
Big Data Utilization /Analysis
Modelling/Learning

Feed back

Send Model

Send Data

Connection with IT-layered host cloud core systems

FA layer

CIM/PC　Master PLC

Change to motion

Feed back

Edge
YASKAWA Cockpit
(Software)

Connected with data

Data analysis at edge area

Collection, storage, and analysis of real-time data from production sites

Connections with various equipment at production sites

Competing products

YASKAWA products

System configuration and basic functions of YASKAWA Cockpit

The YCP Platform collects, stores, and analyzes data collected in real time from robot and machine controllers at production sites. The system is equipped with a standard function to visualize the status of robots and functions tailored to robot applications can be added. The YCP screen display can be viewed on the main PC screen and other PC screens.

OPCUA client

Other PC
Real-time data can be monitored remotely on a PC in an office or elsewhere by using a web browser.

Main PC

OPCUA server

Analyze

Standard function
Visualize robot status

Basic Information Window
System configuration
System management time
Version

Operation Status Window
Robot status
Operation rate
Production quantity

Maintenance Function
Service life diagnosis of speed reducers
Service life diagnosis of hardware
Periodic inspection ⋯etc.

YASKAWA Cockpit Platform

Collect

Application program for collecting robot data

Application program for collecting machine controller data

Store

Database

Add-on Functions

Functions for specific applications and purposes can be added.
(Many new add-on functions are being developed and will be added upon completion.)

Ethernet   Ethernet

YCP Add-on Function   Robot Recorder

Visualize the data from torque sensors built into the collaborative robot in detail

YASKAWA Cockpit   **Collaborative robot torque sensors**
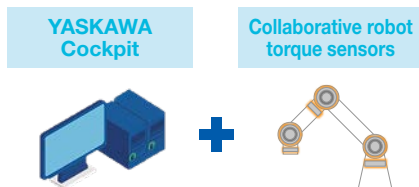
Each axis of the collaborative robot is equipped with a torque sensor. The value of the load the torque sensor receives from outside the robot can be checked on the programming pendant. However, the displayed information is limited in some ways. For example, the values cannot be viewed as a numeric change.
This add-on function allows the values of the torque sensors to be monitored in detail, and it is useful for such purposes as estimating the causes of problems and failure prediction monitoring.

● External force monitor
The change in the external force detected by the torque sensors on the robot is displayed in a graph.

Contact with obstacle

Reaction force of work

The external force change for the specified date/display period is graphed.
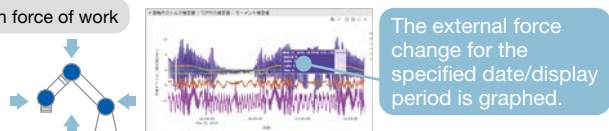
In addition to external force, the line number of the executed job, alarms, and other information are also displayed, so the information can also be used to estimate the causes of problems.

● Sensor status monitor
Deviation in the home position of the torque sensor for each axis is monitored, and alarm notification is provided to perform calibration when a threshold value is reached.
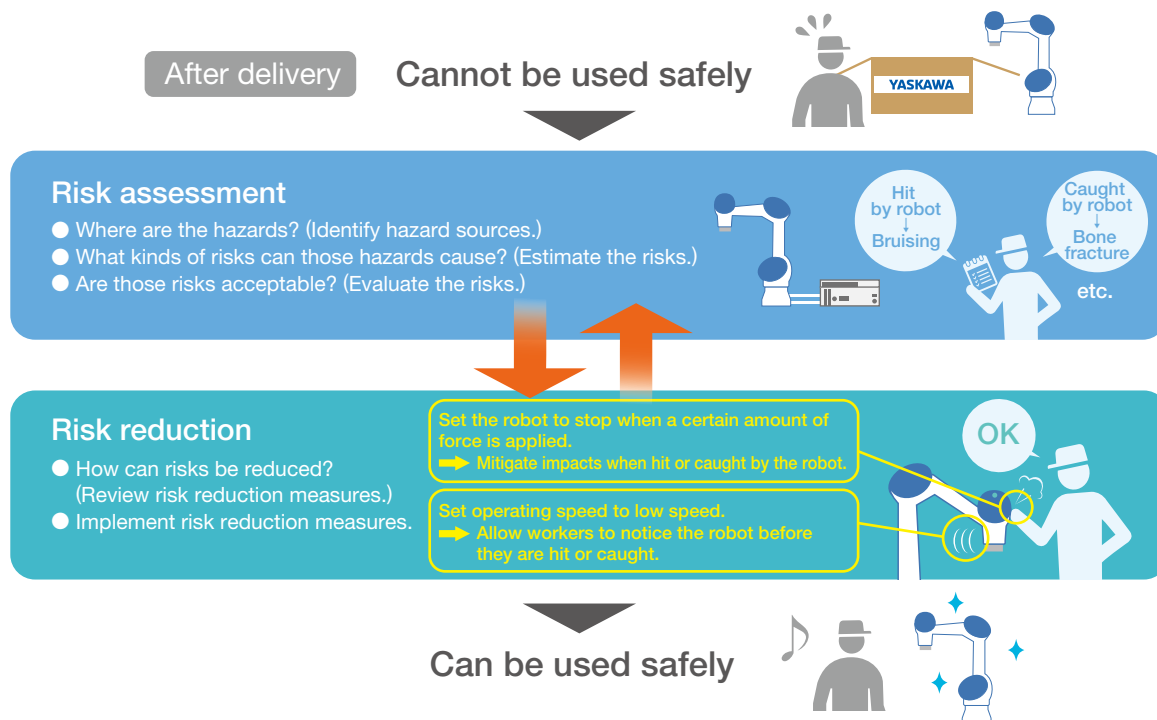
Deviation due to collision

Alarm notification when the estimated torque while the robot is stopped exceeds a preset torque threshold value
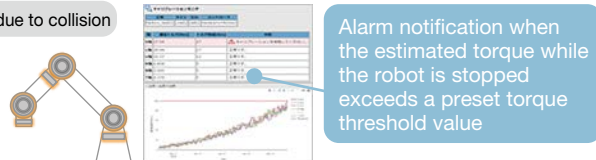
MOTOMAN-HC Series

What is a risk assessment?

The HC series collaborative robot cannot be used safely as delivered without a safety fence. The customer (including the system integrator) must conduct risk assessments and implement risk reduction measures on their own, and then check if potential hazards have been eliminated.

After delivery   Cannot be used safely

Risk assessment
- Where are the hazards? (Identify hazard sources.)
- What kinds of risks can those hazards cause? (Estimate the risks.)
- Are those risks acceptable? (Evaluate the risks.)

Hit by robot ↓ Bruising   Caught by robot ↓ Bone fracture   etc.

Risk reduction
- How can risks be reduced? (Review risk reduction measures.)
- Implement risk reduction measures.

Set the robot to stop when a certain amount of force is applied.
➡ Mitigate impacts when hit or caught by the robot.

Set operating speed to low speed.
➡ Allow workers to notice the robot before they are hit or caught.

OK

Can be used safely

YASKAWA

YASKAWA ELECTRIC CORPORATION