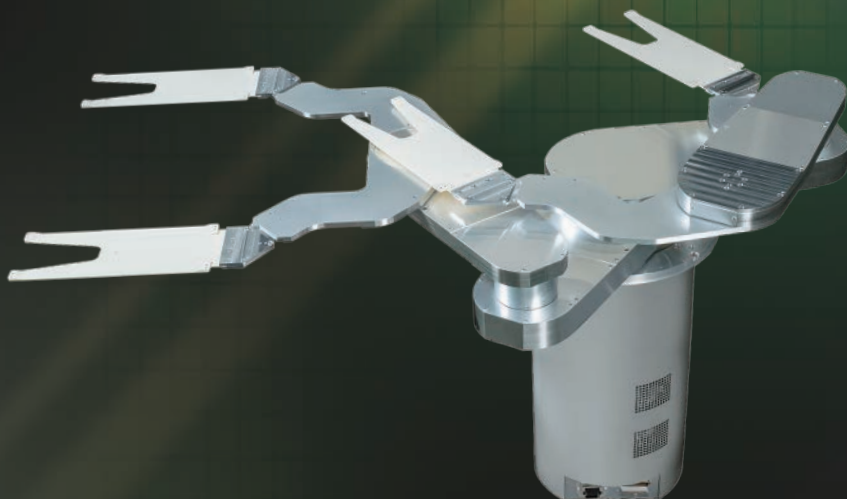
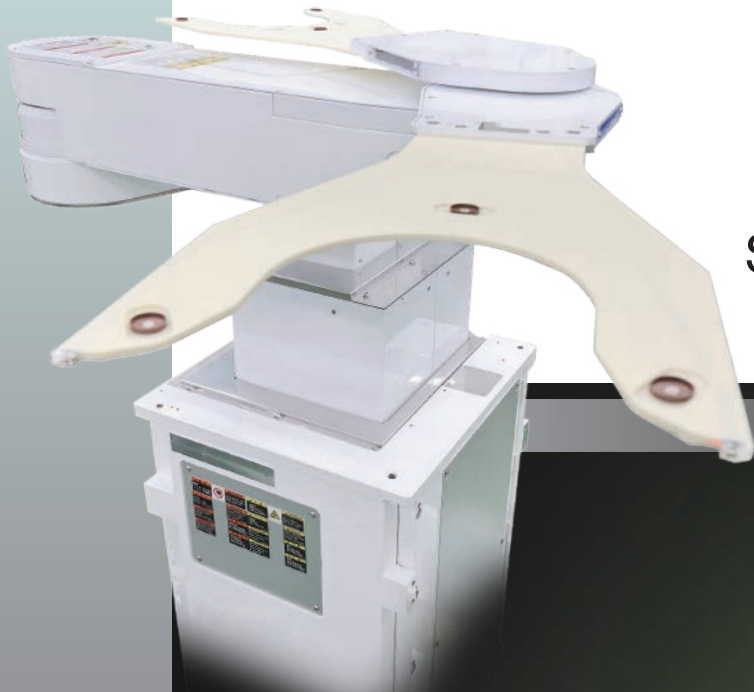


YASKAWA

Clean Robots for
Semiconductor Wafer Transfer
SEMISTAR Series

Compatible with SR200 Robot Controller

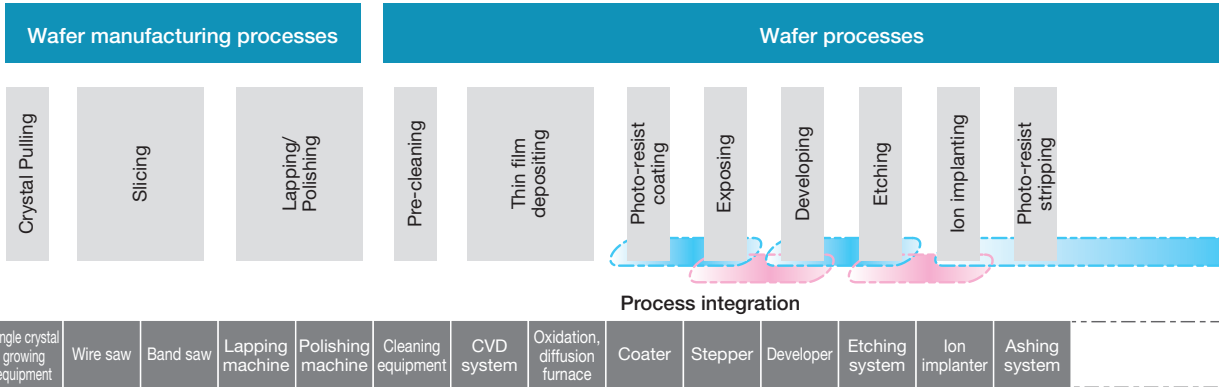


Fast and less damage. Introducing Yaskawa's ideal clean robot for wafer transfer.

Full product lineup supporting miniaturization, multi-layering, and other ever-evolving semiconductor technologies. These robots use Yaskawa's original design technology to offer even more added value, such as reducing damage to wafers.



Semiconductor Manufacturing Process



Feature 1 High-accuracy transfer

Smooth and high-accuracy transfer can be achieved with the high-accuracy motion and positioning features of Yaskawa robots. Notably, the new SEMISTAR-GEKKO series robots that have been added to the product lineup use direct drive (DD) motors in the robot arms. These motors, which do not require speed reducers, help the robots achieve higher accuracy and greater reductions in vibrations than ever before.

Comparison of accuracy in the SEMISTAR-GEKKO series

	Former models		GEKKO MD124D
Vibration Acceleration	2.50 G	10 times ➔	0.25 G or less*1
Repeatability	0.05 mm	Doubled ➔	0.02 mm
Absolute positioning accuracy	0.1 mm	Doubled ➔	0.05 mm

*1: This value represents the vertical direction of the end effector when the arm extends or retracts.

Note: The values on the left are just some examples of results obtained using Yaskawa's in-house measurement conditions and are not official product specifications.

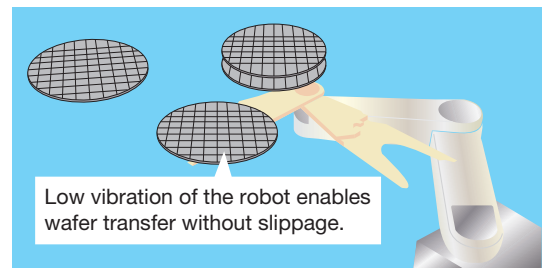
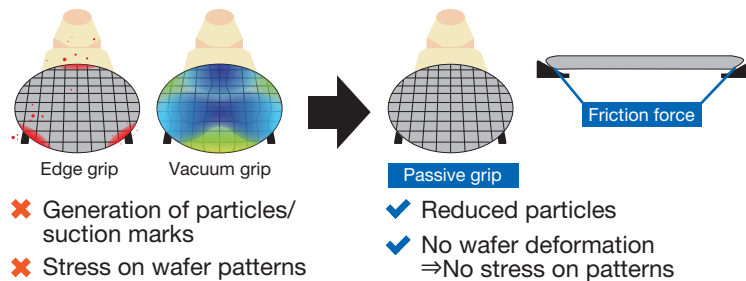
Feature 2 Reduced damage to wafers

The SEMISTAR-GEKKO series has achieved low vibration, resulting in the adoption of a passive grip end effector. This minimizes stress on a wafer, enabling high-speed and high-accuracy wafer transfers with less damage to wafers.

Passive grip method

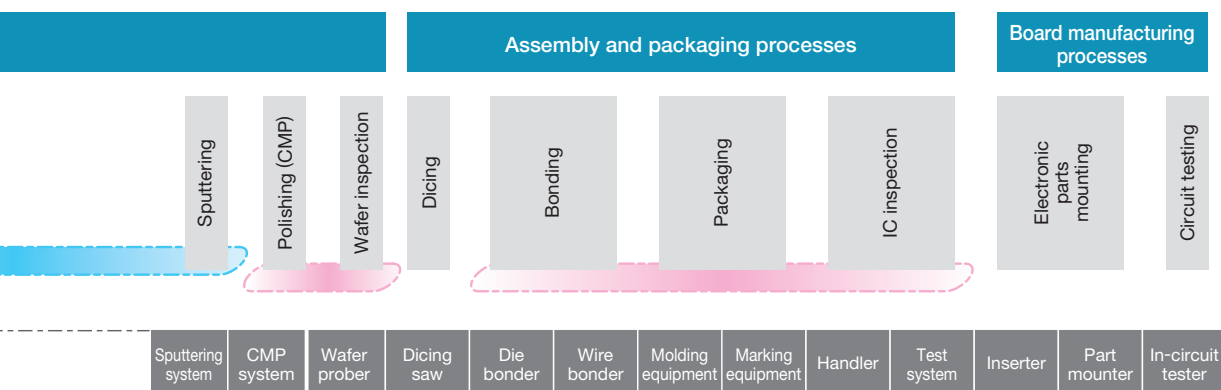
A wafer is held using friction force between a pad attached to an end effector and the wafer surface. This passive grip method can reduce damage to wafers by eliminating the dispersion of particles, which occurs when using an edge grip, as well as the adhesion of suction marks on wafers, which occurs when using a vacuum grip.

Image of end effector



Feature 3 Wide range of optional specifications

A variety of optional specifications are available depending on the equipment used, including long reach and heavy payload as well as long-stroke elevation axis and corrosion-resistant.



Clean Robots

Yaskawa offers an extensive lineup of products to meet the diverse needs of the semiconductor manufacturing process and can also customize the following products.

Vacuum linear motors and products using these motors are also available.

Yaskawa offers strong support to customers to help them find solutions for the problems they face. Contact your Yaskawa representative for more details.

For atmospheric environments



GEKKO MD124D

Model	SEMISTAR-GEKKO MD124D	
Features	<ul style="list-style-type: none"> · High-speed and high-accuracy transfer with minimum stress to wafers using direct drive motors · Batteryless 	
Specification	Standard	
Applicable Wafer Size	300 mm (SEMI compliant)	
Wafer Grip Method	Passive grip (Vacuum and edge grips are also available)	
Length of Standard End Effector	345 mm	
Degree of Freedom	5 degrees of freedom	
Range of Motion	EX-axis (Extension)	1215 mm*3
	R-axis (Extension)	-
	TH-axis (Rotation)	330°
	Z-axis (Elevation)	480 mm
	H-axis (End Effector Rotation)	440°
Minimum Rotation Radius	510 mm	
Repeatability*1	0.05 mm (P-P)	
Mass	86 kg	
Clean Rating*2	ISO class 1	



MU124DLZ CR

MU124DLZ CR
at maximum extension

Model	SEMISTAR-MU124D	SEMISTAR-MU124DLZ CR	
Features	<ul style="list-style-type: none"> · Compatible with the new SR200 robot controller, with a transfer capability equivalent to the former model · Equipped with batteryless absolute encoders 		
Specification	Standard	Corrosion-resistant, long-stroke elevation axis	
Applicable Wafer Size	300 mm (SEMI compliant)		
Wafer Grip Method	Vacuum/Edge grip		
Length of Standard End Effector	345 mm		
Degree of Freedom	5 degrees of freedom		
Range of Motion	EX-axis (Extension)	1215 mm*3	
	R-axis (Extension)	-	
	TH-axis (Rotation)	330°	
	Z-axis (Elevation)	480 mm	805 mm
	H-axis (End Effector Rotation)	440°	
Minimum Rotation Radius	510 mm		
Repeatability*1	0.1 mm (P-P)		
Mass	82 kg	147.5 kg	
Clean Rating*2	ISO class 1		

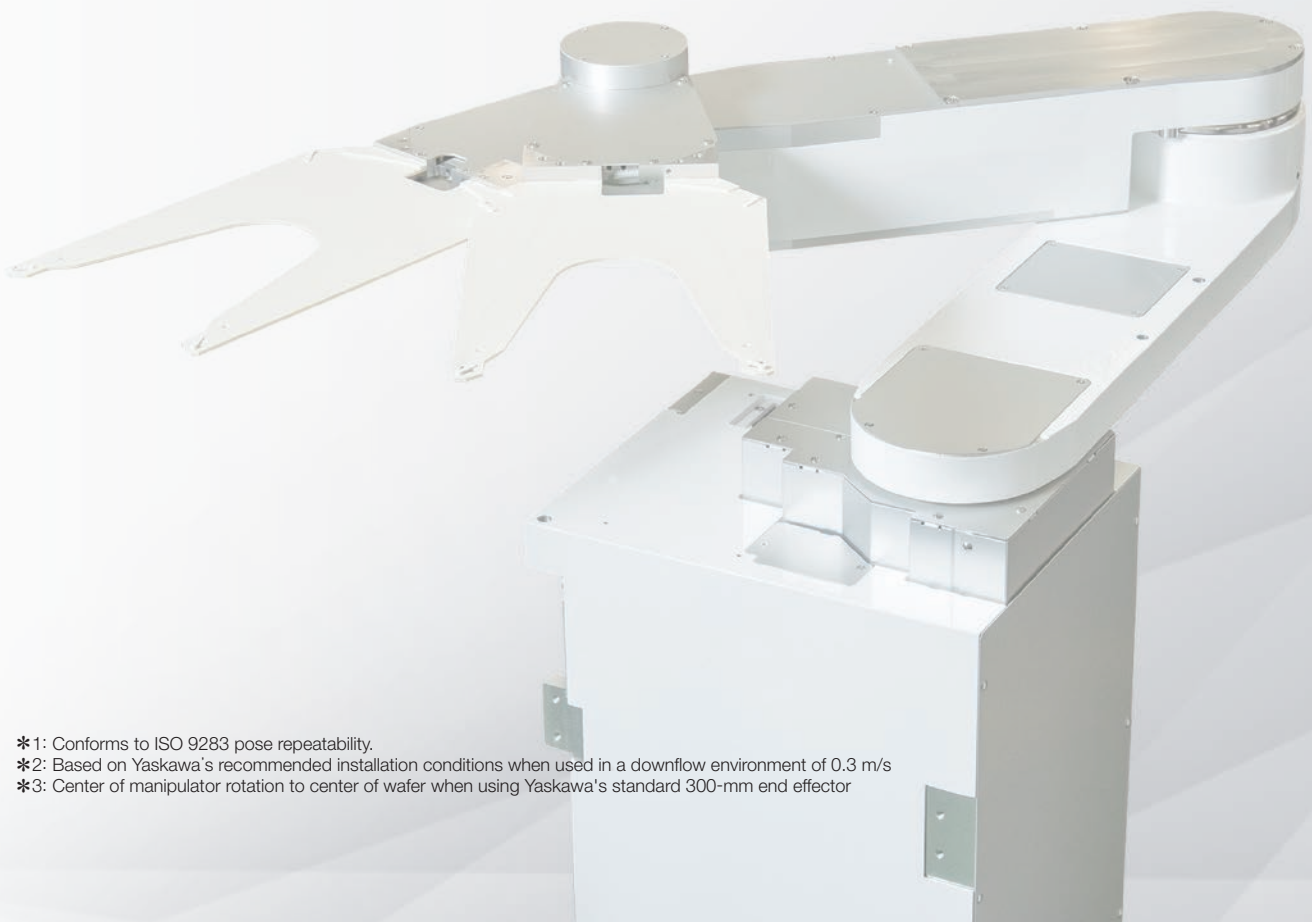


MU122D



MU201D

Model	SEMISTAR-MU122D	SEMISTAR-MU201D	
Features	<ul style="list-style-type: none"> · Compatible with the new SR200 robot controller, with a transfer capability equivalent to the former model · Equipped with batteryless absolute encoders 		
Specification	Standard		
Applicable Wafer Size	300 mm (SEMI compliant)		
Wafer Grip Method	Vacuum/Edge grip		
Length of Standard End Effector	350 mm	315 mm	
Degree of Freedom	5 degrees of freedom	4 degrees of freedom	
Range of Motion	EX-axis (Extension)	732 mm* ³	-
	R-axis (Extension)	-	657 mm* ³
	TH-axis (Rotation)	332°	360°
	Z-axis (Elevation)	355 mm	380 mm
	H-axis (End Effector Rotation)	350°	-
Minimum Rotation Radius	300 mm	255 mm	
Repeatability* ¹	0.1 mm (P-P)		
Mass	57 kg	45 kg	
Clean Rating* ²	ISO class 1		



*1: Conforms to ISO 9283 pose repeatability.

*2: Based on Yaskawa's recommended installation conditions when used in a downflow environment of 0.3 m/s

*3: Center of manipulator rotation to center of wafer when using Yaskawa's standard 300-mm end effector

Clean Robots

For vacuum environments



Model	SEMISTAR-GEKKO VD31HDA-C	SEMISTAR-GEKKO VD31HQF-C
Features	<ul style="list-style-type: none"> Low-contamination and high-speed wafer transfer using vacuum direct drive motors and steel belts Dual arms reduce swap time. 	<ul style="list-style-type: none"> Low-contamination and high-speed wafer transfer using vacuum direct drive motors and steel belts Single arm can simultaneously hold and transfer two wafers to two process chambers.
Applicable Wafer Size	Up to 300 mm (SEMI compliant)	
Wafer Grip Method	Passive grip	
Length of Standard End Effector	618.8 mm*3	468 mm*3
Degree of Freedom	4 degrees of freedom	
Range of Motion	R-axis (Extension)	968 mm*3
	T-axis (Rotation)	360° (Endless)
	Z-axis (Elevation)	150 mm
Minimum Rotation Radius	427.5 mm*3	490 mm*3
Repeatability*1	0.05 mm (P-P)	
Mass	109 kg	112 kg
Supported Vacuum*2	High vacuum	



Model	SEMISTAR-GEKKO VD31LBA-C	SEMISTAR-VS22LDS
Features	<ul style="list-style-type: none"> Low-contamination and high-speed wafer transfer using vacuum direct drive motors and steel belts Arm configuration for small rotation radius and long reach 	<ul style="list-style-type: none"> Compact and lightweight model for low-vacuum environments Equipped with batteryless absolute encoders
Applicable Wafer Size	Up to 300 mm (SEMI compliant)	
Wafer Grip Method	Passive grip	
Length of Standard End Effector	383.5 mm*3	220 mm*3
Degree of Freedom	4 degrees of freedom	2 degrees of freedom
Range of Motion	R-axis (Extension)	776 mm*3
	T-axis (Rotation)	360° (Endless)
	Z-axis (Elevation)	150 mm
Minimum Rotation Radius	300 mm*3	320 mm*3
Repeatability*1	0.05 mm (P-P)	0.1 mm (P-P)
Mass	103 kg	22 kg
Supported Vacuum*2	High vacuum	Low vacuum

*1: Conforms to ISO 9283 pose repeatability.

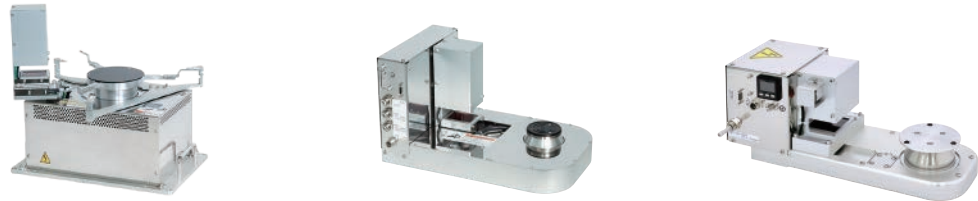
*2: Differs depending on the customer's operating environment. Yaskawa has a track record with robots that support ultra-high vacuums (10E-7Pa). Contact your Yaskawa representative for more details.

*3: When using end effectors specified by Yaskawa

Prealigners

Yaskawa offers the following lineup of prealigners used for aligning wafers.

High-speed, high-accuracy alignment is achieved with the application of high-speed edge sensing using a noncontact line sensor. Yaskawa has an extensive track record in providing prealigners for special wafers, such as glass wafers, and vacuum aligners. Yaskawa offers strong support to customers to help them find solutions for the problems they face. Contact your Yaskawa representative for more details.



Model	PPS1130	PVS1230A	PVS1130
Applicable Wafer Size	300 mm (SEMI compliant)	200 mm / 300 mm (SEMI compliant)*3	300 mm (SEMI compliant)
Wafer Grip Method	Passive grip (PG) [Edge grip (EG) is also available]	Vacuum grip (VG) [Passive grip (PG) is also available]	Vacuum grip (VG) [Passive grip (PG) is also available]
Detection Target	Notch	Notch or orientation flat*3	Notch
Material of Wafer*1	Silicon		
Alignment Accuracy*2	PG: $\pm 0.1^\circ$, EG: $\pm 0.03^\circ$	VG: $\pm 0.03^\circ$, PG: $\pm 0.1^\circ$	
Alignment Time*2	PG: 5.0 s or less, EG: 1.7 s or less	VG: 1.7 s or less, PG: 5.5 s or less	
Mass	8.5 kg	7.0 kg	5.2 kg

*1: Yaskawa has a track record with special wafers, including quartz wafers. Contact your Yaskawa representative for assistance with special wafer use. Related parameters need to be adjusted and evaluated.

*2: Values for a SEMI compliant wafer (300-mm silicon wafer, notch)

*3: Must be changed by instructions. (Move sensor section + change parameters)(Standard setting: 300-mm silicon wafer)

SR200 Robot Controller

The SR200 is a compact, lightweight robot controller with optimal functions and capabilities for wafer transfer equipment. With an open architecture that surpasses those of previous models, the SR200 can be easily connected to external devices such as Yaskawa's SERVOPACKs (Σ -7 Series). This controller is designed to achieve functional safety and can be used with a compact teaching pendant.



■ Controller

Dimensions	425 (W) × 300 (D) × 133 (H) mm (Protrusions are not included)
Approx. Mass	13 kg max.
Power Supply	Three-phase 200 VAC to 240 VAC (+10% to -15%), 50/60 Hz Single-phase 200 VAC to 240 VAC (+10% to -15%), 50/60 Hz
Communications (Connection to Host)	Ethernet (10BASE-T/100BASE-TX) 2 ports
Optional Board Slot	2 slots
Number of Control Axes	8 axes max.
Applicable Standards	SEMI S2, S8, F47, UL61010-1 ISO 13849-1, Category 3 (PL=d), etc.

■ Teaching Pendant

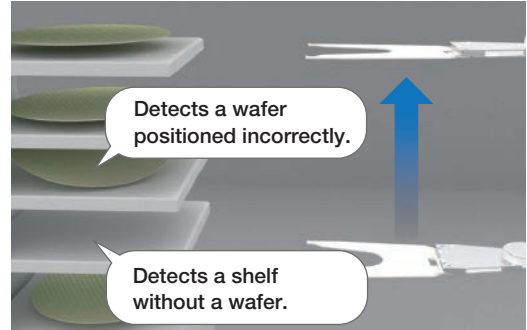
Dimensions	191 (W) × 71 (D) × 169 (H) mm
Approx. Mass	0.50 kg [1.30 kg (includes cable)]
Display	4.3-inch color TFT LCD
Protection Rating	IP54
Cable Length	8 m

SR200 Functions

The SR200 robot controller is equipped with various functions that enable safe, high-accuracy wafer transfer.

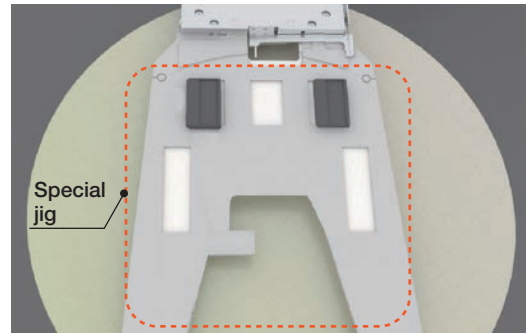
■ Mapping function

This function determines the status of wafer insertion in the FOUP. The existence and position of wafers are checked using a combination of a sensor attached to the robot hand and a robot's up-and-down motion. The function determines if a wafer is on a shelf of the FOUP and if it is in the correct position to prevent a robot hand from damaging wafers in the FOUP.



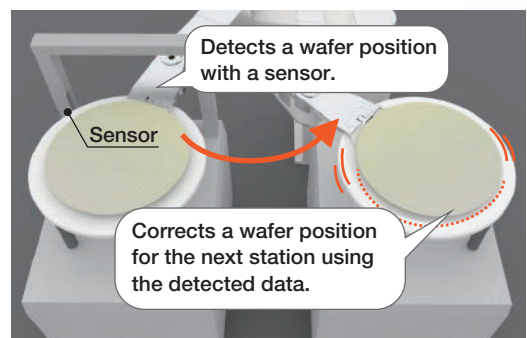
■ Auto-teaching function

This function uses dedicated jigs for auto-teaching. The function is used to automatically teach the transfer station (horizontal and vertical directions) by detecting a wafer jig installed on the transfer station with a special jig installed on a robot hand. High-accuracy teaching can be achieved even within a small space, such as a FOUP, reducing time to start up equipment.



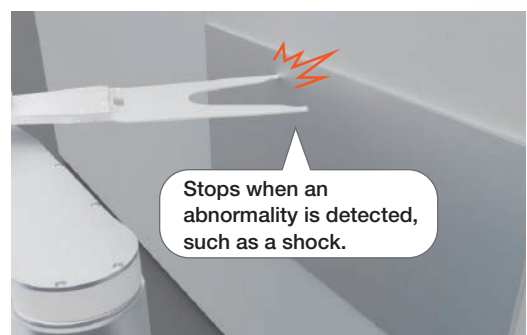
■ Wafer position detection and correction function

This function detects the position of a wafer on the robot hand using a sensor installed in the transfer path to the transfer station. When a robot passes a wafer to a station, the function corrects the position in which the wafer is passed based on the detected wafer position.



■ Abnormal torque detection function

This function detects abnormalities in robots by monitoring the motor torque to identify abnormal torques. The robot stops immediately if the function detects an abnormality.





Clean Robots for Semiconductor Wafer Transfer

SEMISTAR Series

YASKAWA ELECTRIC CORPORATION

2-1 Kurosakishiroishi, Yahatanishi-ku, Kitakyushu, 806-0004, Japan
Phone: +81-93-645-7703 Fax: +81-93-645-7802
www.yaskawa.co.jp

YASKAWA AMERICA, INC. (MOTOMAN ROBOTICS DIVISION)

100 Automation Way, Miamisburg, OH 45342, U.S.A.
Phone: +1-937-847-6200 Fax: +1-937-847-6277
www.motoman.com

YASKAWA EUROPE GmbH (ROBOTICS DIVISION)

Yaskawastrasse 1, 85391, Allershausen, Germany
Phone: +49-8166-90-0 Fax: +49-8166-90-103
www.yaskawa.eu.com

YASKAWA NORDIC AB

Verkstadsgatan 2, Box 504, SE-385 25 Torsås, Sweden
Phone: +46-480-417-800 Fax: +46-486-414-10
www.yaskawa.se

YASKAWA EUROPE TECHNOLOGY LTD.

13 Hamelacha St., Afek Industrial Park Rosh Ha'ayin 4809129, ISRAEL
Phone: +972-73-2400-800 Fax: +972-73-2400-888
www.yaskawa.co.il

YASKAWA ELECTRIC (CHINA) CO., LTD.

22F, One Corporate Avenue, No.222 Hubin Road, Huangpu District, Shanghai 200021, China
Phone: +86-21-5385-2200 Fax: +86-21-5385-3299
www.yaskawa.com.cn

YASKAWA SHOUGANG ROBOT CO., LTD.

No.2 Building, No.6 Rongchang East Street, Beijing E&T Development Area, Beijing 100176, China
Phone: +86-10-6788-2858 Fax: +86-10-6788-2878
www.yasr-motoman.cn

YASKAWA ELECTRIC KOREA CORPORATION

6F, 112, LS-ro, Dongan-gu, Anyang-si, Gyeonggi-do, 14118, Korea
Phone: +82-31-8015-4224 Fax: +82-31-8015-5034
www.yaskawa.co.kr

YASKAWA ELECTRIC TAIWAN CORPORATION

12F, No.207, Sec. 3, Beishin Rd., Shindian District, New Taipei City 23143, Taiwan
Phone: +886-2-8913-1333 Fax: +886-2-8913-1513
www.yaskawa.com.tw

YASKAWA ASIA PACIFIC PTE. LTD.

30A Kallang Place, #06-01, 339213, Singapore
Phone: +65-6282-3003 Fax: +65-6289-3003
www.yaskawa.com.sg

YASKAWA ELECTRIC (THAILAND) CO., LTD.

59, 1st-5th Floor, Flourish Building, Soi Ratchadapisek 18, Ratchadapisek Road, Huaykwang, Bangkok 10310, Thailand
Phone: +66-2-017-0099 Fax: +66-2-017-0199
www.yaskawa.co.th

PT. YASKAWA ELECTRIC INDONESIA

Secure Building-Gedung B Lantai Dasar & Lantai 1 Jl. Raya Protokol Halim Perdanakusuma, Jakarta 13610, Indonesia
Phone: +62-21-2982-6470 Fax: +62-21-2982-6471
www.yaskawa.co.id

YASKAWA INDIA PRIVATE LIMITED (ROBOTICS DIVISION)

No.136, Sector-8, Industrial Estate, IMT Manesar, Gurugram, Haryana 122050, India
Phone: +91-124-475-8500
www.yaskawaindia.in

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