

# Kawasaki Robot

## K series Explosion-proof Painting Robots and Painting Package Cells Japan & Asia

Kawasaki Heavy Industries, Ltd.

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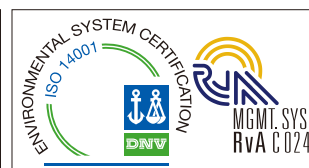
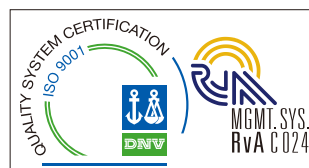
※Materials and specifications are subject to change without notice.

Simple  friendly  
**Kawasaki Robot**

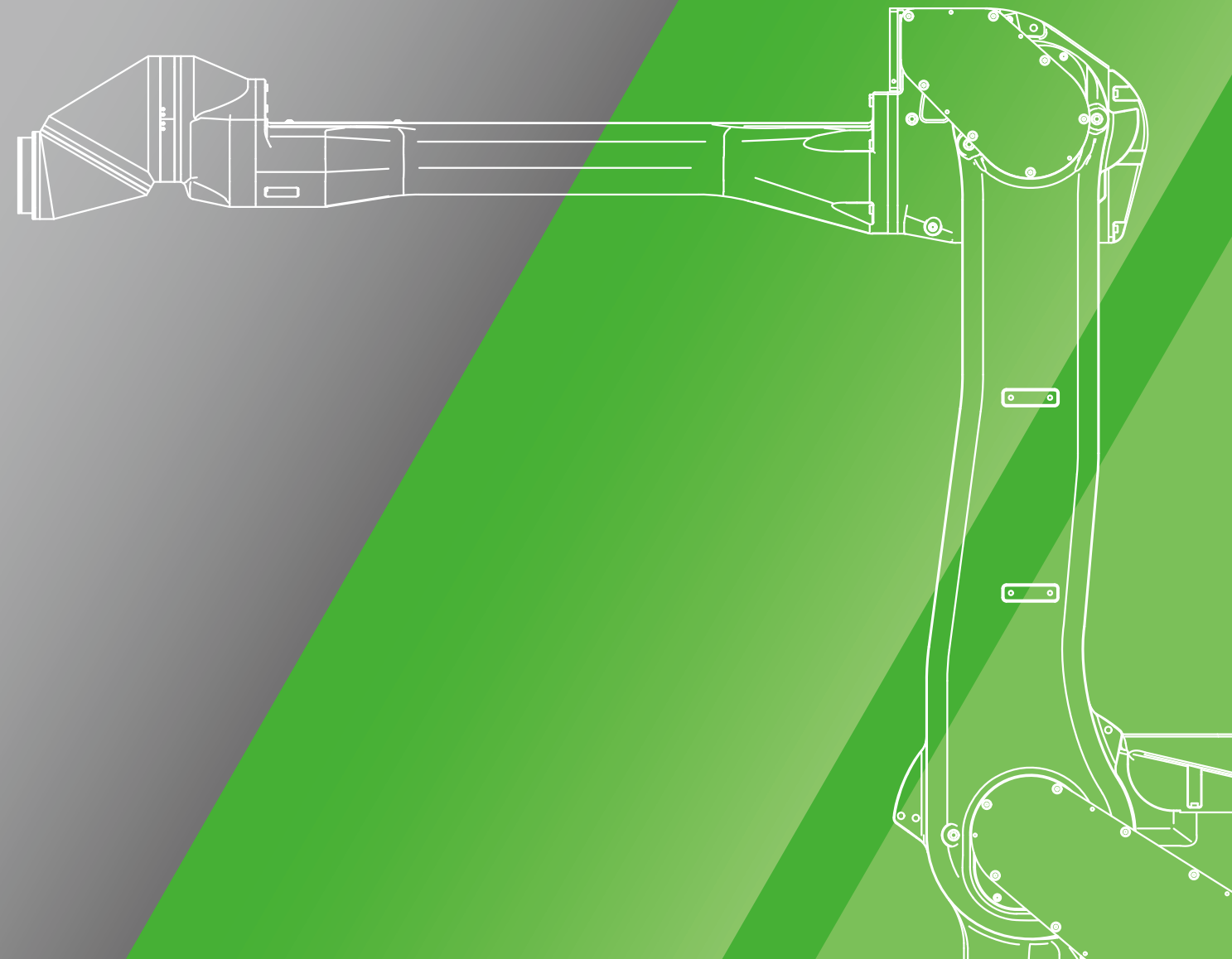


#### CAUTIONS TO BE TAKEN TO ENSURE SAFETY

- For those persons involved with the operation / service of your system, including Kawasaki Robot, they must strictly observe all safety regulations at all times. They should carefully read the Manuals and other related safety documents.
- Products described in this catalogue are general industrial robots. Therefore, if a customer wishes to use the Robot for special purposes, which might endanger operators or if the Robot has any problems, please contact us. We will be pleased to help you.
- Be careful as Photographs illustrated in this catalogue are frequently taken after removing safety fences and other safety devices stipulated in the safety regulations from the Robot operation system.



ISO certified in Akashi Works.



Kawasaki explosion-proof painting robots and package cell are prepared to respond to all customers expectations.

## Manipulators

**A selection of robots is available to match your painting application.**

Kawasaki K-series robots are explosion-proof painting robots developed on Kawasaki's concept of "Simple and Friendly." This range of robots covers all painting applications from small to large, and the fully integrated hose system provides maximum protection against external dust and dirt.



Painting Line for Car Bumpers



Automobile body coating line  
Photo: Mazda's 3 wet-on coating system clear coating process



Painting resin cowlings of motorcycles

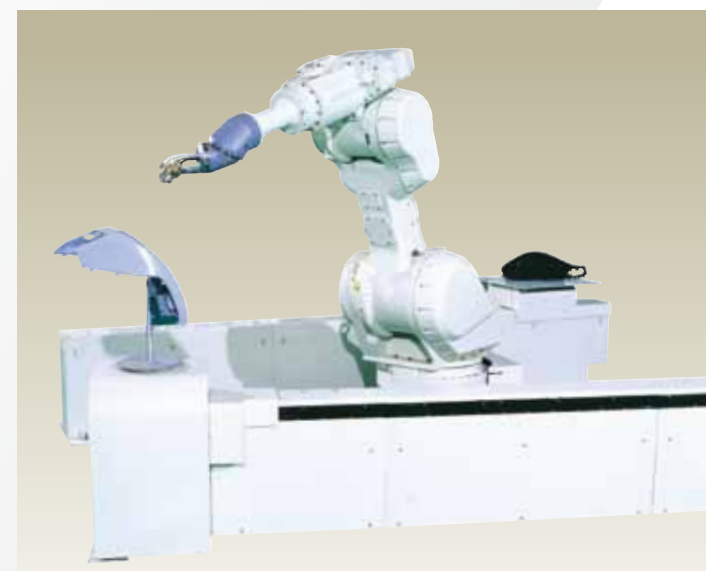


Painting lines on the front car of the Shinkansen

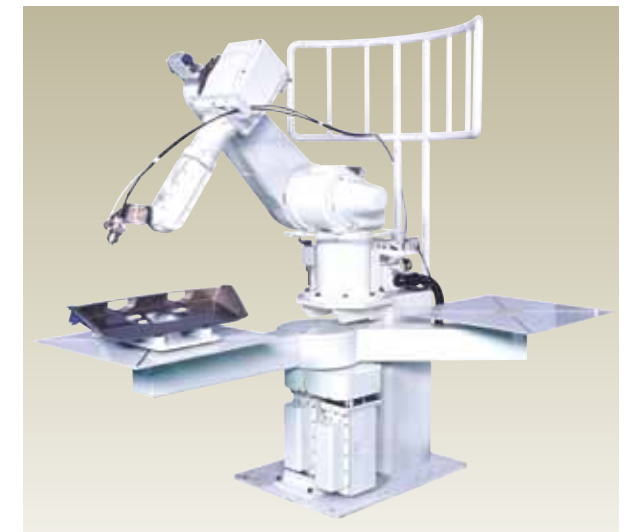
## Package Cell

**Our robot is available in a "package cell" allowing production to commence almost instantly.**

If you need to get your painting system operational quickly, Kawasaki painting package cells are available. These package cells arrive as a compact, ready-to-use units that can be easily installed in a limited space, allowing you to begin the painting process immediately.



Servo shuttle + KF193



Servo twister + KF121



Manipulators



Features

1 A broad range of robots

Kawasaki offers five basic types of painting robot from the KF121 for small workpieces to the KJ314 for inner and outer bodies of automobiles. We provide a range of robots that covers the requirements of all applications and installations.

2 Built-in hoses

The hollow wrist (3R) prevents paint mist from adhering on tubes and cables and can minimize the chance of painting defects. The inner diameter of the hollow wrist is either 40 or 70 mm.



3 Enhanced peripheral units

A control panel is provided to enhance the ease of system development and to interface with the robot traveling unit, workpiece transfer unit, rotation unit, and other devices.

4 Significant painting experience

Gathering painting robot experience has enabled Kawasaki to put together a robot that will match your every need. The K series has used this information and is now equipped with more advanced functions than ever, resulting in a robot of great capability.

5 Customer support

Our professional staff will be available for support from the initial planning stage right up to system start up. This service will be of great benefit to those new to painting applications.

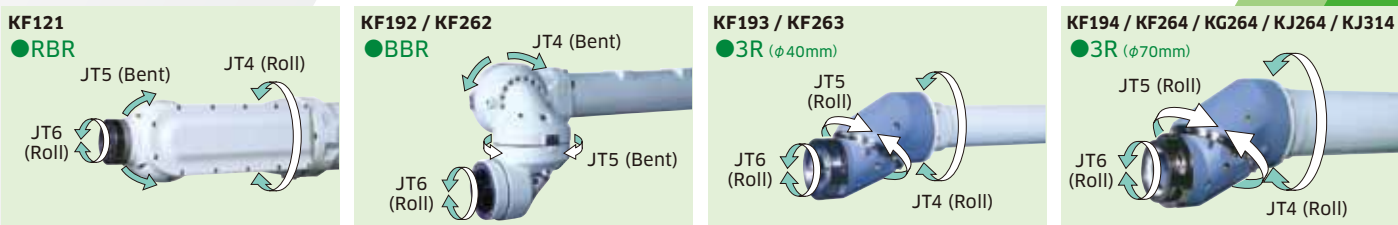
Standard specifications

※Other options or Software : Please contact us.

Model		KF121		KF192	KF193	KF194	KF262	KF263	KF264	KG264	KJ264 (Floor)	KJ264 (Shelf)	KJ264 (Wall)	KJ314	
Degrees of freedom (axes)		6												7	
Max. payload (kg)		5		Wrist : 12    Arm : 20						Wrist : 20 Arm : 30	Wrist : 15    Arm : 25				
Wrist type		RBR		BBR	3Rø40*5	3Rø70 *5	BBR	3Rø40 *5	3Rø70 *5						
Motion range (°)	Arm rotation (JT1)	±160		±150					±120			+30~-120*4	±120		
	Arm out-in (JT2)	±90		+110~-60					+120~-60	+130~-80					
	Arm up-down (JT3)	+150		+90~-80					+90~-65						
	Wrist swivel (JT4)	±270		±360	±720		±360	±720							
	Wrist bend (JT5)	±145		±360	±720		±360	±720							
	Wrist twist (JT6)	±360		±360	±410		±360	±410							
	Arm swing (JT7)	—												±90	
Moment (N・m)	Wrist swivel (JT4)	7.8		33.3	33.2	35.3	33.3	33.2	35.4	79.9	56.2				
	Wrist bend (JT5)	7.8		28.8	26.7	27.7	28.8	26.7	27.7	61.3	43.4				
	Wrist twist (JT6)	2.9		7.9	7.9	7.9	7.9	7.9	7.9	15.6	22.0				
Moment of inertia (kg・m <sup>2</sup> )	Wrist swivel (JT4)	0.17		1.28	1.27	1.44	1.28	1.27	1.45	3.33	2.19				
	Wrist bend (JT5)	0.17		0.96	0.82	0.89	0.96	0.82	0.89	1.95	1.31				
	Wrist twist (JT6)	0.06		0.11	0.11	0.10	0.11	0.11	0.11	0.12	0.33				
Positional repeatability (mm)*1		±0.2		±0.5											
Max. reach (mm) *2		1,240		1,973		1,978	2,665		2,668	2,665	2,640		3,100		
Max. speed (m/s)		1.5		2.0						1.5					
Mass (kg)		140		690	720	750	720	740	770	795	540	530		720	
Body color		Munsell 10GY9/1 equivalent													
Installation		Floor, Wall									Floor	Shelf	Wall		
Explosion protection		Combination of pressurized type and intrinsically safety type (Expib Ⅱ BT4 / Exib Ⅱ BT4)									Combination of pressurized type and intrinsically safety type (f2G4 / Exib Ⅱ BT4)				
Ambient temperature (℃)		0~40													
Power requirements (kVA) *3		1.5		5											
Matching controller		E27		E25											

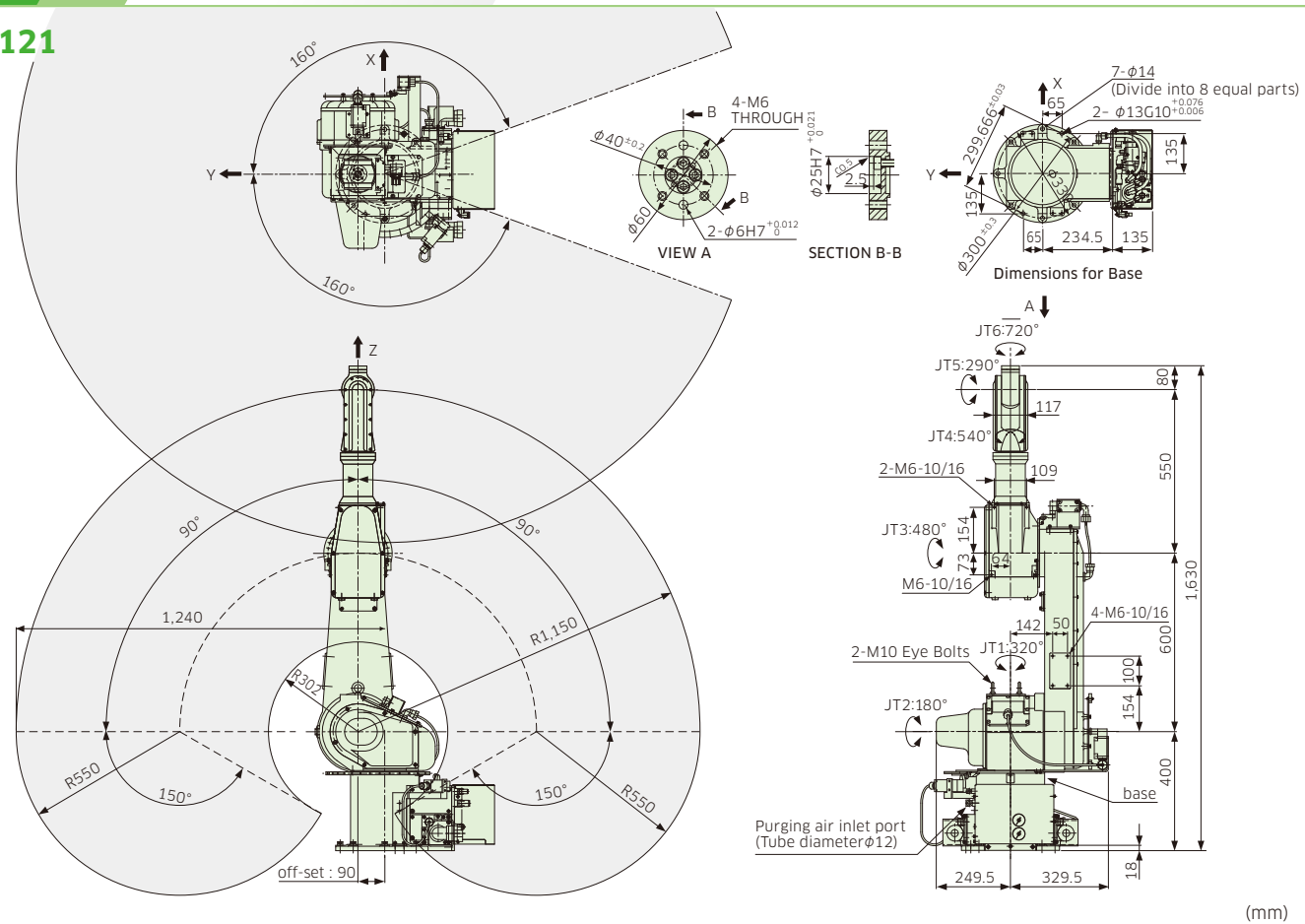
\*1: conforms to ISO9283  
\*2: Maximum reach : The RBR (Roll Bend Roll) wrist refers to the distance from the center of JT1 to the center of JT5. The BBR (Bend Bend Roll) wrist is the distance from the top arm center line to the JT4 axis. The 3R (Roll Roll Roll) wrist is the distance from JT1 to the axis cross-point between JT4 and JT5.  
\*3: Depends on the payload and motion patterns  
\*4: Operating range of JT1 is depend on the side of mounting surface. The range is "+120~-30" in the case of the left side. The range is "+30~-120" in the case of the right side.  
\*5: Hose Built-in

●Variation of Wrists

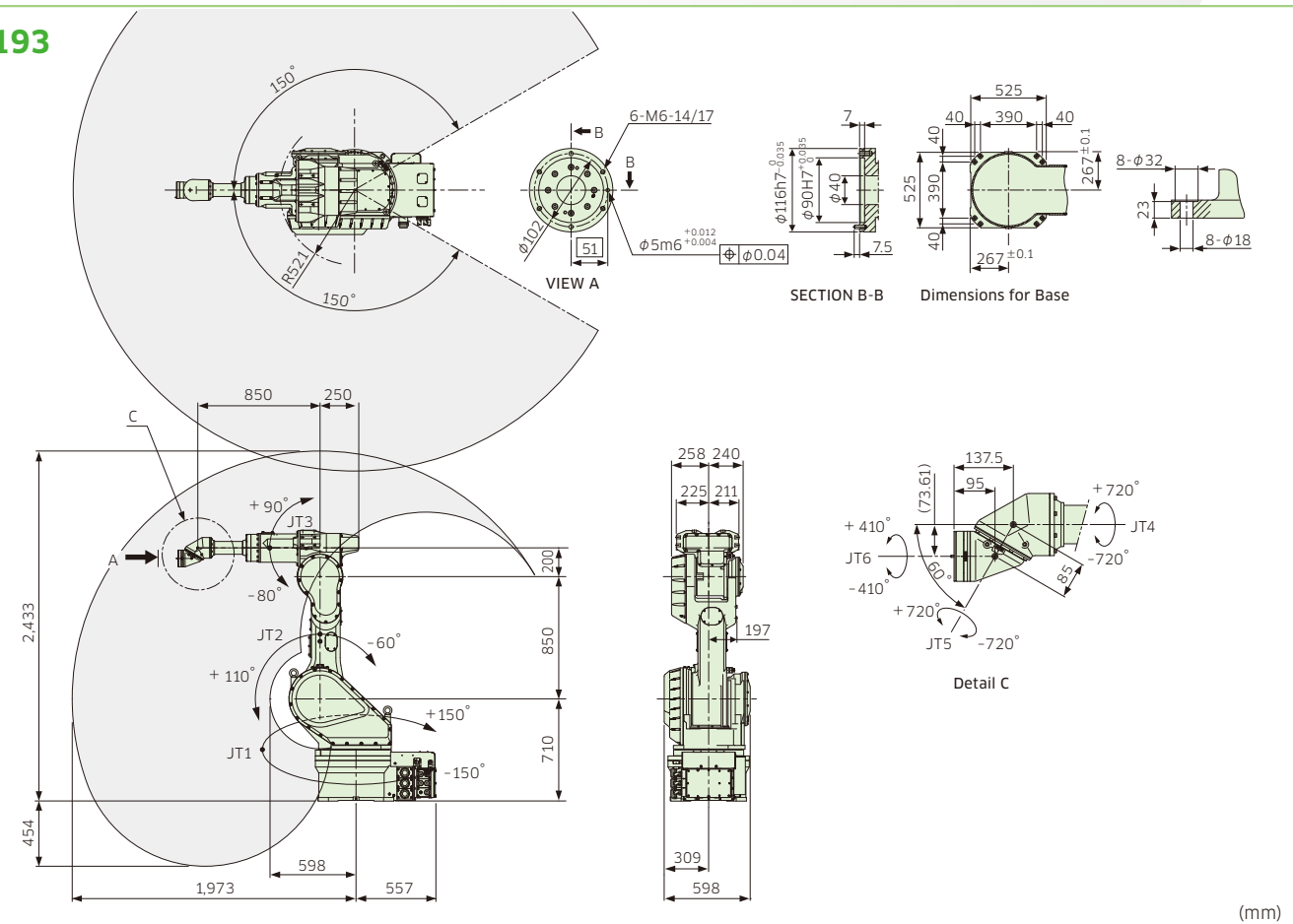
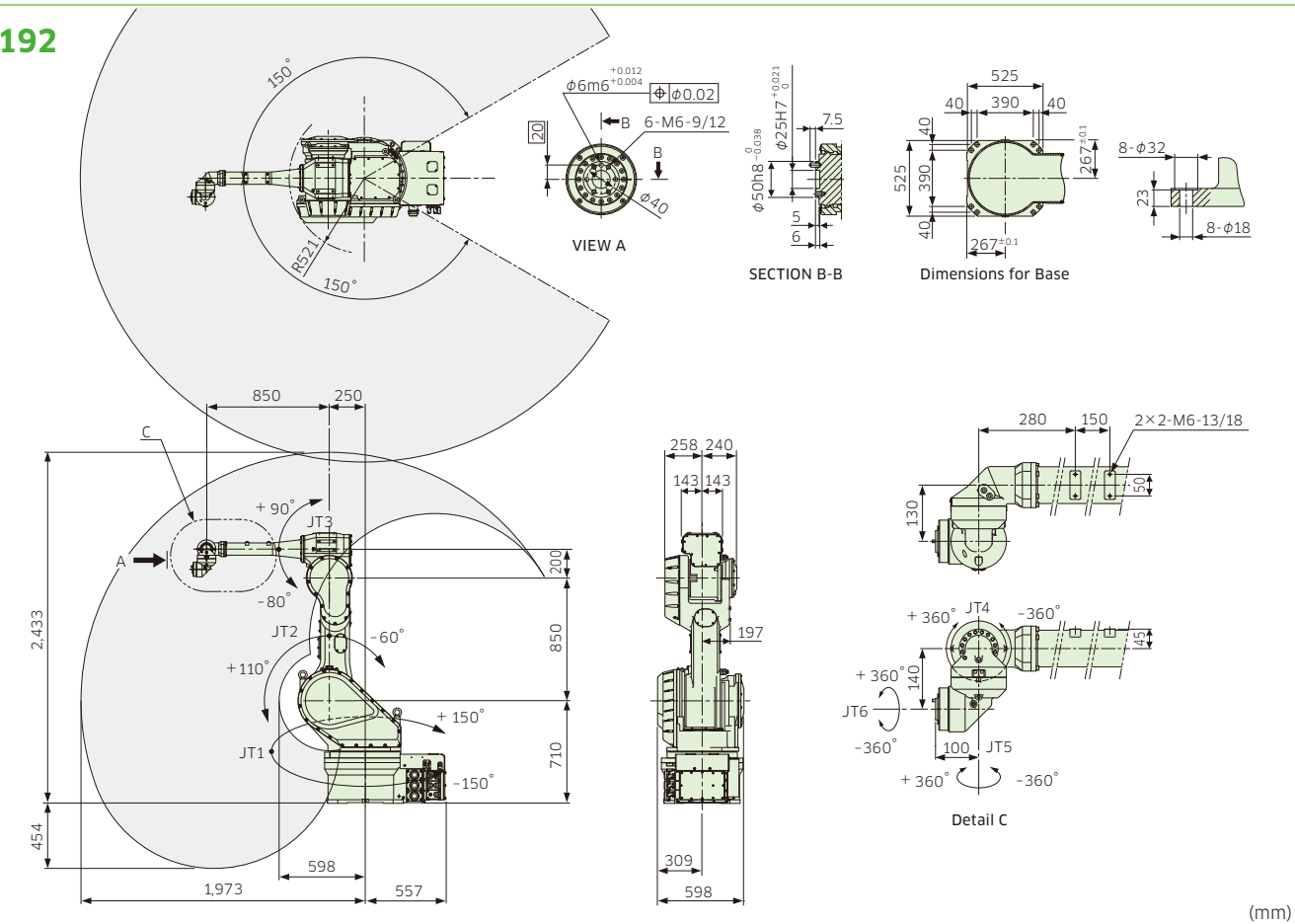


## Motion Range & Dimensions

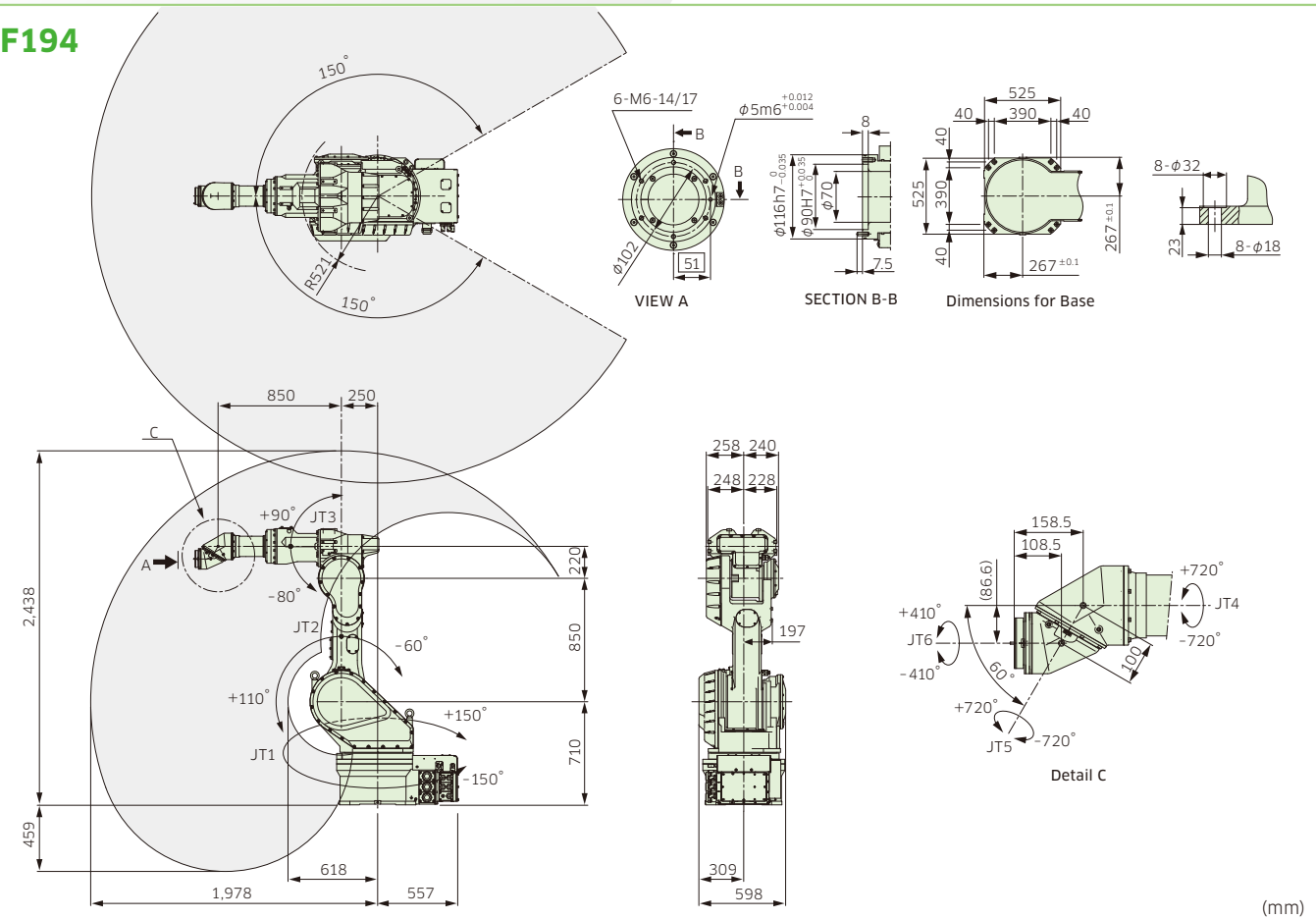
**KF121**



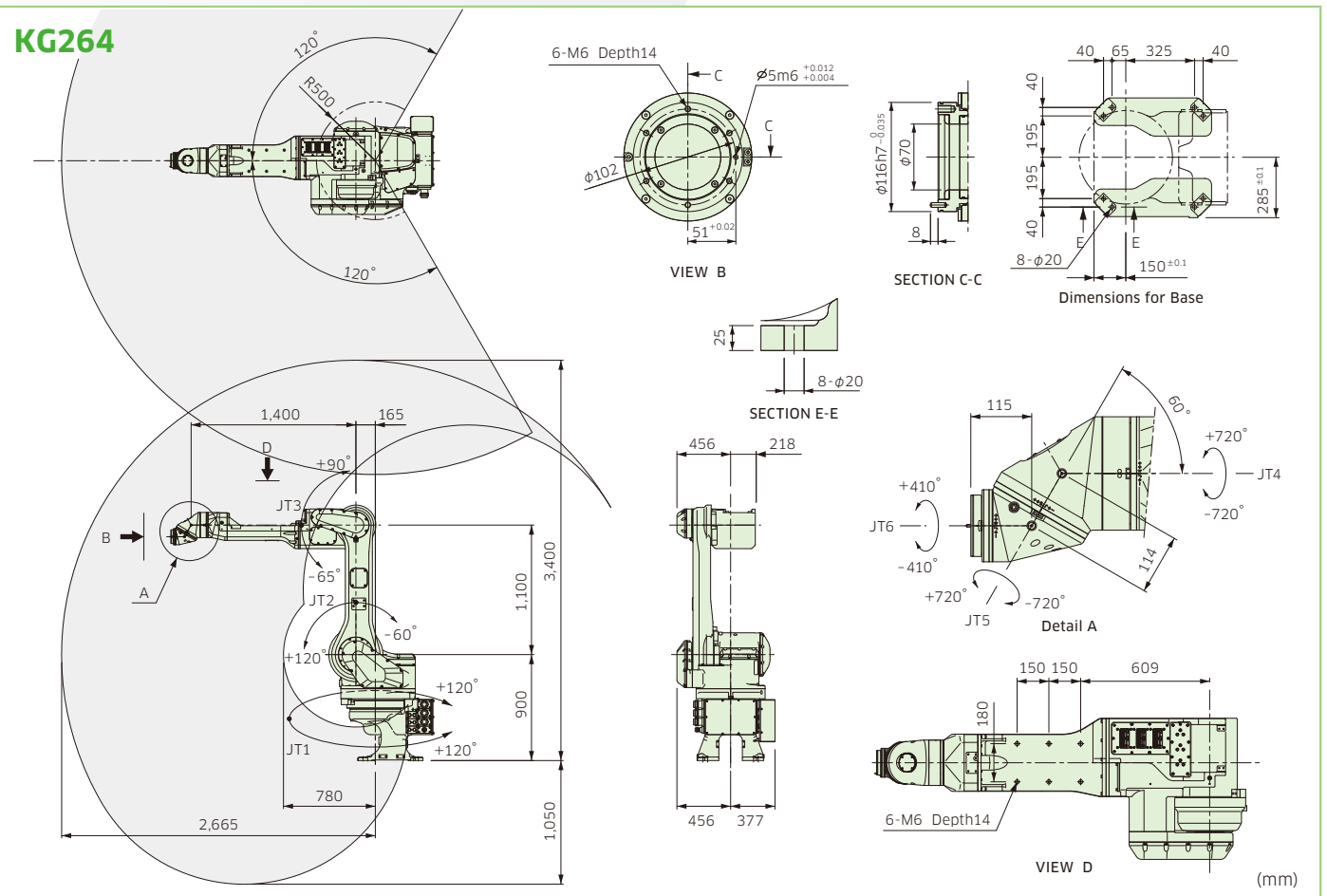
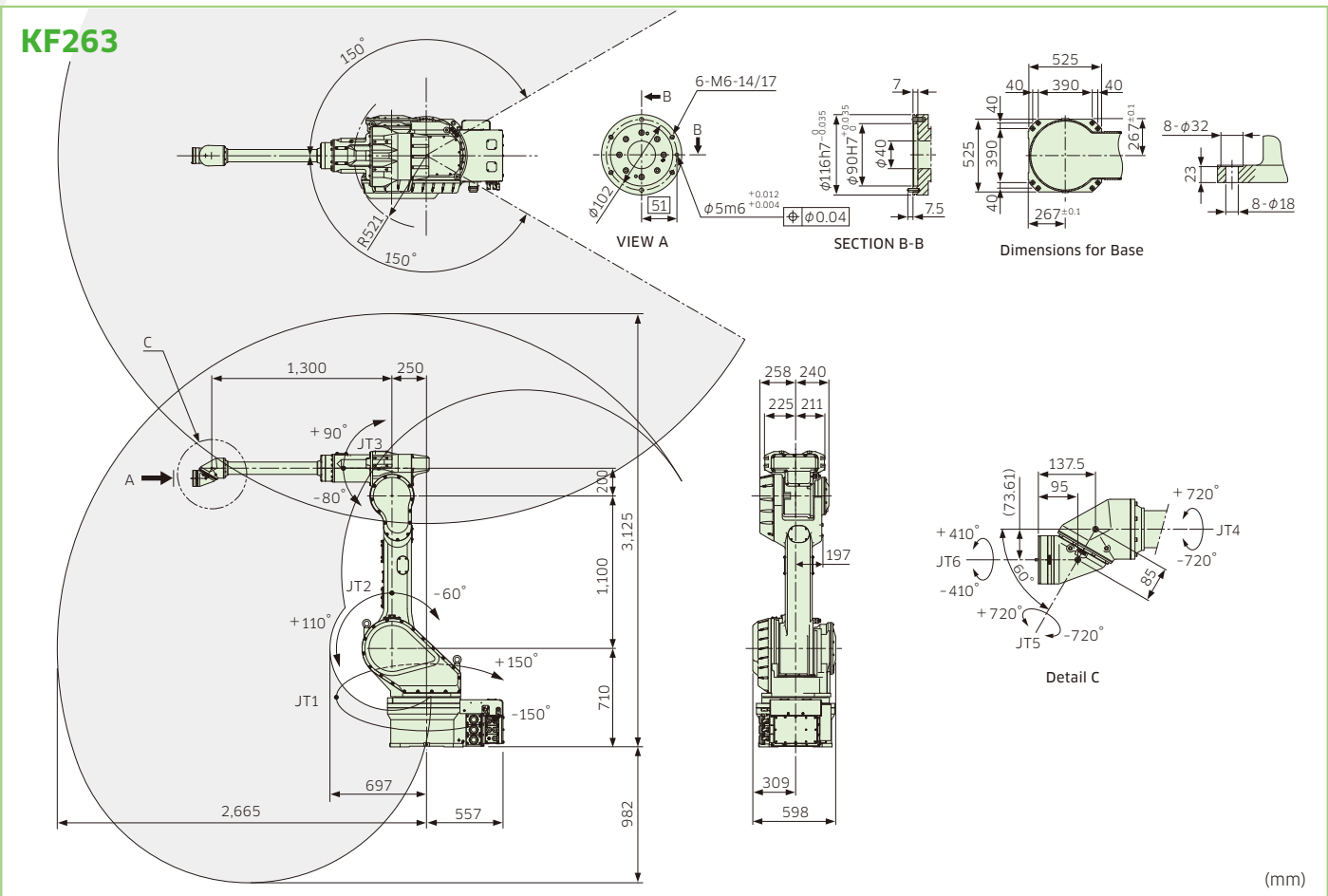
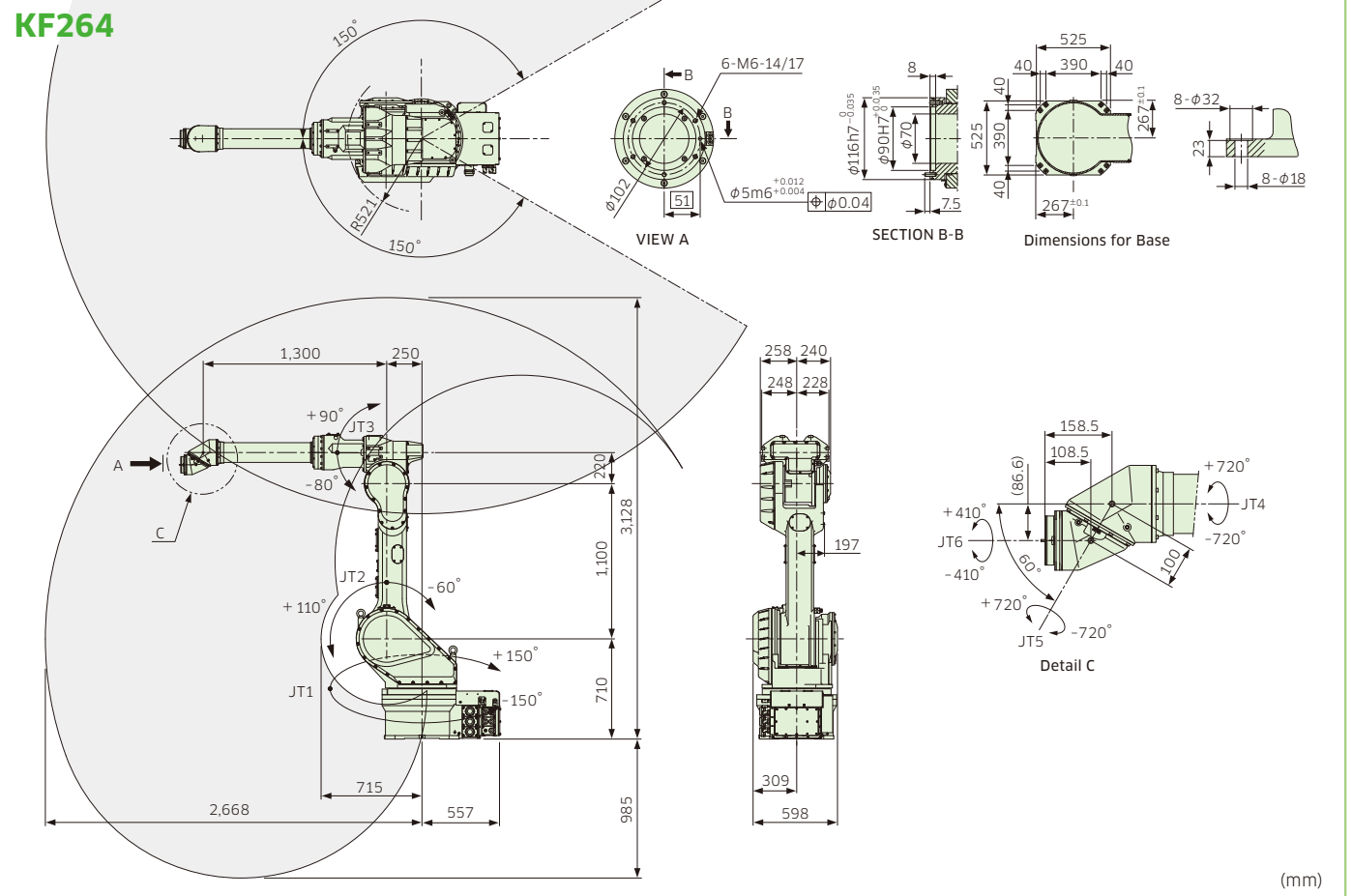
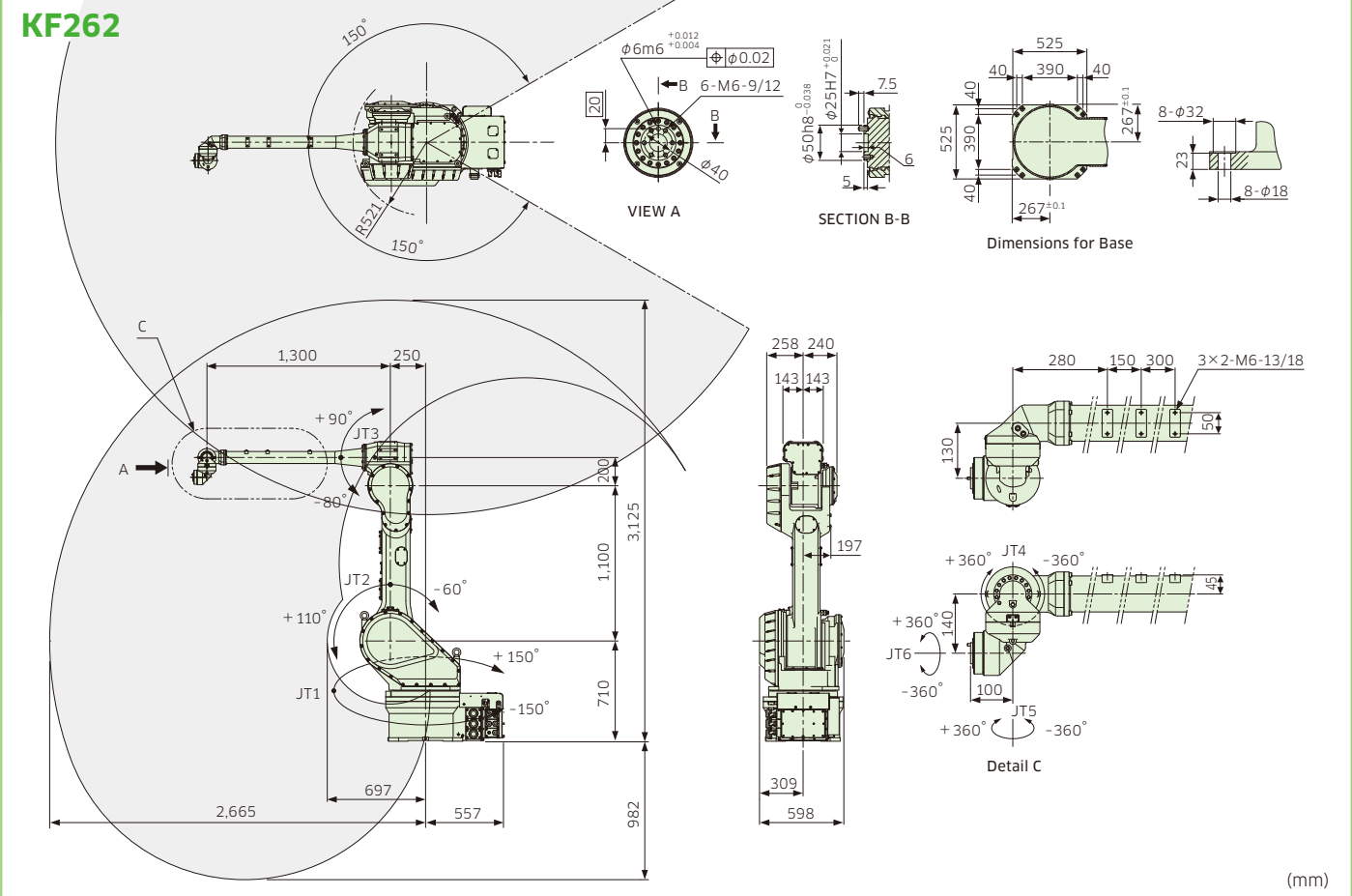
**KF193**

**KF192**

**KF194**



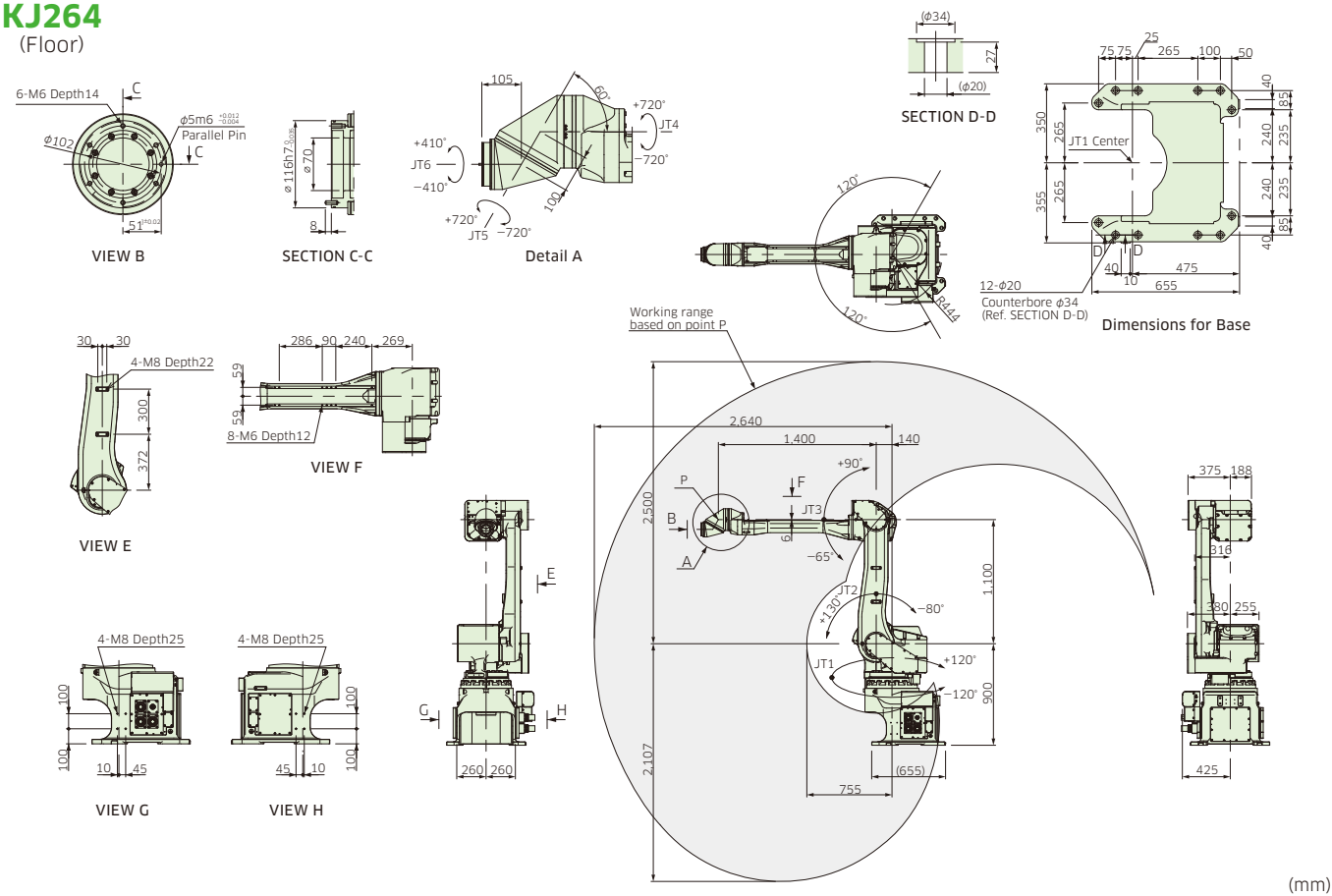
# Motion Range & Dimensions



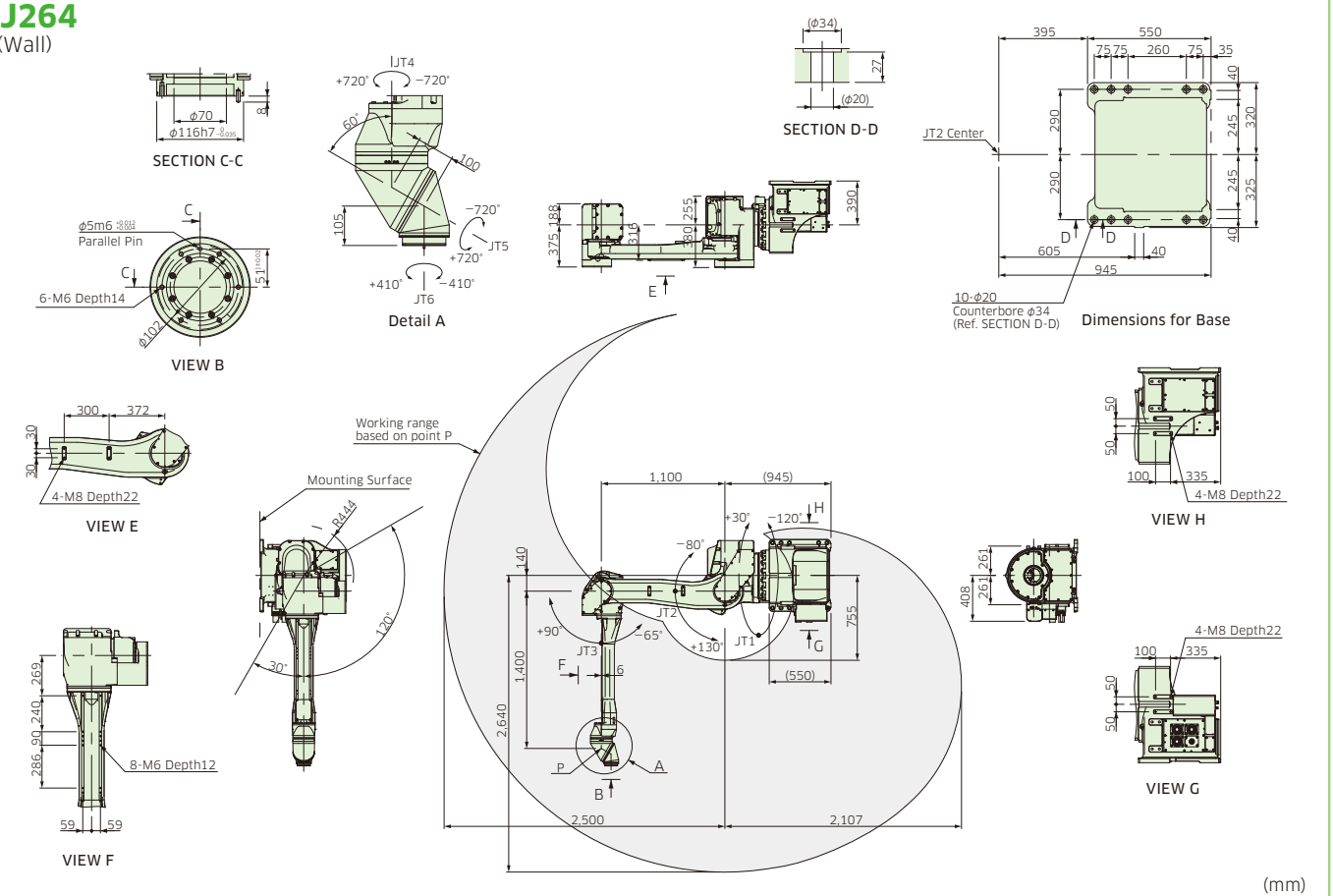


## Motion Range & Dimensions

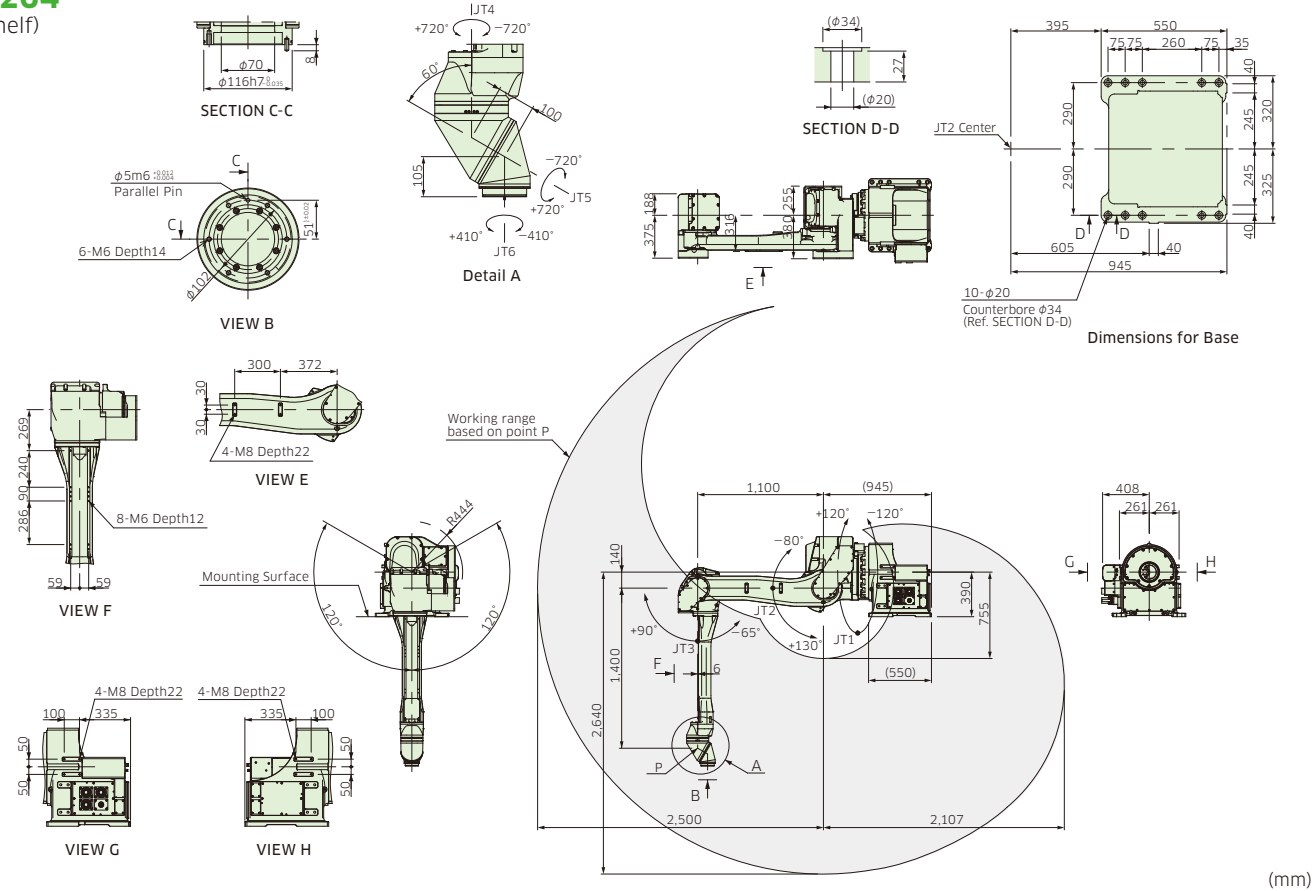
**KJ264**  
(Floor)



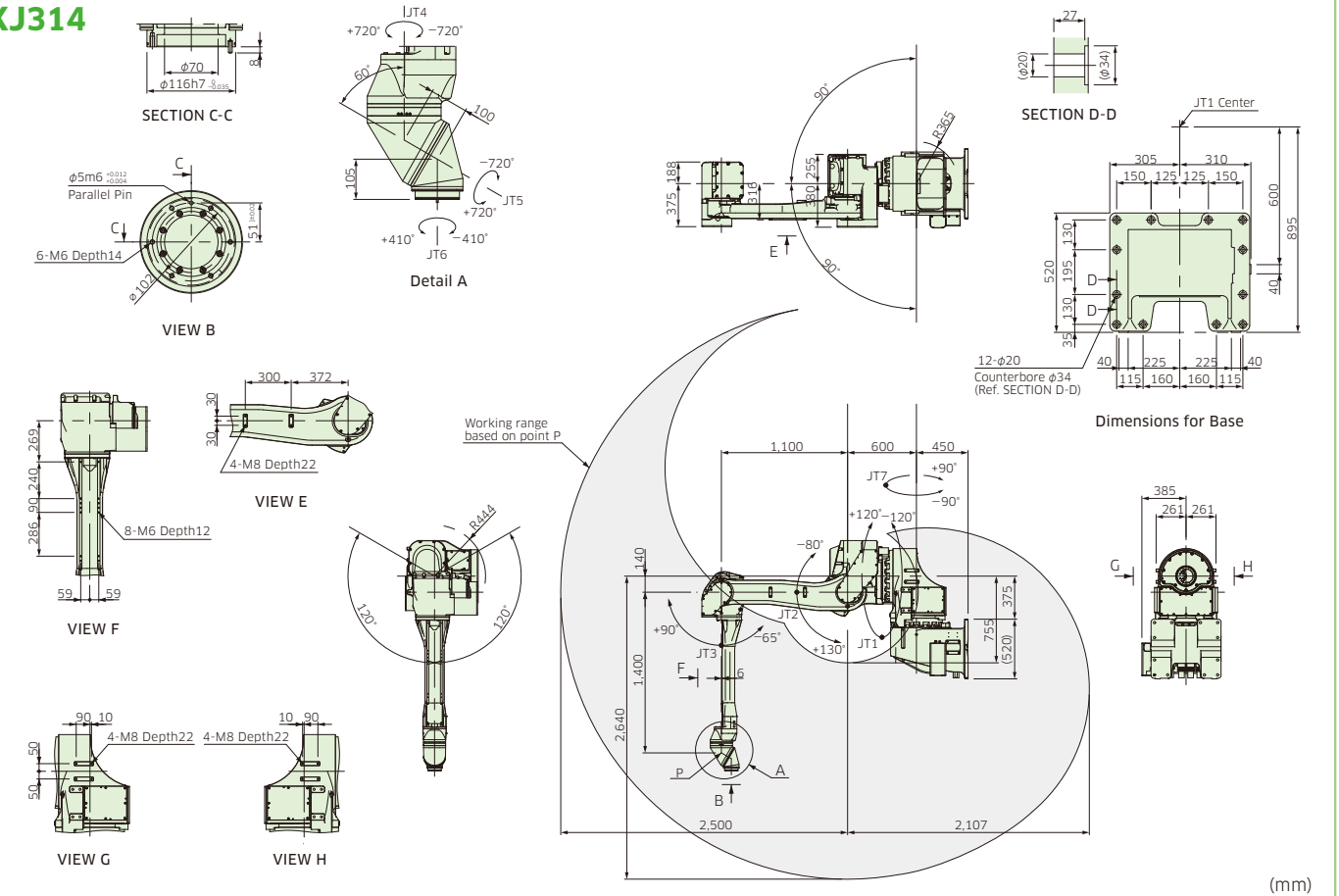
**KJ264**  
(Wall)



**KJ264**  
(Shelf)



## KJ314



# Controller

## E25/E27

The E-controller, delivering unprecedented quality with a compact size, was developed to respond to the requirements of our customers. Kawasaki's past achievements and experience have led to the development of the most technically advanced controller available. This industry-leading design provides improved performance and easy operation that surpasses all expectations.

### ●Features

#### 1. Compact

We have reduced the controller's foot print and overall volume to make high-density layouts easy to achieve.

#### 2. Explosion-proof teach pendant

The explosion-proof color LCD with its large touch panel allows users to teach, edit, and monitor information such as current position and I/O signals in the explosion-proof area. The interface panel can be customized to meet user preferences, while the backlit screen is easy to read in dark locations.

#### 3. User-friendly operation system

The operating system has now fully matured into a more user-friendly design. The operator can switch on the motors and activate the cycle start all from the teach pendant, providing more convenient system control. Two information screens can be displayed simultaneously to provide access to different types of information (for example, positional and signal information).

#### 4. Painting unit control functions (option)

By controlling the CCV, the electro-pneumatic regulator, and the rotation of the discharge control gear pump from the robot controller's CPU board, this low cost, flexible system is compatible with a range of painting devices. You can also set up painting conditions and conduct discharge rate calibration on the teach pendant screen.

#### 5. Using the latest technologies

The enhanced CPU capacity has resulted in more accurate trajectory control, faster program execution, and quicker saving and loading of files, as well as other advantages. In addition the memory has been expanded to provide greater program storage capacity, while a USB port is also provided as standard for connecting external storage devices.

#### 6. Easier maintenance

With modular components and fewer cables, Kawasaki has developed a controller that is compact, and easy to maintain. A host of maintenance functions are available, including the DIAG function for self-diagnostics, a maintenance support function that can handle not only hardware errors but also application errors, a Web server that allows remote diagnostics, and more.

#### 7. Highly expandable

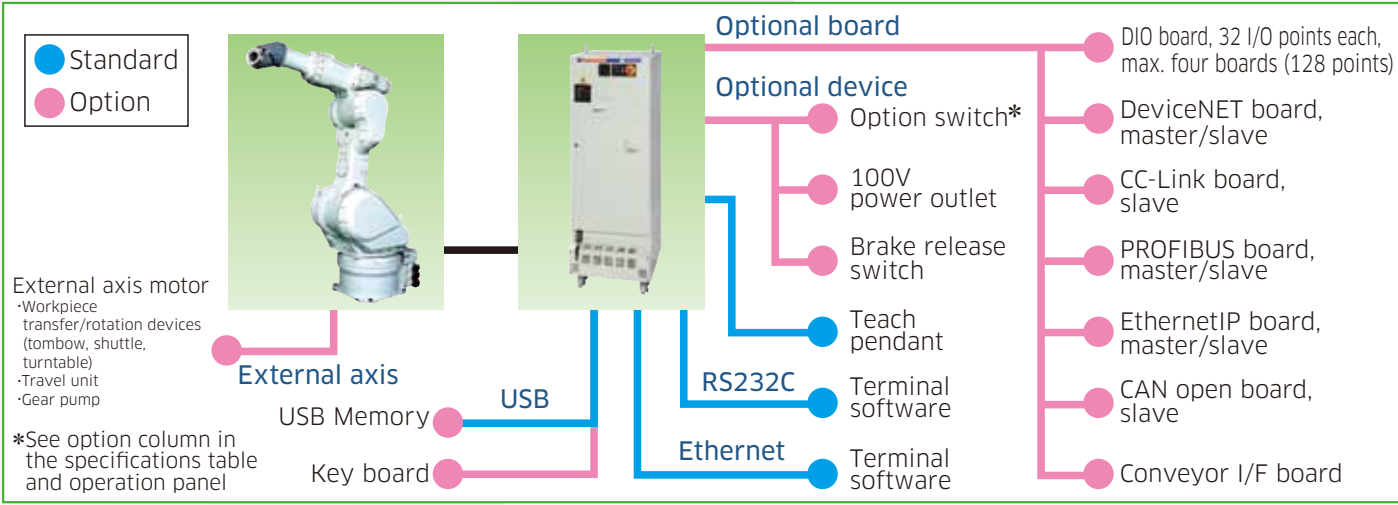
By installing an additional amplifier, and adding workpiece transfer devices (tombow, shuttle, turntable, etc.), travel unit and gear pump, etc., the system can accept up to three external axes. The system is compatible with a large number of field buses for controlling peripheral devices. Combination with software sequencer function (KLogic), which can be edited on the teach pendant, allows easy structuring of a highly sophisticated system.



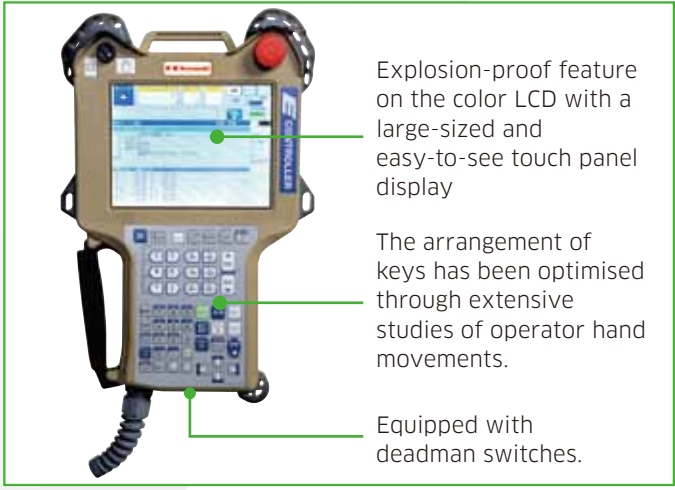
### ●Specifications

Model		Standard		Option
		E25	E27	
Dimensions (mm)		W500×D550×H1,400		
Structure		Enclosed structure/Indirect cooling system		
Number of controlled axes		6		Max. 9
Drive system		Full digital servo system		
Coordinate systems		Joint, Base, Tool		Fixed tool point
Types of motion control		Joint/Linear/Circular Interpolated motion		
Programming		Point to point teaching or language based programming		
Memory capacity (MB)		8		
General purpose signals	External operation	Motor power Off, Hold		
	Input (Channels)	32		Max. 128
	Output (Channels)	32		Max. 128
Operation panel		E-Stop switch, teach/repeat switch, control power light (Cycle start, motor-on, hold/run, and error reset are activated from the teach pendant.)		Cycle start switch, motor-on switch, hold/run switch, error light, error reset switch
Cable length	Robot-controller (m)	6		Possible to extend up to 40
	Teach pendant (m)	5		5, 15, 20, 25
Mass (kg)		120		
Power requirements		AC200-220V ±10%, 50/60Hz, 3Φ, Max.10kVA		AC200-220V ±10%, 50/60Hz, 3Φ, Max.5.6kVA
		Class D ground (Standard for robots)		
		Class A ground (for intrinsic explosion-proof safety circuit)		
Environmental condition	Ambient temperature (°C)	0~45		
	Relative humidity (%)	35~85 (No dew, nor frost allowed)		
Body color		Munsell 10GY9/1 equivalent		
Teach pendant		TFT color LCD display with touch-panel, E-Stop switch, teach lock switch, Dead man's switch		
Auxiliary storage unit				USB Memory
Interface		USB, Ethernet (100BASE-TX), RS232C		

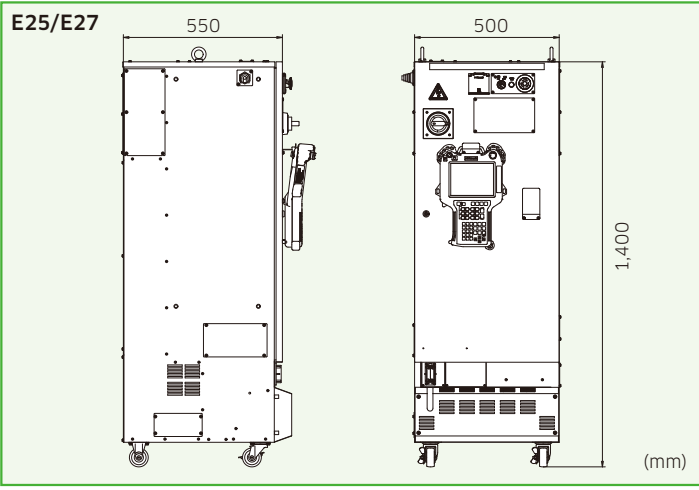
### ●System configuration diagram



### ●Explosion-proof teach pendant



### ●External View and Dimensions





Peripheral Equipment

High quality, efficient spray painting can be achieved by combining high performance workpiece transfer and rotation devices, paint spray control systems of advanced technology and highly developed paint spray robots and atomizers. Kawasaki's various types of peripheral equipment provide ideal paint spray facilities.

◆Package Cells

To meet customer needs, we offer packaged cells that come in various sizes and configurations, these cells are named, servo twister, servo tombow, servo shuttle, servo spinner, servo turntable and servo wing.

◆Painting unit control panel (air panel)

The painting unit control panel allows control of the changes to the discharge rate, atomizing air and air patterns to meet complex work applications. Functions such as automatic color change and automatic washing for each specified cycle could be incorporated to suit the customers needs.

◆Robot travel unit

Robot travel unit synchronizes with robot motion by additional servo drives, thus allowing the painting process to take place on a moving component. Robot travel units can be used during the painting of automobiles, construction machinery, and septic tanks.

◆“KOSMOS” line control software

In painting processes where two or more robots are in operation, the KOSMOS line control panel provides real time status information and access to production management information.

• Line monitoring function

The LCD screen lets you observe the status of the entire system such as work-piece type, color, coating robot and peripheral unit operation, painting conditions, system errors etc.

• Data setting function

The graphical interface of the touch panel allows the setting and changing of the coating requirements and coating unit control panel.

- Paint flow rate, atomizing air pressure, pattern air pressure and the other painting requirement settings.
- Time chart setting for color change, gun cleaning etc.
- Program number setting for each work-piece type and color.
- CCV number setting for each color

• Statistical functions

Available data for production management include, production statistics, error statistics, paint consumption, etc.



Painting unit control panel



Line control panel

Small sized painting applications  
**Servo Twister**  
A compact but sophisticated system

1. Small installation space

The minimum installation space required for this system is 2,200 mm wide x 1,966 mm long for a 600 x 600 mm table. Such compactness allows you to install this system in a narrow hand-blowing booth.

2. Rotary table functions

In spite of its small size the Servo Twister provides rotary coating, indexed coating and rotary synchronization functions.

3. 6-axis robots

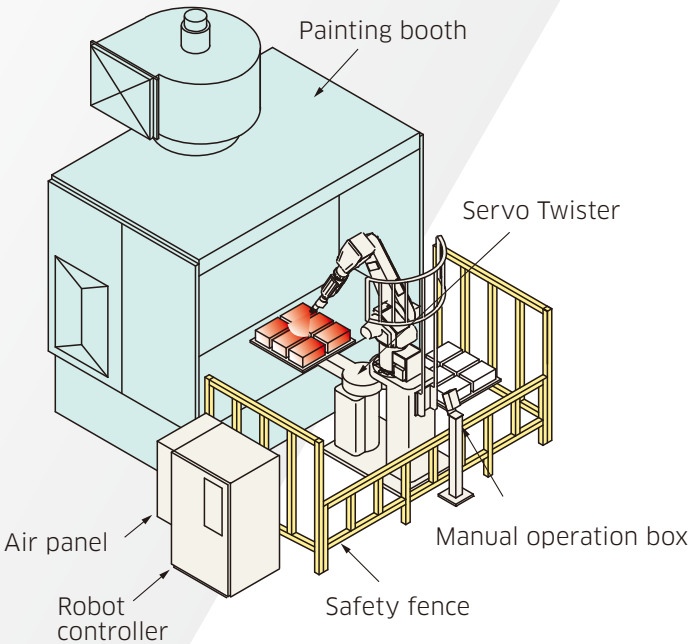
The Servo Twister installation uses a 6-axis, articulated robot.

4. Shared coating program

The integration of the robot and painting table into one unit allows for programs to be shared by more than one robot.

5. Short installation time

The servo twister cell can be built before delivery, so that the installation time is as shortened and in production as soon as possible.

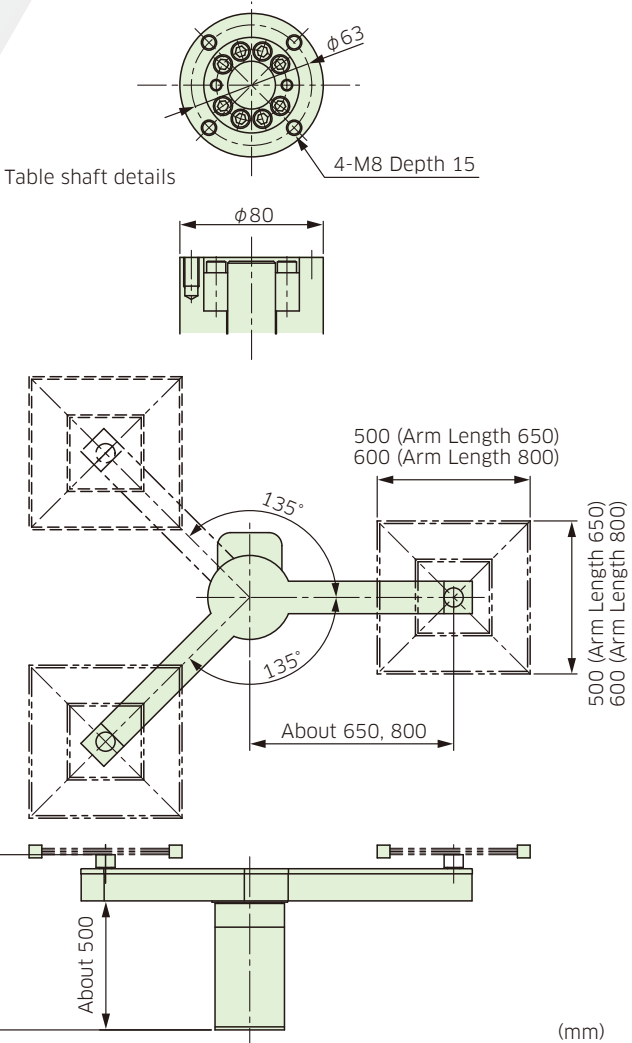


●Specifications

		Standard
Table load		20 kg x 2 Table
No. of control axes		Robot 6+Servo twister 2
Control method		Servo control
Teaching playback method		PTP teaching + CP control
Position detection method		Absolute encoder
Arm	Length (mm)	650, 800
	Operation angle (°)	135
	Indexing time	1.8/135°
Table	Operation angle	Infinite revolution
	Indexing angle	90-deg and arbitrary angle
	Indexing time	0.8/90°
	Uninterrupted rotary speed (rpm)	Max. 90
	Rotary direction	Normal/reverse rotation
Explosion protection		Air pressurized explosion protection and intrinsically safe. Explosion-proof composite type (Expib II BT4 / Exib II BT4)
Mass (kg)		120
Color		Munsell 10GY9/1 equivalent

Note : The work loading table and loading fixtures to be prepared by the purchaser.

●External View and Dimensions





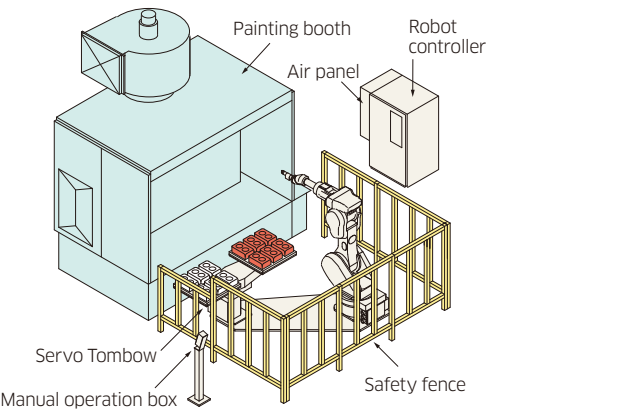
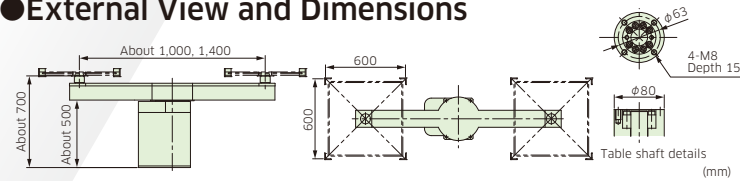
Small sized painting applications

# Servo Tombow

Space saving and easy-to-install

- 1. Smooth movement**  
Servo motion control provides smooth movement to eliminate work slippage.
- 2. Higher painting quality**  
For small cubical boxes (electronic appliances such as TV cabinets, etc.), the spray gun can be oriented to each surface at a right angle. The distance between the gun and the surface can also be adjusted simply by entering a value. These features enable easy operation and enhance the painting quality.
- 3. Synchronous operation with the robot**  
The Servo Tombow's table rotation is synchronized with the robot movements, assuring a uniform paint finish for cylindrical shaped components such as hot plates, wooden trays, automobile hubs etc. The Tombow table offers 360 degrees of rotation.
- 4. Preventing paint mist accumulation**  
To reduce the problem of paint mist accumulation, workpieces can be positioned above a water tank when spraying.

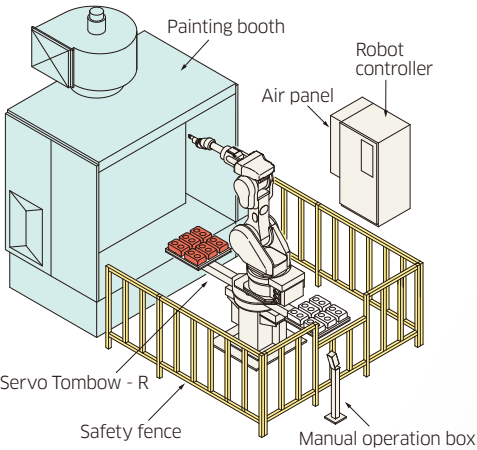
External View and Dimensions



Specifications

	Standard	Heavy load carrying
Table load	20 kg x 2 Table	40 kg x 2 Table
No. of control axes	Robot 6 + Servo tombow 2	
Control method	Servo control	
Teaching playback method	PTP teaching + CP control	
Position detection method	Absolute encoder	
Arm	Diameter (mm)	1,000, 1,400
	Operation angle (°)	180
	Indexing time	2/180°
Table	Operation angle	Infinite revolution
	Indexing angle	90-deg and arbitrary angle
	Indexing time	0.8/90° 1.2/90°
Table	Uninterrupted rotary speed (rpm)	Max. 90 Max. 45
	Rotary direction	Normal/reverse rotation
Explosion protection	Air pressurized explosion protection and intrinsically safe. Explosion-proof composite type (Exipb II BT4 / Exib II BT4)	
Mass (kg)	110 (Diameter: 1,000 mm), 150 (Diameter: 1,400 mm)	
Color	Munsell 10GY9/1 equivalent	

Note : The standard arm lengths are 1,000 mm and 1,400 mm.  
The work loading table and loading fixtures to be prepared by the purchaser.

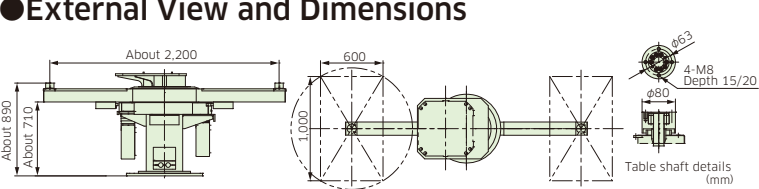


Specifications

	Standard	Heavy load carrying
Table load	20 kg x 2 Table	40 kg x 2 Table
No. of control axes	Robot 6 + Servo tombow 2	
Control method	Servo control	
Teaching playback method	PTP teaching + CP control	
Position detection method	Absolute encoder	
Arm	Diameter (mm)	2,200
	Operation angle (°)	180
	Indexing time	4/180°
Table	Operation angle	Infinite revolution
	Indexing angle	90-deg and arbitrary angle
	Indexing time	1.0/90° 1.7/90°
Table	Uninterrupted rotary speed (rpm)	Max. 90 Max. 45
	Rotary direction	Normal/reverse rotation
Explosion protection	Air pressurized explosion protection and intrinsically safe. Explosion-proof composite type (Exipb II BT4 / Exib II BT4)	
Mass (kg)	550	
Color	Munsell 10GY9/1 equivalent	

Note : The standard arm lengths are 1,000 mm and 1,400 mm.  
The work loading table and loading fixtures to be prepared by the purchaser.

External View and Dimensions

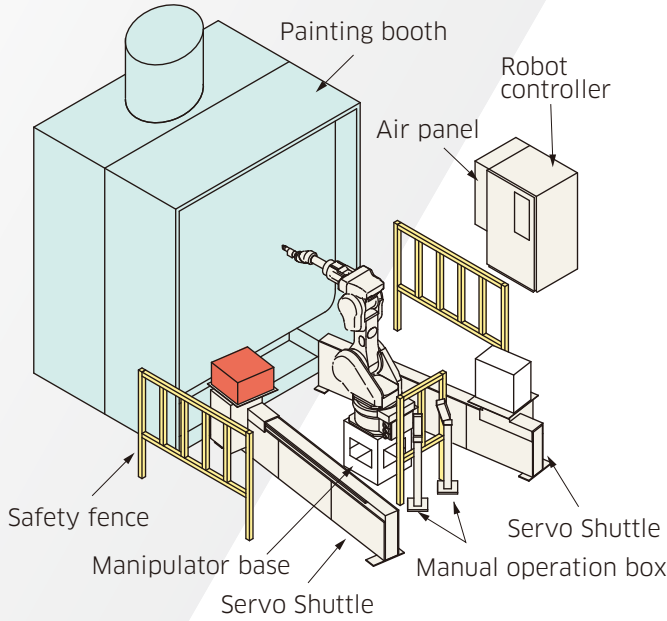


Medium sized work-piece painting cell

# Servo Shuttle

Ultimate "table painting" type

- 1.Improvement in productivity**  
Servo motion provides high speed work transfer and table rotation with shock-less smooth start and stop motion, and also enables continuous rotation tracking with robot and any stand-by position of feeder.
- 2. Higher coating quality**  
Controlling the position of the table provides the optimum painting position. This combined with the high-speed, high-precision robot with the servo shuttle enables high-quality painting.
- 3. Simple teaching**  
The simple teaching function provided by the KF series painting robot eliminates time-consuming program teaching.
- 4. Increased table load**  
The system can be used for painting large TV cabinets, sanitary ware, automobile instrument panels etc.
- 5. Simple installation**  
This complete package is simple to install, but will provide for the painting of the most complex of components.

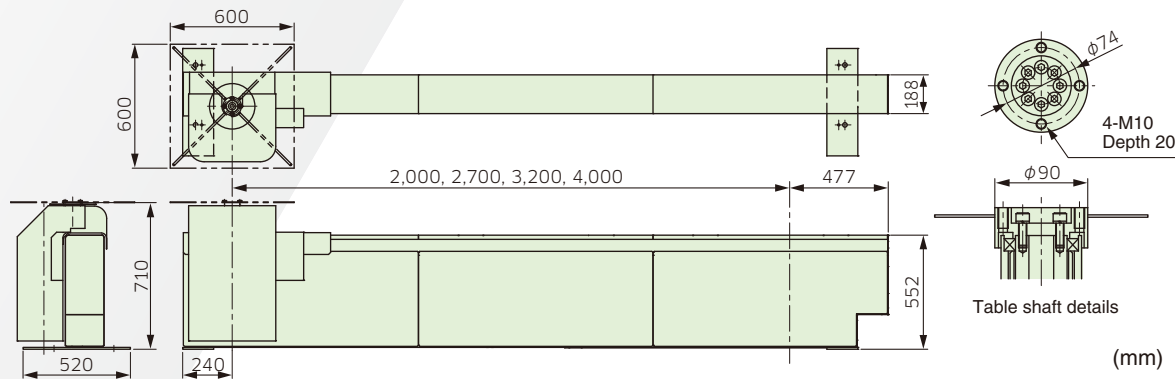


Specifications

	Standard	Heavy load carrying
Table load	20 kg x 2 Table	60kg x 2 Table
No. of control axes	Robot 6 + Servo shuttle 2	
Control method	Servo control	
Teaching playback method	PTP teaching + CP control	
Position detection method	Absolute encoder	
Shuttle	Stroke (mm)	2,000, 2,700, 3,200, 4,000
	Max. speed (mm/sec)	1,000
Table	Operation angle	Infinite revolution
	Indexing angle	90-deg and arbitrary angle
	Indexing time	0.8/90° 1.2/90°
	Uninterrupted rotary speed (rpm)	Max. 90 Max. 45
	Rotary direction	Normal/reverse rotation
Intermediate stop function	The intermediate stop function and multiple coating control function are available.	
Explosion protection	Air pressurized explosion protection and intrinsically safe. Explosion-proof composite type (Exipb II BT4 / Exib II BT4)	
Mass (kg)	One side: 230 to 310	One side: 350 to 405
Color	Munsell 10GY9/1 equivalent	

Note : The work loading table and loading fixtures to be prepared by the purchaser.

External View and Dimensions

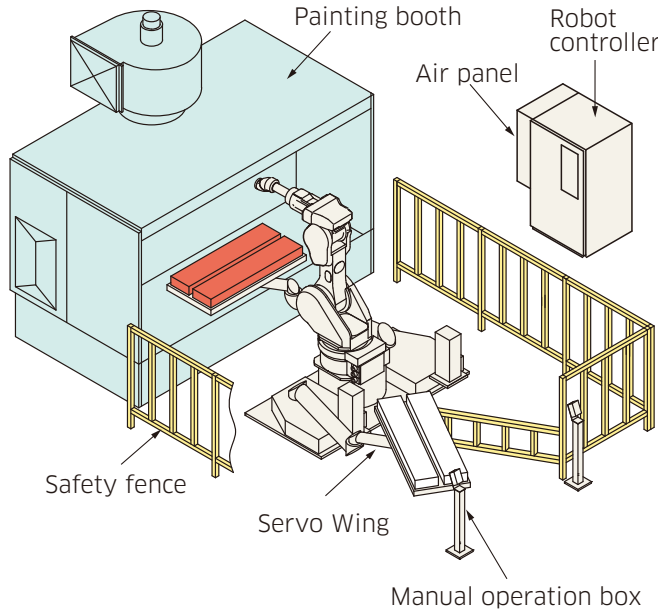


Medium sized work-piece painting cell

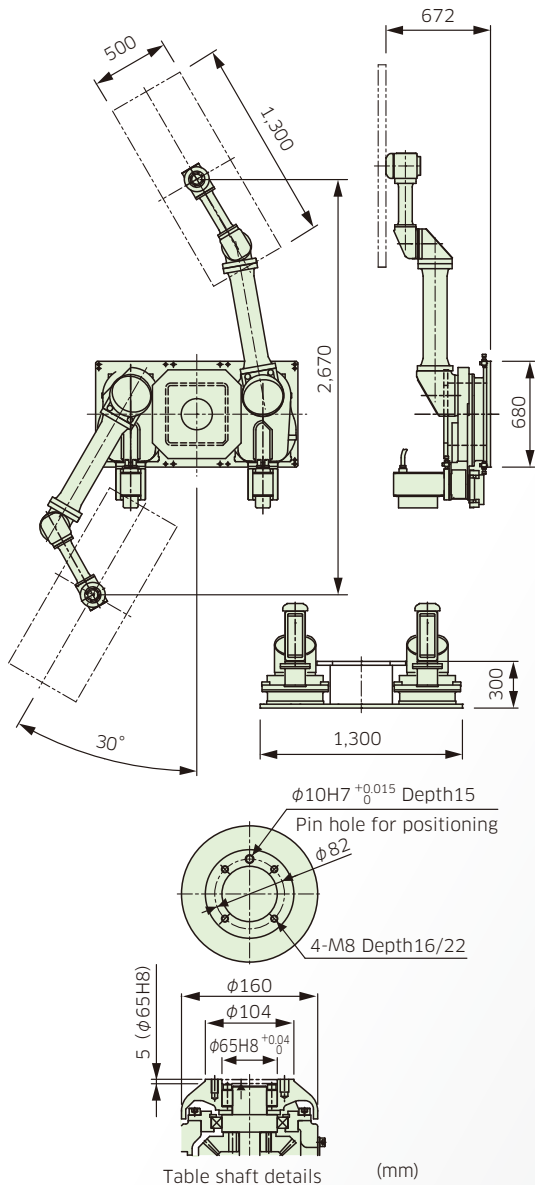
# Servo Wing

The installation space for “Table Painting” was made even smaller.

- 1. Space Saving**  
While suitable for workpieces of a larger size than in the Servo Shuttle, the installation space is made smaller. Because the left and right workpieces are closer together, loading and unloading work is reduced.
- 2. Even Small-sized Robots Cope with Large Work-pieces.**  
Because there is one painting position, the distance between the workpiece and the robot becomes closer, making the robot possibly smaller than that in Servo Shuttle.
- 3. Less teaching work**  
Because the left and right arms can be set for the same painting positions (one position), a single program can be used, thus making the teaching time shorter.
- 4. Preventing paint mist accumulation**  
Because the arms are slim with no fixed rails, painting can be conducted above the water, reducing soiling of the booth. In addition, the airflow turbulence inside the paint booth can be minimized.
- 5. Short Construction Period**  
This device is delivered pre-assembled. So, it can be installed in as little as one day and you can start production immediately.



●External View and Dimensions



●Specifications

Standard	
Table load	30 kg x 2 Table
No. of control axes	Robot 6+Servo wing 2
Control method	Servo control
Teaching playback method	PTP teaching+CP control
Position detection method	Absolute encoder
Arm	Stroke (mm)
	2,670
	Max. speed (°/sec)
	540
Table	Operation angle
	Infinite revolution
	Indexing angle
	90-deg and arbitrary angle
	Indexing time
	1.2/90°
	Uninterrupted rotary speed (rpm)
	Max. 90
	Rotary direction
	Normal/reverse rotation
Intermediate stop function	The intermediate stop function and multiple coating control function are available.
Explosion protection	Air pressurized explosion protection and intrinsically safe. Explosion-proof composite type (Expib II BT4 / Exib II BT4)
Mass (kg)	970
Color	Munsell 10GY9/1 equivalent

Medium sized work-piece painting cell

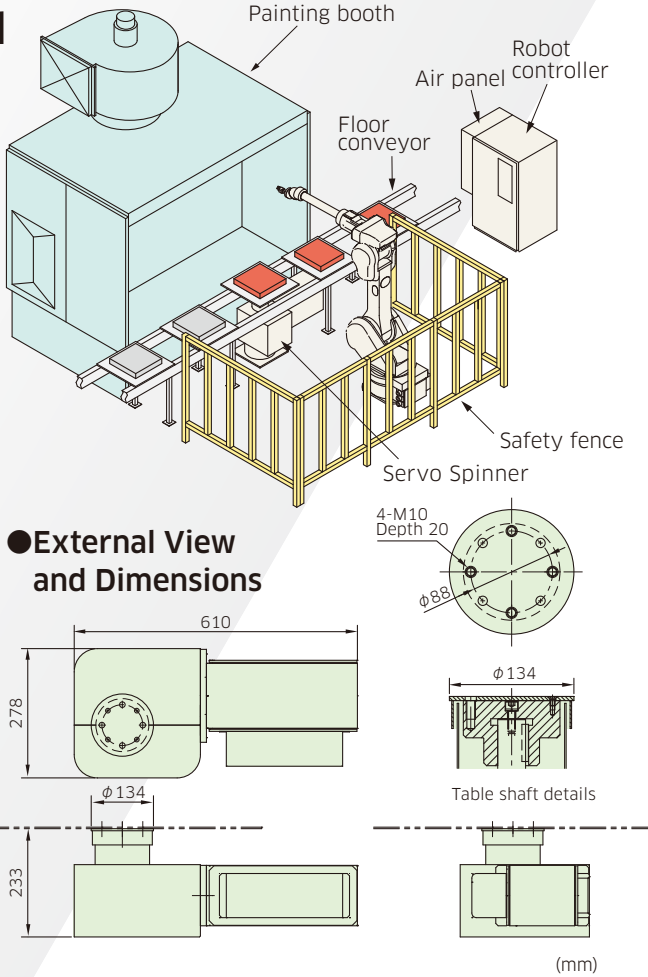
# Servo Spinner

A new dimension in “line coating”

- 1. Flexible component placement**  
Choose the optimum painting posture for the workpiece, and reduce contamination of the paint booth.
- 2. Uninterrupted painting**  
Painting can be performed with the table rotating, thus minimizing the robot's wait time.

●Specifications

Standard		Heavy load carrying
Table load (kg)	20	60
No. of control axes	Robot 6+Servo Spinner 1	
Control method	Servo control	
Teaching playback method	PTP teaching+CP control	
Position detection method	Absolute encoder	
Table	Operation angle	Infinite revolution
	Indexing angle	90-deg and arbitrary angle
	Indexing time	0.8/90° 1.1/90°
	Uninterrupted rotary speed (rpm)	Max. 90 Max. 45
	Rotary direction	Normal/reverse rotation
	Explosion protection	Air pressurized explosion protection and intrinsically safe. Explosion-proof composite type (Expib II BT4 / Exib II BT4)
Mass (kg)	60	
Color	Munsell 10GY9/1 equivalent	



●External View and Dimensions

Large sized work-piece painting cell

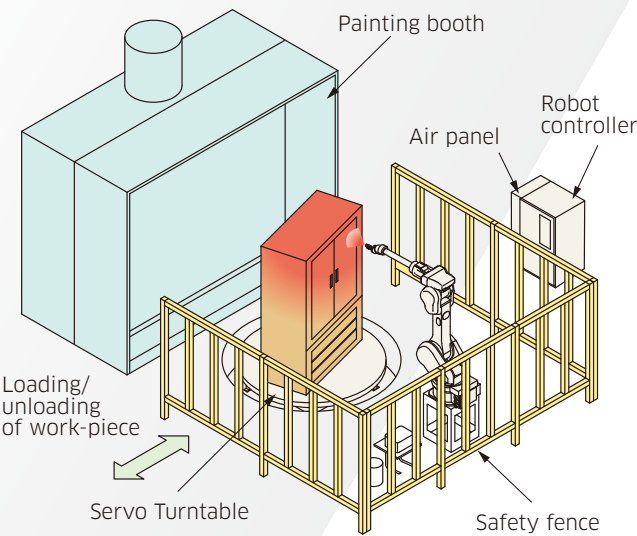
# Servo Turntable

Complete surface painting is possible with uninterrupted turntable rotation

- 1. The integrated control of the robot and table allows any painting position to be achieved according to the work shape.
- 2. The system can be applied to various types of painting such as synchronous control, arbitrary-angle indexing, paint spraying with continuous rotation of the table.

●Specifications

Standard		Heavy load carrying
Table load (kg)	Max. 500	Max. 1,000
No. of control axes	Robot 6+Servo Turntable 1	
Control method	Servo control	
Teaching playback method	PTP teaching+CP control	
Position detection method	Absolute encoder	
Table	Operation angle	Infinite revolution
	Indexing angle	90-deg and arbitrary angle 45-deg, 90-deg, 180-deg and arbitrary angle
	Indexing time	2.5/90° 5/90°
	Uninterrupted rotary speed (rpm)	Max. 10 Max. 5
	Rotary direction	Normal/reverse rotation
	Explosion protection	Air pressurized explosion protection and intrinsically safe. Explosion-proof composite type (Expib II BT4 / Exib II BT4)
Mass (kg)	510	560
Table	Diameter (mm)	φ650, φ1,000, φ1,500, φ2,000
	High (mm)	450
Color	Munsell 10GY9/1 equivalent	
Foot switch function (Option)	Uninterrupted normal rotation, rotation stop	Uninterrupted rotation, 45-deg, 90-deg, 180-deg, indexing (changeable indexing angle), rotation stop



●External View and Dimensions

