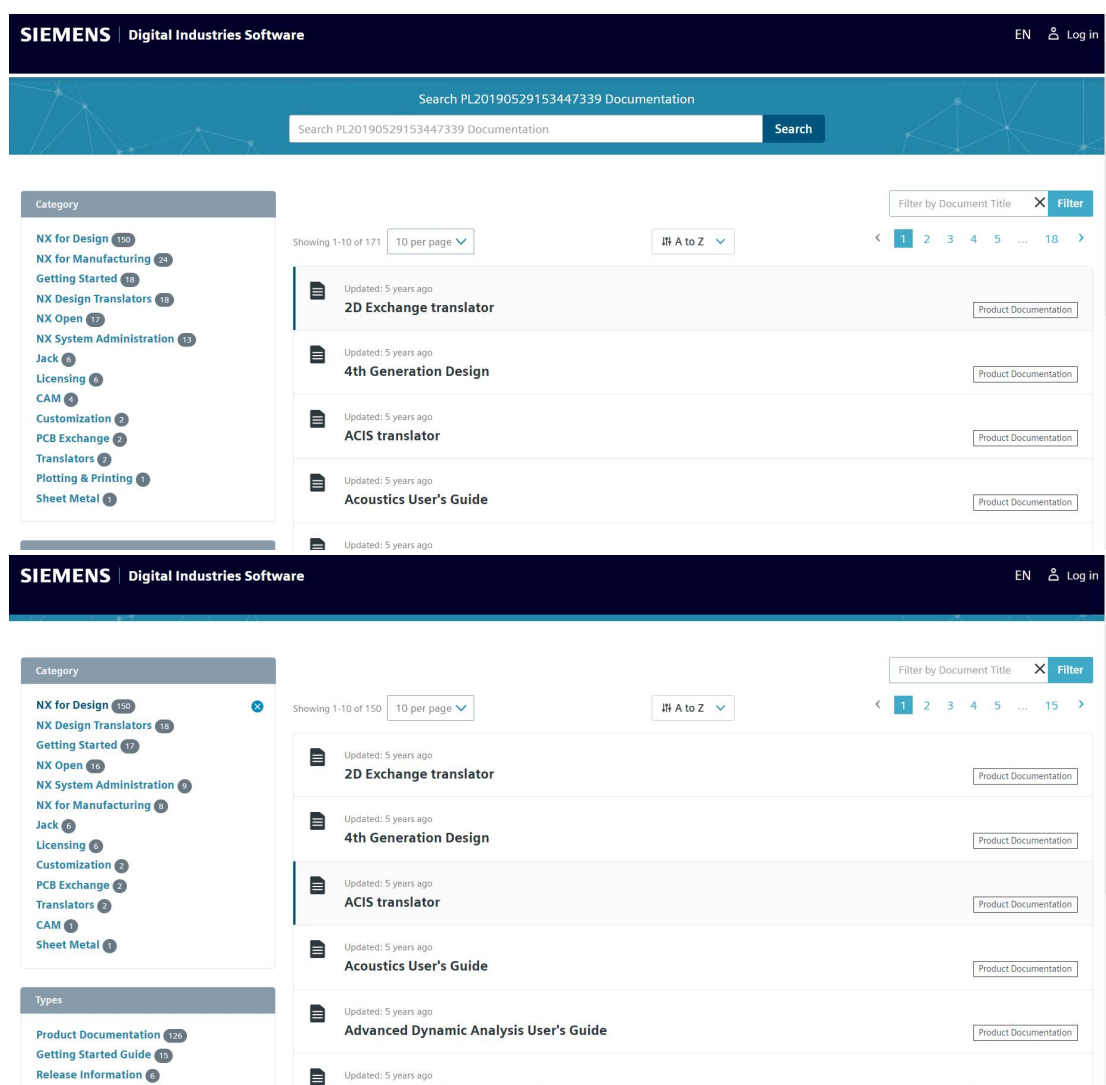


佐证材料 8-1-1：引入国际化资源促进专业技能学习

在专业群共享平台课《三维建模与工程制图》、《产品三维设计》课程中引入西门子官方学习资源；在工业机器人技术专业核心课《工业机器人应用系统集成》课程中引入 Fanuc 原厂学习资源；助力学生在专业技能的学习和训练与国际更为接轨。

材料 1：西门子官方学习资源（示例）

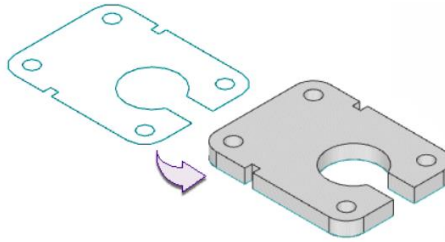




Extrude

Use the **Extrude** command to create a solid or sheet body by selecting a section of curves, edges, faces, sketches, or curve features and extending them a linear distance.

The following example shows how **Extrude** can form a solid body from a section of curves.



You can:

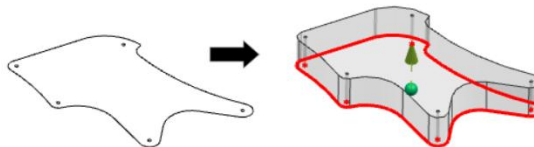
- Size an extrude feature by dragging distance handles or specifying distance values.
- Unite, subtract or intersect an extrude feature with existing bodies.

Extrude a solid body

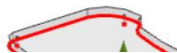
The following example shows you how to extrude a solid body.

1. Choose **Home** tab→**Feature** group→**Extrude** .
2. Select a closed string of curves or edges for the section.

A preview of the extrude feature based on the selected section and default parameters appears.



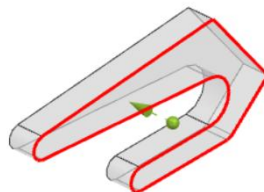
3. (Optional) Change the size of the extrude feature by dragging the **Start** handle.



Create an extrude feature with an offset

1. Choose **Home** tab→**Feature** group→**Extrude** .
2. Select a closed string of curves for the section.

A preview of the extrude feature based on the selected section appears.



3. In the **Extrude** dialog box, in the **Limits** group, from the **Start** option list, select **Until Extended**.
4. In the graphics window, select a face on a solid body for the start of the extrude feature.

In the following figure, the selected face is highlighted in red.



Subtract an extrude feature

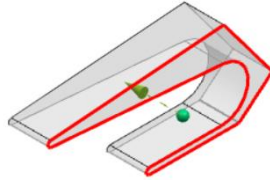
The following example shows how to subtract an extrude feature from a solid body.

1. Choose **Home** tab→**Feature** group→**Extrude** .

The **Extrude** dialog box opens.

2. In the graphics window, select a closed string of curves or edges for the extrude section.

A preview of the extrude feature appears.



3. In the **Extrude** dialog box, in the **Limits** group, from the **End** option list, select **Until Selected**.



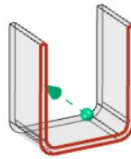
Extrude between two bodies

The following example shows you how to create an extrude feature between two solid bodies.

1. Choose **Home** tab→**Feature** group→**Extrude** .

2. Select a string of curves or edges for the section.

A preview of the extrude feature appears.



3. In the **Limits** group, from the **End** option list, select **Until Selected**.

Tip:

You can also right-click the **End** limit handle and choose **Until Selected**.

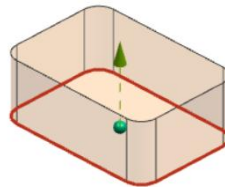
Extrude with an asymmetric angle

This example shows how to extrude a draft with an asymmetric angle.

1. Choose **Home** tab→**Feature** group→**Extrude** .

2. Select a closed string of curves or edges for the section.

A preview of the extrude feature based on the selected section and default parameters appears, as in the following example.




Note:

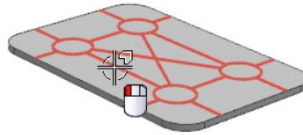
If the extrude preview is not already two-sided (that is, it appears on both sides of the section), drag a limit handle to make it two-sided.



Extrude using a section with self-intersecting curves




This example shows how to extrude a section with self-intersecting curves as a single feature.




1. Make sure the Customer Default setting will allow self-intersecting sections.
Choose **File** tab—**Utilities**—**Customer Defaults**—**Modeling**—**General**.
On the **Miscellaneous** page, select the **Allow Self-intersecting Section in Extrude Feature** check box.
2. Choose **Home** tab—**Feature** group—**Extrude** .
3. Select the section curves.



4. Set and select the desired parameters.
- For this example:

Extrude dialog box

Section	
	Lets you select curves, edges, a sketch, or a face for the section to extrude.
Select Curve	<p>If you select a planar face when the Selection Intent rule is set to Infer Curves, the Sketch task environment opens to let you sketch new curve sections on the face.</p> <p>If you select multiple sections, you get multiple sheet bodies or solid bodies, but only one extrude feature.</p> <div><p>Note:</p><p>A section cannot include 3 or more curves whose end points coincide.</p></div>
	Reverse Direction
	Reverses the direction of the section string.
	Sketch Section
	Opens the Sketch task environment so you can create an internal sketch .

Direction	
	Changes the direction of the extrude to the opposite side of the section.
Reverse Direction	You can also change the direction by right-clicking the direction vector arrowhead and choosing Reverse Direction .
Specify Vector	<p>Lets you define the direction to extrude the section by selecting a vector method from the Specify Vector option list  or the Vector Constructor , and then selecting faces, curves, or edges supported by that type.</p> <p>The vector remains at the specified type (Two Points, Curve/Axis Vector, On Curve Vector, Face/Plane Normal) regardless of section selected, and only changes when the Extrude dialog box is reset or when you explicitly change it to another type.</p> <p>The extrude feature and its direction are associative.</p>


Limits	
Start / End	Lets you define the start and ends of the extrude feature, as measured from the section.
Value	<p>Specifies numeric values for the start or end of the extrude feature. Values above the section are positive and those below are negative.</p> <p>You can drag the limit handles on either side of the section or type values directly in the Distance boxes or in the on-screen input boxes.</p>
Snap to Object	



材料 2: Fanuc 原厂学习资源（示例）

FA & ROBOT **FANUC**

Multi-purpose Intelligent Robot R-2000iA



FANUC LTD

1

FA & ROBOT **FANUC**

Intelligent Function

- Newly developed robot controller R-J3iB makes robot intelligent by the newest servo function, network function, sensor control function, etc.

High Sensitive Collision Detection

This is safety function which detects the symptom of the collision and stops the robot urgently. This can protect robot and peripherals without traditional mechanical clutch.

Automatic Payload Identification

Robot identifies payload by itself and realizes best performance automatically.

Soft Float

Floating function is realized by software. This can reduce the system cost by eliminating mechanical floating device.

Robot Link

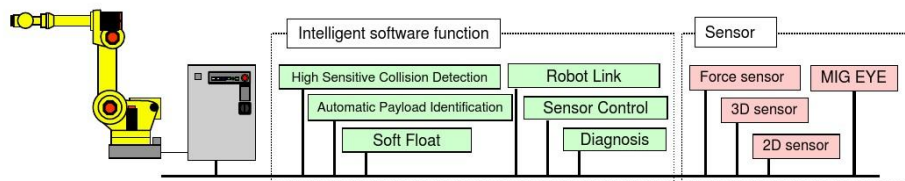
Simultaneous motion or coordinated motion is realized by multiple robots which are connected with ethernet. This can handle heavy /large workpiece which can't be handled by single robot or can reduce system cost by replacing from current special machine to multiple robot handling system.

Sensor Control

By combining various sensors (force sensor, 2D sensor, 3D sensor, etc.), robot can be realized better performance.

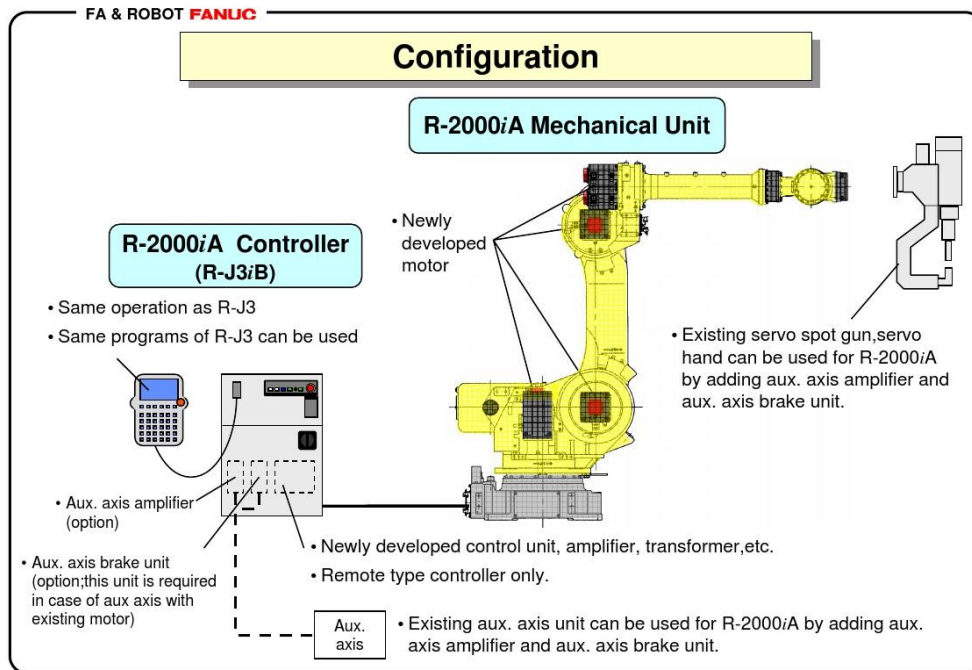
Diagnosis

Diagnostic function for appropriate maintenance is enriched by using various information (voltage, current, temperature, etc.) from amplifier and pulse encoder.

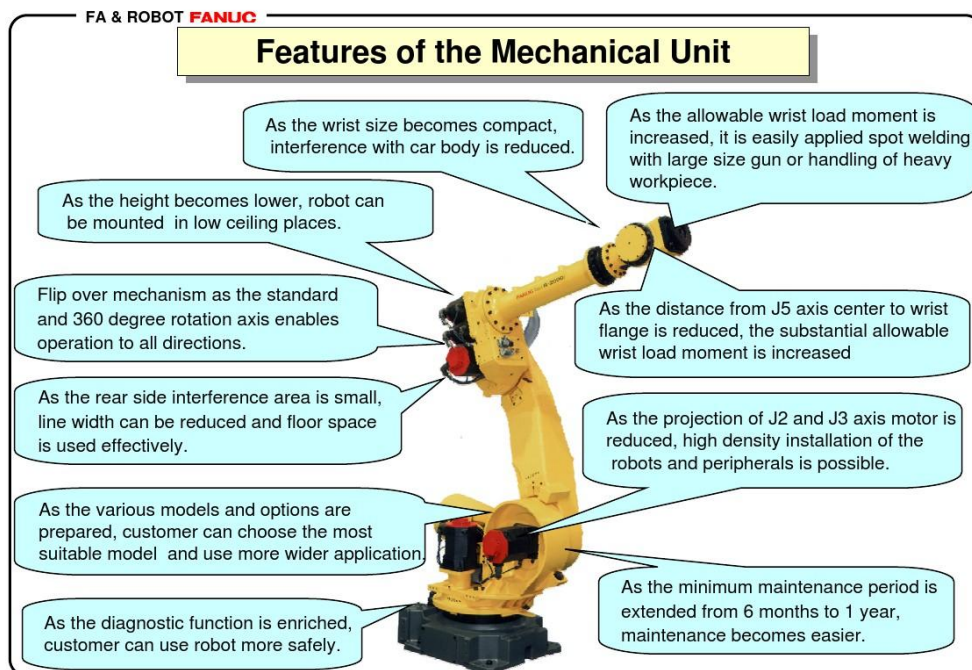


The diagram illustrates the architecture of the intelligent robot system. On the left, a yellow robot arm is connected to a grey control cabinet. The control cabinet is linked to a central 'Intelligent software function' block, which contains five sub-functions: High Sensitive Collision Detection, Automatic Payload Identification, Soft Float, Robot Link, and Sensor Control. To the right of the software block is a 'Sensor' block containing three types of sensors: Force sensor, MIG EYE, and 3D sensor. Below the 3D sensor is a 2D sensor. The 2D sensor is further connected to a 'Diagnosis' block, which is part of the overall system architecture.

2



3



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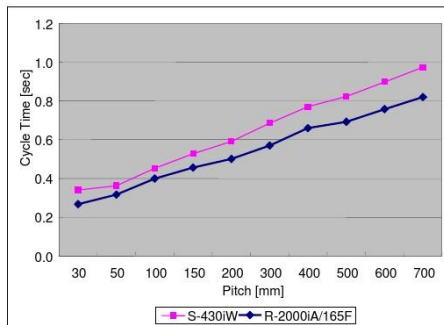
FA & ROBOT **FANUC**

Improvement of Motion Performance

In order to evaluate motion performance, the following many programs are used.

- Box pattern - from short pitch to long pitch
- Actual programs used by customers

1) Box pattern



2) Actual programs used by customers

Programs with servo weld gun

	Cycle Time [sec]		Improve-ment
	S-430iW	R-2000iA/165F	
No.1	29.3	23.1	-21%
No.2	18.0	13.4	-26%
No.3	25.0	22.0	-12%
No.4	25.8	21.7	-16%
Average Improvement			-19%

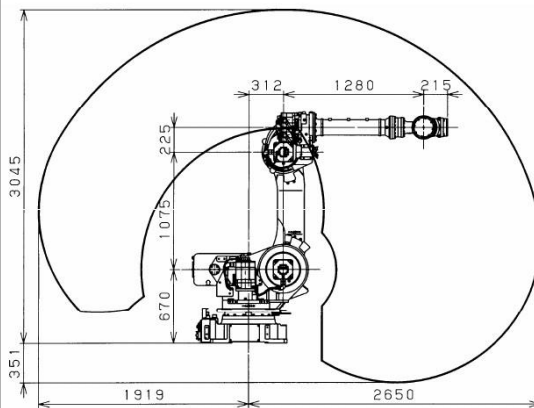
Programs without servo weld gun

	Cycle Time [sec]		Improve-ment
	S-430iW	R-2000iA/165F	
No.1	25.8	24.7	-4.2%
No.2	21.9	21.7	-1.2%
No.3	19.3	17.3	-10.5%
No.4	22.9	22.6	-1.5%
No.5	18.1	15.8	-13.1%
No.6	29.2	28.8	-1.5%
No.7	14.5	14.1	-2.5%
No.8	17.5	17.6	0.6%
Average Improvement			-4.2%

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Outer view and Specification (R-2000iA/165F)



Payload at wrist		165 kg
Reach		2650mm
Maximum speed	J1	105 deg/sec
	J2	105 deg/sec
	J3	105 deg/sec
	J4	130 deg/sec
	J5	130 deg/sec
Allowable load moment at wrist	J6	210 deg/sec
	J4	921 Nm
	J5	921 Nm
Allowable load inertia at wrist	J6	461 Nm
	J4	78.4 kgm ²
	J5	78.4 kgm ²
Repeatability	J6	40.2 kgm ²
	±0.3mm	

Note) All specifications are subject to change without notice.

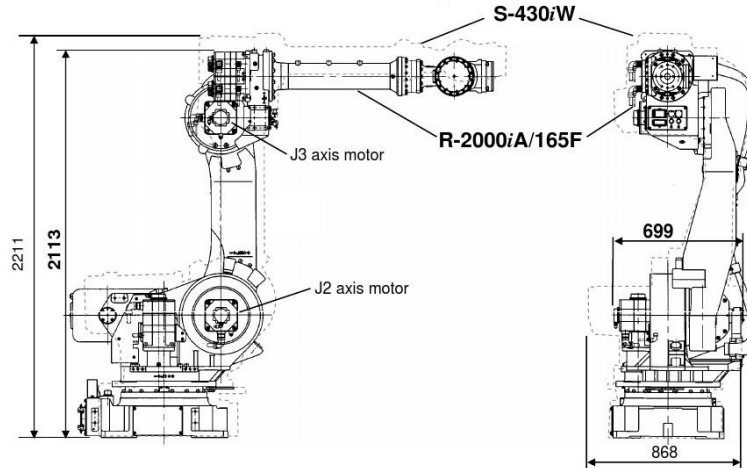
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FA & ROBOT **FANUC**

Compact Mechanical Unit(1)

- Total height is reduced 98mm still maintaining a motion range equivalent to the S-430i. This reduction enables mounting in low ceiling places.
- Thanks to the newly developed small size motor, the projection of J2 and J3 axis motor is reduced, and then total width of the robot is reduced 158mm. This enables high density installation of the robots and peripherals.



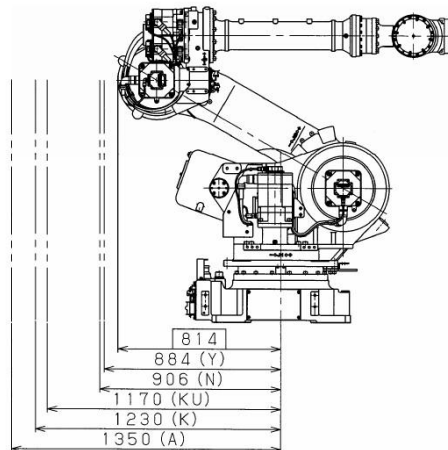
Note) All specifications are subject to change without notice.

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Compact Mechanical Unit(3)

- Simple direct drive mechanism reduces rear side projection at robot escape position. Line width can be reduced and floor space is used effectively.



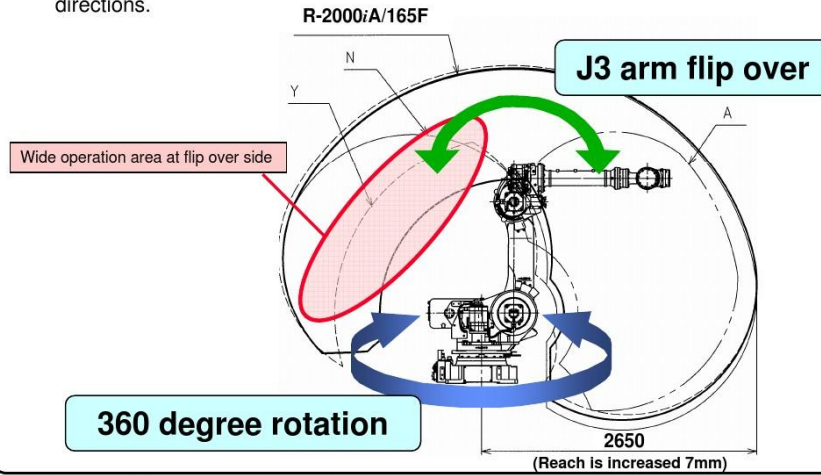
Note) All specifications are subject to change without notice.

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FA & ROBOT **FANUC**

Excellent Performance and Function(1)

- As maximum reach is extended 7mm, wider operating area can be covered.
- Flip over mechanism as the standard and 360 degree rotation axis enables operation to all directions.



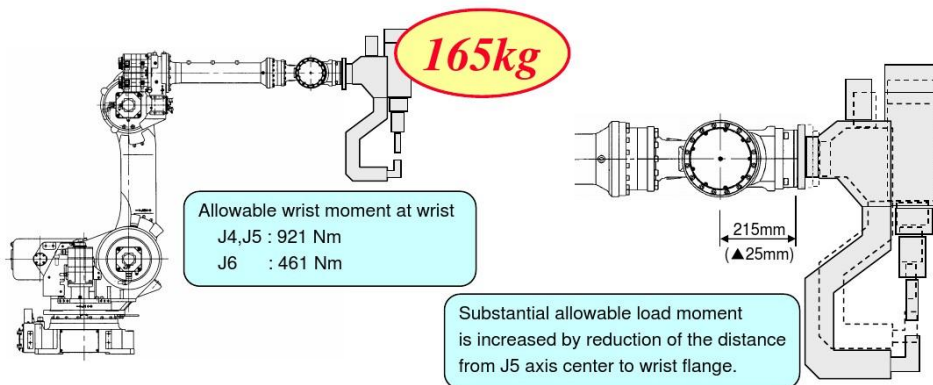
Note) All specifications are subject to change without notice.

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FA & ROBOT **FANUC**

Excellent Performance and Function(2)

- Payload at wrist is 165kg as standard, and allowable load moment at wrist is increased. It is easily applied spot welding with large size gun or handling of heavy workpiece.
- The distance from J5 axis center to wrist flange is reduced 25mm.(ISO flange)
This reduction increases the substantial allowable load moment at wrist.



Note) All specifications are subject to change without notice.

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