

Data types

**confdata - Robot configuration data**

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**Usage**

confdata is used to define the axis configurations of the robot.

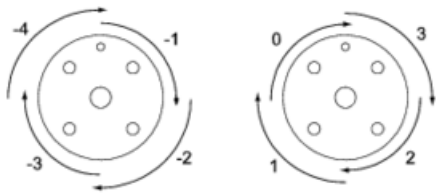
**Description**

All positions of the robot are defined and stored using rectangular coordinates. When calculating the corresponding axis positions, there will often be two or more possible solutions. This means that the robot is able to achieve the same position, i.e. the tool is in the same position and with the same orientation with several different positions or configurations of the robots axes.

Some robot types use iterative numerical methods to determine the robot axes positions. In these cases the configuration parameters may be used to define good starting values for the joints to be used by the iterative procedure.

To unambiguously denote one of these possible configurations, the robot configuration is specified using four axis values. For a rotating axis, the value defines the current quadrant of the robot axis. The quadrants are numbered 0, 1, 2, etc. (they can also be negative). The quadrant number is connected to the current joint angle of the axis. For each axis, quadrant 0 is the first quarter revolution, 0 to 90°, in a positive direction from the zero position; quadrant 1 is the next revolution, 90 to 180°, etc. Quadrant -1 is the revolution 0° to (-90°), etc. (see figure below).

The figure shows the configuration quadrants for axis 6.



For a linear axis, the value defines a meter interval for the robot axis. For each axis, value 0 means a position between 0 and 1 meters and 1 means a position between 1 and 2 meters. For negative values, -1 means a position between -1 and 0 meters, etc. (see figure below).

The figure shows configuration values for a linear axis.



**Robot configuration data for IRB 140, 6600, 6650, 7600**

There are three singularities within the robot's working range (See *RAPID reference manual - RAPID summary*, section *Motion and I/O principles - Singularities*).

- cf1 is the quadrant number for axis 1.
- cf4 is the quadrant number for axis 4.
- cf6 is the quadrant number for axis 6.

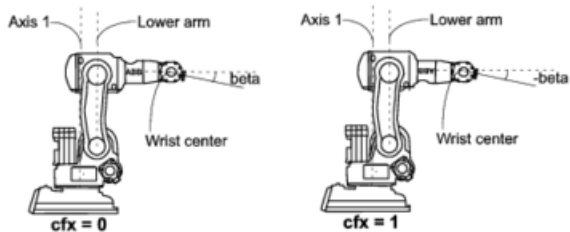
cfx is used to select one of eight possible robot configurations numbered from 0 through 7. The table below describes each one of them in terms of how the robot is positioned relative to the three singularities.

cfx	Wrist center relative to axis 1	Wrist center relative to lower arm	Axis 5 angle
0	In front of	In front of	Positive
1	In front of	In front of	Negative
2	In front of	Behind	Positive
3	In front of	Behind	Negative

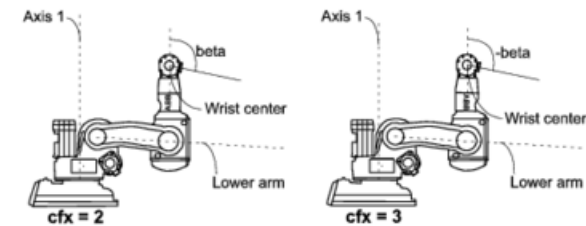
cfx	Wrist center relative to axis 1	Wrist center relative to lower arm	Axis 5 angle
4	Behind	In front of	Positive
5	Behind	In front of	Negative
6	Behind	Behind	Positive
7	Behind	Behind	Negative

The pictures below give an example of how the same tool position and orientation is attained by using the eight different configurations.

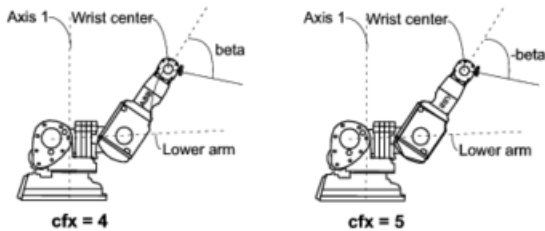
The following figure shows an example of robot configuration 0 and 1. Note the different signs of the axis 5 angle.



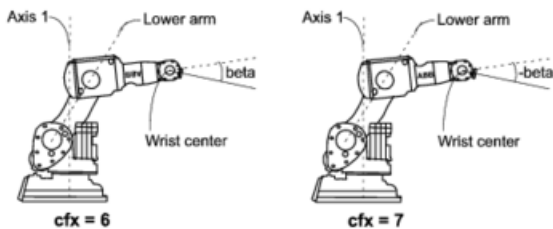
The following figure shows an example of robot configuration 2 and 3. Note the different signs of the axis 5 angle.



The following figure shows an example of robot configuration 4 and 5. Note the different signs of the axis 5 angle.



The following figure shows an example of robot configuration 6 and 7. Note the different signs of the axis 5 angle.



Robot configuration data for IRB 340

Robot configuration data for IRB 260, 660

Robot configuration data for IRB 1400, 2400, 3400, 4400, 6400

Only the configuration parameter `cf4` is used.

Only the configuration parameter `cf6` is used.

Only the three configuration parameters `cf1`, `cf4`, and `cf6` are used.

## Robot configuration data for IRB 5400

All four configuration parameters are used. `cf1`, `cf4`, `cf6` for joints 1, 4, and 6 respectively and `cfx` for joint 5.

## Robot configuration data for IRB 5404, 5406

The robots have two rotation axes (arms 1 and 2) and one linear axis (arm 3).

- `cf1` is used for the rotating axis 1
- `cfx` is used for the rotating axis 2
- `cf4` and `cf6` are not used

## Robot configuration data for IRB 5413, 5414, 5423

The robots have two linear axes (arms 1 and 2) and one or two rotating axes (arms 4 and 5). (Arm 3 locked).

- `cf1` is used for the linear axis 1
- `cfx` is used for the linear axis 2
- `cf4` is used for the rotating axis 4
- `cf6` is not used

## Robot configuration data for IRB 840

The robot has three linear axes (arms 1, 2 and 3) and one rotating axis (arm 4).

- `cf1` is used for the linear axis 1
- `cfx` is used for the linear axis 2
- `cf4` is used for the rotating axis 4
- `cf6` is not used

Because of the robot's mainly linear structure, the correct setting of the configuration parameters `c1`, `cx` is of less importance.

## Components

### `cf1`

Data type: `num`

Rotating axis:

The current quadrant of axis 1, expressed as a positive or negative integer.

Linear axis:

The current meter interval of axis 1, expressed as a positive or negative integer.

### `cf4`

Data type: `num`

Rotating axis:

The current quadrant of axis 4, expressed as a positive or negative integer.

Linear axis:

The current meter interval of axis 4, expressed as a positive or negative integer.

### `cf6`

Data type: `num`

Rotating axis:

The current quadrant of axis 6, expressed as a positive or negative integer.

Linear axis:

The current meter interval of axis 6, expressed as a positive or negative integer.

### `cfx`

Data type: `num`

Rotating axis:

For the IRB 140, the current robot configuration, expressed as an integer in the range from 0 to 7.

For the IRB 5400, the current quadrant of axis 5, expressed as a positive or negative integer.

For other robots, using the current quadrant of axis 2, expressed as a positive or negative integer.

Linear axis:

The current meter interval of axis 2, expressed as a positive or negative integer.

## Basic examples

Basic examples of the data type `confdata` are illustrated below.

### Example 1

```
VAR confdata conf15 := [1, -1, 0, 0]
```

A robot configuration conf15 for robot type IRB 5400 is defined as follows:

- The axis configuration of the robot axis 1 is quadrant 1, i.e. 90-180°.
- The axis configuration of the robot axis 4 is quadrant -1, i.e. 0-(-90°).
- The axis configuration of the robot axis 6 is quadrant 0, i.e. 0 - 90°.
- The axis configuration of the robot axis 5 is quadrant 0, i.e. 0 - 90°.

Structure

```
< dataobject of confdata >  
< cf1 of num >  
< cf4 of num >  
< cf6 of num >  
< cfx of num >
```

Related information

For information about	See
Coordinate systems	<i>Technical reference manual - RAPID overview, section Motion and I/O principles - Coordinate systems</i>
Handling configuration data	<i>Technical reference manual - RAPID overview, section Motion and I/O principles - Robot configuration</i>
Position data	<a href="#">robtargt - Position data</a>