confdata Robot configuration data

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 1).

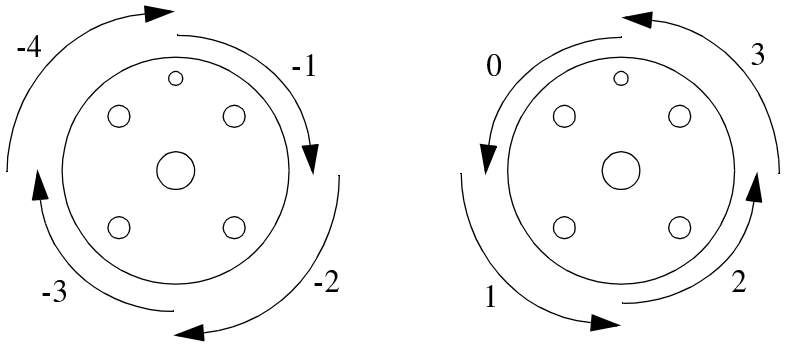

Figure 1 The configuration quadrants for axis 6.

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, 1 means a position between 1 and 2 meters. For negative values, -1 means a position between -1 and 0 meters, etc. (see Figure 2).

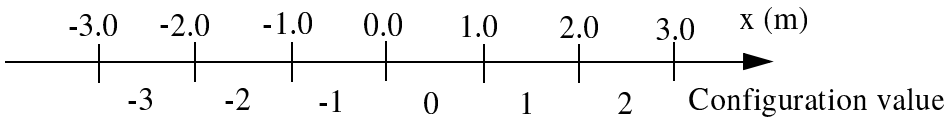

Figure 2 Configuration values for a linear axis.

Robot Configuration data for IRB140

There are three singularities within the robot's working range (See *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 centre relative to axis 1	Wrist centre 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
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:

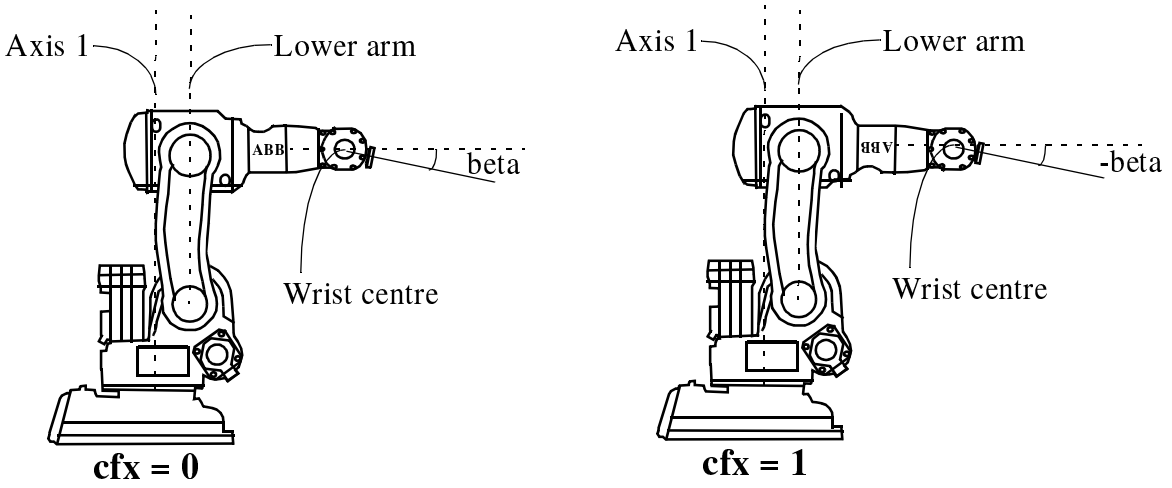

Figure 3 Example of robot configuration 0 and 1. Note the different signs of the axis 5 angle.

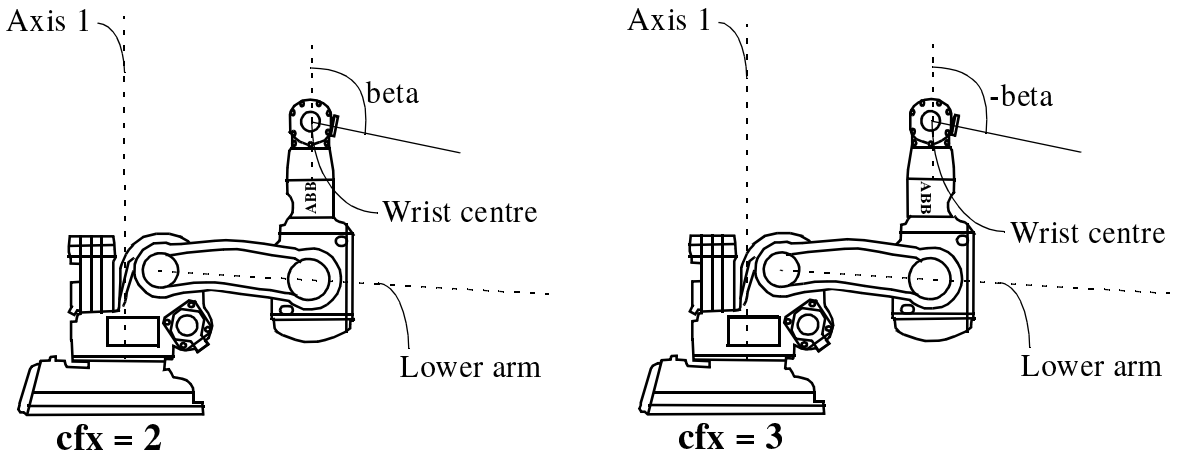

Figure 4 Example of robot configuration 2 and 3. Note the different signs of the axis 5 angle.

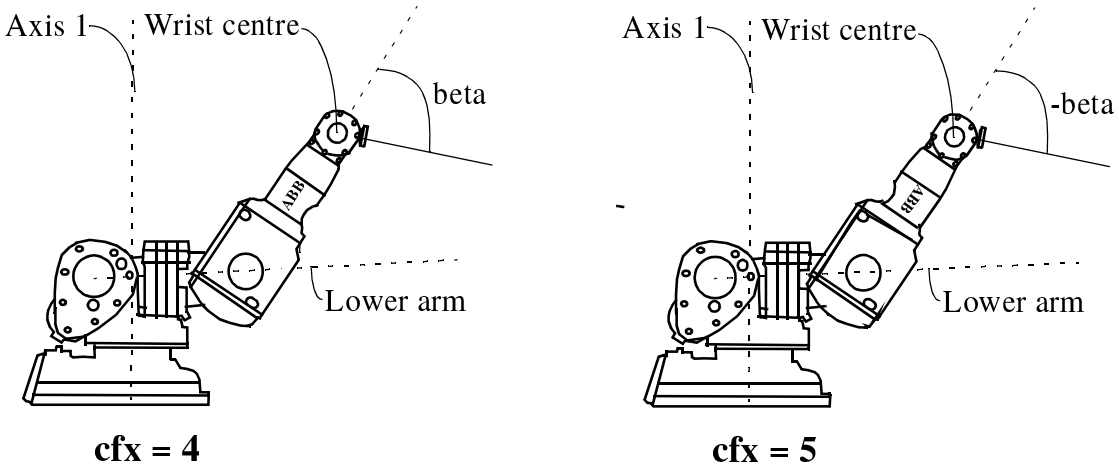

Figure 5 Example of robot configuration 4 and 5. Note the different signs of the axis 5 angle.

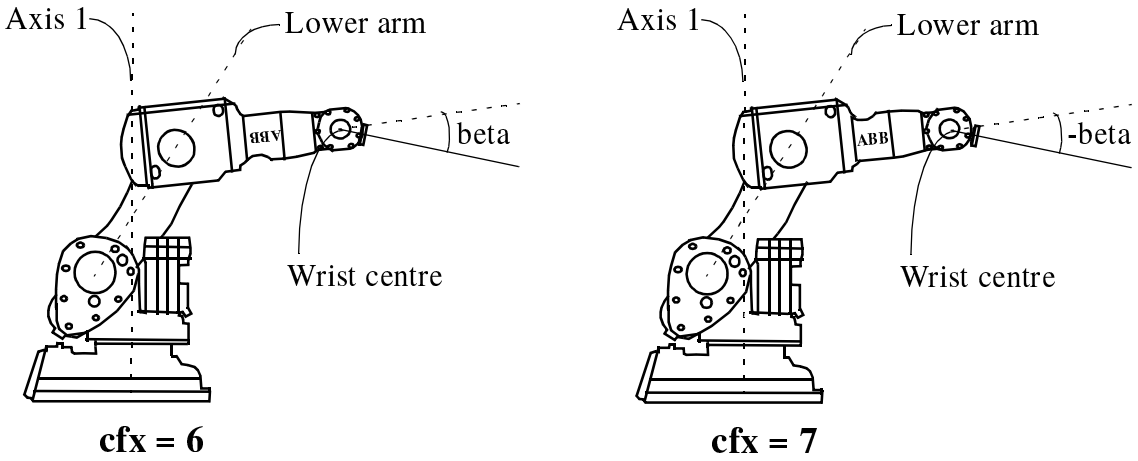

Figure 6 Example of robot configuration 6 and 7. Note the different signs of the axis 5 angle.

Robot Configuration data for IRB540, 640

Only the configuration parameter cf6 is used.

Robot Configuration data for IRB1400, 2400, 3400, 4400, 6400

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

Robot Configuration data for IRB5400

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 IRB5404, 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 IRB5413, 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 IRB840

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 the robot's structure is mainly linear, 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 IRB140, the current robot configuration, expressed as an integer in the range from 0 to 7.

For the IRB5400, 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.

Example

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

A robot configuration *conf15* is defined as follows:

- The axis configuration of the robot axis 1 is quadrant *1*, i.e. 90-180^{o}.
- The axis configuration of the robot axis 4 is quadrant *-1*, i.e. 0-(-90^{o}).
- The axis configuration of the robot axis 6 is quadrant *0*, i.e. 0 - 90^{o}.
- The axis configuration of the robot axis 5 is quadrant *0*, i.e. 0 - 90^{o}.

Structure

< dataobject of *confdata* >
  < *cf1* of *num* >
  < *cf4* of *num* >
  < *cf6* of *num* >
  < *cf*x of *num* >

Related information

	Described in:
Coordinate systems	Motion and I/O Principles - *Coordinate Systems*
Handling configuration data	Motion and I/O Principles - *Robot Configuration*