

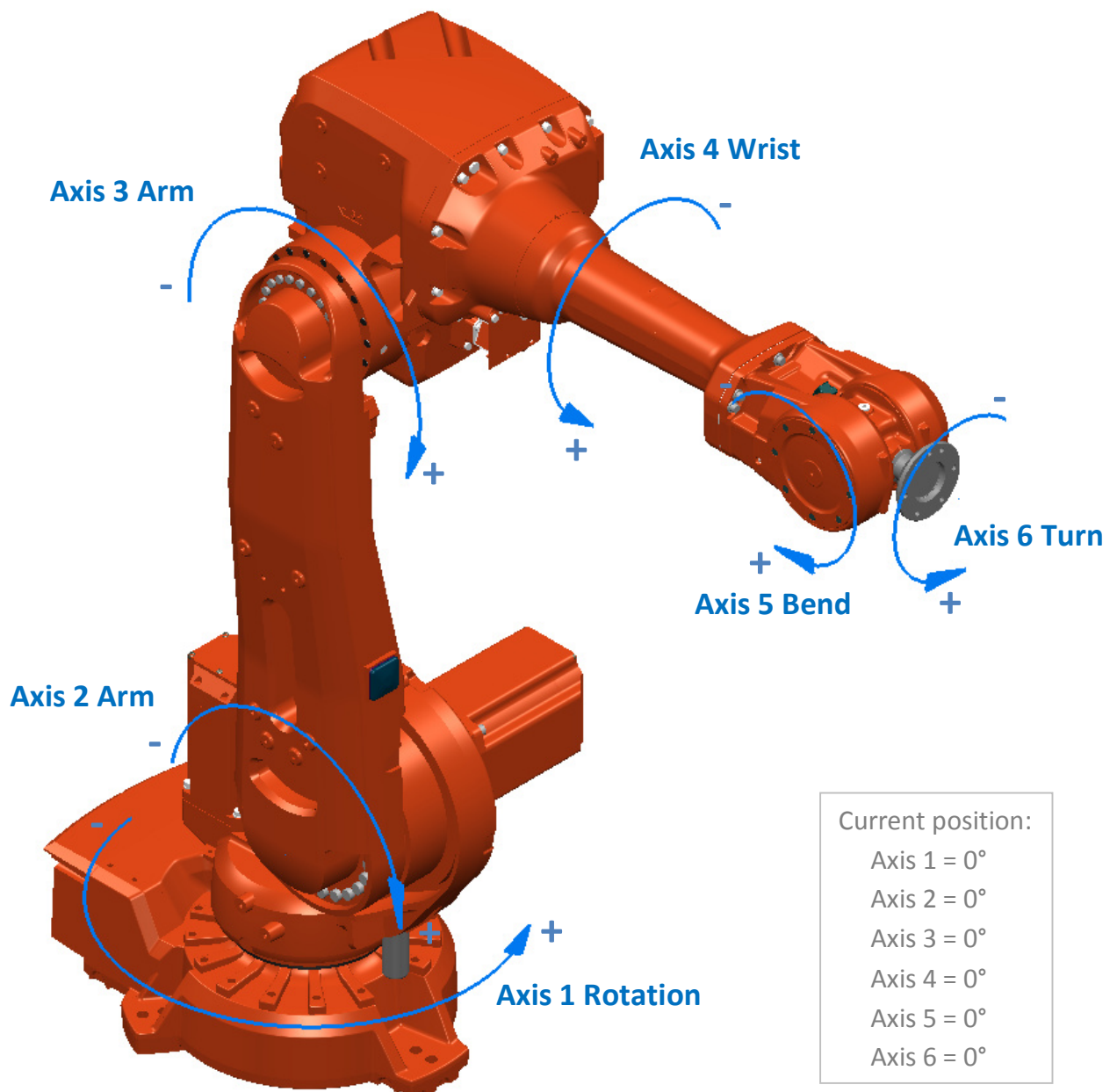
PowerMILL Robot

- ABB Robot Setup -

This document describes the default parameters of a 6 axis ABB robot and lists the information needed to run it.

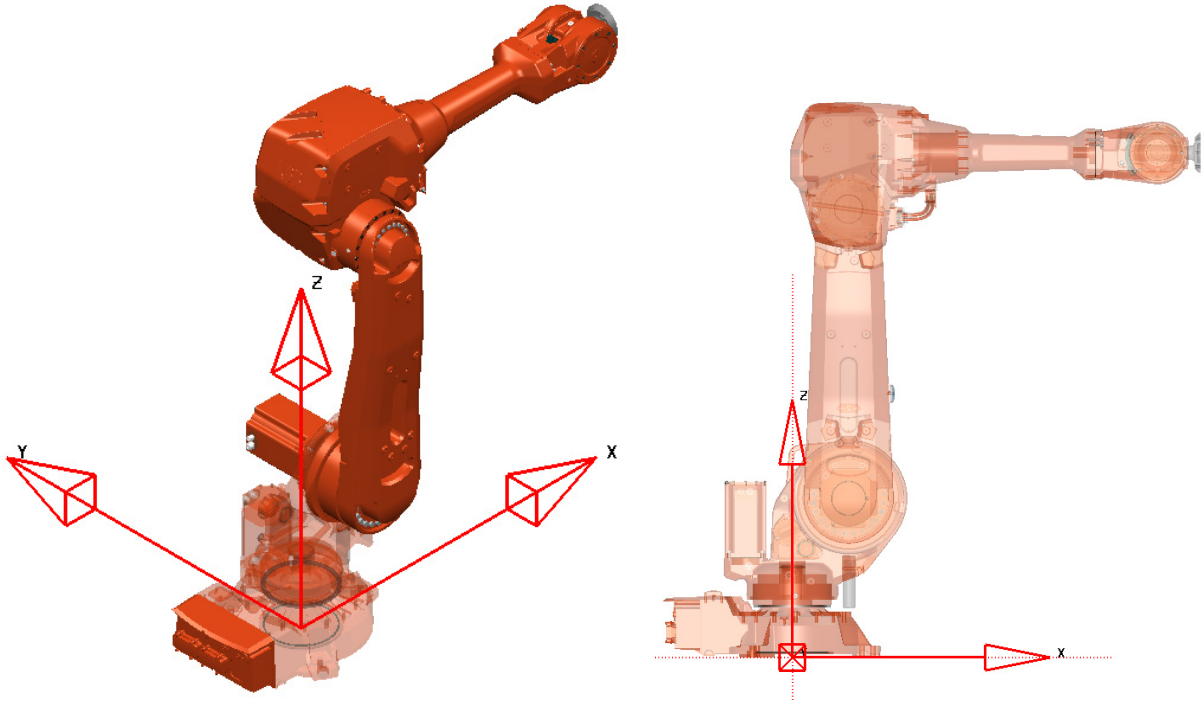
Warning: All of these points need to be checked carefully as the robot may be set up in a different way by the robot integrator.

1. Axes names and directions



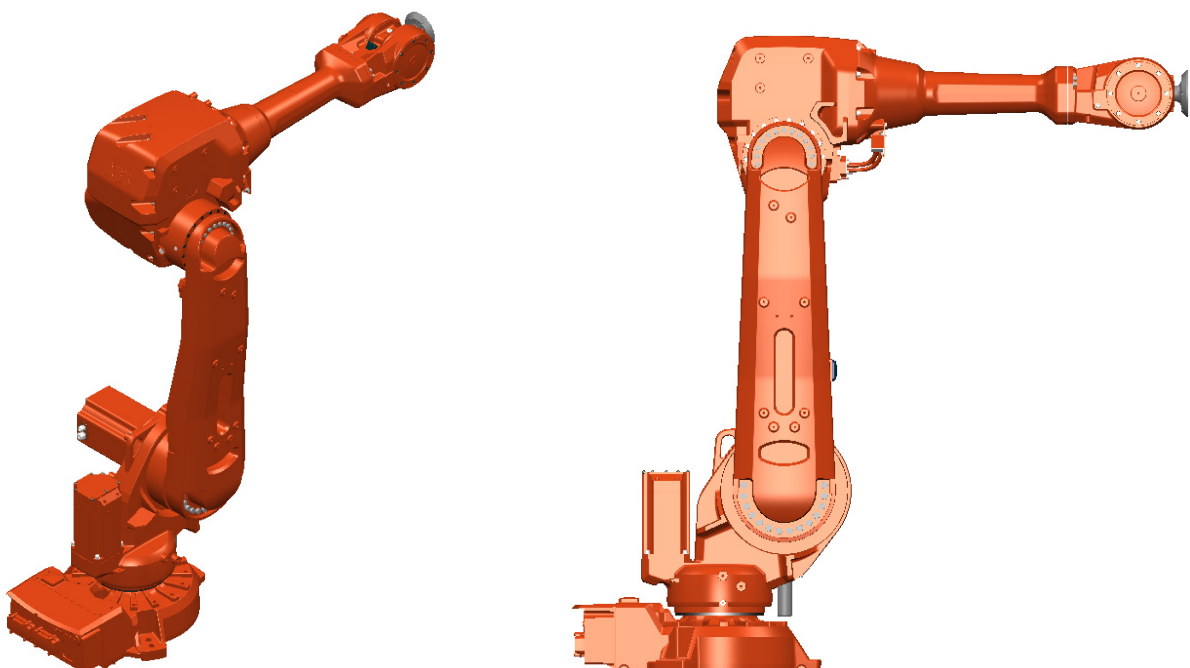
2. ABB robot “world workplane” position

The ABB robot world workplane is positioned at the intersection of axis one and the robot base.



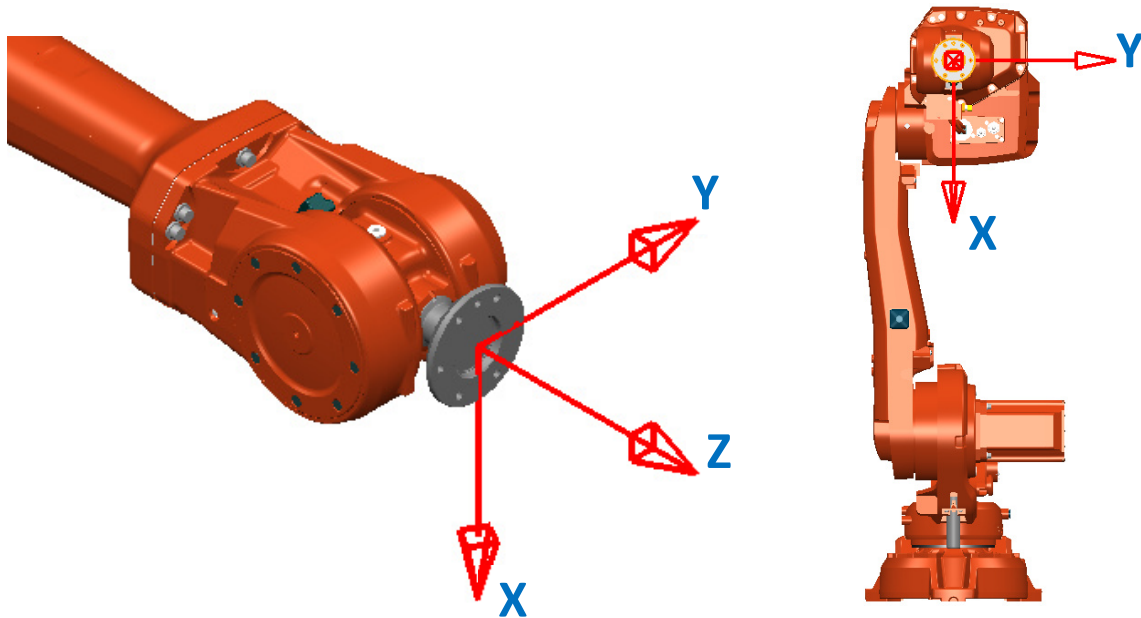
3. ABB robot “Zero position”

When all axes are at their 0° position, the robot looks like the pictures below.



4. ABB Robot “6th axis workplane orientation”

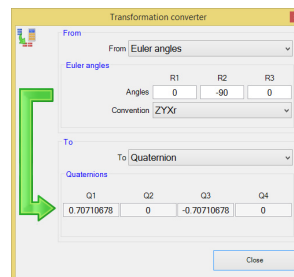
The 6th axis default orientation is like the pictures below.



5. “Tool workplane” definition

A tool workplane is called “Tool Data” (tooldata). ABB uses Quaternion angles to define the tool workplane orientation, from the 6th axis (flange) workplane.

Quaternion can be calculated using the “Transformation converter” tool available in PowerMILL Robot. It can convert “ZYX rotary” Euler convention to Quaternion values “Q1, Q2, Q3, Q4”.



This tool workplane is defined by moving and then rotating:

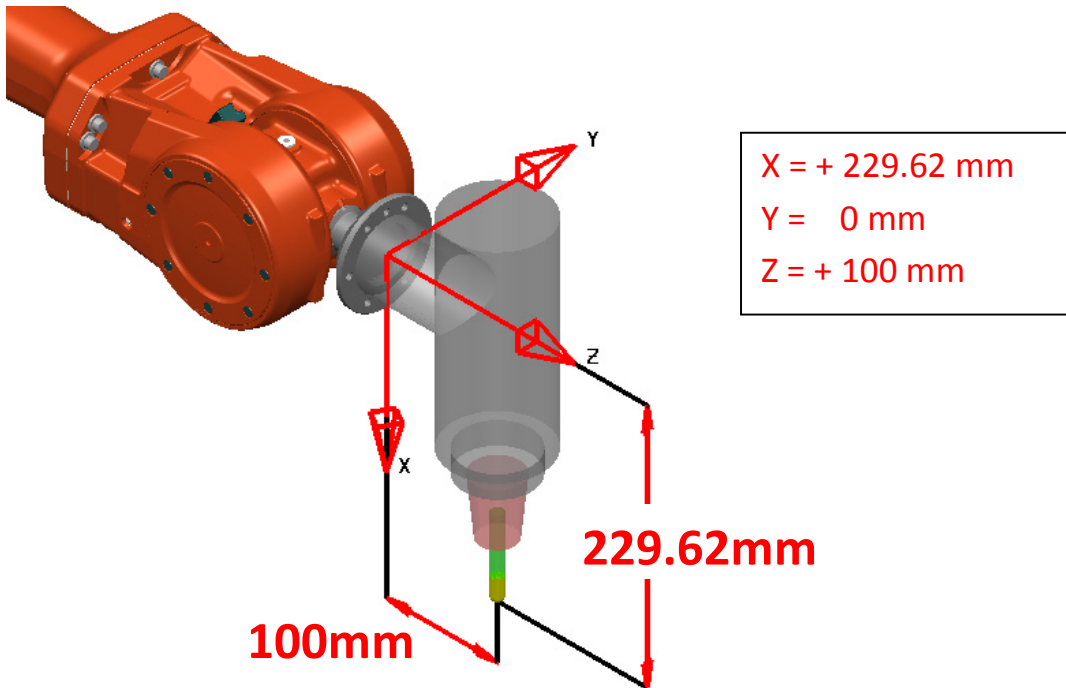
- First, move along X, Y and Z axes (from the 6th axis workplane).
- Then rotate Z, then Y, and X around the transformed workplane, to get the desired Euler orientation. Then use the calculator to get the four quaternion values.

Below is an example definition of the ABB Tool Data (coordinates only, called tdelcam0):

```
tdelcam0:=[x,[[229.62,0,100],[0.707107,0,-0.707107,0]],x,[x,x,x],[x,x,x,x],[x,x,x,x]];
```

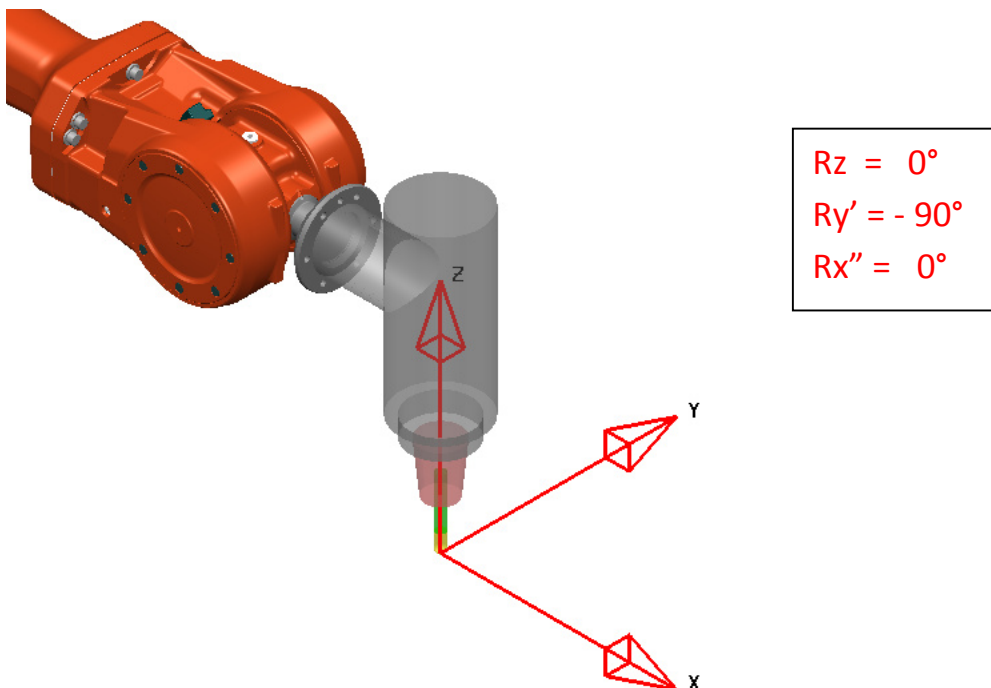
5.1 Move...

Move along each axis of the 6th axis robot workplane.



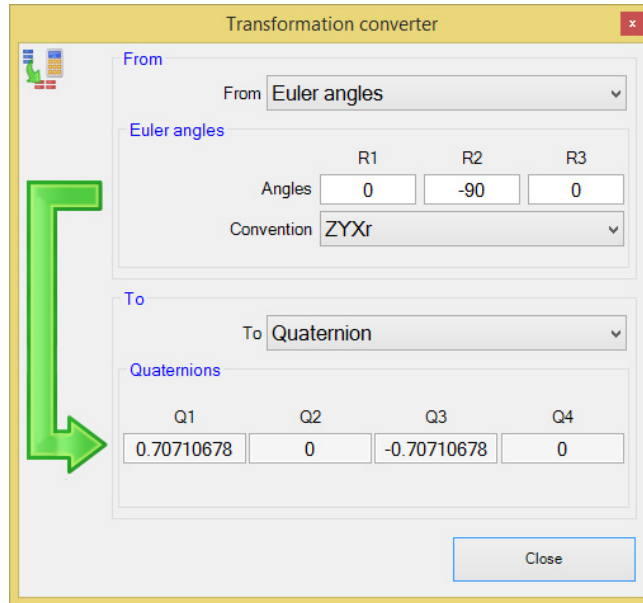
5.2 ...Then Rotate...

Rotate around Y axis of -90° to get the result below.



5.3 ...And convert to Quaternion

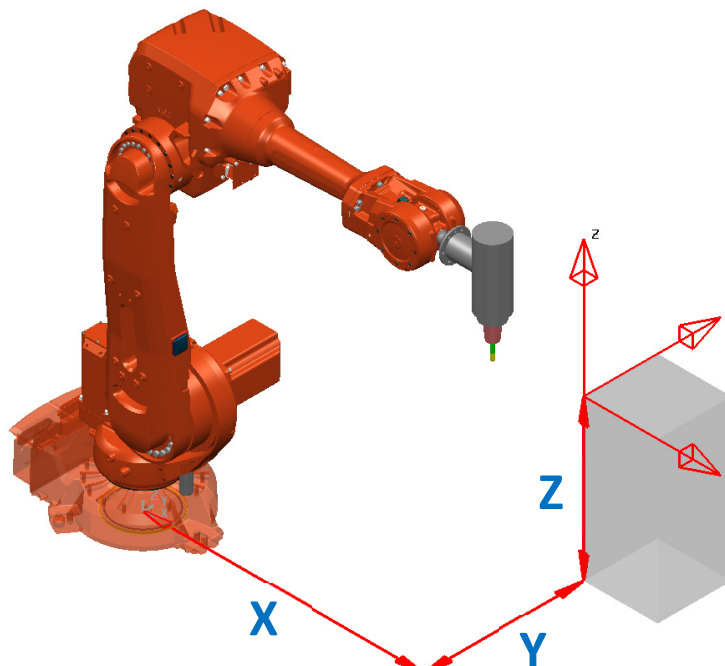
Using the “Transformation converter” tool (which can convert “ZYX rotary” Euler angles), the rotation of -90° around the Y axis can be converted to Quaternion values (Q1, Q2, Q3, Q4).



6. “Part workplane” definition

A part origin workplane is called “Work Object Data” (wobjdata). ABB uses Quaternion angles to define the part origin workplane orientation, from the robot world workplane.

The method of defining a part origin workplane is similar to that when defining a tool workplane. However, the reference of the coordinates is the robot world workplane instead the robot 6th axis workplane.



7. Part on the robot, spindle on the table.

In case of an ABB robot set for having the part on the robot and the spindle (cutting tool) on the table, some flags are set in the "Tool Data" and the "Work Object Data". In both cases (tool-on-robot and part-on-robot), the "Tool Data" is the real cutting tool and the "Work Object Data" the part origin workplane.

Below are two examples where the cutting tool is held by the robot and one where the part is held by the robot:

- The tool is on the robot, the part on the table:

```
PERS tooldata tdelcam0:=TRUE,[[x,x,x],[x,x,x,x]],[x,[ x, x, x],[ x, x, x], x, x, x];
PERS wobjdata wdelcam0:=FALSE,TRUE,"",[[x,x,x],[x,x,x,x]],[[x,x,x],[x,x,x,x]]
```

- The part is on the robot, the tool on the table:

```
PERS tooldata tdelcam0:=FALSE,[[x,x,x],[x,x,x,x]],[x,[ x, x, x],[ x, x, x], x, x, x];
PERS wobjdata wdelcam0:=TRUE,TRUE,"",[[x,x,x],[x,x,x,x]],[[x,x,x],[x,x,x,x]]
```

8. Miscellaneous

In ABB Rapid language (MOD files), the robot default speed unit is millimeter per second: **mm/s**

MoveL [...],**v17**,z0,t1\WObj:=w1; *means robot TCP speed = 17 mm/s (≈1000 mm/min)*