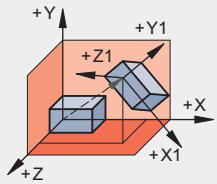
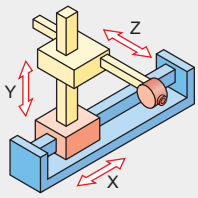
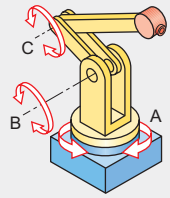
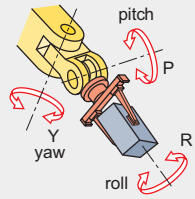
Coordinate systems and axes

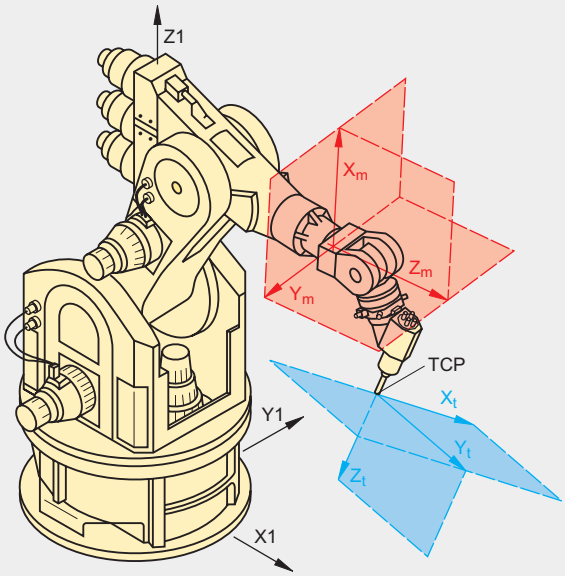
cf. DIN EN ISO 9787 (2000-07)

Robot axes

Coordinate system	Robot main axes for positioning		Robot auxiliary axes for orientation
			
To manipulate workpieces or tools in space, the following are necessary: • 3 degrees of freedom for positioning and • 3 degrees of freedom for orientation	To reach a desired point in space, 3 robot main axes are necessary.		3 robot auxiliary axes for spatial orientation • R (roll) • P (pitch) • Y (yaw)
	Cartesian robots	Articulated arm robots	
	3 translation axes (T axes) designated X, Y and Z	3 rotational axes (R-axes) designated A, B and C	

Coordinate systems

cf. DIN EN ISO 9787 (2000-07)



Base coordinate system

The base coordinate system references
- the level mounting surface for the X-Y plane
- the center of the robot for the Z axis

Flange coordinate system

The flange coordinate system references the end surface of the terminating main axis of the robot.

Tool coordinate system

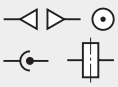
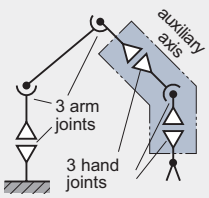
The origin of the tool coordinate system lies at the tool center point *TCP* (*T*ool *C*enter *P*oint).

The speed of the tool center point is referred to as the robot speed and the path of tool travel as the robot trajectory.

Symbols for representing robots (selection)

cf. VDI 2861 (1988-06)

A

Designation	Symbol	Designation	Symbol	Example RRR robots
Translation axis (T-axis)[1] Translation aligned (telescoping) Translation out of alignment		**Rotation axis (R-axis)**[2] Rotation aligned Rotation out of alignment		
Gripper		Auxiliary axis (e.g. for roll, pitch and yaw)		

[1] Translation = straight line motion [2] Rotation = rotational motion