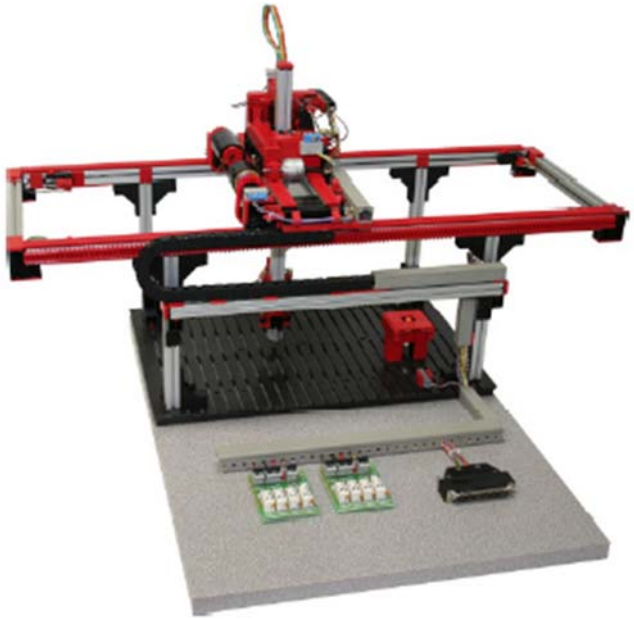
3 Axis Portal



The model 3-axis-portal simulates a stationary used handling robot with an orthogonal work space used for passing on work pieces to processing or sorting unit, as used e. g. in factories being automated in a large degree. The model consists of the portal robot that is able to move in three linear directions and an electromagnetic gripper, fit to be moved in Z-direction, a piece store and a discharge station. The end positions of the several moving parts are each recognized by software end position switches. The simulated process shows metal work pieces being withdrawn from the store by the electromagnetic gripper, being moved to the discharge station and there getting put down: At the beginning of the sequence the moving parts of the robot execute a reference tour, in order to equalize the incremental distance measuring systems of the X- and Y-axes with their real positions. The reference tour is done with the gripper being in its upper end position. After this, the gripper is moved in X- and Y-direction until it has reached its demanded position above the piece store. The gripper moves in –Z-direction until it touches the work piece. The magnet gets switched on and the part is attached to the gripper. The gripper moves in +Z-direction until it has again reached its upper end position. Following this, it executes a movement in X- and Y-direction until it has reached a position above the discharge station. Having reached this state, the gripper again moves in –Z-direction until the attached piece is put on the discharge station, where it gets recognized by an inductive proximity switch. The work piece is withdrawn by deactivating the electromagnetic gripper. In order to save the whole unit from being damaged by moving out of the allowed work space, caused by a mistake in programming the control unit, the linear directions are supplementary equipped with hardware end position switches, which cause an immediately stop of the corresponding axis in case of being actuated. The electronic concept of the model only enables a restarting of the robot by executing a movement towards the work space.

Inputs / Sensors

Variable	Name	Direction
x0	X-Axis: Crane position right	Input
x1	X-Axis: Crane position left	Input
x2	X-Axis: Crane at reference position	Input
x3	Y-Axis: Crane position back	Input
x4	Y-Axis: Crane postition front	Input
x5	Y-Axis: Crane at reference position	Input
x6	Z-Axis: Crane at position up	Input
x7	Z-Axis: Crane at position down	Input
x8	Proximity sensor	Input
x9	User button	UserInput
x10-x25	Absolut Position X [16 Bit Vector]	Input
x26-x41	Absolut Position Y [16 Bit Vector]	Input

Outputs / Actuators

Variable	Name	Direction
y0	Crane drive +X (right)	Output
y1	Crane drive -X (left)	Output
y2	Crane drive +Y (back)	Output
y3	Crane drive -Y (front)	Output
y4	Crane drive +Z (up)	Output
y5	Crane drive -Z (down)	Output
y6	Electromagnet	Output