



18 KAIRO Language reference

The following section explains the behaviour of all available KAIRO commands.

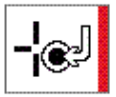
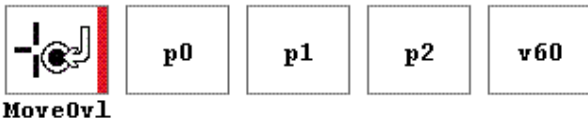
18.1 Movement instructions

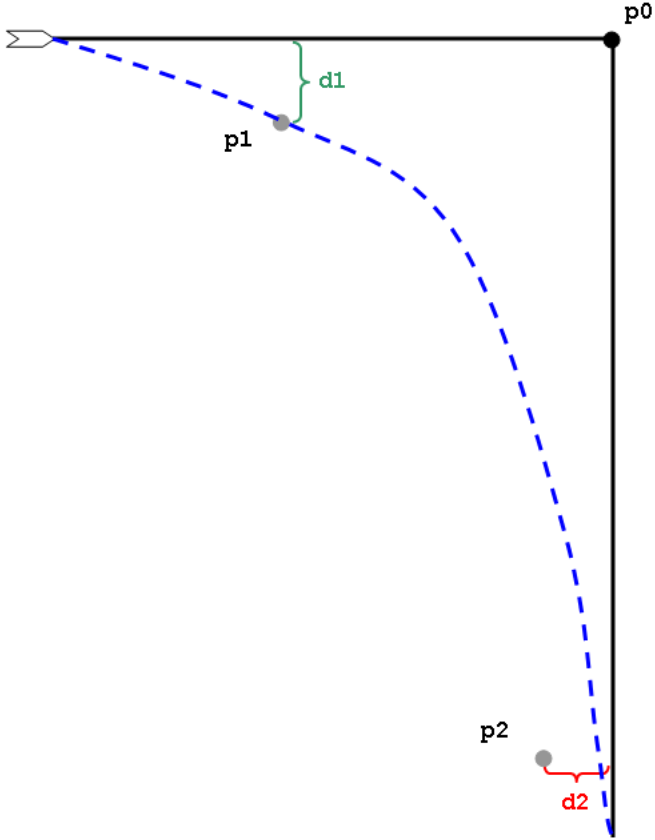


Move


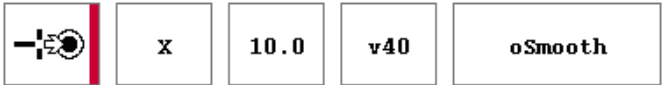
Symbol	
Graphical editor	
Textbased editor	Move (p0, v40, oSmooth)
Explanation	<p>p0... cartesian position</p> <p>v40... path velocity in % of maximum axis dynamics</p> <p>oSmooth...Overlap radius.</p> <p>Movement command for all axes.</p>

MoveOv1



Symbol	 MoveOv1
Graphical editor	

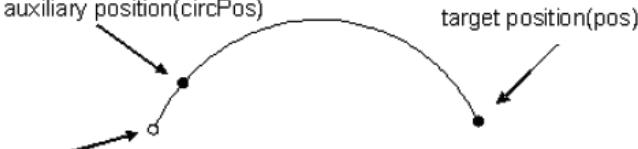
Textbased editor	MoveOv1(p0, p1, p2, v60)
Explanation	<p>p0... name of the corner point of the motion</p> <p>p1... name of the first constraint position [optional].</p> <p>p2... name of the second constraint position [optional]</p> <p>v60...velocity override</p> <p>Movement instruction with asynchronous axis movement. The Point p0 is mandatory, it marks the corner point of the axis movement.</p> <p>Points p1 and p2 (if specified) mark the first and second overlap constraint which define the maximum allowed path deviation at point p1 and p2, which is denoted with d1 and d2 in the figure. In order to determine the deviation distances d1 and d2, the normal distance from p1 and p2 to the linear axis movement direction is calculated.</p> <p>Note: In many practical cases the movement directions will be aligned with the coordinate axes, which will cause the dominant axis to be either the X-, Y-, or Z-Axis of a real robot. Therefore the MoveOv1 command only affects linear axes and omits rotatory axes.</p>  <p>Fig.18-1: Actual geometric path of a MoveOv1 command with both optional parameters specified.</p>

MoveAxis


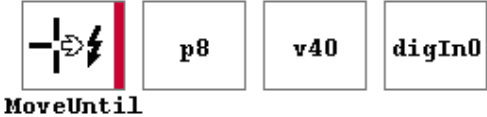
Symbol	
Graphical editor	 MoveAxis
Textbased editor	MoveAxis(p0, 10.0, v40, oSmooth)
Explanation	<p>x... name of the axis</p> <p>10.0... axis position (degree or mm)</p> <p>v40... velocity in % of maximum axis dynamics</p> <p>oSmooth...Overlap radius.</p> <p>Movement command for one axis (here: the "X" axis).</p>

MoveCirc



Symbol	
Graphical editor	 MoveCirc

Textbased editor	MoveCirc(p6, p7, v40, oSmooth)
Explanation	<p>p6... auxiliary position p7... target position v40... velocity in % of maximum axis dynamics oSmooth...Overlap radius.</p> <p>Cartesian movement command with circular path interpolation</p>  <p>initial position (target position of previous motion command, current robot position)</p> <p>The circle (or semi-circle) is defined by the initial position, the auxiliary position <code>circPos</code> and the target position <code>pos</code>. Please note the following conditions:</p> <ul style="list-style-type: none"> • For a full circle, two <code>MoveCirc</code> commands must be concatenated • None of the above mentioned positions can be equal, all three must be differ from each other. • The type of orientation interpolation (<code>OriMode</code>) is key, please refer to the KeMotion System Manual for details.



MoveUntil

Symbol	
Graphical editor	 <p>MoveUntil</p>
Textbased editor	MoveUntil(p8, v40, digIn0)
Explanation	<p>p8... target position v40... velocity in % of maximum axis dynamics digIn0... digital input to check</p> <p>Move the robot to the target position, e.g. p8, but only while the digital input <code>digIn0</code> is true. Abort motion as soon as <code>digIn0</code> has a falling edge.</p>


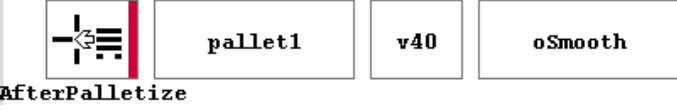
StopRobot

Symbol	
Graphical editor	
Textbased editor	StopRobot
Explanation	Stops the robot program immediately. Press the "Start" button again to restart the program.

Palletize

Symbol	
Graphical editor	
Textbased editor	Palletize(pallet1, v40, oSmooth)
Explanation	<p>pallet1... name of the pallet</p> <p>v40... velocity in % of maximum axis dynamics</p> <p>oSmooth... overlap radius</p> <p>Moves the robot to the next free place position on a pallet. The respective trajectory depends on the configured intermediate positions.</p> <p>The place position is the next empty position for a new part on the pallet. If the pallet is full the macro causes an error message.</p> <p>For further information about palletizing please refer to the KeMotion Palletizing Manual.</p>

AfterPalletize



Symbol	
Graphical editor	

Textbased editor	AfterPalletize (pallet1, v40, oSmooth)
Explanation	<p>pallet1... name of the pallet</p> <p>v40... velocity in % of maximum axis dynamics</p> <p>oSmooth... overlap radius</p> <p>Moves the robot to the current pick position. The respective trajectory depends on the configured intermediate positions.</p> <p>The pick position is the position of the next available part of the pallet (with respect to the pallet's part counter). If the pallet is empty, the macro causes an error message. The movement is generated by a set of Move commands.</p> <p>For further information about palletizing please refer to the KeMotion Palletizing Manual.</p>



18.2 Settings





Dynamic

Symbol	
Graphical editor	 <p>Dynamic</p>
Textbased editor	Dynamic (40, 60, 80)
Explanation	<p>40... velocity in %</p> <p>60... acceleration in %</p> <p>80... deceleration in %</p> <p>Sets the maximum velocity, acceleration and deceleration for subsequent robot motions. Note that the absolute velocity, acceleration and deceleration depend on the configured dynamics of each axis.</p>



DynamicAxis

Symbol	
Graphical editor	 DynamicAxis
Textbased editor	<code>DynamicAxis(X, 40, 60, 80)</code>
Explanation	X... name of the axis 40... velocity in % 60... acceleration in % 80... deceleration in % Sets the maximum velocity, acceleration and deceleration for subsequent robot motions only for one axis. Note that the absolute velocity, acceleration and deceleration depend on the configured dynamics of the respective axis.

Increment



Symbol	
Graphical editor	 Increment
Textbased editor	<code>Increment (d1)</code>
Explanation	d1... double integer variable Increments the double integer variable.

Decrement


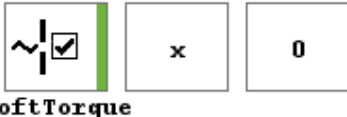
Symbol	
Graphical editor	 Decrement

Textbased editor	Decrement (d1)
Explanation	d1... double integer variable Derements the double integer variable.



ResetPallet

Symbol	
Graphical editor	 ResetPallet
Textbased editor	RestPallet (pallet1, 0)
Explanation	pallet1... pallet variable 0... number of parts Sets the pallet counter to the given value (here: zero).

SoftTorque ON

Symbol	
Graphical editor	 Soft Torque
Textbased editor	SoftTorque (x, 0)
Explanation	x... name of the axis 0... percentage of the nominal torque the drive controller uses to control the axis. Typical values are between 20 and 30%. Makes an axis "soft" by reducing the actual torque that is used to hold the axis in position.

SoftTorque OFF

Symbol	
Graphical editor	 Soft TorqueOff

Textbased editor	SoftTorqueOFF (x)
Explanation	x... name of the axis Disables the soft torque feature for the specified axis.




18.3 I/O-Control





GripperGroup

Symbol	
Graphical editor	
Textbased editor	GripperGroup(GripperGroup1, OPEN) GripperGroup(GripperGroup1, CLOSE)
Explanation	GripperGroup1... name of the GripperGroup Open/Close... action Issues the OPEN or CLOSE command to a gripper group.




VacuumGroup

Symbol	
Graphical editor	 
Textbased editor	<p>VacuumGroup (VacuumGroup1, OPEN)</p> <p>VacuumGroup (VacuumGroup1, CLOSE)</p>
Explanation	<p>VacuumGroup1... name of the VacuumGroup</p> <p>Open/Close... action</p> <p>Issues the OPEN or CLOSE command to a vacuum group.</p>




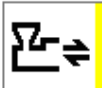
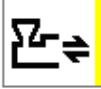

IMMStartup

Symbol	
Graphical editor	
Textbased editor	<p>IMMStartup (40, 60, 80, 2.0)</p>
Explanation	<p>40... velocity in %</p> <p>60... acceleration in %</p> <p>80... deceleration in %</p> <p>2.0... wait time [sec]</p> <p>Prepares the injection molding machine. The machine performs one motion cycle without the robot. The dynamic values are only valid for the startup cycle.</p>

SetDO


Symbol	
Graphical editor	 
Textbased editor	SetDO (digOut0, ON) SetDO (digOut0, OFF)
Explanation	digOut0... name of the digital output ON/OFF... action Sets or clears a digital output.

SetIMM

Symbol	
Graphical editor	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; align-items: center; margin-bottom: 10px;">  <div style="margin: 0 10px;">M_CLOSE</div> <div style="border: 1px solid black; padding: 2px 10px;">TRUE</div> </div> <div style="margin-bottom: 10px;">SetIMM</div> <div style="display: flex; align-items: center; margin-bottom: 10px;">  <div style="margin: 0 10px;">E_FORWARD</div> <div style="border: 1px solid black; padding: 2px 10px;">TRUE</div> </div> <div style="margin-bottom: 10px;">SetIMM</div> <div style="display: flex; align-items: center; margin-bottom: 10px;">  <div style="margin: 0 10px;">E_BACK</div> <div style="border: 1px solid black; padding: 2px 10px;">TRUE</div> </div> <div style="margin-bottom: 10px;">SetIMM</div> <div style="display: flex; align-items: center; margin-bottom: 10px;">  <div style="margin: 0 10px;">AUTOMATIC</div> <div style="border: 1px solid black; padding: 2px 10px;">TRUE</div> </div> <div style="margin-bottom: 10px;">SetIMM</div> <div style="display: flex; align-items: center;">  <div style="margin: 0 10px;">M_AREA_FREE</div> <div style="border: 1px solid black; padding: 2px 10px;">TRUE</div> </div> <div style="margin-bottom: 10px;">SetIMM</div> </div>
Textbased editor	<pre>SetIMM(M_CLOSE, TRUE) SetIMM(E_FORWARD, TRUE) SetIMM(M_BACK, TRUE) SetIMM(AUTOMATIC, TRUE) SetIMM(M_AREA_FREE, TRUE)</pre>
Explanation	<p>M_CLOSE, E_FORWARD, E_BACK, AUTOMATIC, M_AREA_FREE ... mold signal</p> <p>TRUE, FALSE ... desired state</p> <p>Set or clear EUROMAP signals.</p>

18.4 Flow Control


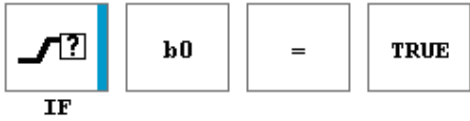

Assignment

Symbol	
Graphical editor	
Textbased editor	
Explanation	Assigns a value to a variable. An assignment consists of a variable (left hand side) , the assignment operator :=, and an expression (right hand side). The type of expression must be assignable to the data type of the variable (see Basic data types). When assigning structs (the type is a struct, an array, or a unit) the associated memory is copied from one variable to the other. For variables not containing any MAPTO-elements this is equal to assigning all elements, where the elements are subdivided until basic data types are reached. For variables containing MAPTO-elements this is different, as references are copied rather than the referenced contents.

Comment



Symbol	
Graphical editor	
Textbased editor	<code>//my test comment</code>
Explanation	Adds a comment to the code which is ignored by the compiler. Comments must start with //

IF


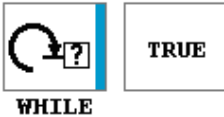

Symbol	
Graphical editor	 

Textbased editor	IF b0 = TRUE THEN END_IF
Explanation	b0 ... boolean variable IF-instructions are used to introduce conditional branches into the program. The result of the IF-condition must be of type BOOL. The number of instructions after THEN, ELSIF and ELSE is unlimited. Every IF-instruction must be terminated using the key word END_IF


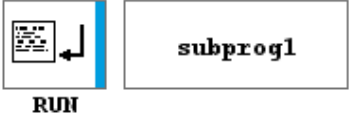
ELSE

Symbol	
Graphical editor	
Textbased editor	ELSE
Explanation	ELSE The ELSE-instruction is used to insert an ELSE-branch into an existing IF instruction thus creating an alternative course of execution.


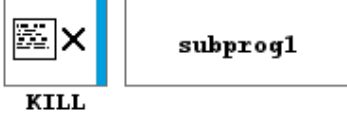
WHILE

Symbol	
Graphical editor	 
Textbased editor	WHILE <CONDITION> DO END_WHILE
Explanation	The WHILE-instruction is used to repeat an instruction block as long as a >CONDITION> is met. The condition of the loop must be of type BOOL. The loop may contain an unlimited number of instructions. The WHILE-instruction must be terminated using the key word END_WHILE.

RUN...

Symbol	
Graphical editor	
Textbased editor	<p>RUN <progname></p>
Explanation	<p>Executes a second program within another thread of execution. The calling program and the called program thus run in parallel.</p> <p>The following state matrix applies:</p> <ul style="list-style-type: none"> • If <progname> is already running, an error is displayed. • If <progname> is interrupted, it will be continued. • If <progname> cannot be started, because compiler errors are pending or because it does not exist, an error message is displayed. <p>Upon inserting a RUN command into a program, the following dialog is shown in order to select the program to invoke:</p> <div style="border: 1px solid gray; padding: 5px;"> <p style="background-color: #92d050; margin: 0; padding: 2px;">Choose Program</p> <p>Program</p> <ul style="list-style-type: none"> <input type="checkbox"/> wspace1 <ul style="list-style-type: none"> — kneetest1 — reference — subprog1 — test_chinamap — homing <div style="text-align: right; margin-top: 10px;"> <input type="button" value="✘"/> <input type="button" value="✔"/> </div> </div>



KILL...

Symbol	
Graphical editor	
Textbased editor	<p>KILL <progname></p>
Explanation	<p>Terminates the execution of another program.</p> <p>The following state matrix applies:</p> <ul style="list-style-type: none"> • If <progname> is is not running, a warning is displayed. • If <progname> cannot be stopped or does not exist, an error is displayed. <p>Upon inserting a KILL command into a program, the following dialog is shown in order to select the program to kill:</p> <div style="border: 1px solid gray; padding: 10px;"> <p style="background-color: #92d050; padding: 2px;">Choose Program</p> <p>Program</p> <ul style="list-style-type: none"> <input type="checkbox"/> wspace1 — kneetest1 — reference — subprog1 — test_chinamap — homing <div style="text-align: right; margin-top: 10px;"> ✖ ✔ </div> </div>


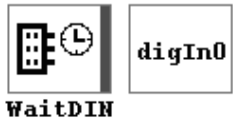
18.5 Timing





WaitTimeSec

Symbol	
Graphical editor	
Textbased editor	WaitTimeSec(10.0)
Explanation	10.0... time to wait in seconds Waits for the specified amount of time before the program continues

WaitDIN








Symbol	
Graphical editor	
Textbased editor	WaitDIN(digIn0)
Explanation	digIn0... digital input Pauses the program main run until a digital input has a rising edge.

OnParameter

Symbol	
Graphical editor	


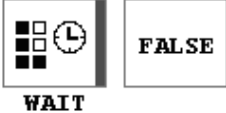
Textbased editor	OnParameter(60, d0)
Explanation	<p>60... desired percentage of completion of current path segment</p> <p>d0... pre- or post warn time in milliseconds (no prewarn with CP23x)</p> <p>Trigger condition is met upon completion of the desired percentage of the current path segment. If d0 is negative, the condition will be met before the desired percentage of the path segment has been covered (-> prewarn time). If d0 is positive, the trigger will fire after the desired percentage of the path segment has been covered (-> postwarn time).</p>

WaitIMM

Symbol	
Graphical editor	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; align-items: center; margin-bottom: 10px;">  <div style="border: 1px solid black; padding: 5px; margin-left: 10px;">M_IS_OPEN</div> </div> <div style="margin-bottom: 10px;">WaitIMM</div> <div style="display: flex; align-items: center; margin-bottom: 10px;">  <div style="border: 1px solid black; padding: 5px; margin-left: 10px;">M_IS_CLOSED</div> </div> <div style="margin-bottom: 10px;">WaitIMM</div> <div style="display: flex; align-items: center; margin-bottom: 10px;">  <div style="border: 1px solid black; padding: 5px; margin-left: 10px;">E_IS_FORWARD</div> </div> <div style="margin-bottom: 10px;">WaitIMM</div> <div style="display: flex; align-items: center; margin-bottom: 10px;">  <div style="border: 1px solid black; padding: 5px; margin-left: 10px;">E_IS_BACK</div> </div> <div style="margin-bottom: 10px;">WaitIMM</div> <div style="display: flex; align-items: center; margin-bottom: 10px;">  <div style="border: 1px solid black; padding: 5px; margin-left: 10px;">IS_AUTOMATIC</div> </div> <div style="margin-bottom: 10px;">WaitIMM</div> <div style="display: flex; align-items: center;">  <div style="border: 1px solid black; padding: 5px; margin-left: 10px;">IS_REJECT</div> </div> <div style="margin-bottom: 10px;">WaitIMM</div> </div>

Textbased editor	<pre>WaitIMM(M_IS_OPEN) WaitIMM(M_IS_CLOSED) WaitIMM(E_IS_FORWARD) WaitIMM(E_IS_BACK) WaitIMM(IS_AUTOMATIC) WaitIMM(IS_REJECT)</pre>
Explanation	<p>M_IS_OPEN, M_IS_CLOSED, E_IS_FORWARD, E_IS_BACK, IS_AUTOMATIC, IS_REJECT ... desired EUROMAP signal</p> <p>Waits for the specified EUROMAP signal.</p>

Wait

Symbol	
Graphical editor	 <p>WAIT</p>
Textbased editor	WAIT <CONDITION>
Explanation	Waits until <CONDITION> is true. Note that only boolean conditions are allowed.