User Manual URCap v3.0.0

Contents

INTRODUCTION

This URCap manual is intended to help guide the user in using the Mirka tools with Universal Robots. The URCap supports e-Series and UR20/UR30 robots.

Note that this manual only focuses on configuration and usage from the perspective of Polyscope. For installation of the AIROS tool or AutoChanger on the robot please refer to the respective manuals.

URCap v3.0.0

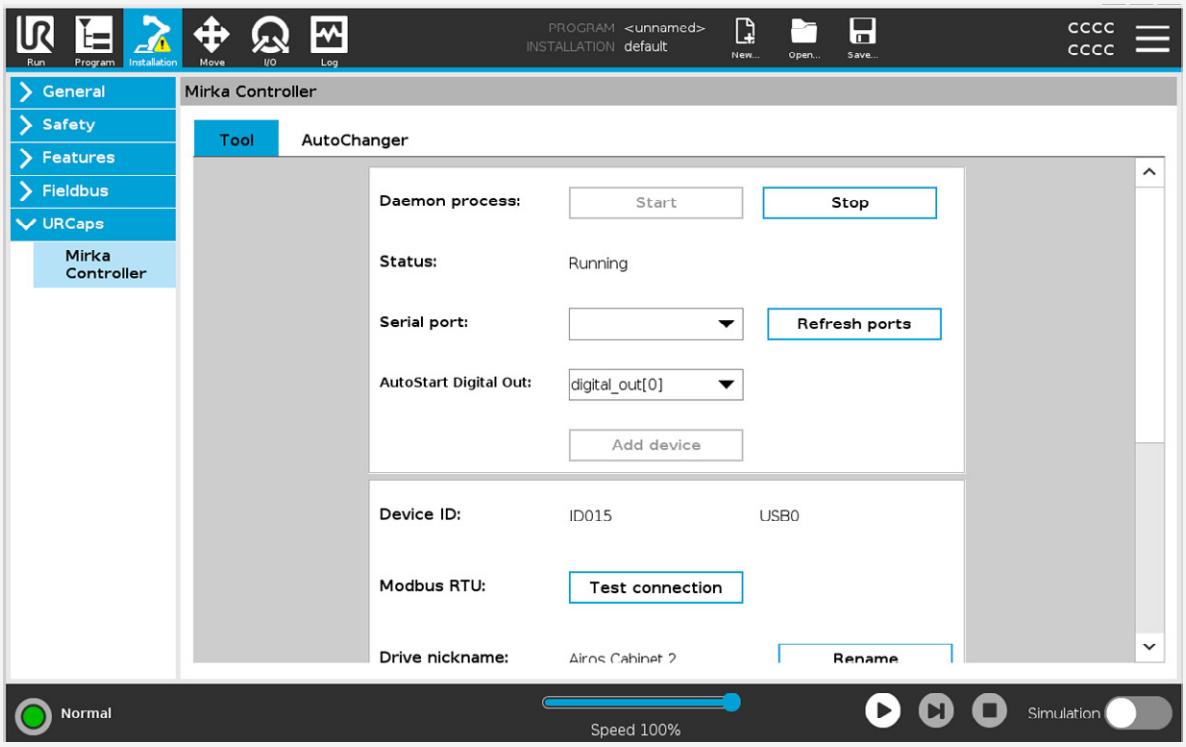

Figure 1: Daemon control and tool configuration.

CONFIGURATION **TOOL**

Navigate to Installation tab ➔ URCaps ➔ Mirka Controller ➔ Tool and verify that the daemon process is running. ***Figure 1*** illustrates what the URCap installation looks like when opened.

Tool

In the Tool tab it is possible to add, remove and configure tools. Adding a device requires the Mirka drive to be powered on and connected to the UR via USB. All available tools (powered on and connected via USB) are added automatically on startup. The "Serial port" dropdown in Figure 1 displays the available Mirka drives. Serial ports which are already in use will not be visible.

The "AutoStart Digital Out" dropdown in Figure 1 allows the user set which digital out is used for the AutoStart module. This output is utilized in the program node to start and stop the dust extractor.

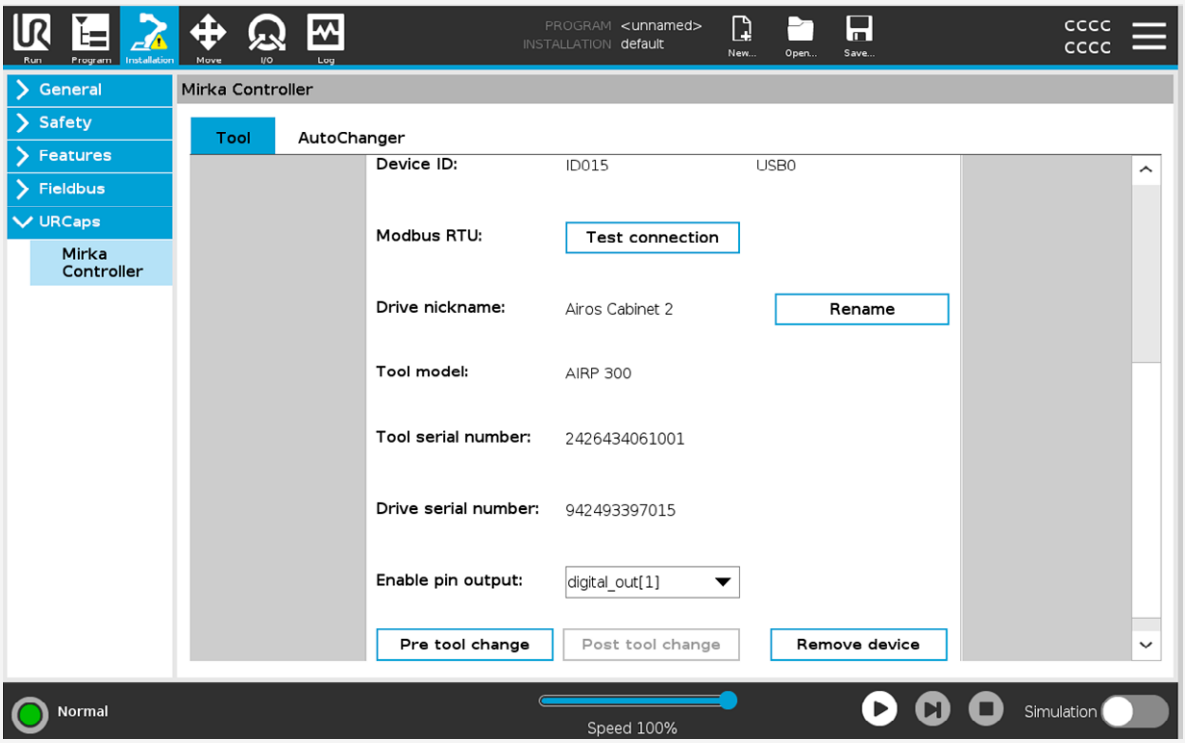

Figure 2: Tool info and control.

CONFIGURATION **TOOL**

As illustrated in ***Figure 2*** it is possible to check the tool information as well as giving the tool a nickname. The nickname is stored in the drive and does not change if another tool is mounted. The nickname is used in the program node to help the user identify the drive, which is helpful in case of multiple drives. The user can trigger a tool change in the installation to update the tool info. A tool change is required to detect a tool change and update the info. Pressing "Test connection" button in Figure 2 fetches the info stored in the drive and updates the displayed tool info.

For AIROS drives with firmware versions 3.05 and above a dropdown menu labeled "Enable pin output" is enabled as illustrated in Figure 2. The dropdown lets the user specify which of the robots' digital outputs is connected to the pin DI1 in the AIROS drive. The DI1 pin must be set to high to start the tool. Selecting an output pin here automatically configures it. For Polyscope versions 5.9 and above, the output pin is set to low during an unscheduled stop, and otherwise remains high. For versions below 5.9, the output pin is configured to be low when the program is stopped and high when it is running.

AIROS firmware versions below 3.05 do not require the pin to be set and thus, the dropdown in disabled and can be ignored.

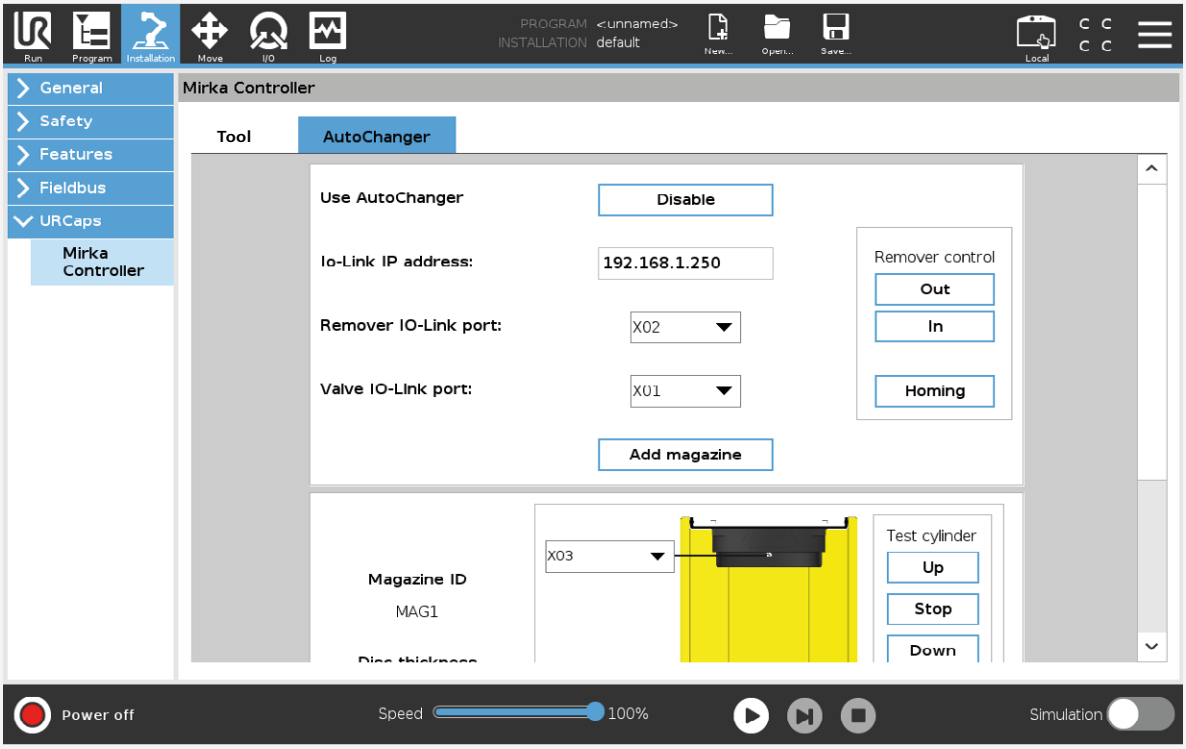

Figure 3: AutoChanger Remover and valve terminal configuration.

CONFIGURATION **AUTOCHANGER**

AutoChanger

Navigate to Installation tab ➔ URCaps ➔ Mirka Controller ➔ AutoChanger to access the AutoChanger configuration. ***Follow the steps on the next page*** to configure the AutoChanger.

Note!

Only AutoChangers with Modbus TCP communication kit is supported in this URCap.

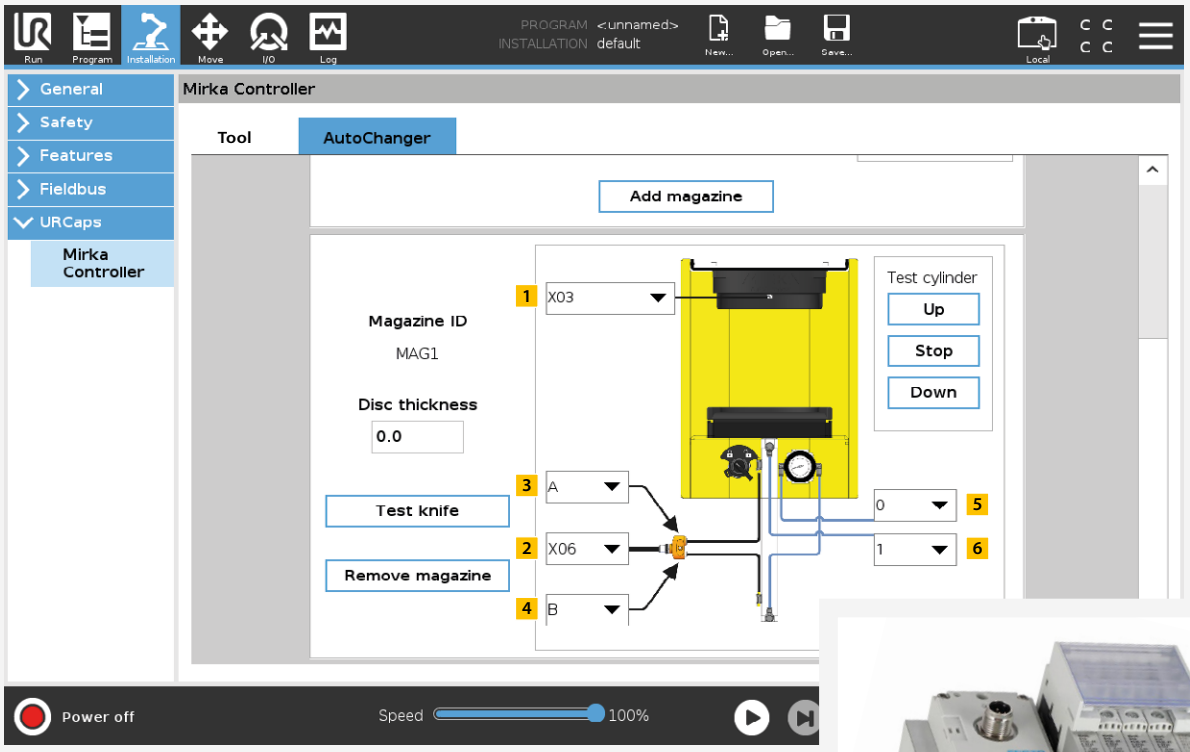

Figure 4: AutoChanger magazine configuration.

Figure 5: Valve numbering on the manifold.

CONFIG. **AUTOCHANGER**

Configuration steps

Step 1. Set the IO-Link master IP address.

Step 2. Press the Enable button.

a. The URCap will not activate the AutoChanger functions if the IO-Link master cannot be reached.

Step 3. Add a magazine.

Step 4. Set the ports of the connections in the URCap. Check the IO-Link master for port labels.

a. Figure 3 "Remover IO-Link port" is the port of the linear motor controlling the Remover.
b. Figure 3 "Valve IO-Link port" is the port of the pneumatic valve manifold.
c. Component 1 in Figure 4 sets the port of the safety switch. This can be either IO-Link or UR digital IO.
d. Component 2 in Figure 4 sets the port of the cylinder sensors.
e. Component 3 and 4 in Figure 4 sets the orientation of the two cylinder sensors. Check the splitter for the letters.
f. Component 5 in Figure 4 sets the valve of the upper side of the pneumatic cylinder control.
g. Component 6 in Figure 4 sets the valve for the hose that goes to the pressure regulator of the magazine. Refer to Figure 5 for valve numbering.

Step 5. Set the thickness of the abrasive disc in the magazine.

Step 6. Use the buttons to try and control the remover and valves.

a. Remove the sliding plate before doing a homing sequence. Homing sequences are only required to be done the first time using the remover.

PROGRAMMING

Navigate to Program tab ➔ URCaps to locate the two Mirka Program nodes.

MIRKA

The "Mirka" program node contains the functions for the tool as described below in **Table 1.**

FUNCTION	COMMENTS
RUN	Start the tool. With or without delay. Delay is non-blocking.
STOP	Stop the tool. With or without delay. Delay is non-blocking.
SET RPM	Set the desired RPM of the tool. Integer input. Refer to the tool manual for valid range.
PRE TOOL CHANGE	Disconnects the current tool from the Airos drive. This step is recommended to do before physically removing the current tool.
POST TOOL CHANGE	Connects the new tool to the Airos drive. This step is recommended after physically attaching the new tool. The node runs until tool parameters can be updated in the drive.
START DUST EXTRACTOR	Sets digital out to AutoStart module to high. Tool selection disabled as it is not needed.
STOP DUST EXTRACTOR	Sets digital out to AutoStart module to low. Tool selection disabled as it is not needed.

Table 1: Tool functions.

MIRKA AUTOCHANGER

Functions for controlling the Mirka® AutoChanger components are listed in **Table 2.**
See the AutoChanger manual for detailed instructions on how to use the AutoChanger.

FUNCTION	COMMENTS
MOVE KNIFE IN	Moves the knife to sliding plate. Used to grab the abrasive when removing.
MOVE KNIFE OUT	Moves the knife away from sliding plate. Used to release a removed abrasive.
MOVE TO DISC THICKNESS	Moves the knife to position for removing an abrasive. Select magazine the abrasive was picked from to get the correct distance.
MOVE MAGAZINE UP	Opens the valve to move the magazine cylinder upwards.
MOVE MAGAZINE DOWN	Opens the valve to move the magazine cylinder downwards.
STOP MAGAZINE	Closes magazine cylinder valves.
PULSE NOZZLE	Blows a 0.4s air pulse to the nozzle at the remover. Useful to blow away a stuck abrasive disc.

Table 2: Mirka AutoChanger functions.

ASSIGNMENT FUNCTIONS

In the function dropdown of the assignment program node there is a list of Mirka related functions.
These are described in **Table 3.**

FUNCTION	PARAMETERS	RETURNS	COMMENTS
mirka_get_current	Device ID	Integer	Get the current draw of the specified device.
mirka_get_rpm	Device ID	Integer	Get the rpm of the specified device.
mirka_get_motor_tmp	Device ID	Integer	Get the motor temperature of the specified device.
mirka_get_drive_tmp	Device ID	Integer	Get the motor drive temperature of the specified device.
mirka_get_tool_sn	Device ID	String	Get the tool serial number of the specified device.
mirka_get_drive_sn	Device ID	String	Get the motor drive serial number of the specified device.
mirka_get_usage_time	Device ID	String	Get the usage time of the specified device. Returns string format "hhh:mm:ss".
mirka_get_fw_version	Device ID	String	Get the firmware version of the specified device.
is_magazine_up	Magazine ID	Boolean	Check if the upper sensor of the magazine cylinder is active.
is_magazine_down	Magazine ID	Boolean	Check if the lower sensor of the magazine cylinder is active.
is_magazine_set	Magazine ID	Boolean	Check if the safety switch of the magazine set.

Table 3: Functions in assignment dropdown.

SCRIPT FUNCTIONS

In **Table 4** are functions available for use in URScript. Each function should start with the prefix "mirka_daemon". For example: "mirka_daemon.send_stop_tool("ID001")" to stop the tool ID001.
Not passing a device ID to the functions where it is optional will make the daemon use the first available tool.

FUNCTION	PARAMETERS	RETURNS	COMMENTS
send_start_tool	RPM, Device ID (optional)	Boolean	Start the specified device at desired RPM.
send_stop_tool	Device ID (optional)	Boolean	Stop the specified device.
set_relay	Device ID (optional), value (optional)	Integer	Set the relay on or off. Value 1 is on, value 0 is off. Default value is 0.
set_rpm	RPM, Device ID (optional)	Boolean	Set the RPM of the specified device. RPM is an integer in correct range. See tool manual for allowed range.
set_rpm_and_wait	RPM, wait, Device ID (optional)	Boolean	Set the RPM of the specified device and optionally wait for the tool to reach desired RPM. RPM is an integer in correct range. Wait is boolean. See tool manual for allowed range.
start_tool_change	Device ID (optional), wait (optional)	Boolean	Start tool change of specified device. Wait is boolean. Waiting for tool to go into tool change mode before return if true.
stop_tool_change	Device ID (optional), wait (optional)	Boolean	Stop tool change of specified device. Wait is boolean.
read_alarm	Device ID (optional)	Integer	Returns alarm status of the specified device. Refer to tool manual for alarm values.
read_current	Device ID (optional)	Integer	Returns current of the specified device.
read_speed	Device ID (optional)	Integer	Returns speed of the specified device.
read_device_name	Device ID (optional)	String	Returns device name of the specified device.
read_drive_serial_number	Device ID (optional)	String	Returns serial number of motor drive.
read_drive_temperature	Device ID (optional)	Integer	Returns drive temperature of the specified device.
read_fw_version	Device ID (optional)	String	Returns firmware version of the specified device.
read_tool_max_speed	Device ID (optional)	Integer	Returns max speed of specified device.
read_tool_min_speed	Device ID (optional)	Integer	Returns min speed of specified device.
read_tool_serial_number	Device ID (optional)	String	Returns serial number of the tool head.

SCRIPT FUNCTIONS

Continued from previous page...

FUNCTION	PARAMETERS	RETURNS	COMMENTS
read_tool_temperature	Device ID (optional)	Integer	Returns tool temperature of the specified device.
get_formatted_tool_usage	Device ID (optional)	String	Returns tool usage in string format "hhh:mm:ss".
move_magazine_up	Magazine ID	Boolean	Opens the valve to move magazine up.
move_magazine_down	Magazine ID	Boolean	Opens the valve to move magazine down.
stop_magazine	Magazine ID	Boolean	Closes all valves for the magazine.
remover_pulse_air_nozzle		Boolean	Opens the valve for the nozzle at the remover to give an air pulse.
remover_move_in		Boolean	Move the remover knife in toward sliding plate.
remover_move_out		Boolean	Move the remover knife out from sliding plate.
remover_move_to_position	Position	Boolean	Move the remover to position. Position in mm as float. Allowed range 0->25,9.
cylinder_is_up	Magazine ID	Boolean	Check if the upper sensor of the magazine cylinder is active.
cylinder_is_down	Magazine ID	Boolean	Check if the lower sensor of the magazine cylinder is active.
magazine_read_switch	Magazine ID	Boolean	Check if the safety switch of the magazine is pressed.
read_pad_diameter	Device ID (optional)	Integer	Read the pad diameter of tools with a circular backing pad.*
read_tool_z_offset	Device ID (optional)	Integer	Reads the TCP offset of the tool in z direction.*
read_tool_orbit	Device ID (optional)	Integer	Reads the tool orbit.*
read_tool_weigth	Device ID (optional)	Integer	Reads the tool weight.*
read_tool_cog_offset_z	Device ID (optional)	Integer	Reads the tool center of gravity offset in z direction.*
read_pad_width	Device ID (optional)	Integer	Reads the pad width of rectangular tools.*
read_pad_length	Device ID (optional)	Integer	Reads the pad length of rectangular tools.*
read_tool_model_name	Device ID (optional)	String	Read the tool model name.*

Table 4: Script functions.
*Supported by AIROS firmware v3.05 and later.

Mirka Ltd
Finland

Brazil Mirka Brasil Ltda.
Belgium Mirka Belgium Logistics NV
Canada Mirka Canada Inc.
China Mirka Trading Shanghai Co., Ltd
Finland & Baltics Mirka Ltd
France Mirka France Sarl
Germany Mirka GmbH
India Mirka India Pvt Ltd
Italy Mirka Italia s.r.l., Mirka Superabrasives S.p.A
Mexico Mirka Mexicana S.A. de C.V.
Netherlands Mirka Benelux B.V
Poland Mirka Poland Sp. z o.o
Singapore Mirka Asia Pacific Pte Ltd
Spain KWH Mirka Ibérica S.A.U.
Sweden Mirka Scandinavia AB
Turkey Mirka Turkey Zımpara Ltd Şirketi
United Kingdom Mirka (UK) Ltd
United Arab Emirates Mirka Middle East FZCO
USA Mirka USA Inc.

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