AIM ROBOTICS™

SD30/55

USER MANUAL

TABLE OF CONTENT

TECHNICAL DATA

FEATURES

- Easy installation
- Recommended for 30 - 55 cc syringes
- Volumetric dispensing
- Full dispensing control through URCap
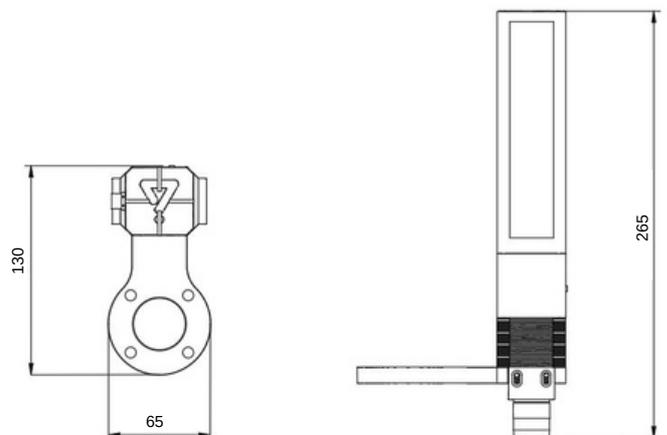

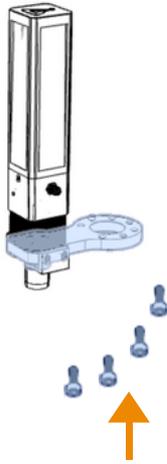|	
Mechanical interface:	ISO 9409-1, type 50-4-M6
Electrical interface:	8-pole M8
Digital interfaces:	URCap, PolyScope ≥5.5
	URCap, API ≥1.8
	RS485
	24V I/O
Weight (without syringe):	0.7kg
Dimensions:	65 x 130 x 265mm

Model #	SD 30/55
URCap version	≥1.0

INSTALLATION

1. Attach to robot

- Attach unit to robot with 4 screws
- Plug in the 8 pin connector*

2. Load syringe
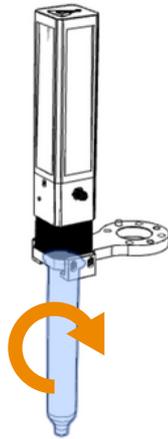
- Ensure plunger is fully retracted.(The plunger automatically retracts when power is on)
- Twist syringe onto mounts and adjust mount fit if necessary.

3. Attach tip
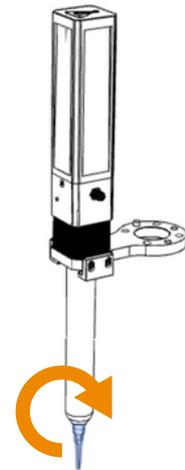
- Attach selected tip
- Prime unit by clicking "Prime" button in Toolbar (page 8)

LED indicator (D)

The unit has a LED indicator. When the unit has power and is in an idle state a steady green light is lit. During Retract and/or an error state, the LED will turn red.

* The 8 pin connector lead

- Ensure Tool IO voltage is set to 'zero' or the **robot is off** before attaching tool. Refer to the 'How to' page for guidance.
    - If the robot shows an error after attaching the tool - restart the robot to reset.
- Position the lead from the unit to the robot so that it does not create a risk.
- The pin can be inserted for orientation.

SOFTWARE CONFIGURATION

1. Install URCap *

- If password protected:
  - Enter **Manual Mode**: Press [icon] and select [icon] manual
  - Enter Password

- If not protected by password:
  - Press [icon] and select Settings > System > URCaps
  - Press [+] symbol to add a new URCap: Navigate to a USB device and select **Aim URCap**

Accept when the robot prompts to restart before continuing.

2. Payload and TCP

Select the **Installation** tab

for Payload select **General > TCP: Payload and Centre of Gravity** and press the wizard button [Wizard]

To define Tool Centre Point, TCP select **General > TCP: Tool Center Point** and press the wizard button [Wizard]

- This feature will guide you through the setup of the Tool Centre Point

* Multiple URCaps

- If multiple URCaps are installed the tool might not perform as intended.
- Some tools are programmed to take over and control the Tool IO and will not allow the Aim URCap to change the Tool IO.
- It is recommended to remove all other tool URCaps to avoid this OR ensure that Tool IO is controlled by the user and input manually entered as described in point 3. Installation of SD unit.
- If multiple URCaps are required, please use our Aim USB2RS485 kit.

SOFTWARE CONFIGURATION

3. Unit Installation

The Tool IO can be controlled by the Aim URCap

- Select the Installation tab and select **General > Tool IO**

- In the IO interface control section use pull down menu to select **Aim URCap**

The Tool IO can be controlled by the user and manually entered

- In the IO interface control section use pull down menu to select **User**

- Change Tool Output Voltage to 24

You are now ready to start programming your unit to start dispensing.
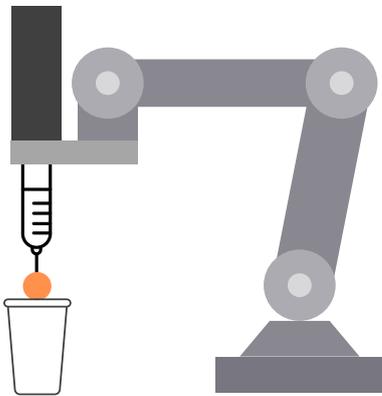
INSTALLATION

SD30/55 Setup / Purge cycle

- **Activate Purge Cycle:** Disabled by default allows to purge material when in purge point. Useful to ensure the material does not cure in the needle when idle.
- **Purge Speed**: Dispensing Speed in microliters when purging
- **Purging Duration**: Time in seconds to dispense at Purge Speed
- **Set Purge Pos.**: Used for defining the Purge position/Point in space
- **Move to Purge Pos.**: AUTO drive robot to the Purge Position.
- **Tool Connection Status:** Green or Red circle indicating tool connection status. Green = connection between robot and tool is stable. Red = robot to tool connection is bad.
- **Scan for tool:** Actively checks Tool Connection Status once clicked.
- **Disable/Enable URCap:** This allows for simple reset or disabling of Aim URCap. Useful when troubleshooting or switching between tool manufacturers.
- **Enable USB/Disable USB:** used when 8-pin M8 tool connection is used by another manufacturer's tool, and SD is connected to the robot control box using Aim USB2RS485 connection kit. Allows combining Aim Robotics tools with other manufacturer tools. OnRobot Eyes or Robotiq Grippers for instance.
- **Pause Program on Empty Syringe**: Enabled by default. Pauses robot program when the syringe is empty
- **Get Notification On Empty Syringe:** Enabled by default. Notifies user via Pop-up when the syringe is empty.
- **Enable Execution Count Check-up:** Shows approximate amount of program cycles current syringe level can do until empty.

INSTALLATION

SD30/55 Setup / Purge cycle

Example

✓ Activate Purge Cycle ⓘ

Purging speed 50   1-100% ⓘ
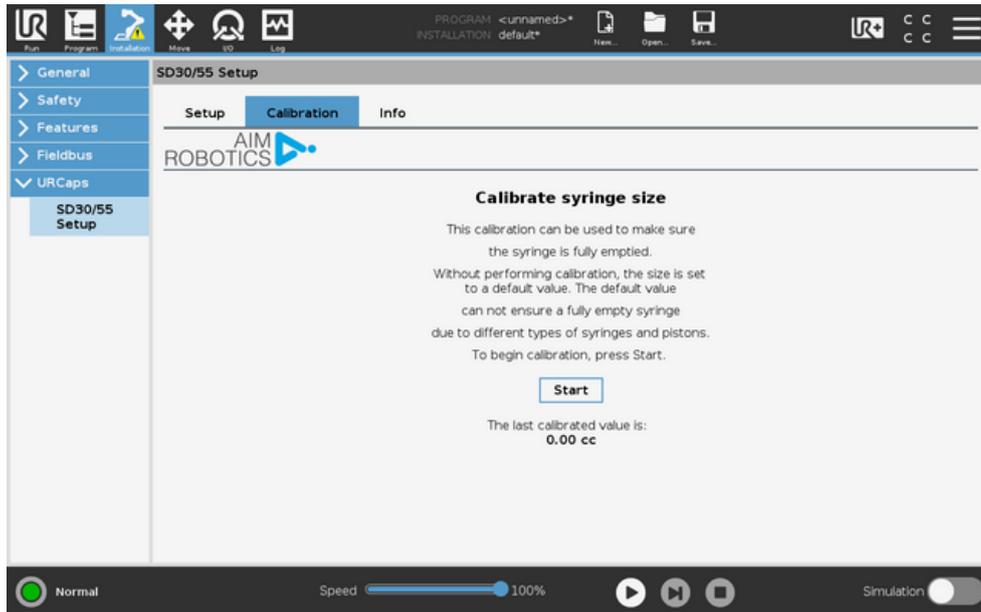Purging time   0.5   Sec   ⓘ
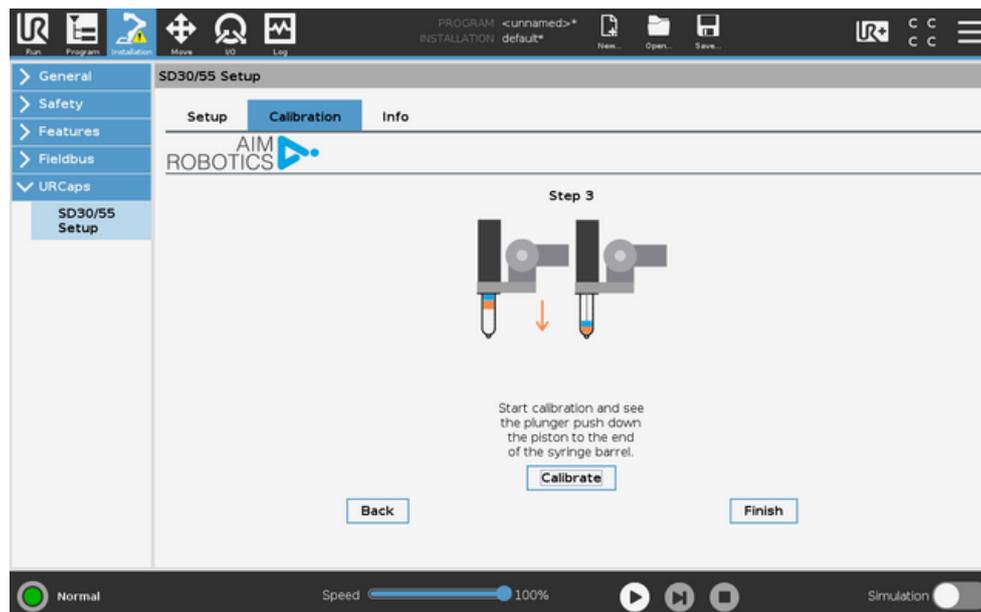Waiting time   10.0   Min   ⓘ

Purge Position

Dispenses for 0.5 seconds
every 10 minutes, when in Purge Position

INSTALLATION

SD30/55 Setup / Calibration

- Guided setup for calibrating an installed syringe size and determining Calibrated syringe value.
- Requires an empty syringe with a piston installed on the SD30/55.

PROGRAMMING

SD30/55 Toolbar
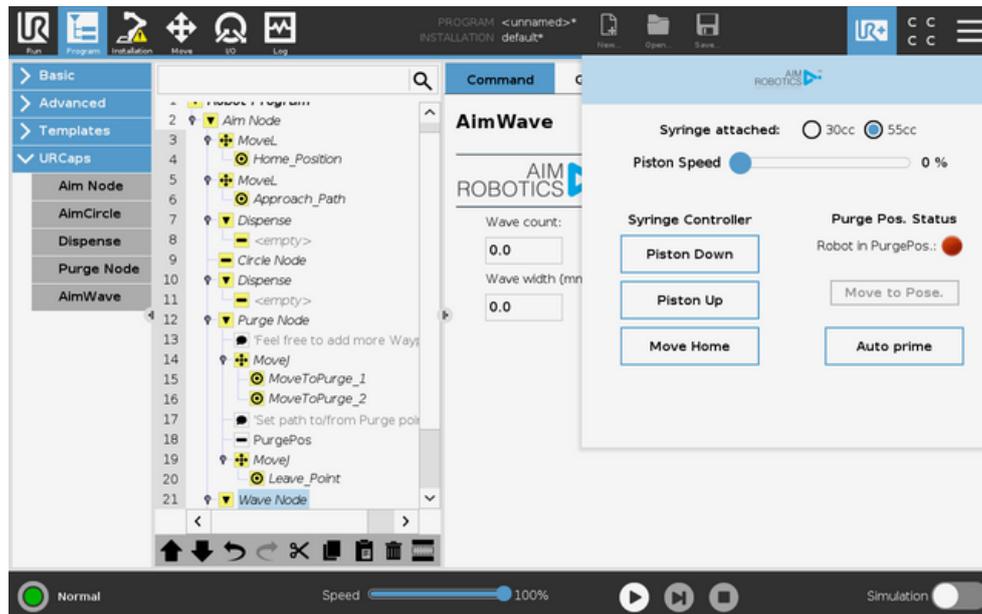
- **Syringe attached:** choose between 30cc and 55cc syringe
- **Piston Speed:** move the slider on a % scale
- **Piston Down:** moves Piston down with Piston Speed
- **Piston Up:** moves Piston up with Piston Speed
- **Move Home:** homes the piston - drives all the way up and resets the home position
- **Purge Pos. Status:** shows if the robot is at a purge position. **Red** = not in purge position. **Green** = in purge position.
- **Move to Pose:** drives robot to Purge position.
- **Auto Prime:** primes the syringe by moving the plunger down until piston/plunger contact is reached. For low viscosity materials with large nozzles, it might be required to temporarily block the needle. It is expected to over-dispense for the first path after priming a new syringe, this is due to a Pre-feed value set. It is recommended to do a test bead after each syringe change. This ensures perfect and repeatable dispensing afterward.

PROGRAMMING

SD Dispense Node
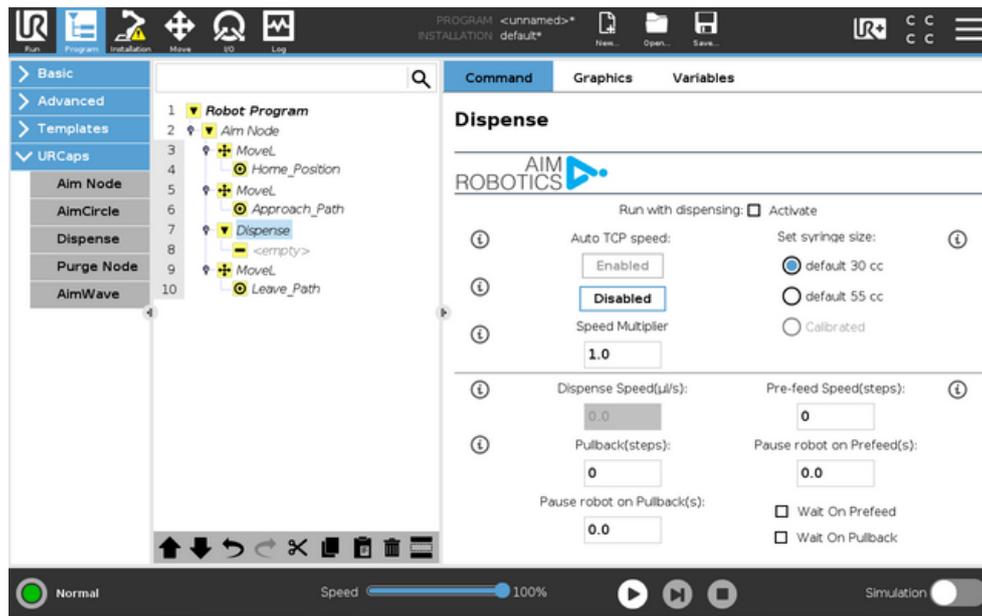
- **Run with Dispensing:** Disabled by default allows to run the path without dispensing. When enabled, run the path with dispensing.
- **Auto TCP speed**: Uses robot TCP speed and a multiplier to set dispensing speed. This ensures constant dispensing amount in corners. Recommended using with robot speeds under 25mm/s for most fluids.
- **Set syringe size**: Choose the size of your syringe. Pre-defined 30cc and 55cc values are set to work with most syringe manufacturers. If there is still material left in the syringe after "Syringe Empty" warning, please use the Calibration tool in installation and choose Calibrated option in the Dispense node.
- **Dispense Speed(µL)**: Set's dispensing speed in µL/sec (microliters per second). 15-25µL is a good starting point for most fluids.
- **Prefeed (steps)**: the amount of steps stepper motor executes at start of dispense node. This is very useful for pressurizing material to correct pressure for dispensing at set Dispense Speed. Often matches the Pullback (steps). Low viscosity 50-100 steps, medium to high viscosity: 200-500 steps.
- **Pullback (steps)**: the number of steps the stepper motor executes at the end of the dispensing node. Allows releasing pressure exerted on the piston to stop material flow. Often matches the Prefeed (steps). Low viscosity 50-100 steps, medium to high viscosity:200-500 steps.
- **Pause robot on Prefeed(s):** allows to pause robot movement for chosen seconds while executing prefeed steps. Useful when the material requires a lot of prefeed in order to reach desired flow rate.
- **Pause robot on Pullback(s):** allows to pause robot movement for chosen seconds, while executing pullback steps. Useful when finding perfect bead stop settings.
- **Wait on Prefeed/ Wait on Pullback** checkboxes: stops robot movement until Prefeed/Pullback steps are executed. This is used in most cases with low viscosity materials, if more control is required, use the Pause robot on Prefeed(s) and Pause robot on Pullback(s) fields.

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PROGRAMMING

Programming CIRCLES

- To program circles to select the [◯] button.
  - In the Program tree, the **Set Circle** move has been inserted.
- Enter **Circle Radius** and select **Center Point** to define the center of the circle.
- After entering the **Robot speed** and **Robot Acceleration** press **Move to start**. This will be the point where the robots start dispensing the circle. Consider the run-up to this point when programming.

Radius

Centre point
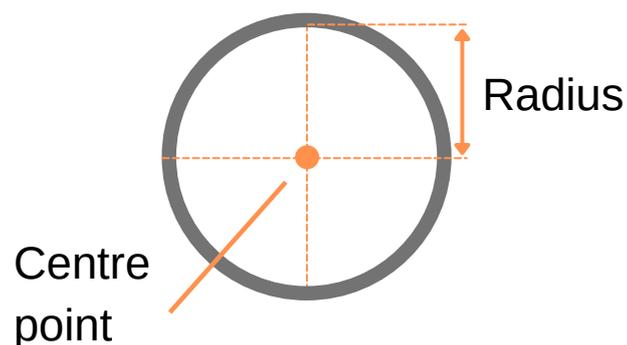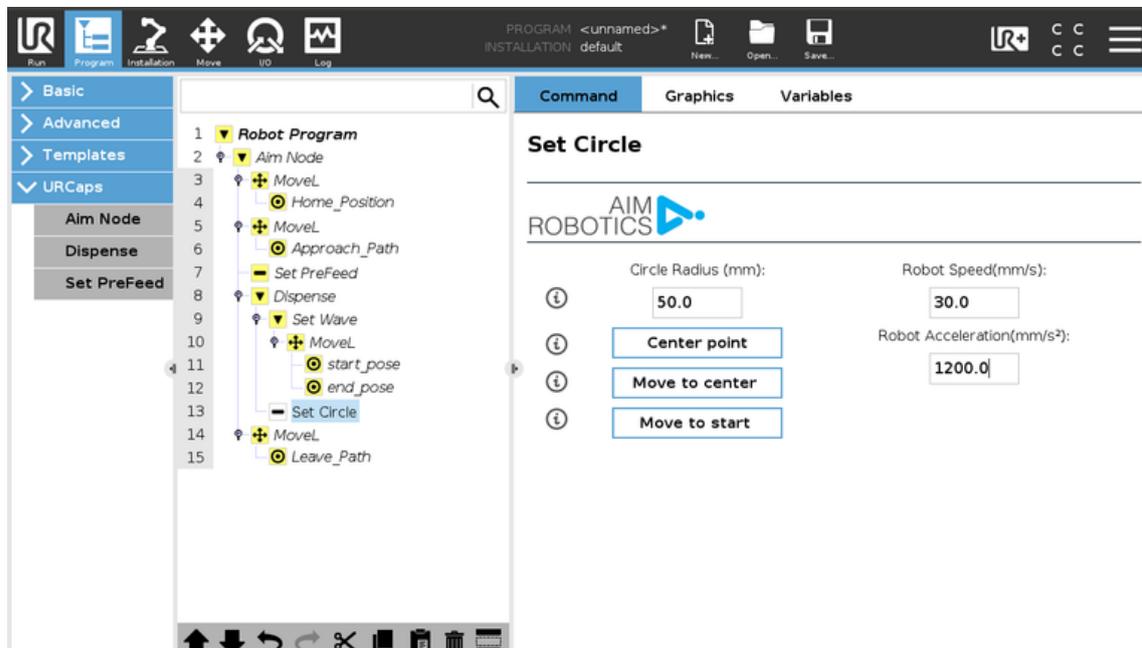
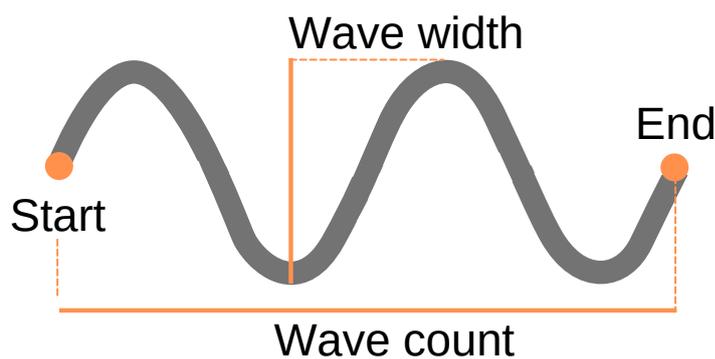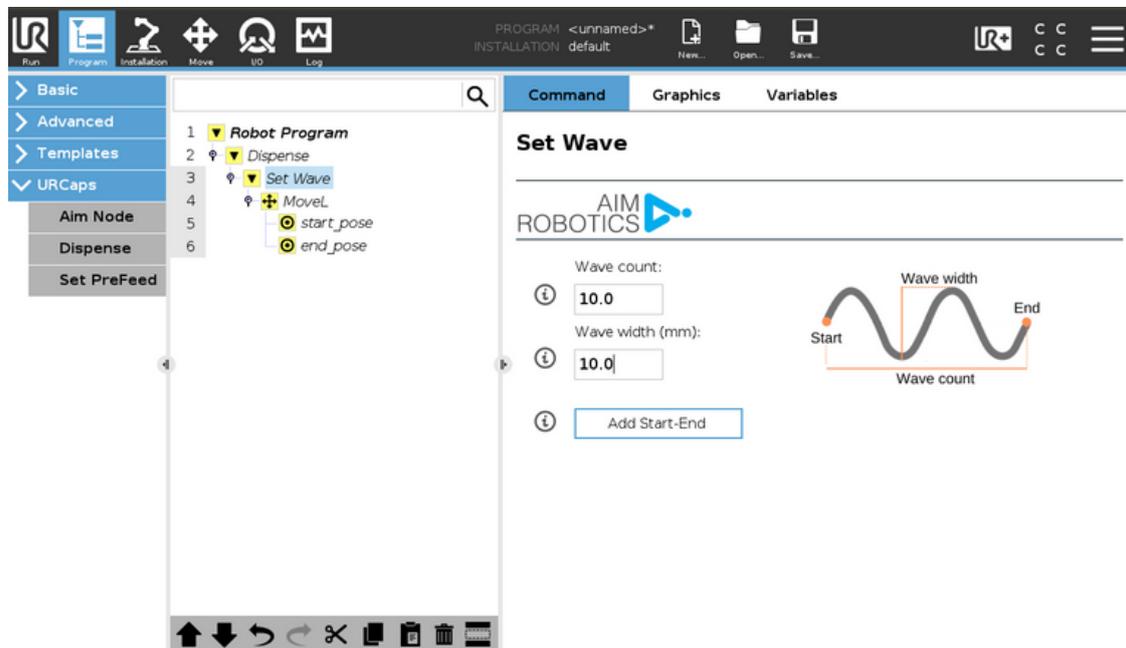# PROGRAMMING

Programming **WAVES**
- To program waves select the ∿ button.
  - In the Program tree, the **Set Wave** move has been inserted.
- Enter **Wave Count** (amount of waves between the start and endpoint)
- Enter **Wave Width**
- Press **Add Start-End** to select the start and end point of the line for the wave to follow

The wave curve is also dependant on the movements of the robot.

PROGRAMMING

Tips and Tricks

- **Start/End Waypoints:** Dispensing starts when the robot program is within Dispense Node and stops upon exit of Dispense Node. Therefore it is advised that the waypoint set right before entering the Dispense node is identical to the first waypoint in the Dispense node. As well as the last waypoint in Dispense Node should match the first waypoint after Dispense Node like illustrated below:
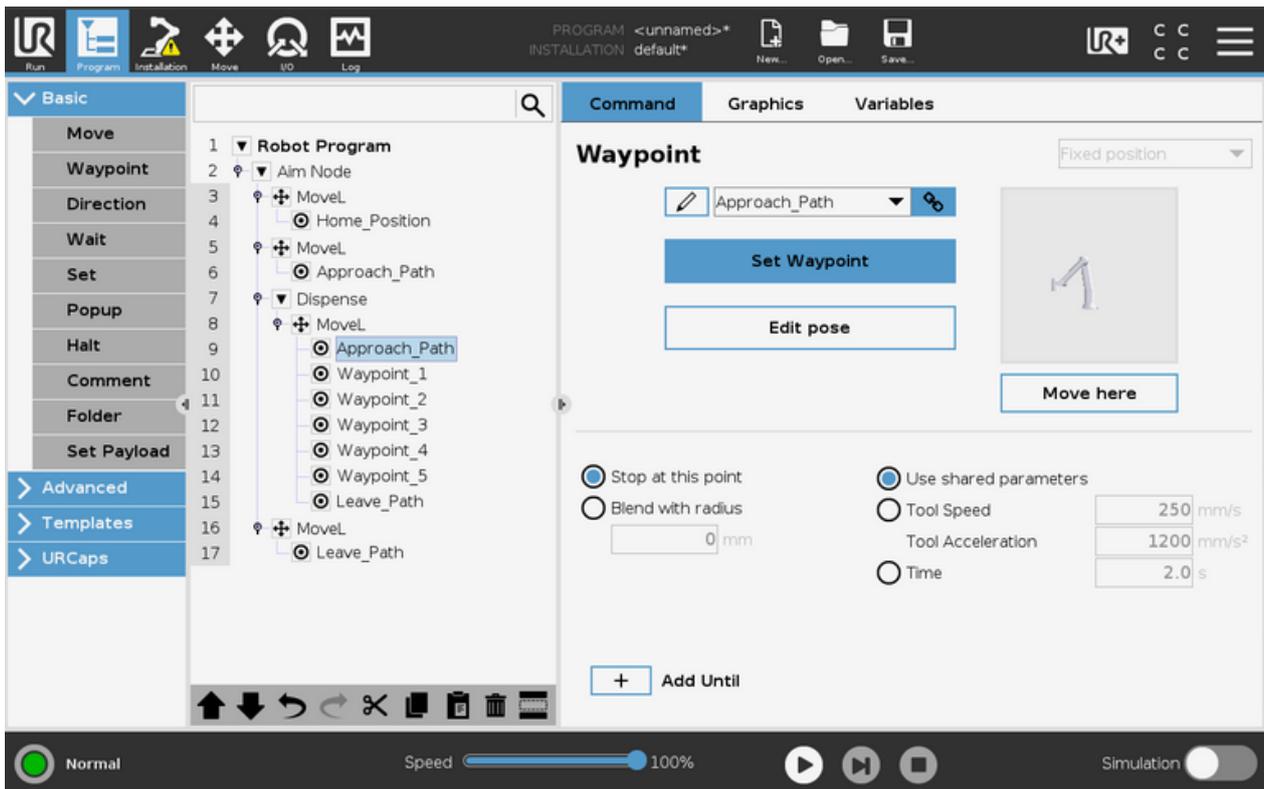
- **Determining perfect dispensing speed:** It is recommended to program a simple line bead for determining the perfect dispensing speed for a material/needle and robot speed combination. The prefeed and pullback values should be set at 0.
- **Determining perfect pull-back/prefeed settings:**
  - Monitor the end of your test bead and increase pull-back and pre-feed steps count incrementally (normally in 50 step increments) until you see a perfect bead-end with no material oozing).
  - Next, adjust Prefeed pause settings until you see a perfect start of the bead (no snails/tails)
  - If any stringing of material is seen, adjust the program to do a move with a slight Z height increase in the backward direction of the path.

PROGRAMMING

Tips and Tricks

- **Empty Syringe:** When the end of the syringe (30cc or 55cc) is reached the robot program will be paused and a pop-up with instructions will be shown.

Please wait for the plunger to fully retract before removing or installing a syringe!
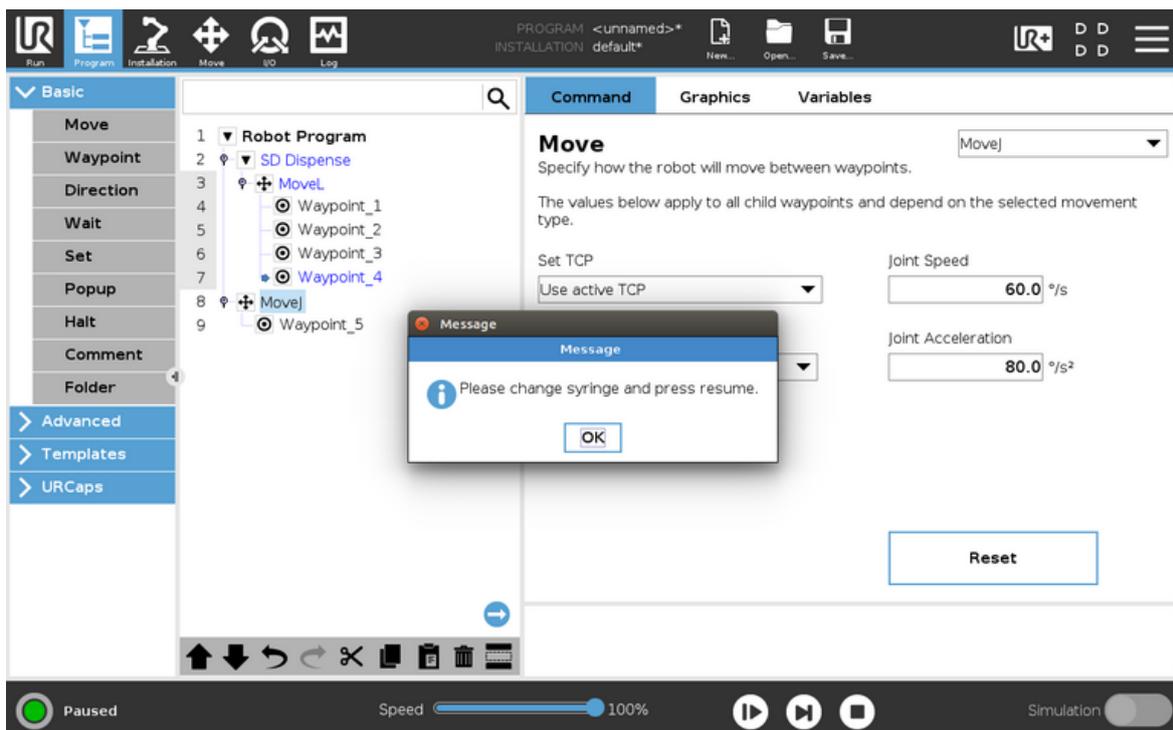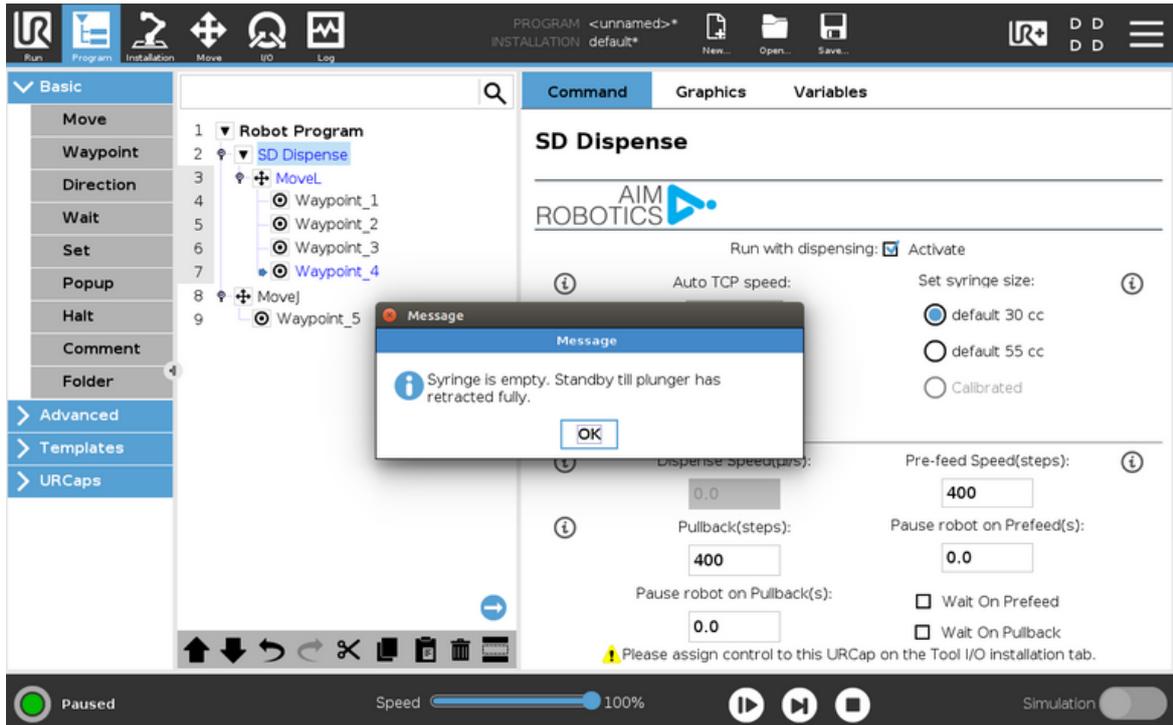
SAFETY

Control path of tip

As the units can be used with nozzles care should be taken when defining the movement for the robot ensuring the tip does not cause incidents.
- Define the path to and from the dispensing path
- Define the path to and from the purge point

Sharp objects

The tool can be equipped with nozzles and needles to dispense as desired.
Caution should be taken when using these attachments because they can puncture your skin.

Limitations

It is recommended to set robot limitations in **Installation > Safety > Robot Limits**: reduce limits to ensure greater safety so that the robot will stop dispensing if it exceeds these limits.
- Tool Speed / Elbow Speed: In the safety, settings consider changing speeds to ensure only full speed when dispensing and reduced speed when away from the path to avoid needle injuries.
- Tool Force / Elbow Force: Limit the maximum force exerted by the tool or elbow on the environment.

WARNING

- Any change to the unit or in-correct assemblies, such as removing o-rings or not screwing the unit on correctly, may lead to accidents, failures, or leaks.
- Ensure that the orifice of the tip is suitable for the fluid to avoid pressure build-up.
- The electronics box must not be opened or the warranty will be void.

SAFETY

AVOID: Clamping between tips and work item

- Select the right (low) force settings in the safety system of the UR robot.
- Move slowly towards the work item.

AVOID: Dangerous chemical substances damaging eyes

Can happen if tips are blocked and pressure is built up in the system.
- Use cleaning cycle in programming.
- Change tips regularly.
- Use appropriate protective equipment when dispensing or handling dangerous substances (glasses/gloves / etc).
- Do not inspect tips at close range when attached to the unit.

AVOID: Collision between needle and eye when robot is moving

Can happen when moving between work units or between separate dispensing paths.
- Ensure safe (orientation down) versus unsafe travel paths between work units or separate dispensing paths.
- Move at slower speeds between work units / separate gluing points.
- Keep a short distance between the nozzle tip and dispensing path.
- Whenever possible lock degrees of freedom in the safety system.

AVOID: Entrapment of fingers / limbs

Entrapment of fingers or limbs can happen if the operator has extremities within the robot's movement area.
- If possible select the right (low) torque/force settings in the safety system of the robot.
- Whenever possible limit rotational range of joint 6.
- Rotate low speeds or when clearance to robot links are small.

RECOMMENDATION

It is recommended that products from Aim Robotics are integrated into compliance with the following standards, technical reports, and specifications:
- **ISO 10218-2:2012**
- **ISO 10218-1:2012**
  - **§5.10 and one or more of the requirements in 5.10.2 to 5.10.5**
- **ISO 12100:2011**
- **ISO/TR 20218-1:2018**
- **ISO/TS 15066:2016**

TROUBLESHOOTING

The unit does not turn on (no green or red LED)

- Check Electrical connections
- Make Sure Tool I/O tool power output is set to 24V or if using USB2RS485 the Digital I/O is set high.
- Restart

Tool makes buzzing sound upon startup

- Check if the plunger is homed.
- Restart tool.

Tool skips steps/buzzes when dispensing

- Check tip for clogs.
- Dispensing speed for the material/needle combo is set too high or pre-feed is set too high.
  - Home Plunger, reduce prefeed or dispensing speed, prime, and try again.

The syringe is not empty / Auto retract happens before syringe is empty

If the syringe plunger is not fully pushed to the end when the unit Auto Retracts
- Check syringe size
  - Ensure that the correct syringe size was selected in the Aim Node
- Go through the syringe calibration process and calibrate the specific syringe model.

Tool Status is red, tool is on and is loosing communication

- Remove all other URCaps
  - Some manufacturer URCaps interfere with Tool I/O Communication even if their tool is not installed and nodes are not used.
- Purchase Aim USB2RS485 kit to allow for multiple manufacturer tool use on a single robot at the same time.
  - SD30/55 + OnRobot Eyes for example.

CERTIFICATION

EU Declaration of Incorporation in accordance with ISO/IEC 17050-1.2010		
Manufacturer:	Aim Robotics ApS Maskinvej 5 DK-2860 Søborg Denmark	CVR: 40494197 www.aim-robotics.com

Description and identification of the partially completed machine(s)	
Product and Function:	Dispensing end-effector for Collaborative Robots
Model:	SD (Syringe Dispenser)
Serial Number:	YEAR-model-sequential numbering restarting at 0 each year, starting from 2020-SD-0000

Incorporation:
The Aim Robotics product shall only be put into service upon being integrated into a final complete machine (robot system, cell or application), which conforms with the provisions of the Machinery Directive and other applicable Directives.
When this incomplete machine is integrated and becomes a complete machine, the integrator is responsible for determining that the completed machine fulfils all applicable Directives, updating the relevant harmonized standards, other standards and documents.

It is declared that the above product, for what is supplied, fulfil the following directives with reference to harmonised standards:

   I.   Machinery Directive 2006/42/EC: It is declared that the relevant technical documentation has been compiled in accordance with Part B of Annex VII.
         A. EN 12100:2010
  II.   EMC Directive 2014/30/EU
         A. EN 61000-6-2:2005
         B. EN 61000-6-4:2007/A1:2011
 III. RoHS Directive 2011/65/EU
         A. EN 50581:2012
 IV. WEEE Directive 2012/19/EU

The relevant information on the partly completed machinery shall be transmitted in response to a reasoned request by the national authorities.

Person authorized to compile the relevant technical documentation:

Mie Haraldsted, CEO	Aim Robotics ApS Maskinvej 5 DK-2860 Søborg Denmark

Signature

Søborg,
Denmark

18.11.2021

Mie Haraldsted / CEO

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CE

RoHS compliant