

Author Peter Jakob, Roland Loy, Florian Walter  
Date 11/04/2024  
Revision 1.2

## FLEXFEEDER UR PLUG-IN

# Quickstart & Reference Guide

flexfeeder GmbH  
Gerhard-Kindler-Straße 8  
72770 Reutlingen

Phone +49 7121 8933-661

[flexfeeder@flexfactory.com](mailto:flexfeeder@flexfactory.com)  
[flexfactory.com](http://flexfactory.com)



---

## Contents

<i>Introduction</i>	2
<i>1. System Installation</i>	3
<i>2. Relevant Robot Poses</i>	6
<i>3. Preparation flexfeeder</i>	8
<i>4. Installation and Setup URCap</i>	9
<i>5. Multifederer Functionality</i>	13
<i>6. Calibration</i>	15
<i>7. Productive Operation</i>	16
<i>8. List of URCap Nodes Calibration</i>	17
<i>9. List of URCap Nodes Production</i>	20
<i>10. List of URCap Nodes Operations</i>	26
<i>11. Overview examples</i>	29
<i>12. Trouble Shooting</i>	30

## INTRODUCTION

This file documents the quick steps for setting up and configuring the URCap Plug-in from Flexfactory AG for operating a Flexfactory flexfeeder X with an UR robot.

In case of an error, please refer to chapter [Trouble Shooting](#).

We would like to point out that we recommend participation in one of our one-day training courses. These trainings will provide you with valuable insights and give you the necessary know-how to get the most out of our products.

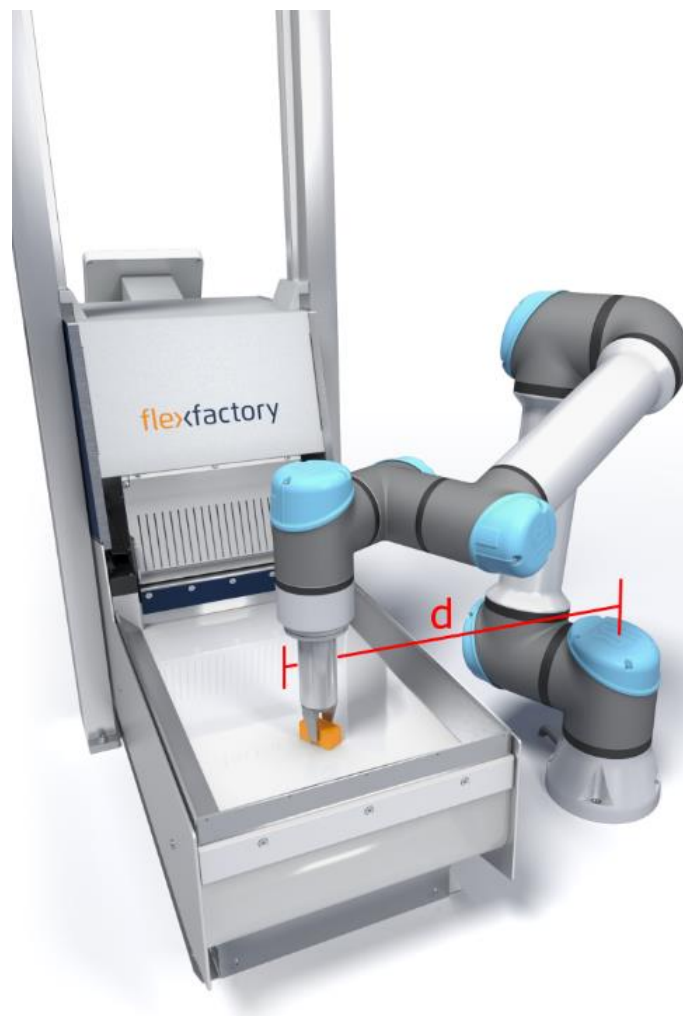
For more information and to register, please visit our training page at: <https://www.flexfactory.com/en/contact-and-support/trainings>



## 1. SYSTEM INSTALLATION

### Mechanical recommendations of the robot in relation to flexfeeder

The UR robot is placed next to the flexfeeder in order to pick parts from the working area on the feeding surface. The field of view of the camera defines that working area.



The minimum distance  $d$  between robot main axis and feeder surface centrum is constrained by robot's shoulder that should not collide with the flexfeeder. The maximum distance is constrained by robot's limitations to reach the corners of the picking surface. The following tables summarize recommended values for these minimum and maximum distances in this particular setting.



---

Any other mounting options (e.g. diagonal of, in front of or above the flexfeeder) are independent of this.

**In general, it is the responsibility of the integrator to avoid collisions and singularity movements of the robot.**

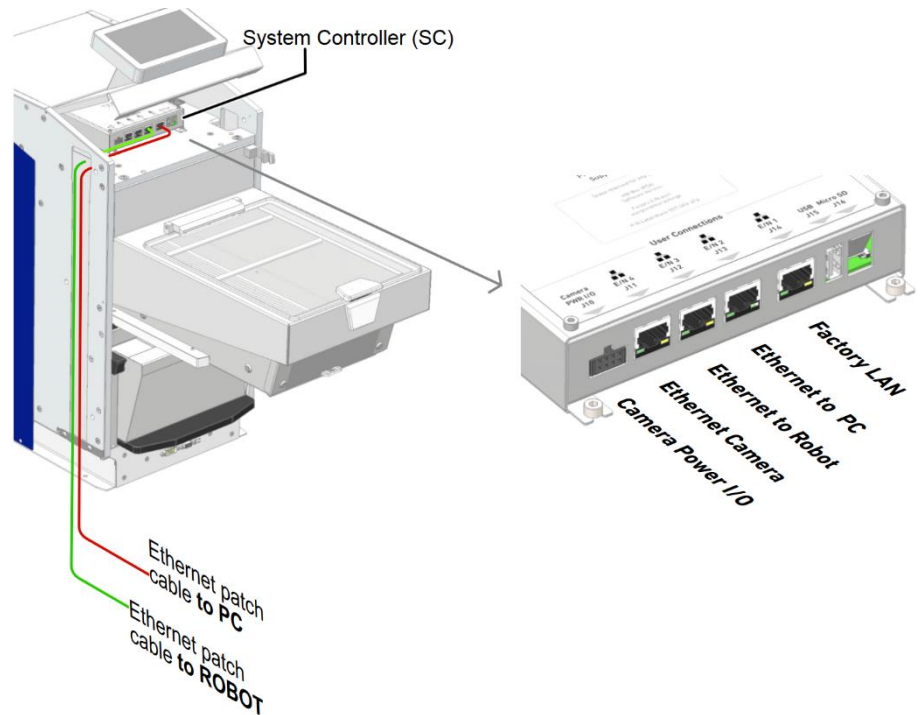
Minimum Distance <b>d / cm</b>			
	UR3e	UR5e	UR10e
X185	33	36	42
X250	not applicable	39	45
X350	not applicable	44	50

Maximum Distance <b>d / cm</b>			
	UR3e	UR5e	UR10e
X185	34	64	120
X250	not applicable	60	116
X350	not applicable	53	110

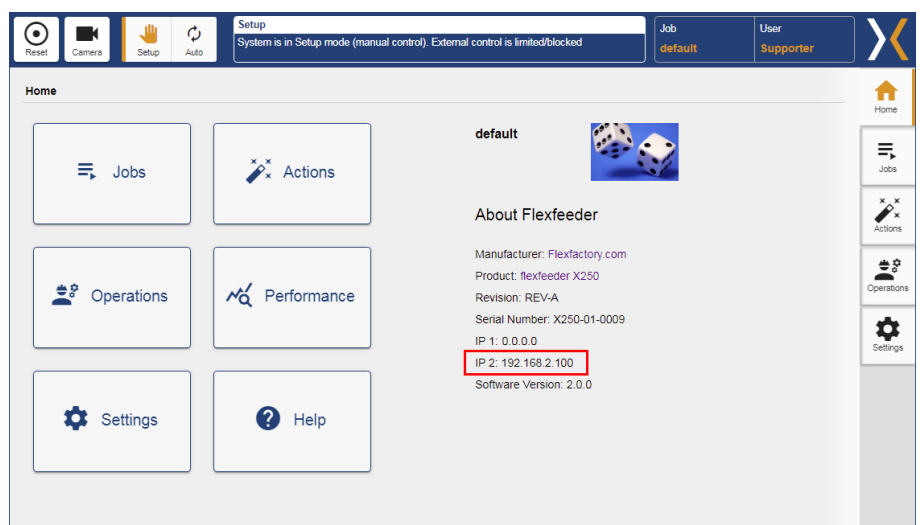


## How to connect the robot to the flexfeeder

The flexfeeder's System Controller provides ethernet ports to the robot system. A simple patch cable enables the electrical and logical connection of both systems.



The IP address of the flexfeeder can be seen on the start page of the display:



## 2. RELEVANT ROBOT POSES



**Pick pose:** Set this pose as if an object is picked from anywhere on the feeder surface. This pose is adjusted automatically during productive operation according to detected objects.

Name of the pose: *Pick pose*

**Attention! Feeder surface needs to be perpendicular to camera's optical axis.**

Involved URCap node: *FFX production*



**Out of view pose:** Pose of the robot arm located outside the flexfeeder camera's field of view.

Name of the pose: *Out of View Position*

**Attention! The gripper and any cables should also be outside the camera's field of view in this pose.**

Involved URCap node: *FFX installation*





**Above shaker pose:** After gripping a part from the surface, this robot pose is approached. E. g. teach pose above a corner of the feeder surface.

Name of the pose: *Above Shaker Position*

**Attention! This pose must be accessible without collision from any gripping poses on the feeder.**

Involved URCap node: *FFX installation*



**Calibration poses:** The calibration object is placed at four different positions on the feeder surface. Ideally, the corners of the feeding area visible to the camera are used for this. Set the robot poses accordingly.

Name of the poses: *Pos 1 - 4*

**Attention! The order of the poses must be either clockwise or counterclockwise.**

**Important! Do not cross**

Involved URCap node: *FFX calibration positions*



---

### 3. PREPARATION FLEXFEEDER

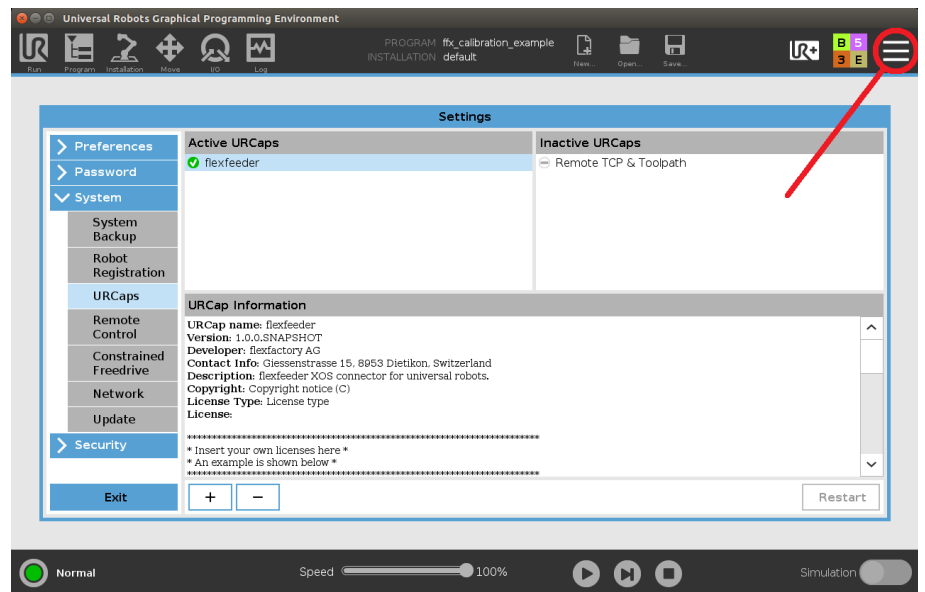
Please follow the check list to get the flexfeeder ready for production and calibration.

1. Set up flexfeeder electrically and mechanically. Further information can be found in its documentation "assembly instruction".
2. Switch on flexfeeder, execute a reset command from its touchpad and turn operation mode to "auto".
3. Teach a user defined part for calibration and production, respectively. See documentation "Anleitung zum Einrichten eines neuen Teils" for further information.
4. Configure appropriate jobs on the flexfeeder for calibration and production, respectively. This includes product specific parameters like feeding force and frequencies.
5. Activate one of those two jobs on the flexfeeder touchpad depending on what you want to do next: run a calibration or a production cycle.





## 4. INSTALLATION AND SETUP URCAP

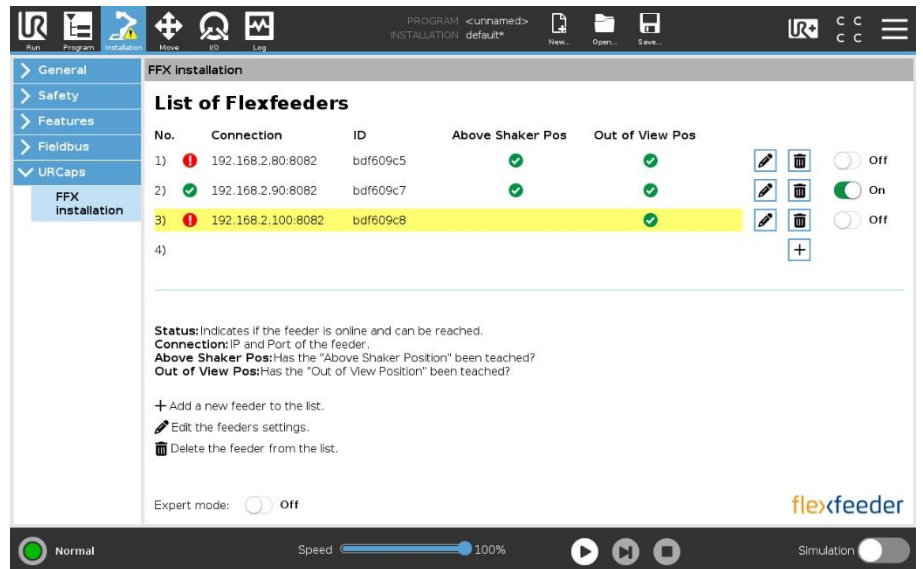


☰ Main menu → Settings → System → URCaps

1. Insert USB Drive with URCap file in USB drive's root folder.
2. Press "+" and choose URCap file from USB drive.
3. Restart system.

Note: The URCap plugin can be uninstalled by using the "-" button.





 → Installation → URCaps → FFX installation

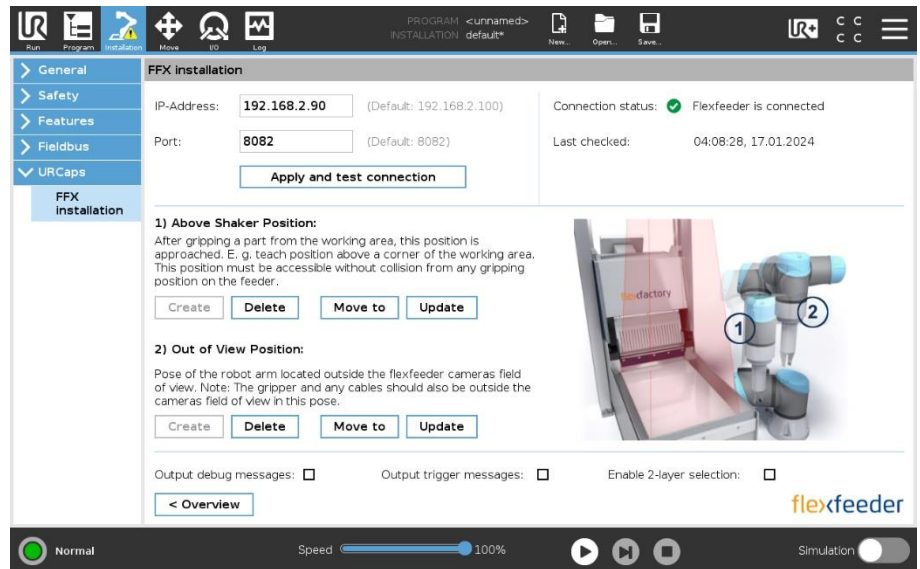
The first page of the FFX Installation screen shows you a list of all configured flexfeeders. The columns in the table are:

- Slot number
- Connection status
- IP-Adress and Port
- Device ID
- Has the "Above Shaker Position" been taught
- Has the "Out of View Position" been taught
- Action Buttons (Edit, Delete, Add)
- Activation-Toggle

To add a new feeder, click on the '+'-Button in a free row.  
 To edit the configuration of a flexfeeder, click on the Pen-Button.  
 To remove the configuration of a flexfeeder, click on the Trashcan-Button.

**Notice:** The yellow background of a row indicates, that there are missing configuration settings.





→ Installation → URCaps → FFX installation → flexfeeder Configuration

1. Check the IP address and the port of the flexfeeder. A successful connection is visible via the status indicator.
2. Create and teach two feature poses that are necessary for the application with a flexfeeder.
  - a. *Above shaker*. After gripping a part from the surface, this robot pose is approached. E. g. teach pose above a corner of the feeder surface.

**Attention! This pose must be accessible without collision from any gripping poses on the feeder.**

- b. *Out of view*. Pose of the robot arm located outside the flexfeeder camera's field of view.

**Attention! The gripper and any cables should also be outside the camera's field of view in this pose.**



**"Enable 2-layer selection"**: When you enable this option, you are able to select the part-layer which should be used when searching for new parts.

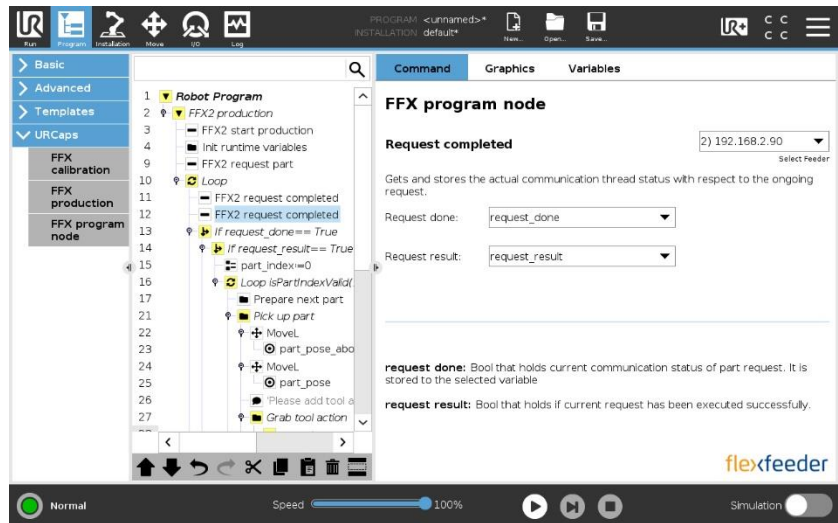
*The desired layer can be selected on the "FFX request part"-node.*

**Hint:** For the **"2-layer-selection"** a corresponding "2-layer" job must be set up and configured on the Cognex camera.

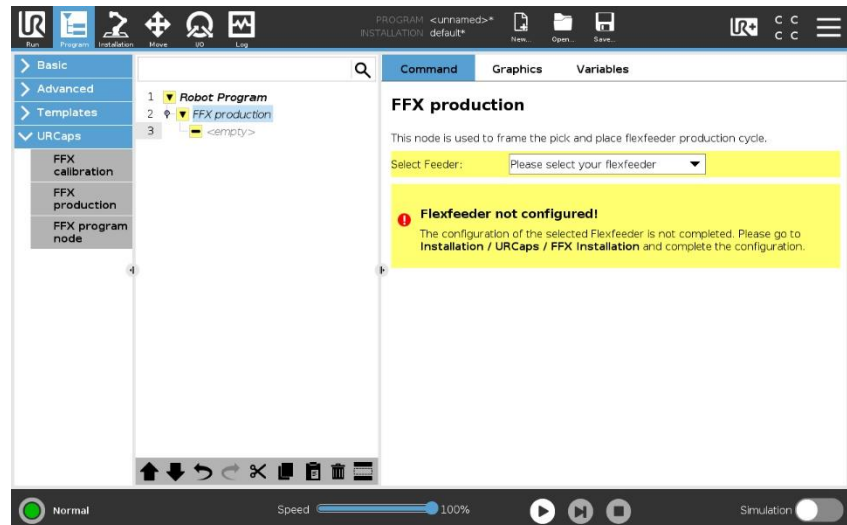
Via the "< Overview"-Button, you can return to the Overview-Page.



## 5. MULTIFEEDER FUNCTIONALITY

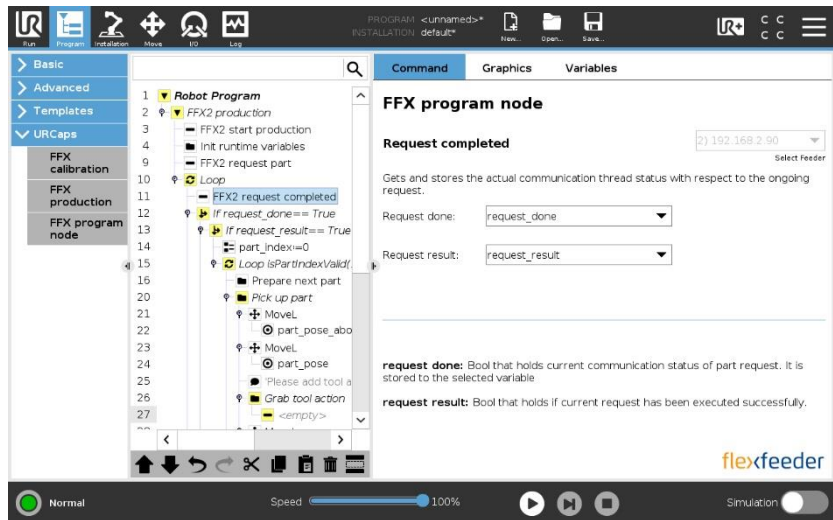


Each FFX node is equipped with a selector to specify the flexfeeder it should engage with. This selector can be found in the upper right of the node details.



If you start with a "FFX calibration" or "FFX production" node, you can initially specify the desired flexfeeder.



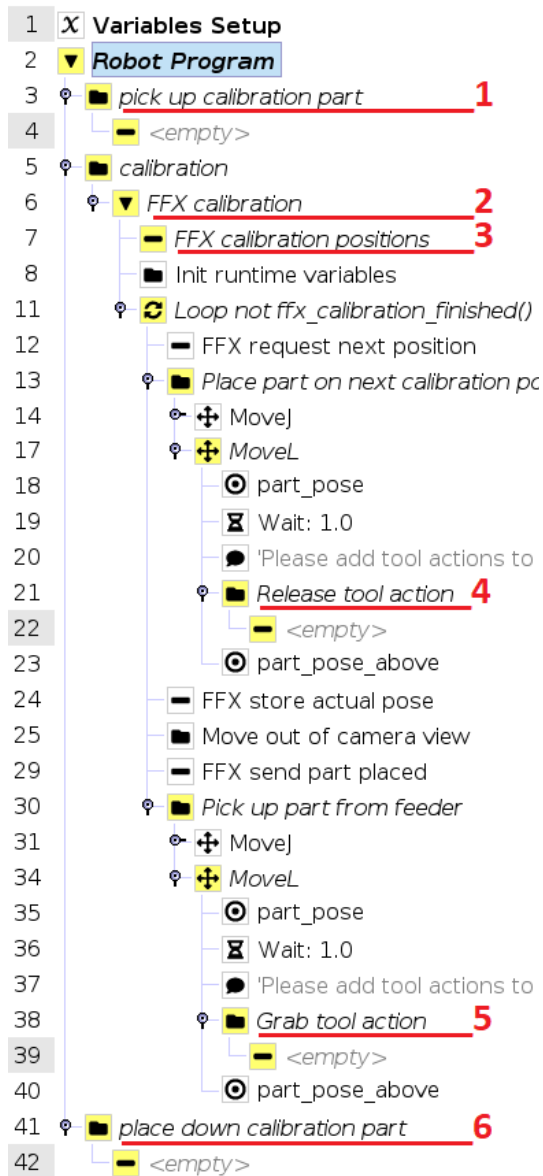


After this initial selection, the selector will be read-only, to prevent configuration errors.

Hint: If you insert a "FFX program node", the selector will stay editable.



## 6. CALIBRATION



Open → Choose *ffx\_calibration\_example.urp* program.

The calibration program is set up. Compare illustrated tree on the left side. At points 1 through 6 the user has to define different robot poses and implement process tasks.

1. Add commands or subroutines to folder *pick up calibration part*: At this point in the program, the robot must fetch a calibration object.  
Note: The calibration object must already be taught in the vision system, see documentation "Anleitung zum Einrichten eines neuen Teils".
2. Click and configure *FFX calibration*: Set camera job name to an existing calibration job's name (default: "ffCalib"). That camera job has to have the ability to detect the calibration object in favour.
3. Click and configure *FFX calibration positions*:
  - a. The calibration object is placed at four different positions on the feeder surface. Click and set them here. They are arranged counter clockwise on the feeder surface.
  - b. Set value to parameter "approach height". The robot approaches the four different positions on the feeder surface trough these hovering positions.
4. Add commands or subroutines to *Release tool action*.
5. Add commands or subroutines to *Grab tool action*.
6. Add commands or subroutines to *place down calibration part*: The calibration object can be returned to its home position. Insert appropriate routines here if applicable.



Save as → Type new file name → Save all

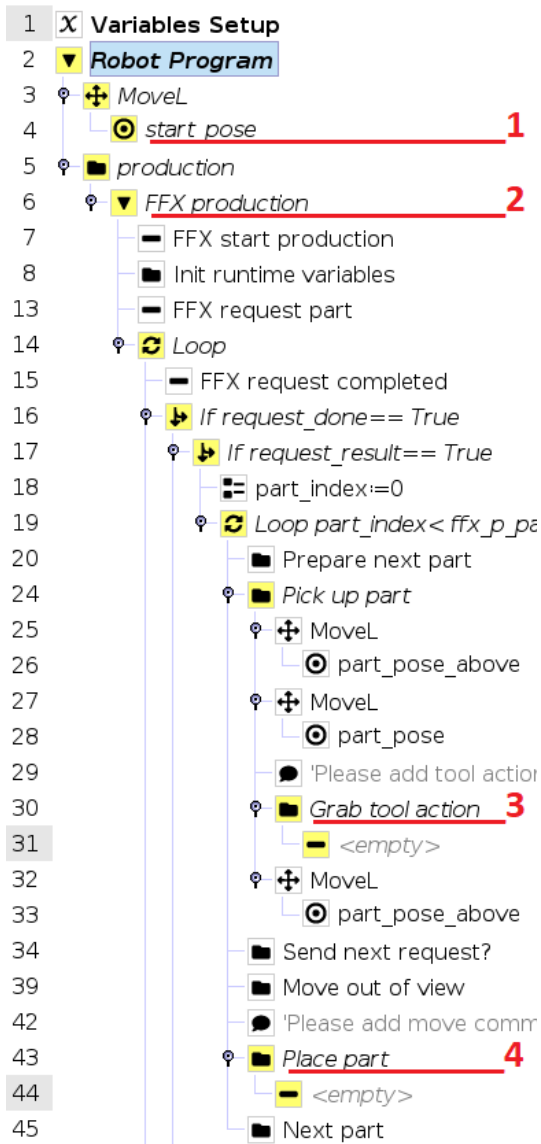


Run program

Note: The calibration is needed one time only to know the mapping between the camera and robot coordinate systems.



## 7. PRODUCTIVE OPERATION



Open → Choose *ffx\_productive\_example.urp* program.

1. Click pose *start\_pose* and set corresponding waypoint. The robot approaches the feeder through this pose.
2. Click and configure *FFX production*:
  - a. Select feeder job that was configured on the feeder before, see feeder documentation.
  - b. Click pose *pick pose*. Set this pose as if an object is picked from anywhere on the feeder surface. This pose is adjusted automatically during productive operation according to detected objects.

**Attention! Feeder surface needs to be perpendicular to camera's optical axis.**

3. Add commands or subroutines to *Grab tool action*.
4. Add commands or subroutines to *Place part* folder. This includes gripper actions as well as moving commands to place the object at a desired location.



Save as → Type new file name → Save all



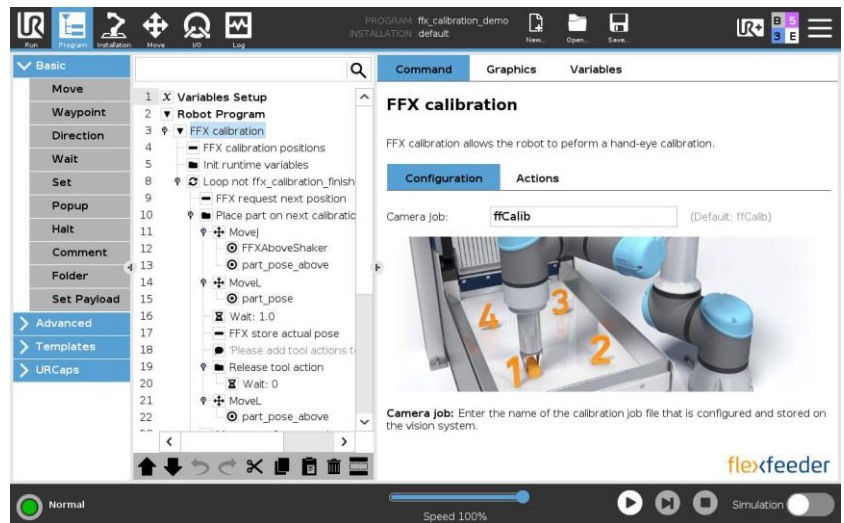
Run program





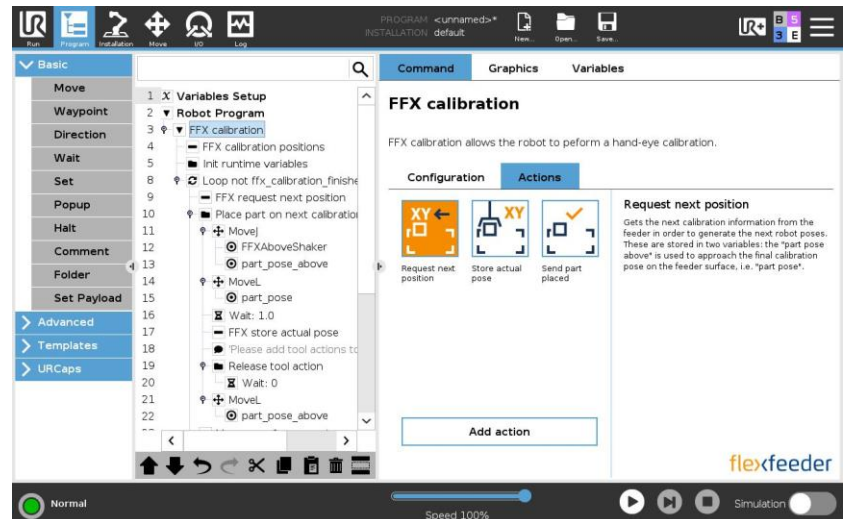
## 8. LIST OF URCAP NODES CALIBRATION

### FFX calibration → Configuration



Start node of calibration process. Enter the name of the calibration job file that is configured and stored on the vision system.

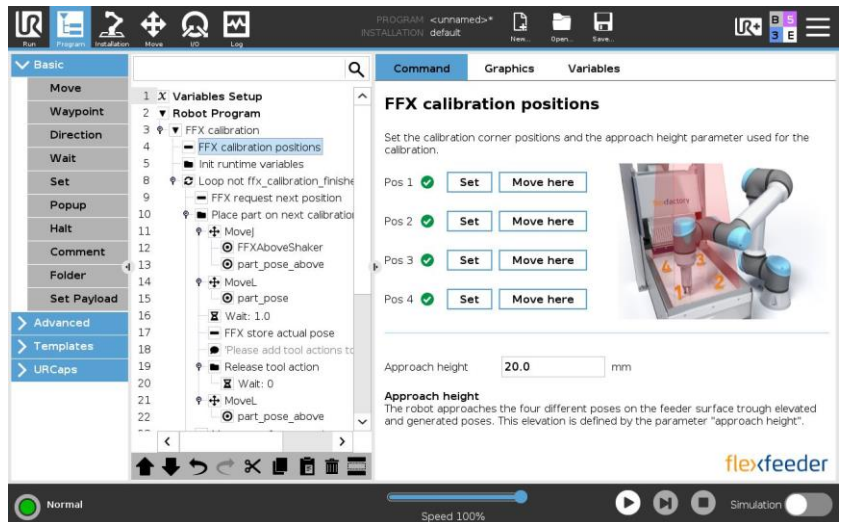
### FFX calibration → Actions



Start node of the calibration process. This includes the actions "Request next position", "Store actual pose" and "Send part place". The user can add these nodes individually.

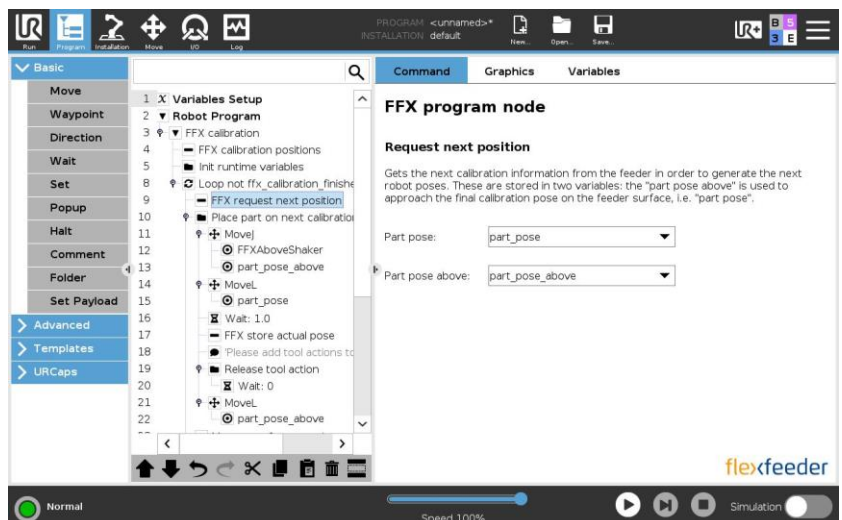


## FFX calibration positions



The calibration object is placed at four different positions on the feeder surface. Click and set them here. They are arranged counter clockwise on the feeder surface within the view field of the camera. The robot approaches those four different positions on the feeder surface trough hovering positions that are defined by the scalar "approach height".

## FFX Request next position

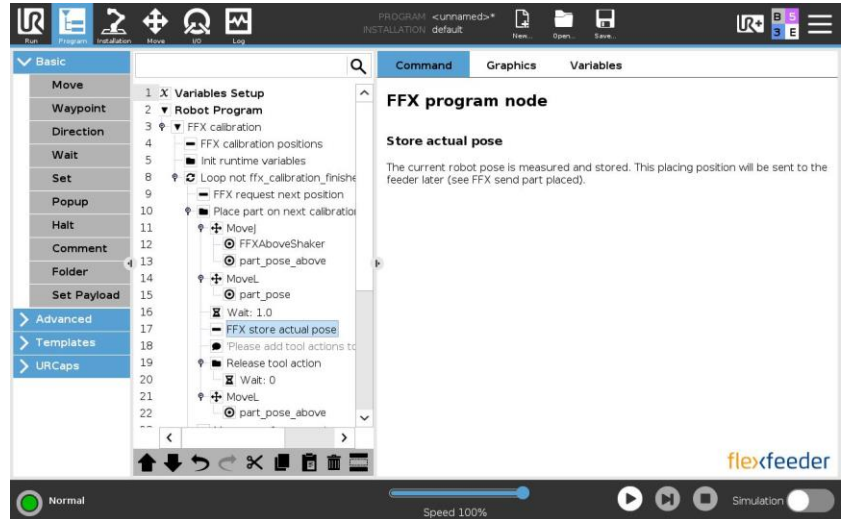


The next calibration information is get from the feeder in order to generate the next robot poses. These are stored In two variables: the *part\_pose\_above* is used to approach the final calibration pose



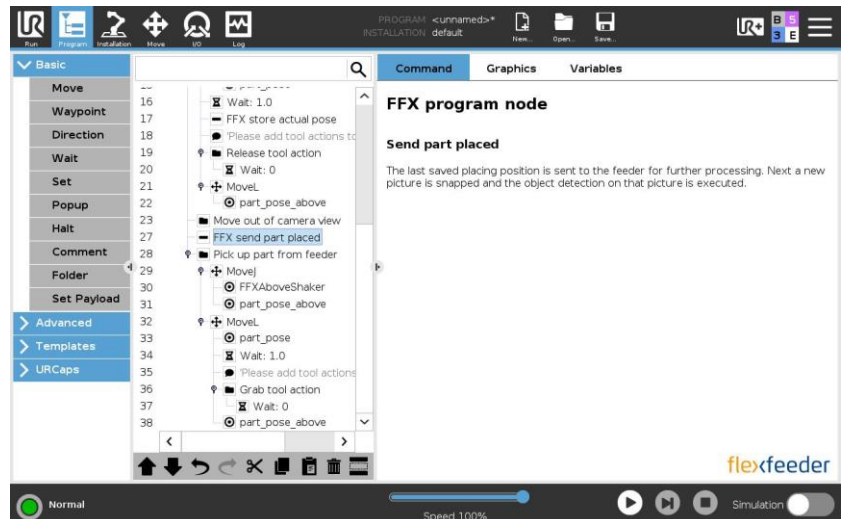
*part\_pose* on the feeder surface. To configure this approaching height refer to node *FFX calibration positions*.

### FFX Store actual pose



The current robot pose is determined and stored. This placing position will be sent to the flexfeeder later.

### FFX Send part placed

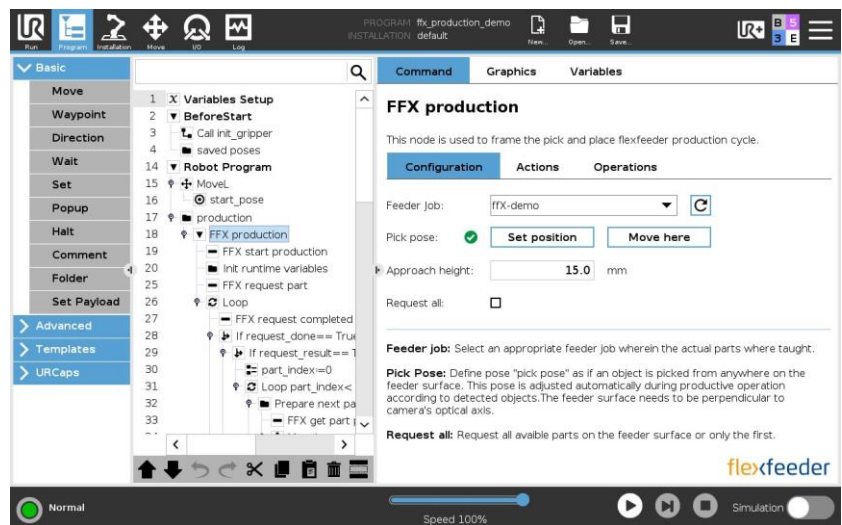


The last saved placing position is sent to the flexfeeder for further processing. Next, a new picture is recorded and the object detection on that picture is executed.



## 9. LIST OF URCAP NODES PRODUCTION

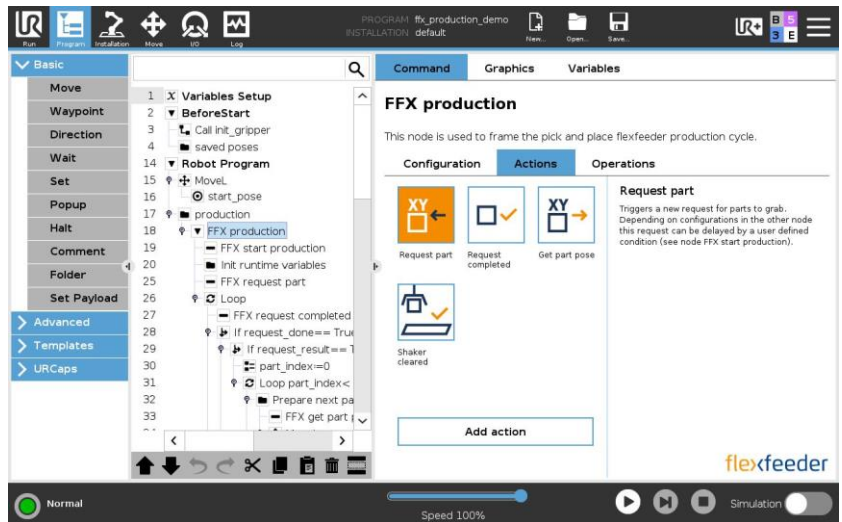
### FFX production → Configuration



Start node of pick and place production process. Select feeder job that was configured on the feeder before, see feeder documentation. Set "pick pose" as if an object is picked from anywhere on the feeder surface. This pose is adjusted automatically during productive operation according to detected objects. The robot approaches these poses through elevated poses that are defined by the scalar "approach height". Decide with "Request all" whether between image recordings a single or all candidates on an image are processed.

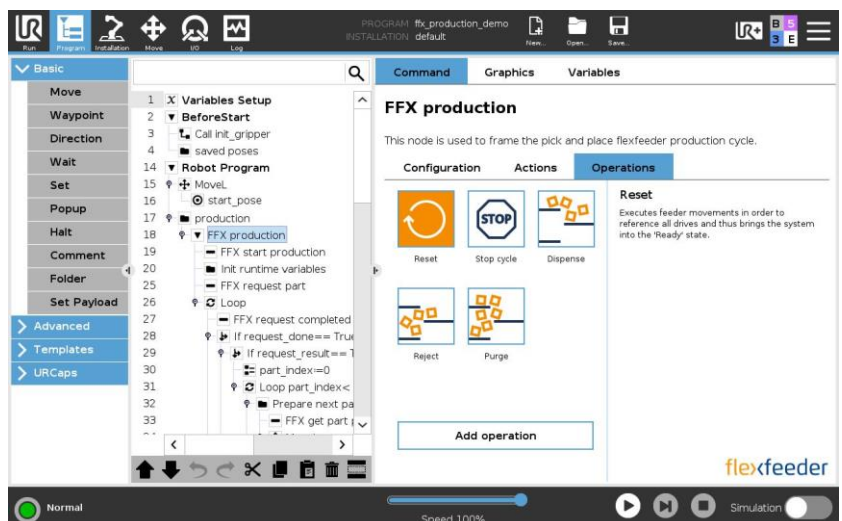


## FFX production → Actions



Start node of pick and place production process. This process is built up from the actions "Request part", "Request completed", "Get part pose" and "Shaker cleared". The user can add individual actions to the usual flow.

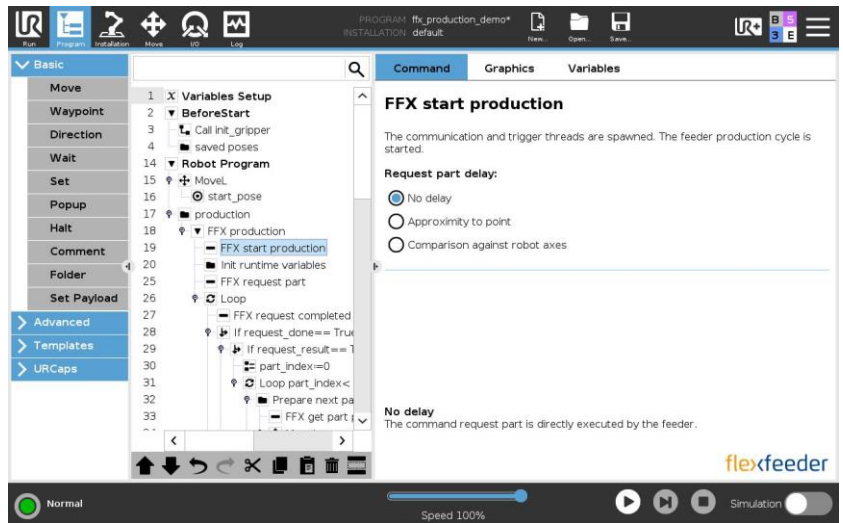
## FFX production → Operations



Start node of pick and place production process. The user can add flexfeeder operations to the program tree. These include stopping all flexfeeder actions ("Stop cycle"), resetting the flexfeeder ("Reset") or explicitly trigger a transport operation ("Dispense", "Purge" and "Reject").



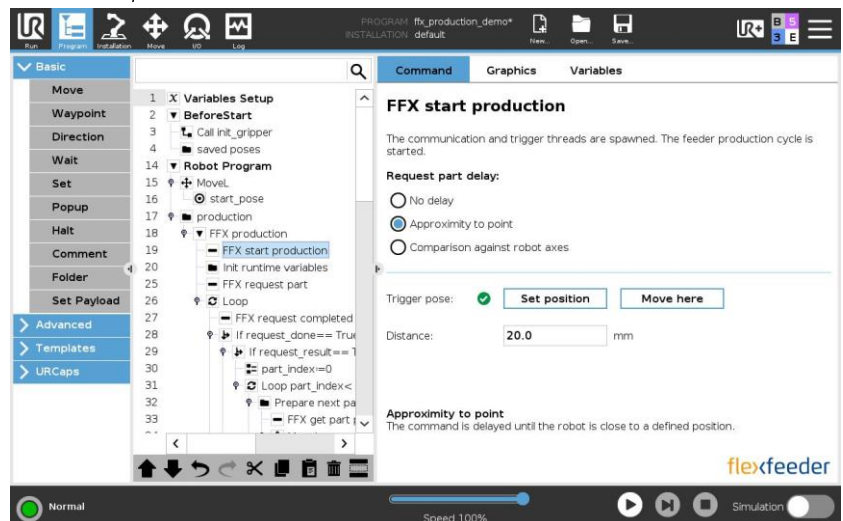
### FFX start production:



This node spawns a thread for trigger and communication purpose. This thread must be configured how to handle a request part command in the further program flow. The option "No delay" causes a request part command to trigger an image acquisition without delay.

The options "Approximity to point" and "Comparison against robot axes" are explained in the following nodes.

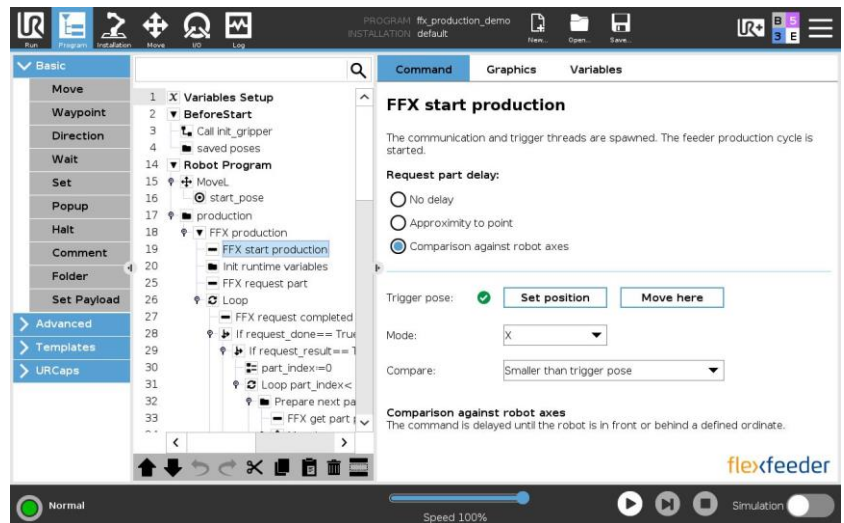
### FFX start production



The selection "Approximity to point" causes a delayed image acquisition. Only when the robot pose is close to the set pose, the trigger is released.

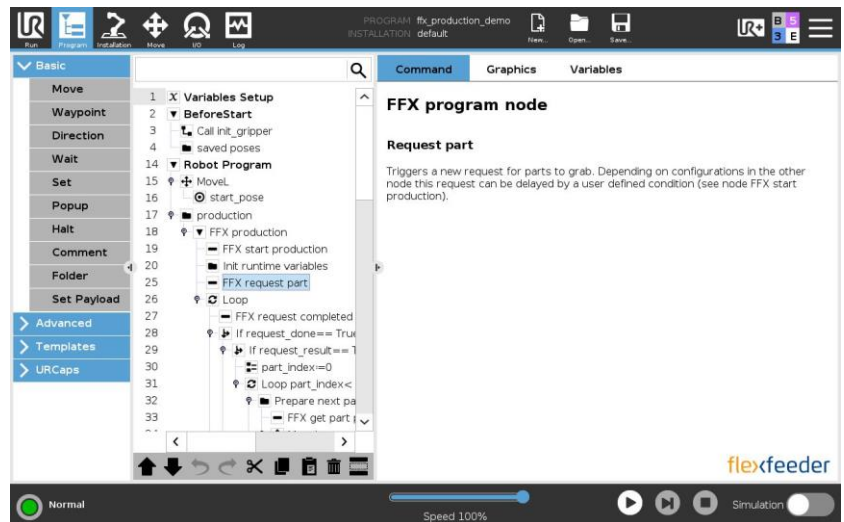


## FFX start production



The option *“Comparison against robot axes”* causes a delayed image acquisition. Only when the robot pose has exceeded the set coordinate, the trigger is released.

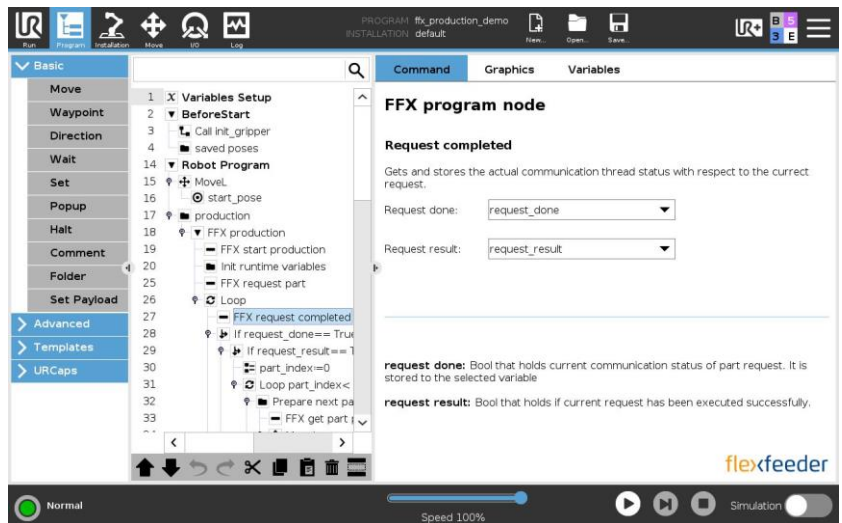
## FFX Request Part



Triggers a new request for parts to grab. Depending on configuration in other nodes, this request can be delayed by a user defined condition.

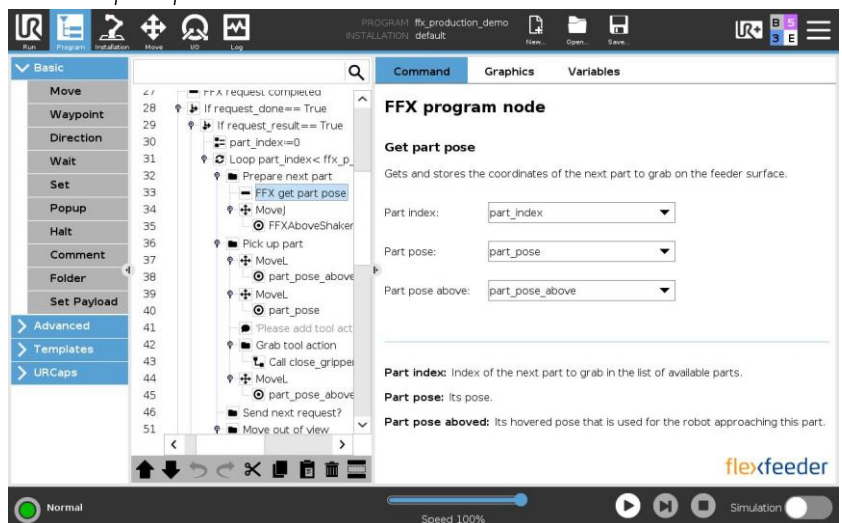


## FFX Request completed



Gets and stores the actual communication thread status with respect to the ongoing request. The listed variables contain the information whether the request was successful and whether results are available.

## FFX Get part pose

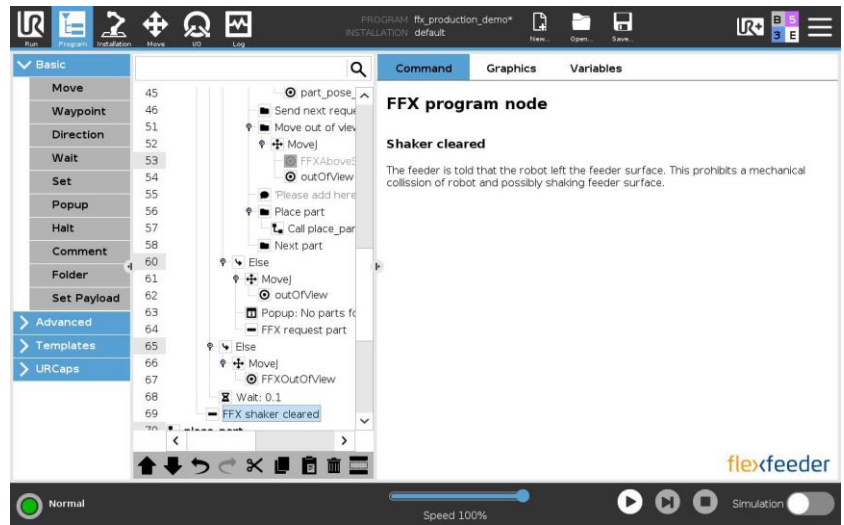


Gets and stores the coordinates of the next part to grab on the working area. For a given index – stored in parameter “Part index” – this node sets the corresponding pose information into the output parameters “Part pose” and “Part pose above”. The later is the pose over which the robot is approaching the next candidate. To configure this approaching height refer to node *FFX start production*.





### FFX Shaker cleared

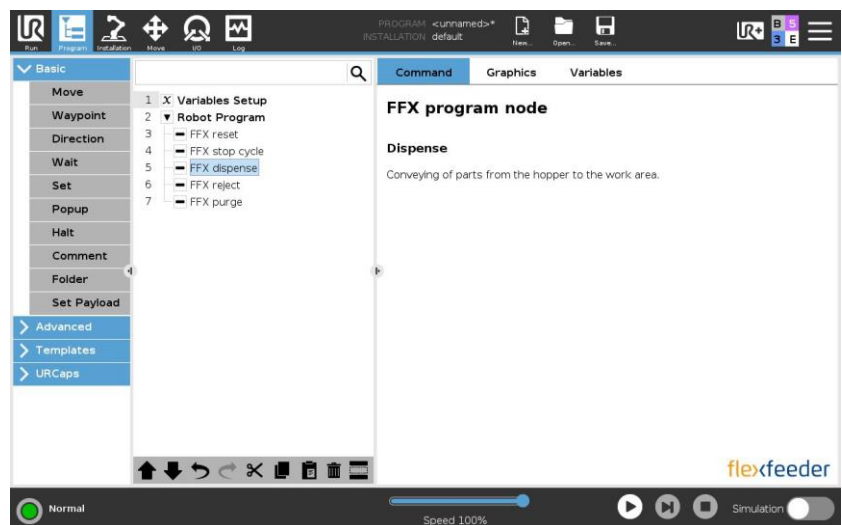


The flexfeeder is told that the robot left the working area on the feeding surface. This prohibits a mechanical collision of robot and possibly shaking feeding surface. Outstanding flexfeeder movements can then automatically started.



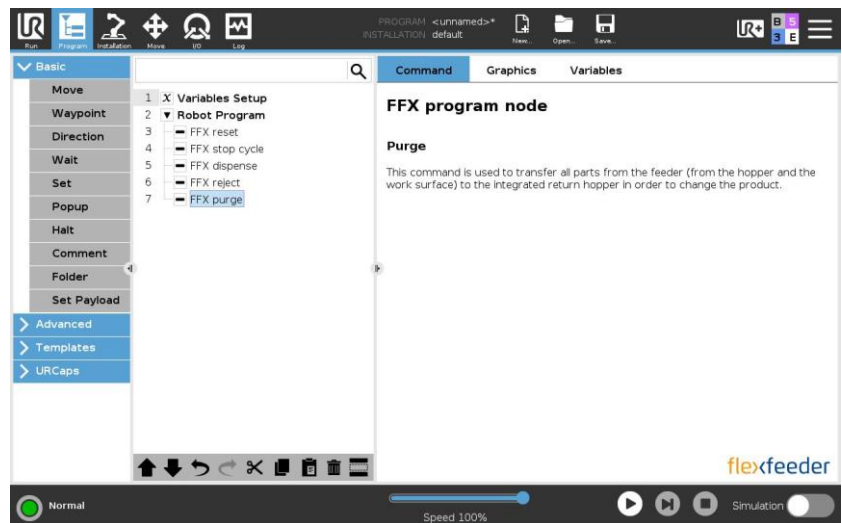
## 10. LIST OF URCAP NODES OPERATIONS

### FFX Dispense



Explicit instruction to the flexfeeder to convey parts from the bulk bin to the working area on the feeding surface.

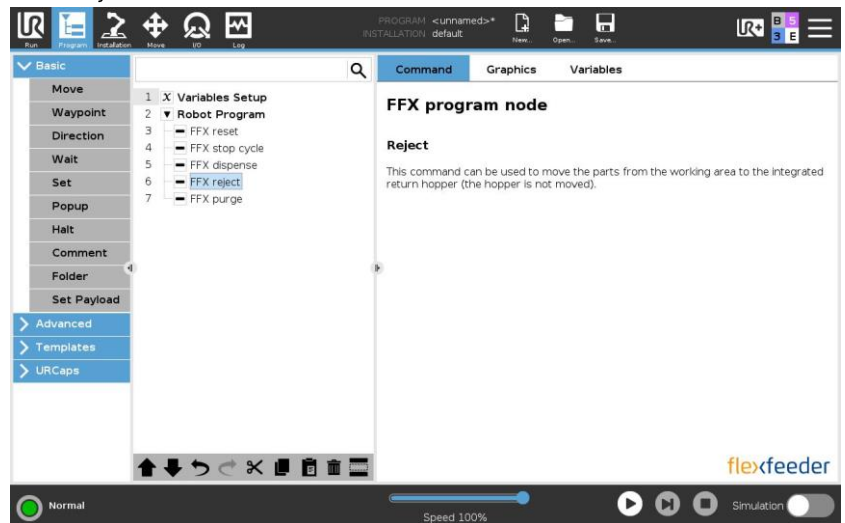
### FFX Purge



Explicit instruction to the flexfeeder to transport all parts from the flexfeeder (from the bulk bin and the feeding surface) to the integrated return bin.

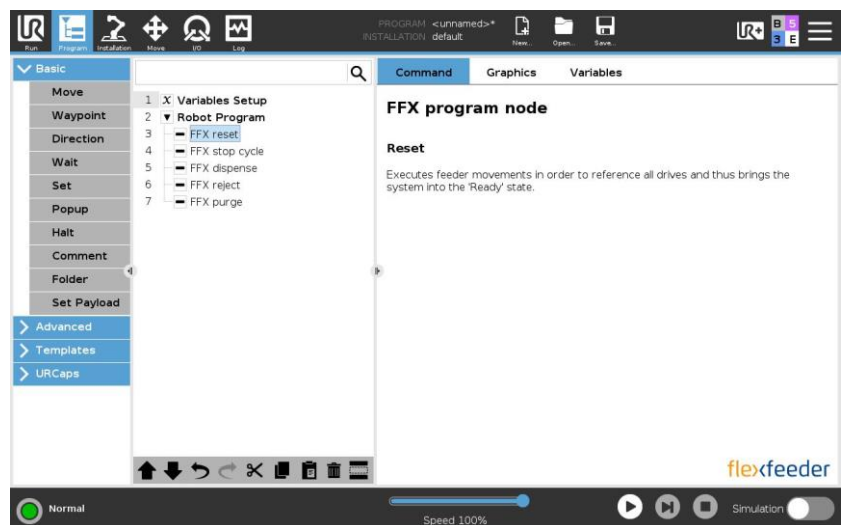


## FFX Reject



Explicit instruction to the flexfeeder to move parts from the working area to the integrated return bin.

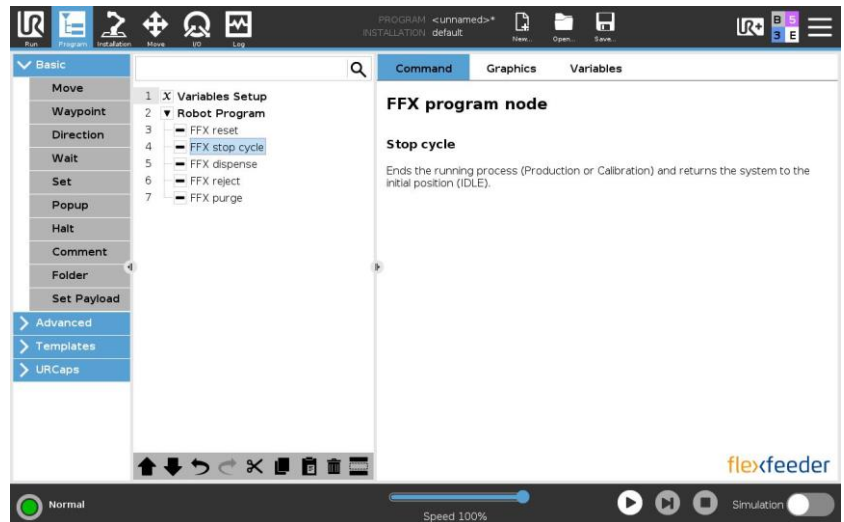
## FFX Reset



Explicit instruction to the flexfeeder to reference all flexfeeder drives and thus bring the system into the 'Ready' state.



## FFX Stop cycle



Explicit instruction to the flexfeeder to exit ongoing process (production or calibration cycle) in order to return the system to 'idle' state.



---

## 11. OVERVIEW EXAMPLES

The following examples are included with the flexfeeder UR plug-in in the "examples" subdirectory:

- **ffx\_calibration\_example.urp**  
Implementation of a calibration with the aim of performing the calibration successfully.
- **ffx\_production\_example.urp**  
Simple production process with one feeder and one part. The aim is to achieve the shortest possible cycle times.
- **ffx\_production\_example\_two\_feeder.urp**  
Represents a production process with two feeders. The same component is run on both feeders according to type. The aim is to achieve the shortest possible cycle times, whereby it is not relevant from which feeder the next part is to be picked up.
- **ffx\_production\_example\_two\_feeder\_alternating.urp**  
Production process with two feeders. However, two different parts are run on the two feeders, one for each type. By alternately picking up different parts from one feeder at a time, the aim is to achieve the shortest possible cycle times.
- **ffx\_production\_example\_two\_layer.urp**  
Production process with one feeder and one part. The part is to be picked from two different layers (two-layer job). The order in which the part layers are picked up is not relevant. The shortest possible cycle times should be realized.
- **ffx\_production\_example\_two\_layer\_alternating.urp**  
Production process with one feeder and one part. The part is to be picked from two different layers (two-layer job). The order in which the part layers are picked up is relevant. A corresponding layer should always be picked up alternately. The shortest possible cycle times should be realized.



---

## 12. TROUBLE SHOOTING

Node FFX start production or FFX calibration are not executed. When starting the robot program, a flexfeeder reset cannot be executed successfully.	Check on flexfeeder touchpad if feeder operation mode is set to "auto". Check if vision system operation mode is set to "online". Refer to checklist in chapter <a href="#">Preparation flexfeeder</a> in this document.
A TCP/IP connection to the flexfeeder cannot be established.	Check ethernet infrastructure including patch cables and switches. Check if flexfeeder's IP address is set correctly in URCap node <i>FFX Installation</i> . The IP of the feeder is displayed on its HMI on the home screen (accessible via web browser or touch screen).
Feeder job list in node FFX production cannot be loaded	Check connection to flexfeeder and reload job list.
The camera is not triggering well (at the wrong time etc.)	Check trigger delay configuration in node <i>FFX start production</i> .
No debug messages are shown.	Switch on debug logging in node <i>FFX Installation</i> .

