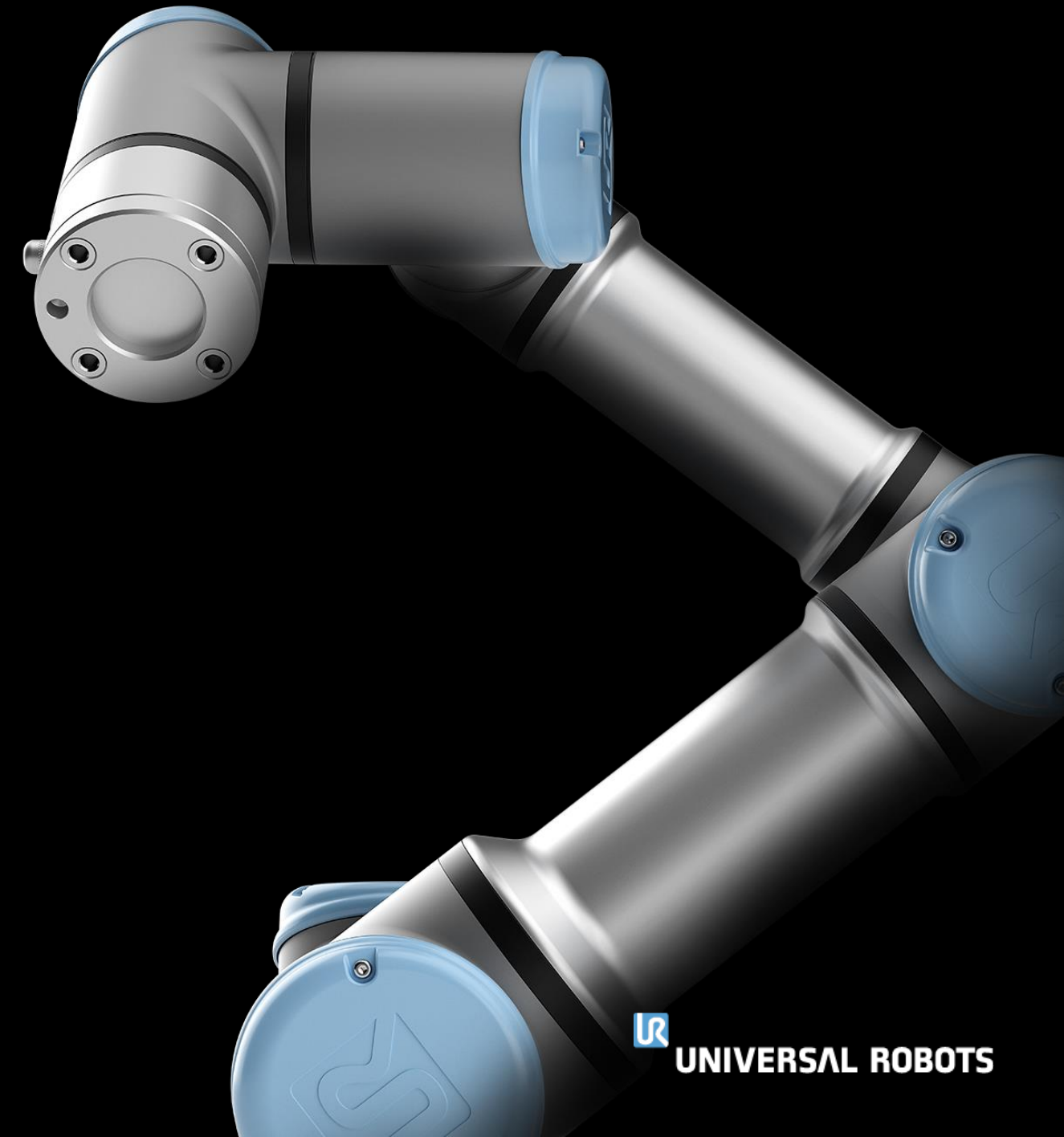


Enabling Process Applications with *Remote TCP & Toolpath URCap*

October 2021



Process Applications

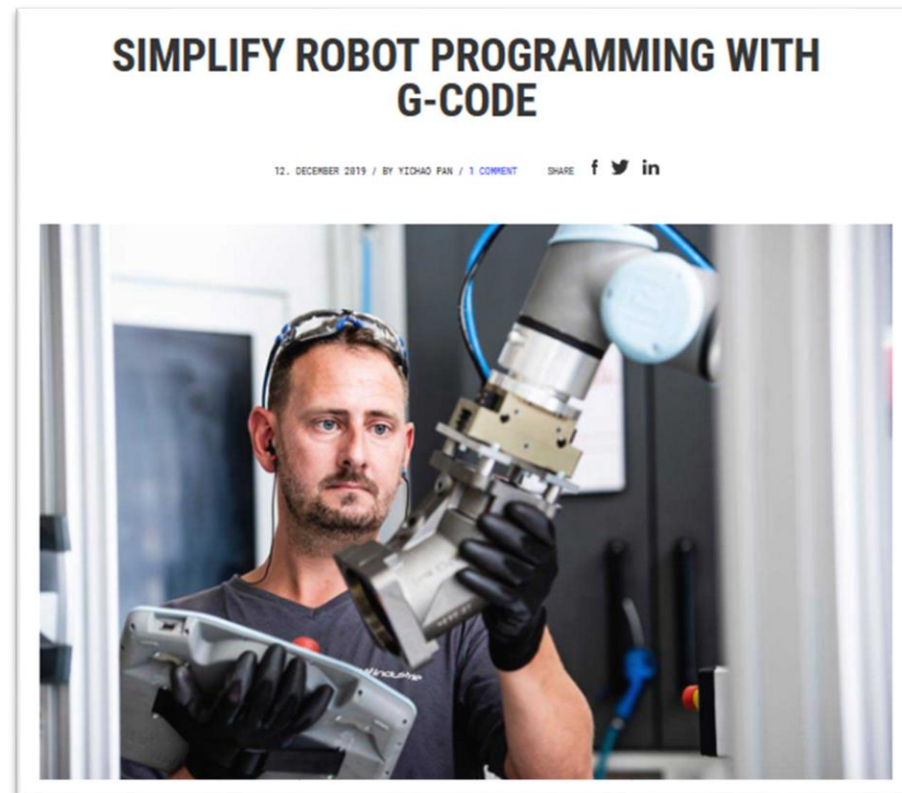
Processing a work-in-process part to drive it closer to a final product

- **Dispensing** an adhesive, fluid or glue around the edges of a windshield or channel of a head gasket
- Picking up a stamped, laser cut or die cut sheetmetal part and **deburring** the edges
- Moving a part in front of a **painting** spray gun
- Automated **sewing** of two fabrics such as rugs and other textiles
- **Polishing** a dull part and placing onto a palletizing tray
- **Welding** two halves of a manifold together

Enabling Features For Process Applications

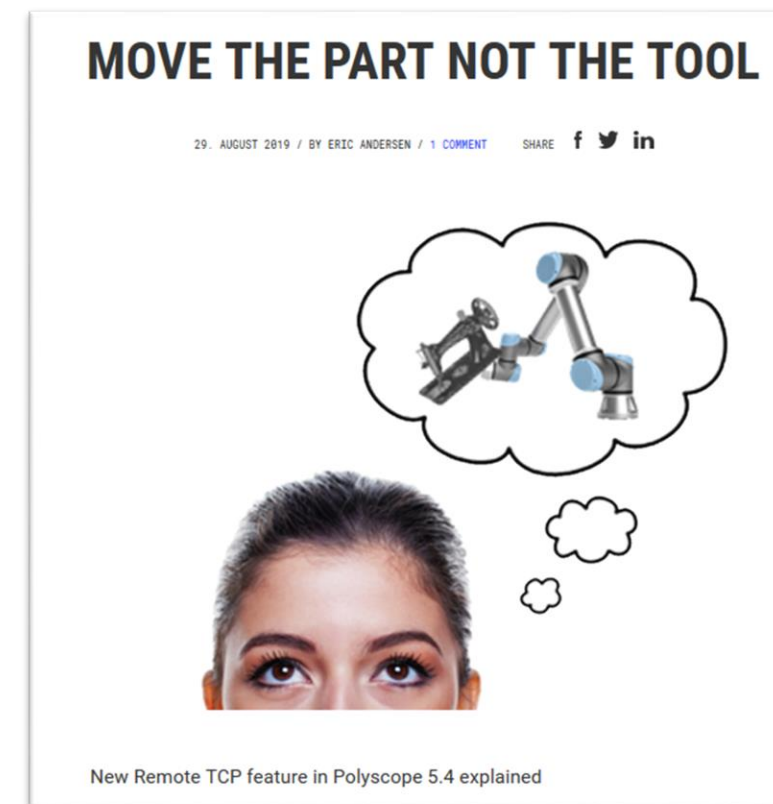
Remote TCP & Toolpath URCap, embedded in PolyScope 5.6 and above, contains two major features:

1. G-Code Toolpath Import



<https://blog.universal-robots.com/simplify-robot-programming-with-g-code>

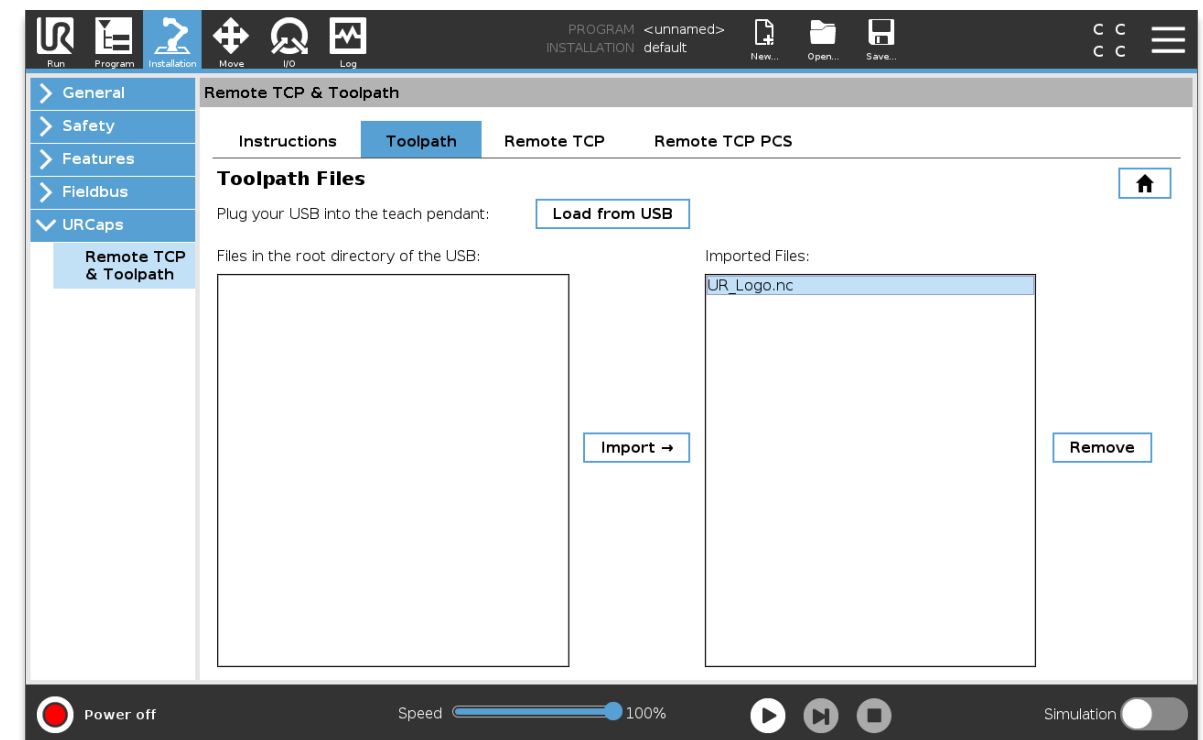
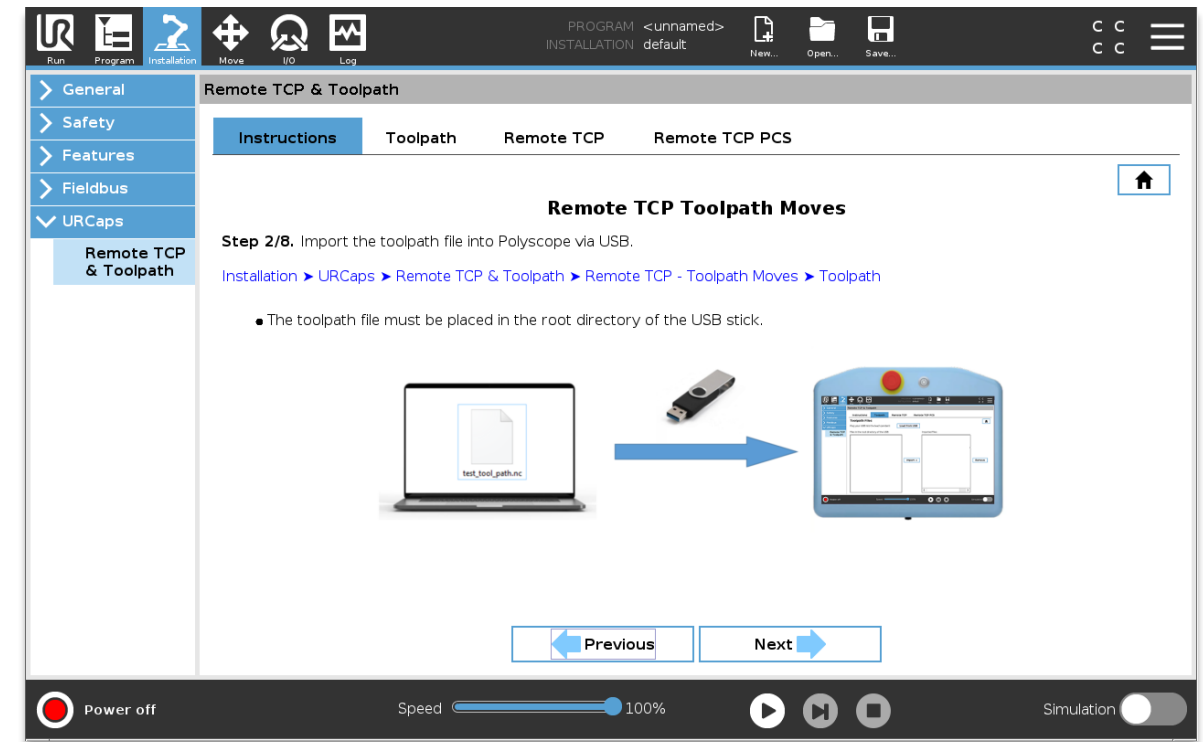
2. Remote Tool Center Point



<https://blog.universal-robots.com/move-the-part-not-the-tool>

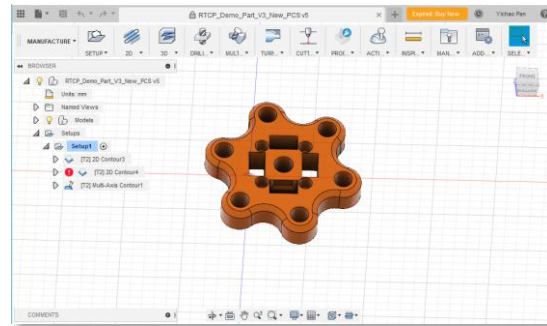
G-Code Toolpath Import

- e-Series robots can follow a complex toolpath at a constant speed
- Generate G-Code toolpath files using standard CAD/CAM packages
 - Autodesk Fusion 360
 - SolidWorks
 - and more
- Load G-Code toolpath files onto UR teach pendant via USB stick
- Optimize robot motion with free-spin-in-Z
- Automatically determine optimal joint configuration and avoid singularities

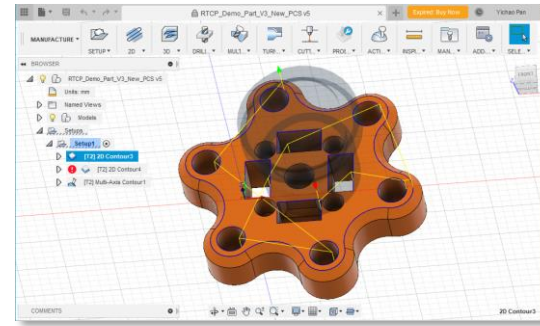


How To Use G-Code Toolpath Import

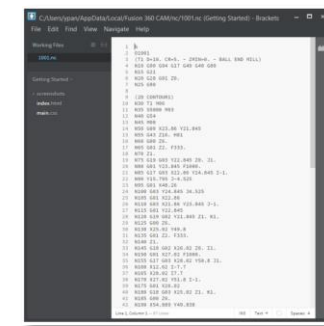
CAD/CAM Software



1. Load part model

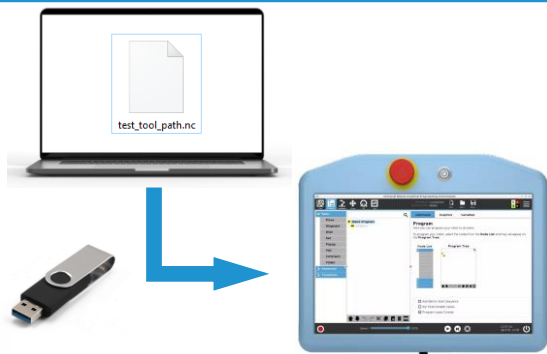


2. Define a toolpath

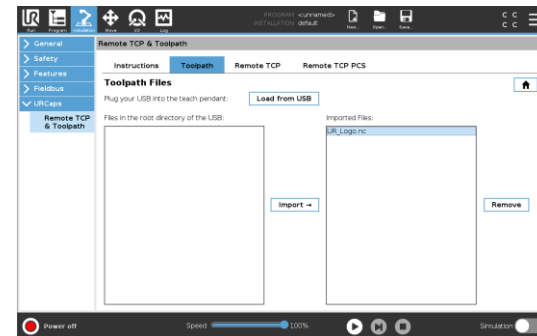


3. Export as G-Code

UR Teach Pendant



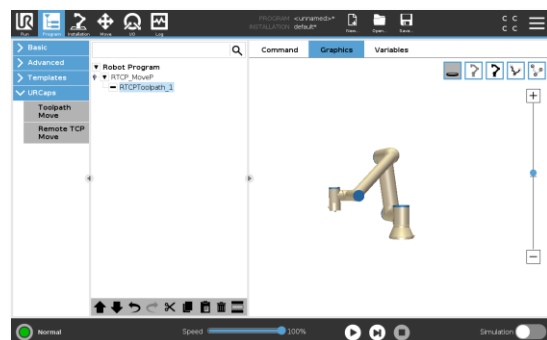
4. Transfer to Teach Pendant via USB



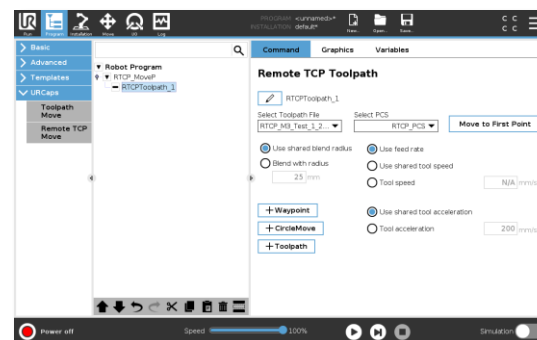
5. Import Toolpath



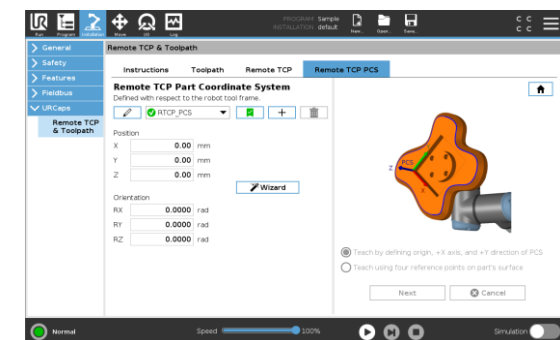
6. Configure TCP



9. Test and Run Program



8. Configure Toolpath Move Node

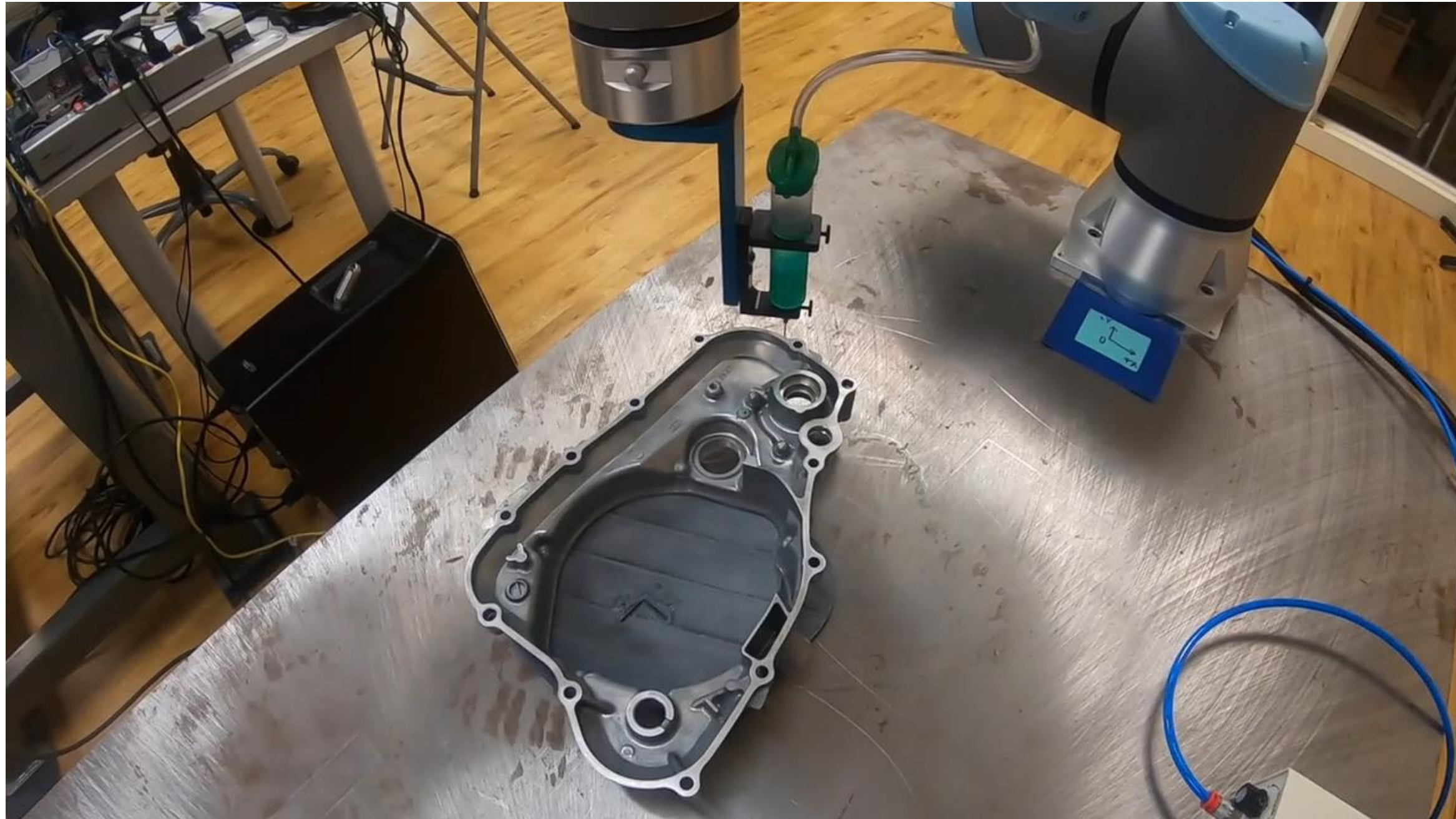


7. Configure Part Coordinate System

Benefits Of G-Code Toolpath Import

- Significantly reduce on-robot programming time
- For a complex path, reduce hundreds of waypoints and circle moves to as few as two nodes in program tree
- Generate paths accurately based on CAD models of workpieces regardless of complexity
- Maintain a constant tool speed along entire path with a single parameter
- Program 6-axis cobots in same CAD/CAM software as CNC machining stations
- Can define complex trajectory without specialized offline robotic programming

Dispensing Application



Case Study: Flywheel Supply

With a fast-moving, high-mix manufacturing environment, Flywheel has also deployed the UR cobot without the ActiNav kit in TIG welding applications. Northway found the integration with the welder to be a straightforward process. “One of the really nice advantages of the UR robot and the software is you’re able to take a CAD file and output a G-code tool path like you would use on a mill,” he says. “The robot will follow that tool path and give you really good, precise control over where your welds end up going on your part.”

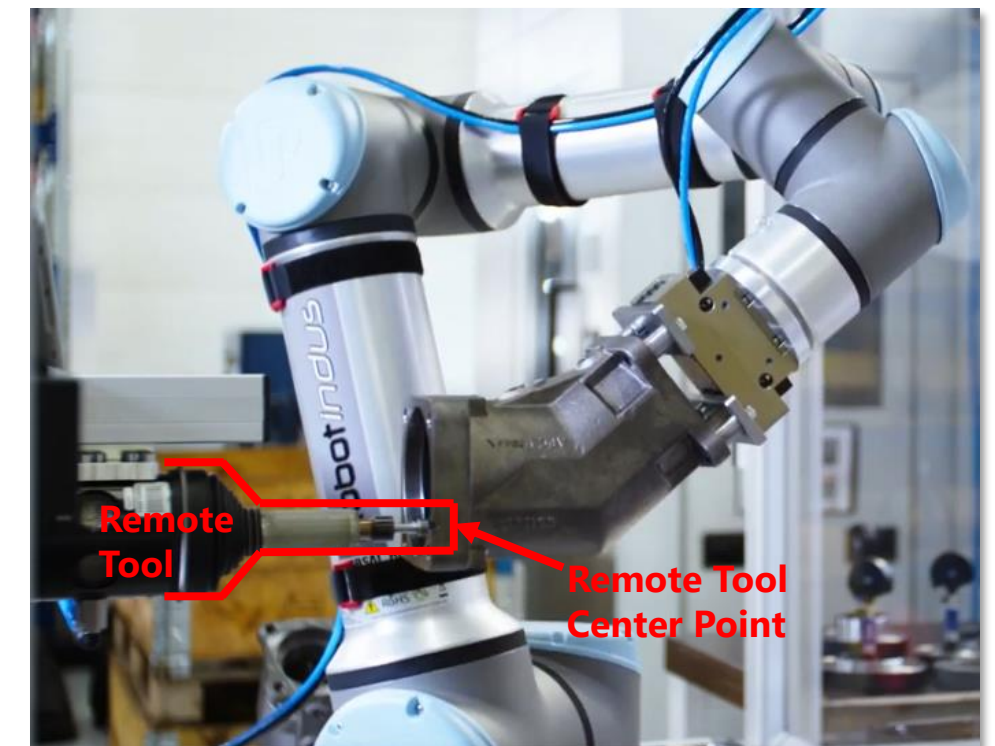
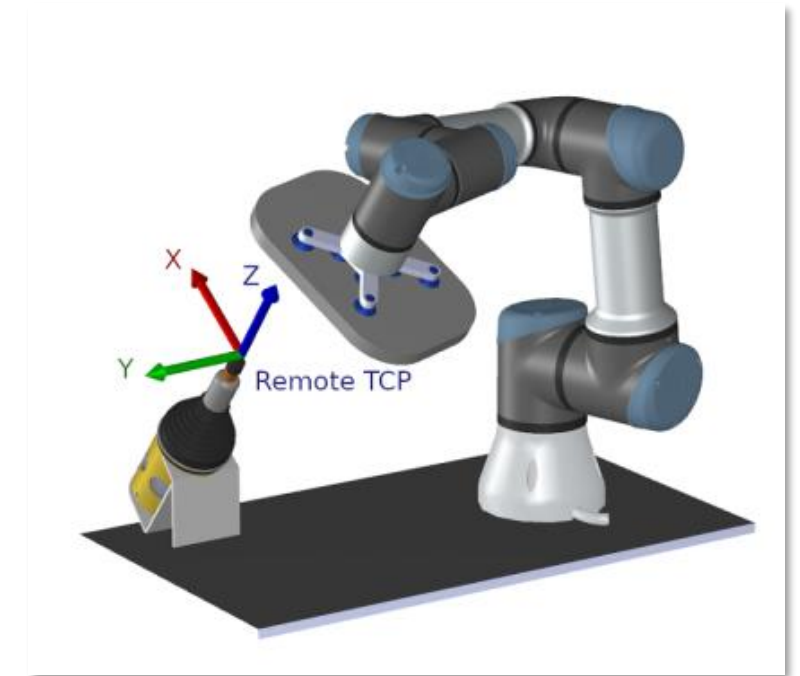
- Zach Northway, Co-owner of Flywheel Supply



<https://www.universal-robots.com/case-stories/flywheel-supply/>

Remote Tool Center Point

- Remote Tool Center Point (RTCP) enables the robot to move the workpiece while maintaining contact with a fixed tool at a constant speed.
- Applications with simple paths or part geometries can use:
 - RTCP Circle Moves with defined radius
 - Linear moves defined by RTCP Waypoints
 - Support automatic blending between RTCP Nodes
 - Triggering I/O at RTCP Waypoints
- Applications with complex paths can use:
 - RTCP Toolpaths utilizing the G-Code Toolpath Import feature



Benefits Of Remote Tool Center Point

- Move the part instead of the tool in these cases:
 - Tool is not designed to be mounted on the end of a robot
 - Large or heavy tool
 - Cabling or power requirements are not well suited to robot mounting of the tool

OR

- You need to move the part anyway. Instead of designing a part moving system (conveyor, carriage, second robot, etc), use one robot to do it all.
 - Pick up the part, process the part utilizing a tool with a remote TCP and then place the finished part. Ultimately, you can pick, process AND place all with a single robot enabled by Remote TCP

Case Study: BWIndustrie

The **Remote TCP** functionality of the e-Series products line, combined with the natural flexibility of the cobot, makes the programming of the cobot very quick, using an external tool by reproducing the complex operator gesture. The cobot can then be reprogrammed to process a wide range of products, including parts that vary greatly in size, design and weight. **Because of this, the learning time on a new complex part has been reduced by a factor of five.**

- Laurent Wagner, CEO of BWIndustrie

BWIndustrie



<https://www.universal-robots.com/case-stories/bw-industrie/>

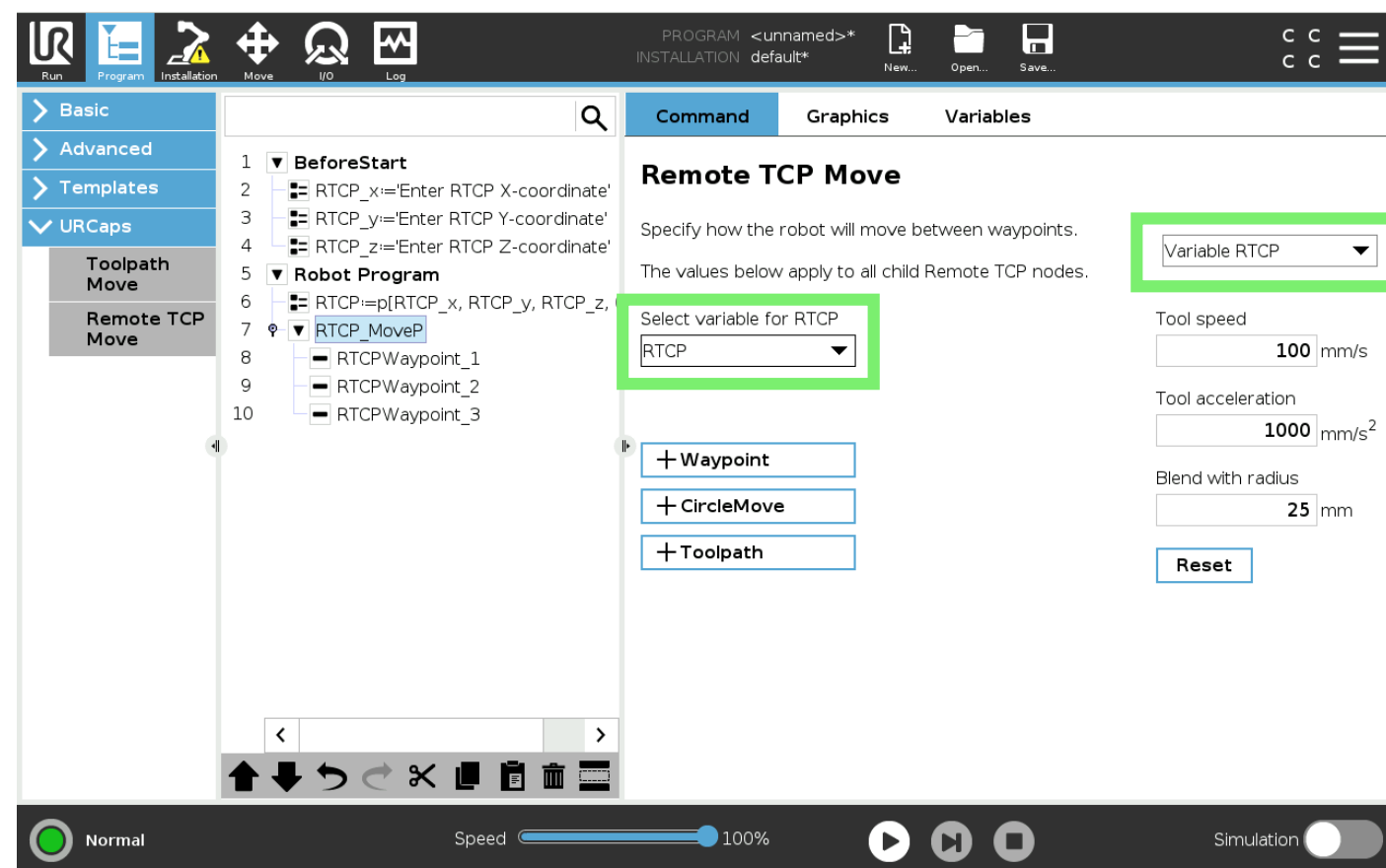
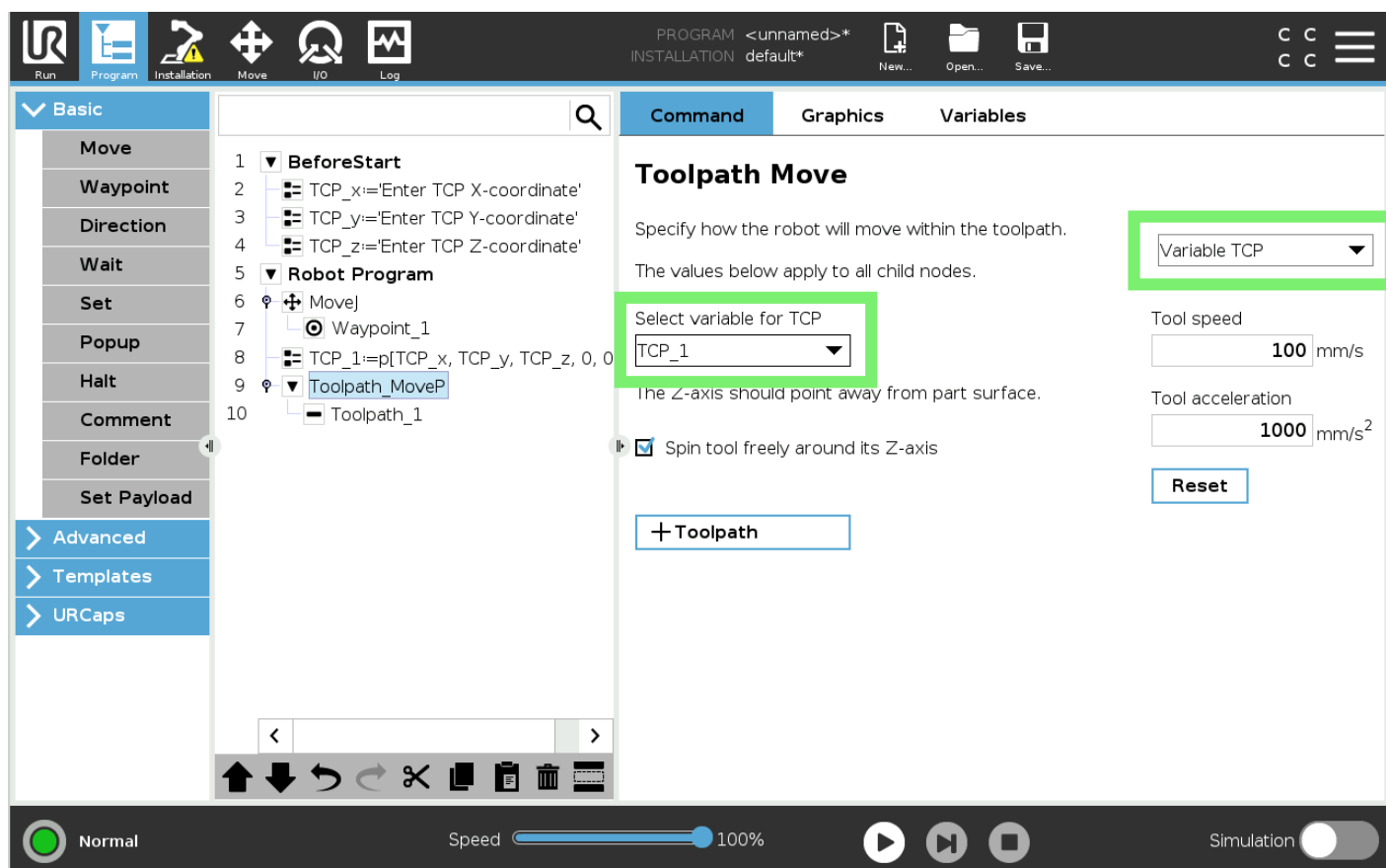
Case Study: BWIndustrie



<https://youtu.be/Fbe313hOiBY>

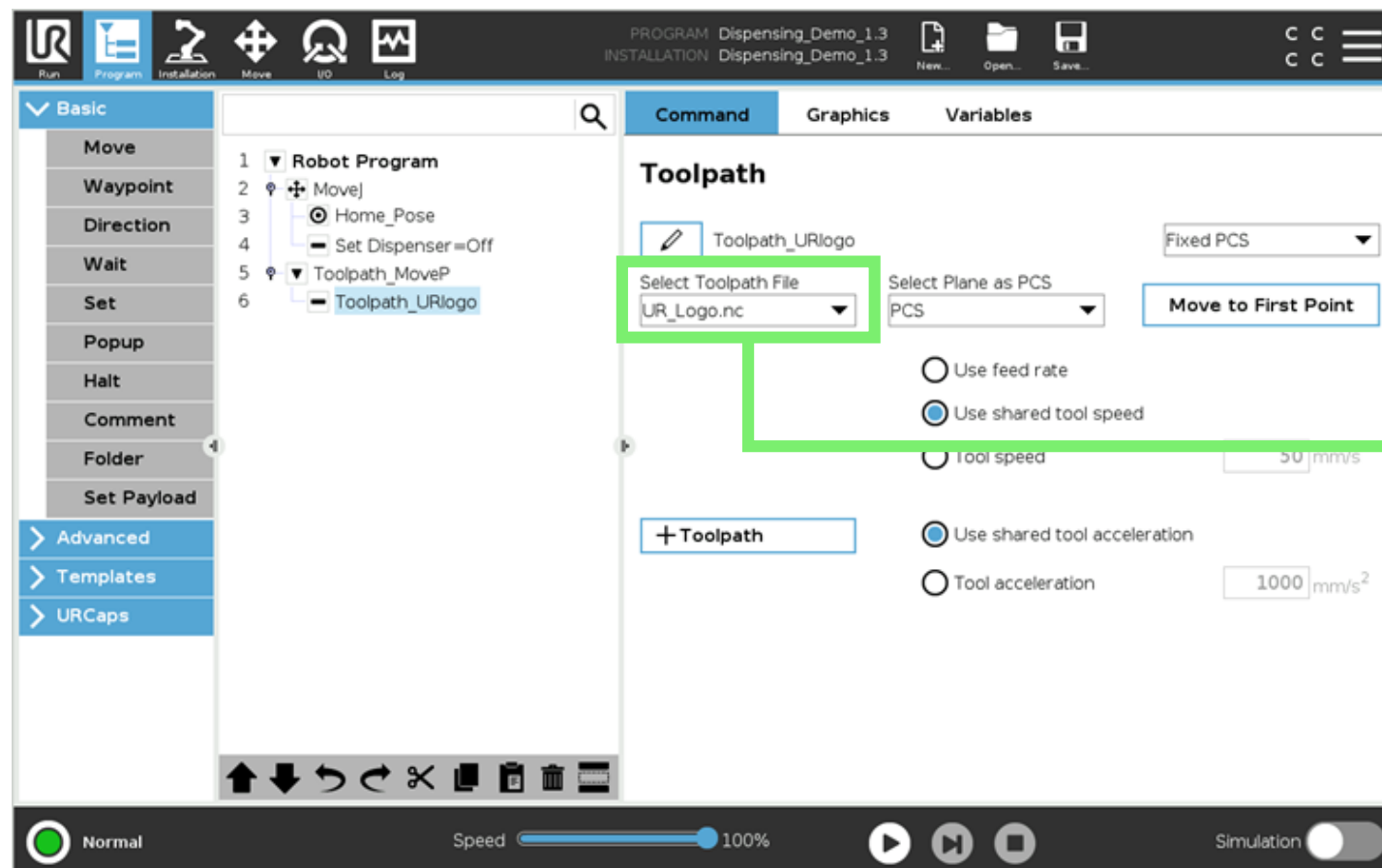
New Features In PolyScope 5.11.5

- TCP in *Toolpath_MoveP* node and Remote TCP in *RTCP_MoveP* node can now be set up as pose variables.
- Useful when the coordinates of a TCP or Remote TCP need to be adjusted by an operator manually or according to feedback from external sensors.



New Features In PolyScope 5.11.5

- With a set of new commands, users now have greater control over the robot's tool I/O directly from the G-Code file.
- This feature can be used to trigger end-effectors while a robot is executing a toolpath.



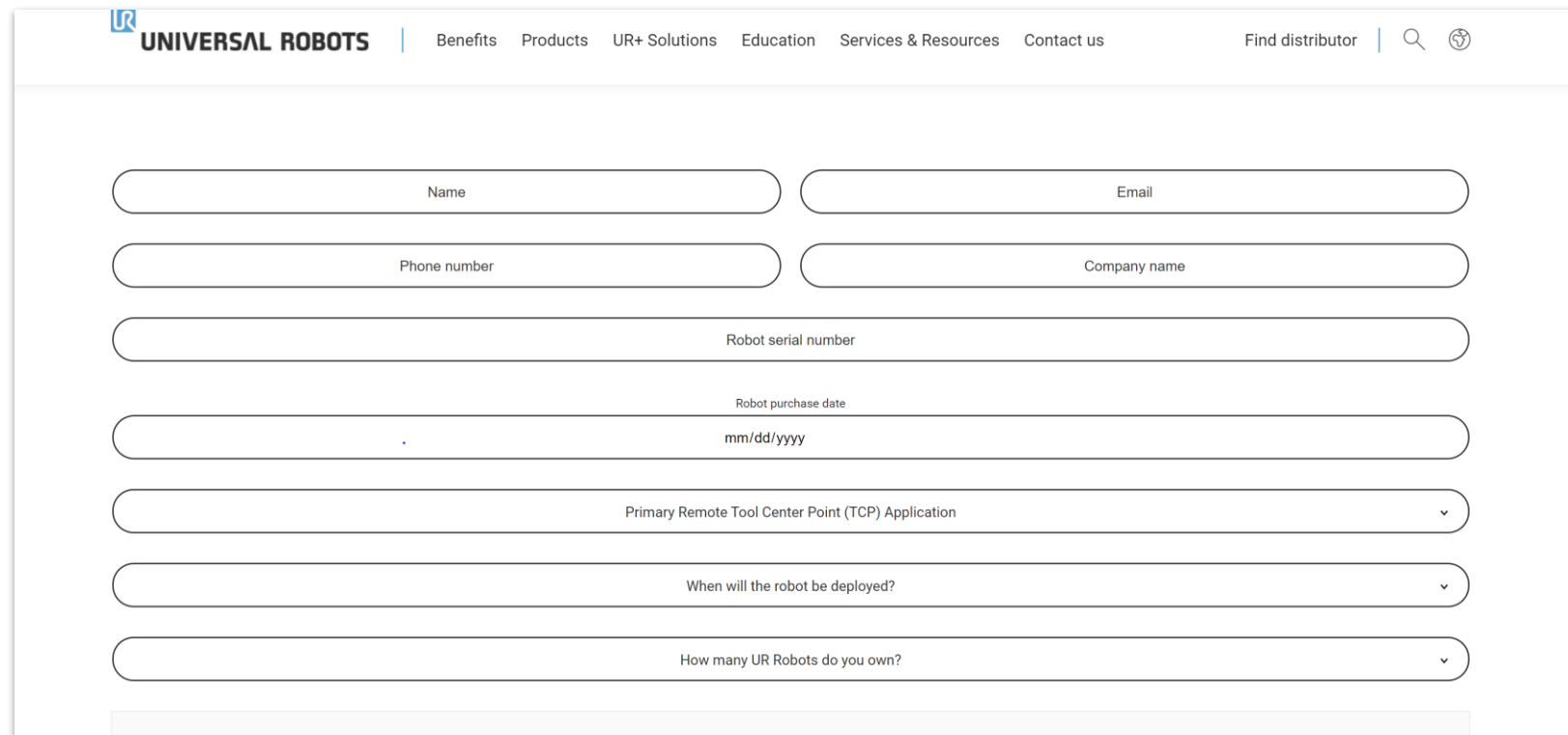
```
N70 G1 Z2.5 F333.33
N75 Z1.5
(** Beginning of First Segment)
(** Turn on Port 0 **)
N76 M62 P0
(** Wait 0.5 sec **)
N77 G4 P0.5
N80 X-0.046 Y-0.019 F1000.
N85 X-0.05 Y0.
N90 Y175.

N2370 X-0.019 Y-0.046
N2375 X-0.035 Y-0.035
(** End of First Segment **)
(** Turn off Port 0 **)
N2376 M63 P0
(** Wait 0.5 sec **)
M2377 G4 P0.5

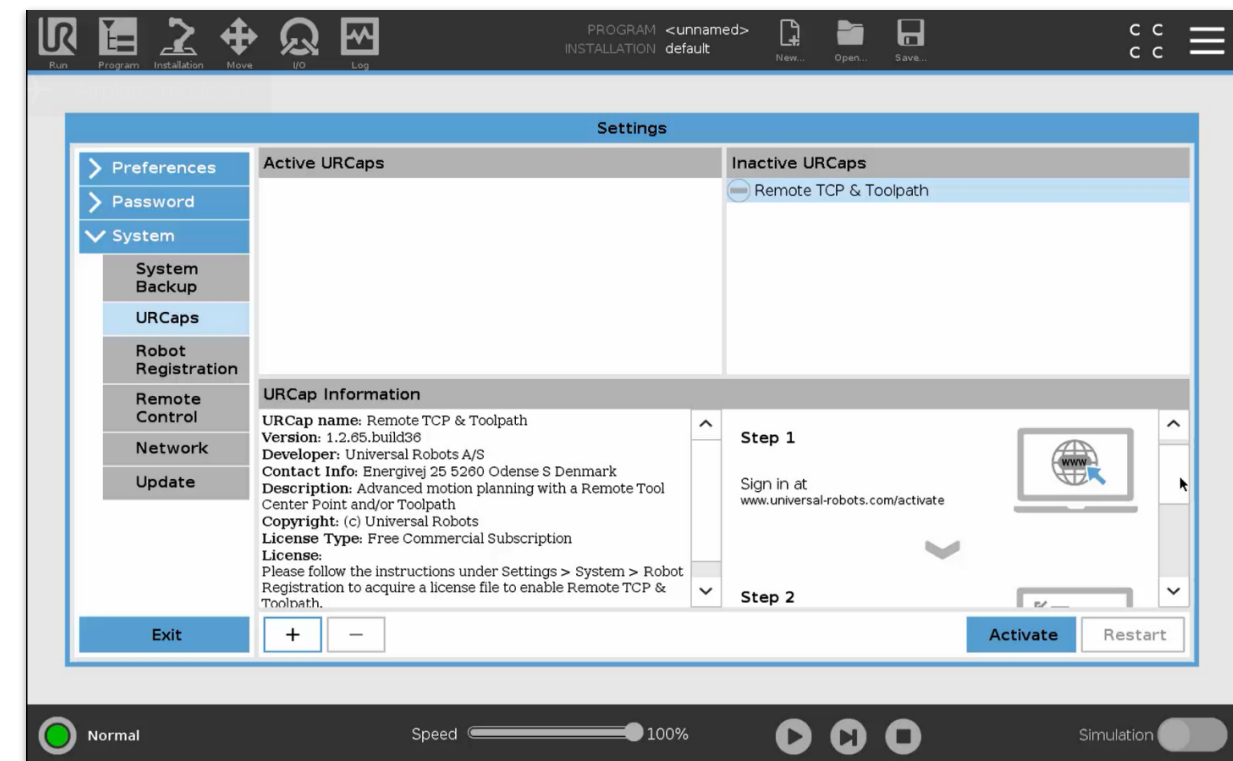
N2380 G0 Z6.5
N2385 G1 X50.01 Y43.333 F5000.
```


Remote TCP & Toolpath URCap Activation

- Remote TCP & Toolpath URCap comes pre-installed in PolyScope 5.6+ and is free to use.
- To activate the URCap, complete the online form at <https://www.universal-robots.com/activate/> to download the license file.
- Load the license file onto a USB and follow the instructions in the URCaps section under Settings in Polyscope.



The image shows a web-based activation form for Universal Robots. The form is titled "UNIVERSAL ROBOTS" and includes a navigation bar with links: Benefits, Products, UR+ Solutions, Education, Services & Resources, and Contact us. There is also a "Find distributor" link and a search icon. The form itself consists of several input fields: Name, Email, Phone number, Company name, Robot serial number, Robot purchase date (mm/dd/yyyy), Primary Remote Tool Center Point (TCP) Application (dropdown), When will the robot be deployed? (dropdown), and How many UR Robots do you own? (dropdown). There is an "Exit" button at the bottom left.

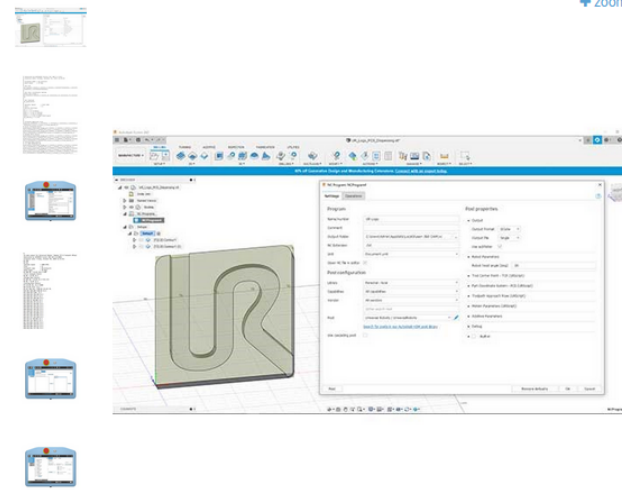


Recommended CAD/CAM

Autodesk Fusion 360 and SOLIDWORKS are recommended CAD/CAM packages for generating G-code files compatible with the URCap.



AUTODESK FUSION 360 POST-PROCESSOR FOR UNIVERSAL ROBOTS

 + zoom Autodesk Fusion 360 is an well-integrated and cloud-based CAD/CAM software package that can generate multiaxis toolpath files based on 3D models. It is easy-to-use, versatile, and affordable.

This post-processor outputs toolpath files in either URScript or G-code format. The URScript format is compatible with both CB-Series and e-Series, whereas the G-code format is compatible with e-Series robots running the Remote TCP & Toolpath URCap.

This post-processor simplifies robot programming for process applications, including dispensing, gluing, deburring, polishing, sanding, welding, milling, etc.

This product is offered to Autodesk Fusion 360 subscribers at no additional charge.

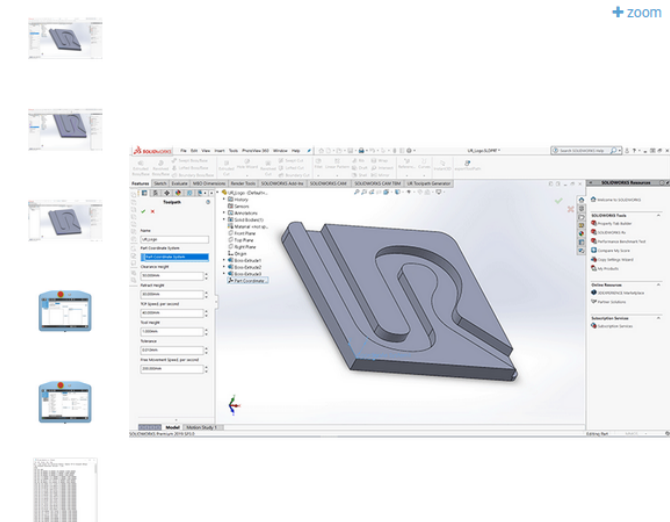
*** Please obtain a link to download the post-processor through the Request Info button below. ***

[REQUEST INFORMATION FROM UR+ PARTNER](#) [WEBSITE](#)

<https://www.universal-robots.com/plus/products/autodesk/autodesk-fusion-360-post-processor-for-universal-robots/>



UNIVERSAL ROBOTS TOOLPATH GENERATOR FOR SOLIDWORKS

 + zoom SOLIDWORKS is a commercial CAD software package for designing industrial components. The 3D models developed in SolidWorks serve as a basis for G-code toolpath generation. Universal Robots' Polyscope software contains the Remote TCP & Toolpath URCap, which automatically generates robot motion based on imported G-code files. The purpose of this Toolpath Generator is to provide an easy-to-use approach for defining 2.5-axis toolpaths in SolidWorks. It also ensures the output from SolidWorks uses the correct syntax that is compatible with the Remote TCP & Toolpath URCap.

This product is provided to e-Series users free of charge. Please download the installation package from the FILES tab below.

*** Please download the installation package from the FILES tab below. ***

[REQUEST INFORMATION FROM UR+ PARTNER](#) [WEBSITE](#)

<https://www.universal-robots.com/plus/products/universal-robots/universal-robots-toolpath-generator-for-solidworks/>

Resources

Support articles can be found on UR website:

<https://www.universal-robots.com/articles/>

REMOTE TCP & TOOLPATH URCAP FAQ

Last updated: 2021-06-23

This section contains questions and answers about the Remote TCP & Toolpath URCap.

REMOTE TCP & TOOLPATH URCAP - INSTRUCTIONAL VIDEOS

Last updated: 2021-06-23

This article contains links to step-by-step instructional videos for the Remote TCP & Toolpath URCap

TABLETOP DEMO OF REGULAR TCP TOOLPATH MOVES - UR LOGO

Last updated: 2021-06-23

Remote TCP & Toolpath is a URCap in Polyscope 5.6 for e-Series robots. This article describes how to set up a tabletop demo with a UR3e robot to showcase Regular TCP Toolpath Moves enabled by this URCap.

TABLETOP DEMO OF REMOTE TCP TOOLPATH MOVES - OBJECT PATH

Last updated: 2021-09-23

Remote TCP & Toolpath is a URCap in Polyscope 5.6 for e-Series robots. This article describes how to set up a tabletop demo with a UR3e robot to showcase Remote TCP Toolpath Moves enabled by this URCap.

REMOTE TCP EXAMPLE: SHEET METAL DEBURRING

Last updated: 2021-06-23

This article describes an example setup using the Remote TCP URCap in Polyscope 5.4 for a deburring task.

REMOTE TCP & TOOLPATH URCAP: POST-PROCESSOR CONFIGURATION USING AUTODESK FUSION 360 ON E-SERIES

Last updated: 2021-06-23

This article explains how to load this post-processor in external Post-processor Software Autodesk Fusion 360

UNIVERSAL ROBOTS TOOLPATH GENERATOR FOR SOLIDWORKS

Last updated: 2021-06-23

This article explains how to install the Universal Robots Toolpath Generator for SOLIDWORKS and use it to generate 2.5-axis G-code toolpaths that are compatible with the Remote TCP & Toolpath URCap.

CONTROLLING END-EFFECTOR FROM G-CODE WHEN USING TOOLPATH NODES IN REMOTE TCP & TOOLPATH URCAP

Last updated: 2021-09-27

Remote TCP & Toolpath URCap is embedded in Polyscope for e-Series Robots. This article describes how to control end-effectors when executing G-code files using the toolpath nodes enabled by this URCap in Polyscope 5.11.4 and above.

REMOTE TCP & TOOLPATH URCAP – URSRIPT FUNCTIONS AND EXAMPLES

Last updated: 2021-09-23

This article explains how to use the URScript functions enabled by the Remote TCP & Toolpath URCap.

Tech Support

Should you have any questions when using the URCap, please contact Technical Support from the UR+ page.

Plus > Products > Universal Robots > Remote TCP & Toolpath URCap

**UNIVERSAL ROBOTS**

REMOTE TCP & TOOLPATH URCAP



+ zoom The Remote TCP & Toolpath URCap makes it easier to program Universal Robots for process applications, such as dispensing, deburring, polishing, etc. First, this URCap allows you to set Remote Tool Center Points (RTCP), where the tool center point is fixed in space, relative to the base of the robot.

Second, it is also able to automatically generate robot motion based on an imported G-code toolpath file. When the robot is required to follow a complex trajectory for a dispensing or deburring application, it is much easier to program the toolpath based on a part model in the CAD/CAM software that the user is already familiar with. The user no longer needs to spend a long time programming waypoints and circle moves from the teach pendant.

[REQUEST INFORMATION FROM UR+ PARTNER](#)

 [WEBSITE](#)

<https://www.universal-robots.com/plus/products/universal-robots/remote-tcp-toolpath-urcap/>

THANK YOU

