Cobot High-Torque Fastening
Setup Guide
High-Torque Fastening setup guide

2021/08/08

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**Revisions**

**Manual revision**

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>001</td>
<td>2021/08/08</td>
<td>Created</td>
</tr>
</tbody>
</table>

**URcap revision**

<table>
<thead>
<tr>
<th>URcap version</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EsticFastening-1.0.10.urcap</td>
<td>2021/7/16</td>
<td>UR testing version</td>
</tr>
</tbody>
</table>

**Compatible Torque controller**

<table>
<thead>
<tr>
<th>Controller</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estic Handy 2000</td>
<td>Firmware version: <strong>GA1452</strong> or later</td>
</tr>
<tr>
<td>Touch</td>
<td></td>
</tr>
</tbody>
</table>

**Annotation**

- The URcap is only compatible with 5.9 or later for e-series, and 3.15 or later for CB3-series.
- This manual is consisting of 3 main sections:
  1. Hardware setup
  2. Torque Controller setup
  3. URcap setup
- For URcap to work correctly, please read the manual thoroughly and complete the steps of each section.
Hardware setup

Mechanical Setup

Bill of Materials

<table>
<thead>
<tr>
<th>End-of-arm tool mounting</th>
<th>Parts Name</th>
<th>Description</th>
<th>Parts number</th>
<th>Vendor</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robot plate</td>
<td>UR tool flange</td>
<td>mounting plate</td>
<td>SN395-X218</td>
<td>Estic</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Bolt</td>
<td>To secure Robot plate to tool flange.</td>
<td>NPN (M6X12)</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Pin</td>
<td>For Robot plate alignment.</td>
<td>NPN (Φ6x12L)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Tool plate</td>
<td>Nutrunner side</td>
<td>mounting plate</td>
<td>SN395-X217</td>
<td>Estic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bolt</td>
<td>To secure Nutrunner to the plate</td>
<td>NPN (M8X12)</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Bolt</td>
<td>To join Robot &amp; Tool plate</td>
<td>NPN (M8X16)</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Pin</td>
<td>For tool plate alignment.</td>
<td>NPN (Φ6x12L)</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Floating Socket</th>
<th>Parts Name</th>
<th>Description</th>
<th>Parts number</th>
<th>Vendor</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Socket assembly</td>
<td>Drive shaft, cushion spring, inner and outer tube assembly.</td>
<td>SN395-X217</td>
<td>Estic</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Socket Adapter</td>
<td>To join Impact Socket and inner tube.</td>
<td>TNA1-AD05-01</td>
<td>Estic</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Impact socket</td>
<td>For bolt fastening. (Varies according to bolt size)</td>
<td>NPN</td>
<td></td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
EOAT Setup

Step 1: Assemble Tool-Robot Coupler

1. Insert two (Φ6x12L) pins to the dowel holes on the Tool plate, as shown below.

2. Face this side of the Robot plate towards the tool plate.

3. Insert the pins to the Robot plate’s dowel hole, as shown below.

4. Secure the joint by fastening two M8x16 bolts.
Step 2: Mount the Coupler to the Robot tool flange

1. Insert one (Φ6x12L) pin to the dowel hole on the UR Tool flange, as shown below.

2. Face this side of the Robot plate towards UR tool flange.

3. Align plate’s dowel hole to the pin and secure using M6x12 bolts after mounting it.
Step 3: Mount Nutrunner to the Coupler

1. Mount the Nutrunner and align the 4 threaded holes to Coupler’s counterbore holes.

2. Insert M8x12 bolts from below. Fasten bolt so it will flush with bottom surface of the Coupler.

3. The bolts shown below should flush with the Nutrunner’s flange if fastened correctly.
Step 4: Mount floating socket to the Coupler

1. Align floating socket's drive shaft with Nutrunner's output shaft.

2. Insert the drive shaft and the spring into the outer case. Then, align it with inner tube’s drive shaft.

3. Once aligned, secure the Floating socket by fastening M8x25 bolts from below.
### Estic fastening system

<table>
<thead>
<tr>
<th>Parts Name</th>
<th>Description</th>
<th>Parts number</th>
<th>Vendor</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Handy2000 Touch Torque controller</td>
<td>Store torque programs. Touch screen.</td>
<td>EH2-HT50-000*** (* optional feature)</td>
<td>Estic</td>
<td>1</td>
</tr>
<tr>
<td>Nutrunner (High-Speed Pulse Drive)</td>
<td>Fastening tool.</td>
<td>See table below</td>
<td>Estic</td>
<td>1</td>
</tr>
<tr>
<td>Tool cable</td>
<td>Connect Controller and the tool</td>
<td>EH2-CVS0*-SS (* cable length. 5=5m)</td>
<td>Estic</td>
<td>1</td>
</tr>
<tr>
<td>Power cable</td>
<td>100V or 230V power cable</td>
<td>EH2-CP02-UL1 (100V) EH2-CP02-CE2 (240V)</td>
<td>Estic</td>
<td>1</td>
</tr>
</tbody>
</table>

### Nutrunner

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
<th>Parts number</th>
<th>Vendor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micro tools</td>
<td>Torque lower than 5Nm</td>
<td>EH2-RA1000-SNL/SNP/SRL EH2-RA2000-SNL/SNP/SRL EH2-RA5000-SNL/SNP/SRL</td>
<td>Estic</td>
</tr>
<tr>
<td>Inline tools</td>
<td>Torque from 6 to 45Nm</td>
<td>EH2-H0025-SC EH2-H1045-SC</td>
<td>Estic</td>
</tr>
<tr>
<td>Right-angle tools</td>
<td>Torque from 46Nm to 140Nm</td>
<td>EH2-H1070-A EH2-H2100-A EH2-H2140-A</td>
<td>Estic</td>
</tr>
</tbody>
</table>
Tool and Controller setup

1. Align and push the tool cable into the connector on the Nutrunner.

2. Secure the tool cable by screwing in the outer case.

3. Connect the other end of the tool cable to the controller.

4. Connect power cable
Modbus connection setup

<table>
<thead>
<tr>
<th>Parts Name</th>
<th>Description</th>
<th>Parts number</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAN cable</td>
<td>Cross-over or Straight LAN cable Cat.5e or above</td>
<td>NPN</td>
<td>1</td>
</tr>
<tr>
<td>Ethernet switch</td>
<td><strong>Required</strong> if using straight LAN cable</td>
<td>NPN</td>
<td>1</td>
</tr>
</tbody>
</table>

1. Connect the LAN cable (Cross-over, Cat.5e or above) to Estic controller's Ethernet port.
2. Connect the other end of the LAN cable to the UR Ethernet port.
3. For straight-through LAN cable, use industrial ethernet switch in between to connect.
**Torque Controller setup**

**IP address configuration**

Configure Torque controller's IP address through touch screen.

1. Push "MODE" button.

2. Select "Settings".

3. Select "System".

4. Scroll down.
5. Select TCP/IP.

6. Specify Torque controller’s IP address. Then, scroll down.

7. Specify subnet mask. Then, scroll down.

8. Specify gateway IP address.

Note:

- **COMM** light on the panel will flash green when connected to a Modbus/TCP server.

- Use the on-screen keypad to change values in selected parameter. When adjustments are complete hit “ENTER” to change the value. Once all changes are complete hit “ENTER” again to register and upload changes to controller.
Channel External settings

For switching Channel selection mode to Channel external (CH-EX). This will allow Channel (Torque Program) selection by an external source, e.g., UR controller.

1. Push "MENU" button.

2. Select "Settings".

3. Select "System".

4. Select "CH-SELECT".

Note:

Channel Number = Program Number = Torque program = Pset
5. Navigate using left or right arrow.

6. Press Enter when “CH-EXT” is displayed.

Note:

Use the on-screen keypad to change values in selected parameter. When adjustments are complete hit “ENTER” to change the value. Once all changes are complete hit “ENTER” again to register and upload changes to controller.

Refer to Handy2000 Touch Manual to program torque program/s for the Estic system.

Go to https://www.estic-global.com/ to download Manuals.
Installing URcap on Polyscope

UR IP address configuration

1. In the Header, press the Hamburger menu and select Settings.
3. Select Static Address
4. Configure network settings accordingly. UR IP address must be different from the torque controller
Installing URcap on Polsyscope

1. Insert Estic URcap USB drive into the UR teach pendant’s USB port. The USB stick contains URCap file (.urcap) required by the UR setup assistant.
2. In the Header, press the Hamburger menu and select Settings.
4. Tap the + button, select the .urcap file and press Open.
5. Press Restart to complete URCap installation.
Installation node

TCP configuration

To define a new TCP for the screwdriving node.

1. Tap the + to define screwdriving TCP. It is recommended to include "Screwdriver" in the TCP name to be easily recognizable in the screwdriving setup.
2. Enter the TCP value from "TCP value sheet" that came with the purchased tool.
3. Enter payload value from "Payload value sheet".
4. Make sure that the current TCP, which is displayed at "TCP Visualization" matches the picture below.
5. Push Save to apply the changes.

Note:

For screwdriving node to work correctly, the +ve direction of TCP’s Z-axis should point downward.
MODBUS Client I/O Setup

To define Modbus signals (I/O) for screwdriving node on Polyscope.

1. To add Estic controller, push "Add MODBUS Unit"
2. Enter Estic controller IP address. Configure the same IP address to URcap installation as well.
3. Check the "Show advanced options" box.
4. Push Add New Signal and create 6 Modbus signals.
5. Set Slave address to 1 for each signal. (Default: 255)
6. Change each signal's properties as shown below.
7. Push Save to apply the changes.

<table>
<thead>
<tr>
<th>Estic Modbus signals</th>
<th>Signal type</th>
<th>Address</th>
<th>Signal Name</th>
<th>Description</th>
<th>Slave address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital Input</td>
<td>80</td>
<td>Ready</td>
<td>Tool Ready</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Digital Input</td>
<td>84</td>
<td>OK</td>
<td>Good fastening</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Digital Input</td>
<td>85</td>
<td>Not OK</td>
<td>Bad fastening</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Digital Output</td>
<td>4096</td>
<td>Start</td>
<td>Start fastening</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Digital Output</td>
<td>4097</td>
<td>Reverse</td>
<td>Start loosening</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Digital Output</td>
<td>4101</td>
<td>Reset</td>
<td>Controller reset</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>
I/O setup

To Change Modbus I/O properties to "Low on unscheduled stop". This will allow the tool to stop immediately when the Robot program is terminated.

1. Select Modbus from the drop-down list
2. Select Start signal from the Output list
3. Select "Low on unscheduled stop" from the drop-down list.
4. Select Reverse signal from the Output list.
5. Select "Low on unscheduled stop" from the drop-down list.
6. Push Save to apply the changes.

Note:

Robot program is terminated unscheduled if any of the following occur:

- Protective stop
- Fault
- Violation
- Runtime Exception
Screwdriving Setup

For configuring screwdriving node I/Os. The TCP and I/O signals selected here are defined beforehand at TCP configuration and Modbus Client I/O setup.

1. Select Screwdriving TCP defined at TCP configuration.
2. Select Modbus from the Interface drop-down list.
3. Select matching Modbus signals from the drop-down list for Inputs.
4. Leave Program selection as default. Torque program selection will be performed by URcap.
5. Select “Start” from the drop-down list for box 5 for starting the tool.
6. Push Save to apply the changes.

Note:

TCP configuration : pg. 18
Modbus Client I/O setup : pg. 19
Estic URcap Overview

Robot movement in a general tightening operation can be described as below.

Typically, each step in the above sequence requires at least one line of robot programming, and the same has to be done for the n-number of fastening (sequence).

**Estic URcap** is designed to:
1) Minimize robot programming for fastening process.
2) Allows the user to individually assign a torque program for each fastening/rundown/bolt.

As shown below, a single Estic URcap node can accommodate robot programming and fastening operations for as many as n (=30) run downs.
Installation Node (URcap)

To configure common parameters in tightening applications. Common parameters such as Bolt pickup position (if applicable) and Move Command parameters are configured here.

Parameter list (Bolt pickup)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set waypoint</td>
<td>Set (teach) waypoint for Bolt pickup.</td>
</tr>
<tr>
<td>Safe approach height</td>
<td>Set safe height when approaching Bolt pickup.</td>
</tr>
<tr>
<td>Bolt pickup program number</td>
<td>Specify bolt pickup program number. Needs to match the preset channel number in Estic controller</td>
</tr>
<tr>
<td>Bolt detection sensor available</td>
<td>Enable bolt pick up detection if the detection sensor is available in the system.</td>
</tr>
<tr>
<td>Set waypoint</td>
<td>Set (teach) waypoint for bolt detection.</td>
</tr>
<tr>
<td>Retry count</td>
<td>Specify retry count for a failed bolt pickup.</td>
</tr>
</tbody>
</table>
### Parameter list (Robot movement)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waypoint move speed</td>
<td>Specify speed for MoveL Command.</td>
</tr>
<tr>
<td>Waypoint move acceleration</td>
<td>Specify acceleration for MoveL Command.</td>
</tr>
<tr>
<td>Waypoint move Blend radius</td>
<td>Specify blend radius for MoveP Command</td>
</tr>
</tbody>
</table>

### Parameter list (Modbus)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP address</td>
<td>Specify Torque controller's IP address for URcap (Refer note below)</td>
</tr>
</tbody>
</table>

### Screen function

<table>
<thead>
<tr>
<th>Functions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Move to waypoint</td>
<td>Move robot to the preset bolt pickup or bolt detection position. Caution: Robot will move directly to the waypoint without retreating to the safe height.</td>
</tr>
</tbody>
</table>

**Note:**

To ensure URcap works properly, please use IP address from the Modbus Client I/O setup. (Torque controller IP address)
Program Node (URcap)

How to create Program

After installing Estic URcap, tap the "Estic Fastening" tab under URcap menu to create **Fasten Bolt** node. Then, go to Templates menu and add **Screwdriving** node under **Fasten Bolt**.

1) **Fasten Bolt node**
Consists of 4 steps that enables users to configure:
   a) Number of fastening points (Max 30)
   b) Approach, Fastening, and Retreat points
   c) Torque program number
   d) Bolt pickup (If applicable)

2) **Screwdriving node**
Screwdriving is a UR built-in node that enables users to configure:
   a) Screwdriving rotational direction
   b) "Follow the screw" parameters
   c) "Until" condition

The yellow down arrow ⬇️ indicates an incomplete configuration of the node beside it. The program cannot be executed unless the configuration is complete. A white down arrow indicates a complete node.
Before configuring

Programming using Estic URcap can be significantly easier if you can identify what type of robot movement is involved in the process beforehand. Depending on the process, robot programming (excluding robot teaching) can be performed in under 2 minutes. Consider clearing the questions below before starting Estic URcap configuration.

Is the process a top-down, straight-line fastening?

Yes  
No

Does Global safe height work for all bolts?

Yes  
No

Global safe height  
Fastening point 1 / Bolt 1

Local safe height  
Fastening point 1 / Bolt 1
### Fasten Bolt - Step 1 Number of Fastening Points

![Image of Fasten Bolt interface]

#### Parameter list

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
<td>Specify how many rundowns/bolts/fastening points are in the process. A maximum 30 fastening points can be selected from the drop-down list.</td>
</tr>
</tbody>
</table>

**Note:**

The value configured here will be linked to the following steps. The “Step 1” box at the bottom will turn from grey to green when configuration in this step is complete. This is the same for other steps as well.
Fasten Bolt - Step 2a  Assign Approach Waypoints

Specify waypoints when approaching each fastening point.

Quick setup 1

Select Yes in Step 2a-2 if:
Both illustrations are true for all fastening points/bolts. In this case, only Global safe approach and retreat height needs to be configured for Step 2a and Step 2c.
Safe height specified here is common for all fastening points.

Fastening point 1 / Bolt 1

Top–down, Straight–line approach
Note:

Safe height is where robot can move horizontally in any direction without the risk of collision.
A common safe height for all fastening points/bolts is called Global safe height while safe height for an individual bolt is called Local safe height.

Quick setup 2

Select No in **Step 2a-2** if:
Illustration ① is true for at least one fastening point/bolt. Select Yes in **Step 2a-4** if the specified fastening point is a top-down, straight-line approach.
In this case, a local safe approach and retreat height needs to be configured for the specified fastening point.
<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 2a-1</strong>&lt;br&gt;Fastening point:</td>
<td>Specify the fastening point or bolt that needs to be configured on this screen. This parameter is linked to the settings in Step 1: Number of Fastening points.</td>
</tr>
</tbody>
</table>
| **Step 2a-2**<br>Use global safe approach height? | **Select Yes** if:  
Top-down, straight-line approach is true for all bolts/screws, AND **Global** safe approach height can be used.  
**Select No** if:  
Top-down, straight-line approach is NOT true for all bolts/screws, OR **Global** safe approach height can NOT be used.  
**Note:**  
Safe height is where robot can move horizontally in any direction without the risk of collision, and a common safe height for all fastening points/bolts is called **Global safe height**. |
| **Step 2a-3**<br>Specify global safe approach height: | Specify a **Global** safe height for the robot when approaching the fastening point/bolt. |
| **Step 2a-4**<br>Top-down, straight-line approach? | **Select Yes** if:  
Top-down, straight-line approach is true for the fastening point specified at Step 2a-1.  
**Select No** if:  
Top-down, straight-line approach is NOT true for the fastening point specified at Step 2a-1. |
| **Step 2a-5**<br>Specify local safe approach height | Specify a **local** safe height for the robot when approaching the fastening point/bolt specified at Step 2a-1.  
**Note:**  
Safe height for an individual bolt is called **Local safe height**. |
| **Step 2a-6**<br>Move Type: | **Select Move type** for the robot. (MoveL, MoveP)  
**Note:**  
MoveL moves the Tool Center Point (TCP) linearly between waypoints.  
MoveP moves the tool linearly with constant speed with circular blends. |
| **Step 2a-7**<br>Add Waypoint | Add waypoints if more waypoints are required to safely approach the fastening point without collision. |
| **Step 2a-8**<br>Set Waypoint 1~5 | Set (teach) approach waypoints. The Polyscope screen will jump to Move Screen. |
| **Step 2a-9**<br>Remove Waypoint | Remove approach waypoints. |
### Screen function

<table>
<thead>
<tr>
<th>Functions</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Step 2a-9**   | **Help button**  
|                 | Display Help screen containing illustrations for the corresponding parameter.                                                              |
| **Step 2a-10**  | **Move to waypoint**  
|                 | Move robot to the preset approach waypoint  
|                 | Caution: Robot will move directly to the waypoint without retreating to the safe height.                                                   |
Fasten Bolt - Step 2b Assign Fastening Point and Torque Program Number
Teach fastening point and assigning Torque program for each bolt/screw.

Parameter list

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2b-1</td>
<td>Specify the fastening point or bolt that needs to be configured in this step. This parameter is linked to the settings in Step 1: Number of Fastening points.</td>
</tr>
<tr>
<td>Fastening point:</td>
<td></td>
</tr>
<tr>
<td>Step 2b-2</td>
<td>Set (teach) fastening points. The Polyscope screen will jump to Move Screen</td>
</tr>
<tr>
<td>Set Waypoint</td>
<td></td>
</tr>
<tr>
<td>Step 2b-3</td>
<td>Assign a Torque program number for the fastening point specified at Step 2b-1.</td>
</tr>
<tr>
<td>Program number</td>
<td></td>
</tr>
<tr>
<td>Step 2b-4</td>
<td>Assign a Bolt number for the fastening point specified at Step 2b-1. Bolt number will be displayed on Estic Fastening results as VIN. Refer to Estic Handy2000 manual for details.</td>
</tr>
<tr>
<td>Bolt Number</td>
<td></td>
</tr>
<tr>
<td>Step 2b-5</td>
<td>Assign bolt pickup for fastening point specified at Step 2b-1. If bolt pickup is assigned to one of the fastening points, users must set Bolt pickup point at the Installation Tab.</td>
</tr>
<tr>
<td>Requires Bolt Pickup? (If applicable)</td>
<td></td>
</tr>
</tbody>
</table>
### Screen function

<table>
<thead>
<tr>
<th>Functions</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 2b-6</strong></td>
<td>Display Help screen containing illustrations for the corresponding parameter.</td>
</tr>
<tr>
<td>Help button</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2b-7</strong></td>
<td>Move robot to the preset fastening point</td>
</tr>
<tr>
<td>Move to</td>
<td></td>
</tr>
<tr>
<td>waypoint</td>
<td></td>
</tr>
<tr>
<td>Caution: Robot</td>
<td>Robot will move directly to the waypoint without retreating to the safe</td>
</tr>
<tr>
<td>: Robot</td>
<td>height.</td>
</tr>
</tbody>
</table>

#### Note:

**Torque program numbers** specified in this step need to match the preset channel number in Estic controller, as shown below. Specifying program number which is not defined in the controller will cause an error.

### Estic Management software

#### Note:

See Handy 2000 Touch Manuals to create torque program in the controller.

Go to [https://www.estic-global.com/](https://www.estic-global.com/) to download Manuals.

Channel Number = Program Number = Torque program = Pset
Fasten Bolt-Step 2c Assign Retreat waypoints

Specify waypoints when retreating (moving away) from each fastening point. This step has identical parameters as Step 2a-Approach waypoints. Please refer to Step 2a for details.

**Note:**

Safe height is where robot can move horizontally in any direction without risk of collision.
A common safe height for all fastening points/bolts is called Global safe height while safe height for one individual bolt is called Local safe height.
Screwdriving

The Screwdriving program is a UR built-in node that provides an easy way to add a screwdriving application for an attached screwdriver/nutrunner. Configuring the screwdriver and its connections to the robot are defined in the Installation Tab. (See 24.1 General in UR user manual_99405)

Parameter list (Screwdriving)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tighten/Loosen</td>
<td>Select Tighten to follow the screw in a tightening direction (in), or select Loosen to follow the screw in a loosening direction (out). This selection only impacts the motion of the robot to follow the screw and its measuring calculations.</td>
</tr>
<tr>
<td>Enable starting point</td>
<td>Select Enable Starting Point, to add a MoveL to the Program Tree that is executed when the screwdriver/nutrunner is already running.</td>
</tr>
<tr>
<td>Follow the screw using</td>
<td>Define robot operation during screwdriving. Force: Select Force to define how much force is exerted on a screw. Then</td>
</tr>
</tbody>
</table>
select Speed Limit, so the robot moves at this speed as long as it does not come into contact with the screw.

- Speed: Select a fixed Tool Speed and Acceleration for the robot to follow the screw.
- Expression: Similar to the If command (see 23.11.2. If on page 168), select Expression to describe the condition under which the robot follows the screw.

+ Add until Refer next section.

**Screwdrive Until**

The Screwdriving program node includes a mandatory until success Until node that defines stop criteria for the screwdriving process.

1) **Until- Success**
   Screwdriving continues until completion is detected using your selected option. You can only add one success condition.

2) **Until- Error**
   Screwdriving continues until an error is detected using your selected option/s. You can add more than one error condition.
<table>
<thead>
<tr>
<th>Parameters</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Success-OK</td>
<td>Screwdriving continues until an OK signal from the screwdriver is detected.</td>
</tr>
<tr>
<td>Success-Time</td>
<td>Screwdriving continues up to a defined time.</td>
</tr>
<tr>
<td>Success-Distance</td>
<td>Screwdriving continues up to a defined distance.</td>
</tr>
<tr>
<td>Success-Expression</td>
<td>Screwdriving continues until a custom expression condition is met.</td>
</tr>
<tr>
<td>Error-Not OK</td>
<td>Screwdriving stops when a NOT OK signal from the screwdriver is detected.</td>
</tr>
<tr>
<td>Error-Distance</td>
<td>Screwdriving stops when the defined distance is exceeded.</td>
</tr>
<tr>
<td>Error-Timeout</td>
<td>Screwdriving stops when the defined time is exceeded.</td>
</tr>
</tbody>
</table>

Note:

A Caution sign as shown on Screwdriving node indicates incomplete installation setup. Refer Installation Node and complete the setup according to the instructions.

See Handy 2000 Touch Manual to create torque program in the controller.

Go to [https://www.estic-global.com/](https://www.estic-global.com/) to download Manuals.