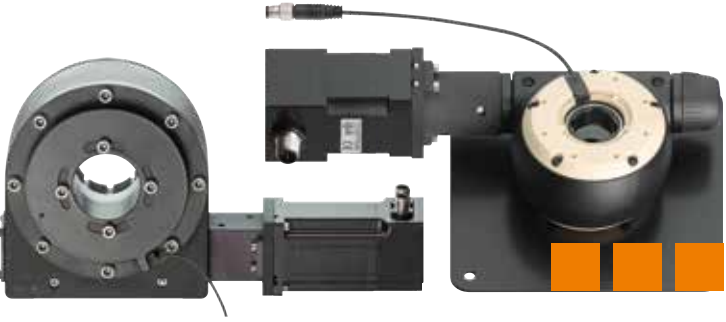
robot.../..

...external axis ... user documentation

... igus.eu/iRC ... igus® motion plastics®

...control

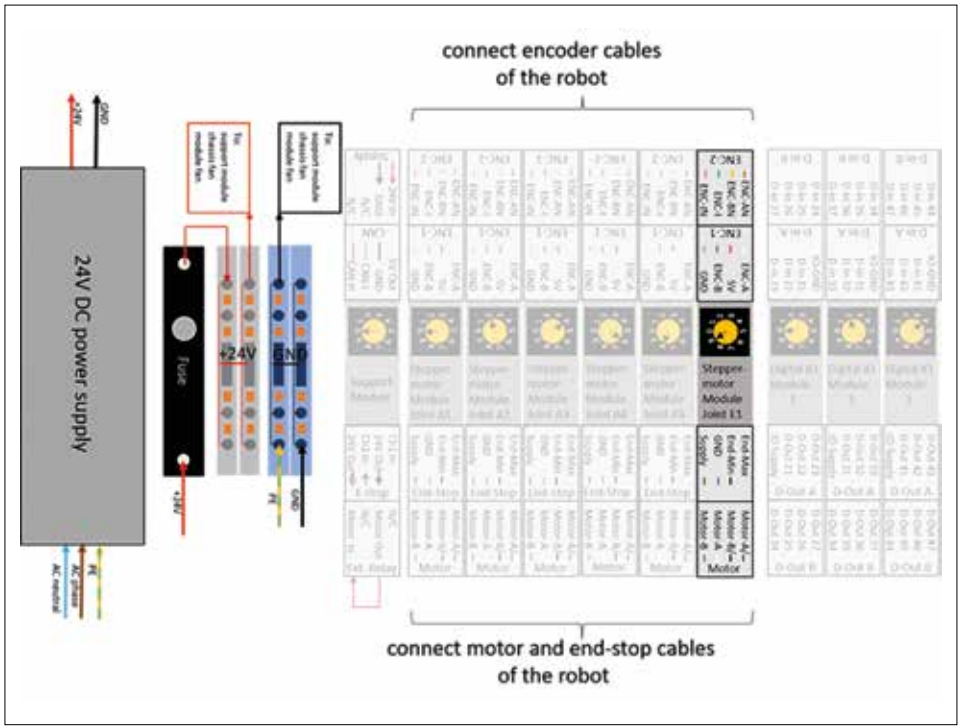


Introduction

This document describes how to add an external axis to igus® Robot Control. An additional stepper motor module is required to control the external axis.
Attention! This should only be done by experts with experience in handling the robot control system. Improper changes may result in damage to the robot, the control system and the surrounding equipment. After having made the changes, you need to test every function of the robot thoroughly. Drive and motor temperatures must be monitored!

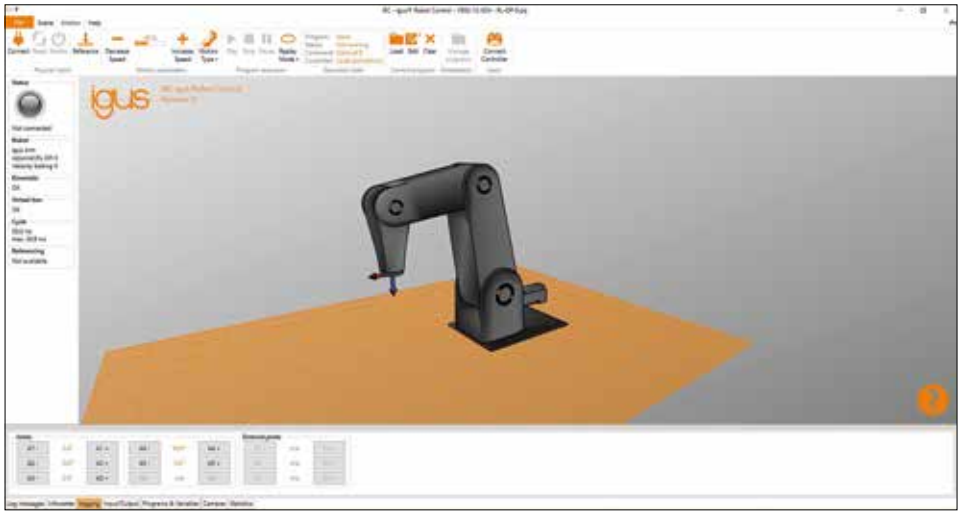
Hardware connections

Connect the external axis as if it were any other axis. See pin assignment below:

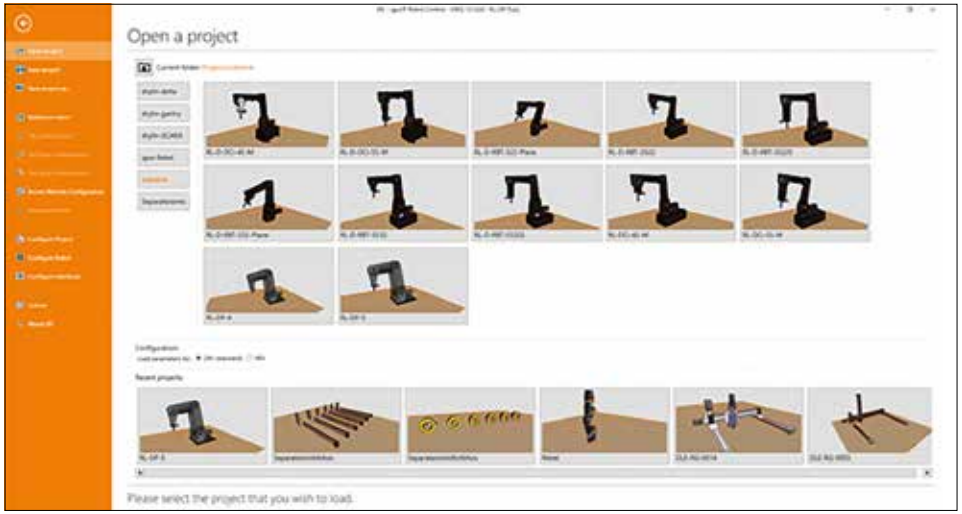


Configuration

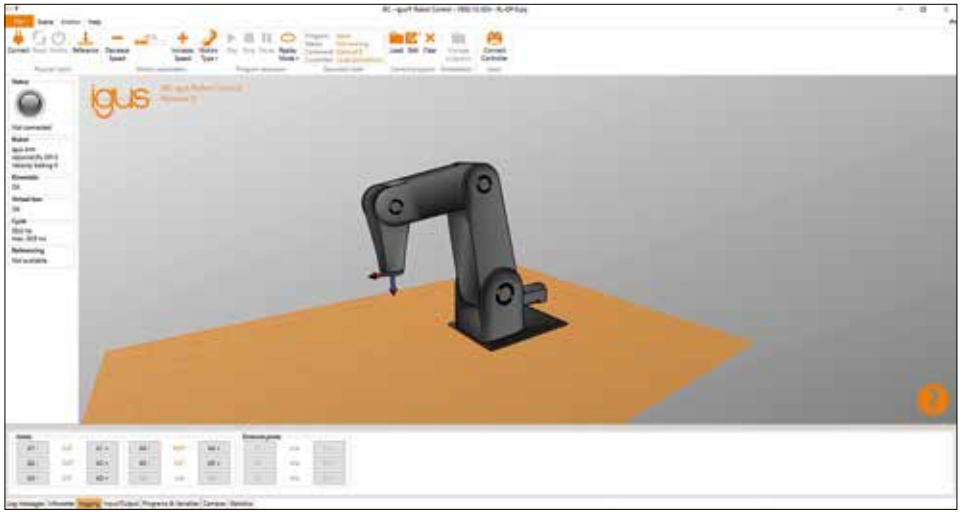
1. Turn on the robot and start CProg/IRC. It takes about 20 to 30 seconds for the embedded computer to power up so that it can be connected in Step 3.



2. Click on "File", then select your robot type.

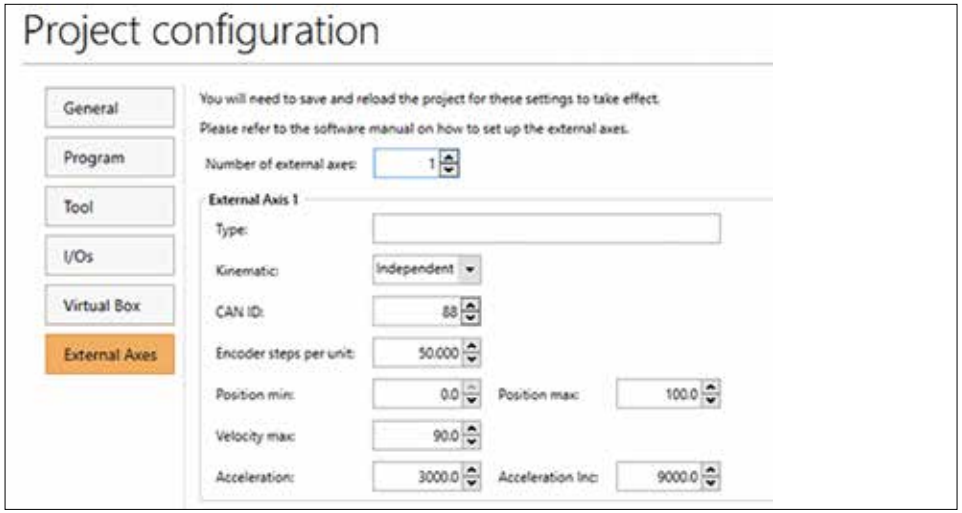


3. Click on "Connect". Once connected, click on "File" again.



4. Click on "Configure project" "External axes".

5. Configure your external axis.

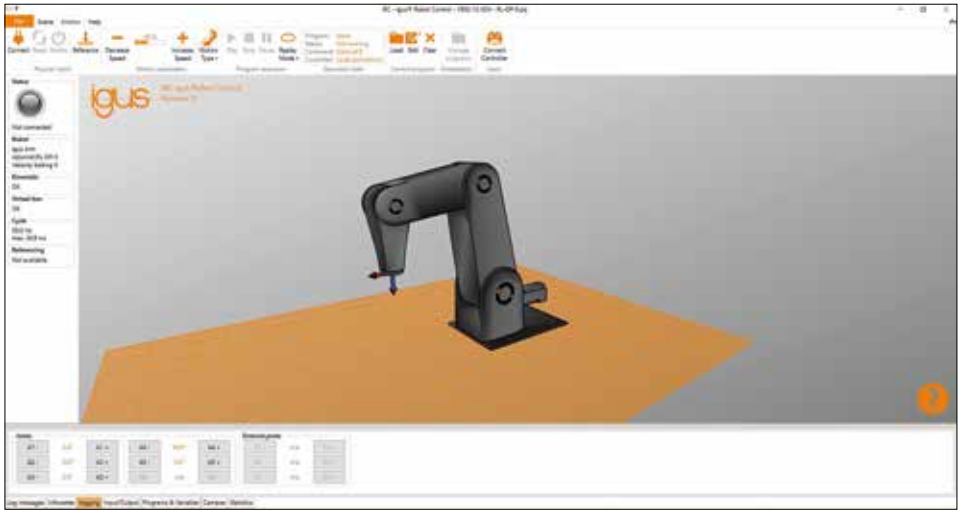


The values shown on the last image above are the correct values for the optional linear axis (7th axis), on which the robolink® DP robots can travel.

- **Type:** leave this field blank unless you know which XML robot configuration file you want to use for the external axis.
- **Kinematics:** if the robot is mounted on the linear axis, enter "dependent".
- **CAN ID:** CAN ID of the axis module
- **Encoder steps per unit:** ratio factor of mm or degree to encoder step (see calculation below)
- **Min. and max. position:** movement limits
- **Max. speed:** maximum speed
- **Acceleration:** acceleration
- **Acceleration Inc:** acceleration increase

6. Click on "Save project". The project is saved both locally on the PC and remotely on the embedded computer module. This process can take up to five seconds. To activate the changes, restart the robot (turn it off, wait ten seconds, turn it on again).

7. Click on "Connect". Once you are connected, click on "File" again.



8. Click on "Configure project" and check that the changes you made are still there.

Examples

Here you can find a number of example configurations, in particular the gear scales

Axis	Transmission	Encoder steps per unit
GRW-0630	44	45,455
GRR-1280	72.26	27,679
ZLW-0630	54	37,037
ZLW-1040-B	66	30,303
ZLW-1040-S	70	28,571
ZLW-1080-S	70	28,571
ZLW-10120-S	75	26,667
ZLW-10160-S	75	26,667
ZLW-10200-S	75	26,667
ZLW-20120-S	144	41,667
ZLW-20160-S	144	41,667
ZLW-20200-S	144	41,667
SAW-1040	2	1,000
RL-D-50	48	266,667
RL-D-30	50	277,778
RL-D-20	38	211,111

The calculation formula shows the determination of the encoder steps per unit from the number of encoder steps, the gear ratio and the distance travelled in a full output rotation in any unit.

$$\frac{4 \cdot \text{encoder steps} \cdot \text{gear ratio}}{\text{distance}} = \text{encode stepper unit}$$

$$\frac{4 \cdot 500 \cdot 38}{360°} = 211{,}111$$

$$\frac{4 \cdot 500 \cdot 1}{70\text{mm}} = 28.57$$

Firmware parameters (advanced)

Each stepper motor module must be configured. For known axes, this is done in the factory. However, there are a large number of different types of motors/reference switches/encoders and joint configurations. For customised joints, this process must be performed by the user so that the system works as intended. The "Quality management" sheet supplied with the electronics indicates that an additional axis is unconfigured if the axis has not been configured.

Check the current parameters

```
<!-- Parameter set for Commonplace Robotics robotics control  /-->
<!-- Target Robot: igus robotink                              /-->
<!-- support@cpr-robots.com                                   /-->
<AmpParameter>
    <Configuration ModuleType="RailStepperV02" NrOfJoints="3"/>

    <Joint0 ID="16" Version="Product 0x42 FW 0x02 0x10"
        CanTimeOut="1000" MaxCurrent="200" MaxLag="5000" EncoderErrorDetection="0" PosP="1,200" PosI="0.0000" PosD="0.000" PosAdv="30"
        Encoder="True" SwapEncoderDirection="False" EndSwitchRising="True" StopOnEndSwitch="False" UseIndexAsRef="False"
        RefStraight="False" RefSinus="False" RefHalf="True" SinusRefTics="2000" SinusRefMaxCycles="6"
        Offset="0" RefSpeed="50" RefSpeedSlow="10" RefFromBothSides="True"
        SGThreshold="2" CSLoad="18" CSStart="18" CSIdle="6" CSRef="15" StartArea="200"
        MinSupplyVoltage="500" MaxTemperature="500" Microstepping="0"
       />

    <Joint1 ID="32" Version="Product 0x42 FW 0x02 0x10"
        CanTimeOut="1000" MaxCurrent="200" MaxLag="5000" EncoderErrorDetection="0" PosP="1.000" PosI="0.0000" PosD="0.000" PosAdv="30"
        Encoder="True" SwapEncoderDirection="False" EndSwitchRising="True" StopOnEndSwitch="False" UseIndexAsRef="False"
        RefStraight="False" RefSinus="False" RefHalf="True" SinusRefTics="2000" SinusRefMaxCycles="6"
        Offset="891" RefSpeed="-50" RefSpeedSlow="-10" RefFromBothSides="True"
        SGThreshold="2" CSLoad="26" CSStart="26" CSIdle="10" CSRef="20" StartArea="200"
        MinSupplyVoltage="500" MaxTemperature="500" Microstepping="0"
       />

    <Joint2 ID="48" Version="Product 0x42 FW 0x04 0x07"
        CanTimeOut="1000" MaxCurrent="0" MaxLag="5000" EncoderErrorDetection="1000" PosP="1.000" PosI="0.0000" PosD="0.000" PosAdv="0"
        Encoder="True" SwapEncoderDirection="False" EndSwitchRising="True" StopOnEndSwitch="False" UseIndexAsRef="False"
        RefStraight="True" RefSinus="False" RefHalf="False" SinusRefTics="500" SinusRefMaxCycles="6"
        Offset="-1" RefSpeed="40" RefSpeedSlow="5" RefFromBothSides="True"
        SGThreshold="2" CSLoad="10" CSStart="10" CSIdle="3" CSRef="8" StartArea="200"
        MinSupplyVoltage="500" MaxTemperature="430" Microstepping="0"
       />

</AmpParameter>
```

Example for electricity

	CS load	CS start	CS idle	CS ref
NEMA17	5	5	2	5
NEMA23	16	16	7	16
NEMA24	18	18	7	18

Referencing

The axis can be referenced without any further changes by clicking on the "Reference axis" button in the Referencing area.

To enable automatic referencing ("Reference all" in the referencing area), the axis can be entered into the project configuration file by hand. To do this, open the following configuration file in a text editor:
<Path-to-iRC>\iRC-igusRobotControl\Data\Robots\<Category>\<Robottype>\<Robottype>.xml

Find the following line and change the first "-1" entry to the number of your external axis.
For a 5-axis robot, this is "5" (as shown below), for a 6-axis one "6", for a 3-axis linear robot "3" etc.

<PLCInterfaceRefSequence JointToRef0="2" JointToRef1="1" JointToRef2="3" JointToRef3="4" JointToRef4="0" JointToRef5="5" JointToRef6="-1" JointToRef7="-1" JointToRef8="-1" />

Disclaimer

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Legal information: The information in this brochure, and the technical data in particular, is based on our current knowledge of the products described as of [05/2022].

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igus® GmbH
Spicher Str. 1a
51147 Cologne
Phone: +49 2203 9649-8255
de-robot-control@igus.net
www.igus.eu

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