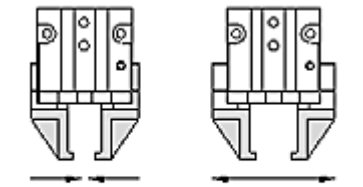
Industrial Robotics Pre-Competition Activity

What is a Parallel Gripper?

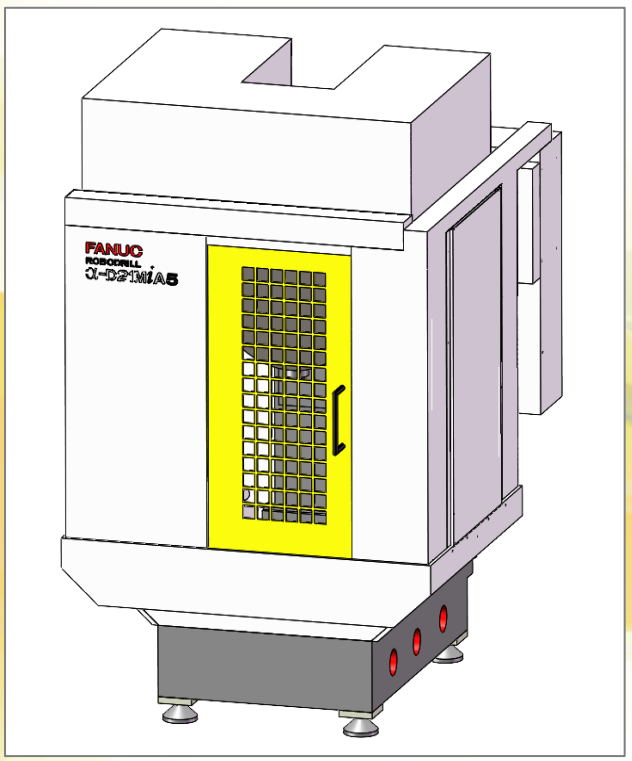
Robotic grippers are one of the most common types of End-of-Arm-Tooling (EOAT) devices integrated with robots. They are used to give the industrial robot the capability to handle, manipulate, and lift workpieces.

Parallel grippers are the most widely used type for robotic automation and generally feature a two-jaw design that moves in parallel with each other over a fixed distance.



The grippers work by grasping parts in the 'fingers' which then close parallel to one another around a workpiece. The finger design and construction will vary, as this typically needs to be customized to suit the specific object being manipulated. The workpiece is released from the gripper when both sides simultaneously open and let go of the object.

Most commonly parallel grippers are used for pick and place applications and are best suited for working with parts that are repeatable and have pre-determined geometries. This means these devices are designed to handle specific part shapes that will remain consistent during the manufacturing process.



The Challenge....

As part of a demonstration, we need to pick-and-place a number of model Robodrill's, pictured on the left, using a robot.

Your task is to design a set of fingers that can be fitted to the parallel gripper system being used for the robots EOAT.

The drawing on the last page gives the overall dimensions of a D21MiA Robodrill. Before designing your fingers, you will first need calculate the given dimensions to suit a model made at a scale of 1:25.

The parallel gripper that is fitted to the robot is based on a Schunk PGN+ 64-1, however, the key pieces of information required to enable you to design suitable fingers are:

- **The stroke distance.** This is the distance moved, by each jaw, when the gripper is opened or closed. In this case it is 6mm.
- **The maximum weight.** This is the maximum weight of part that can be picked using this gripper module and includes a safety factor of 2. For the PGN+ 64-1 this value is 0.27kg, the model being used in the demonstration is made from recycled plastic and weighs 0.15 kg.
- **The maximum finger length**. This is the maximum permissible length of finger to give safe part handling at its nominal operating pressure of 6 bar. If the pressure is increased, the finger length must be reduced proportionally. In this case the maximum length is 100mm.

By thinking about the size and shape of the Robodrill and how you can pick it up and move it, it should be possible to design a set of fingers that will hold it securely even when the robot is moving at speed. Below are some points that could influence your design:

- If there are a number of models arranged in a grid pattern how would this impact on the size & shape of your finger design?
- How can you stop the part from moving in the gripper when the robot is travelling at speed?
- Would the grid arrangement alter how you grip the models to pick them up?
- If the model is made from recycled plastic what material would you use to manufacture your fingers?
- How would the manufacturing process for your fingers affect your design?

There is no time limit or set method to be used in completing this challenge and no requirement to submit anything to WS as part of your competition entry.

Your designs can range from producing freehand sketches through to producing full 3D Cad models and will hopefully give you some insight into how to design EOAT for Industrial Robots.

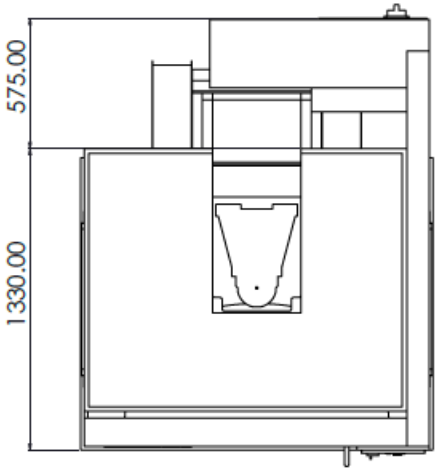
If you prefer to work with 3D models then please get in touch with us using the email:

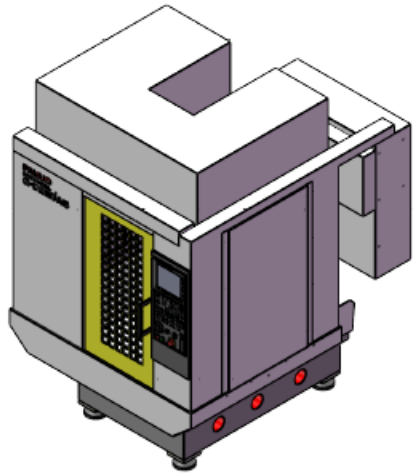
rsi@fanuc.co.uk

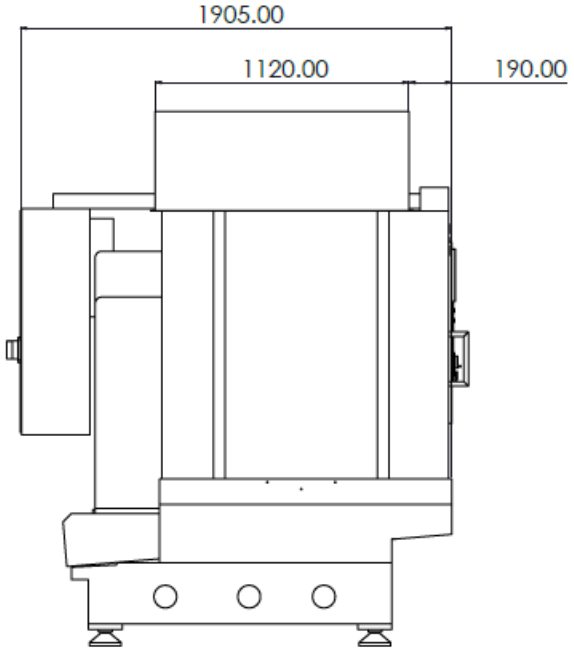
The files for the Robodrill and Schunk gripper module will be sent to you in a generic format suitable for use in a number of software packages to include Autodesk's Fusion 360. In addition, Autodesk offer students and educators free one-year access to their products and services and can be found by following this link:

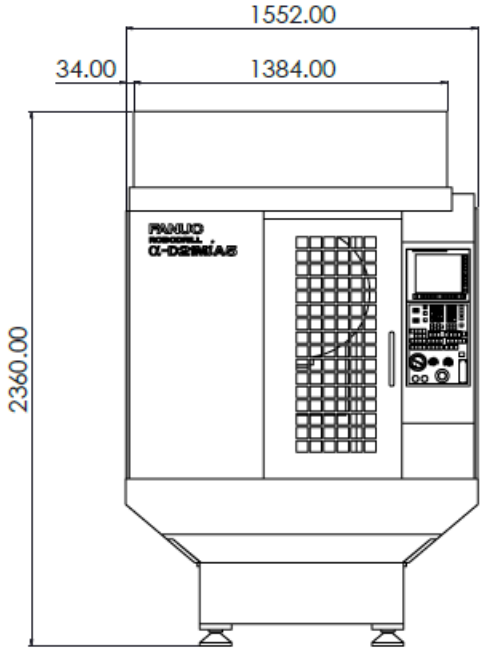
https://worldskills.org/partners/autodesk/

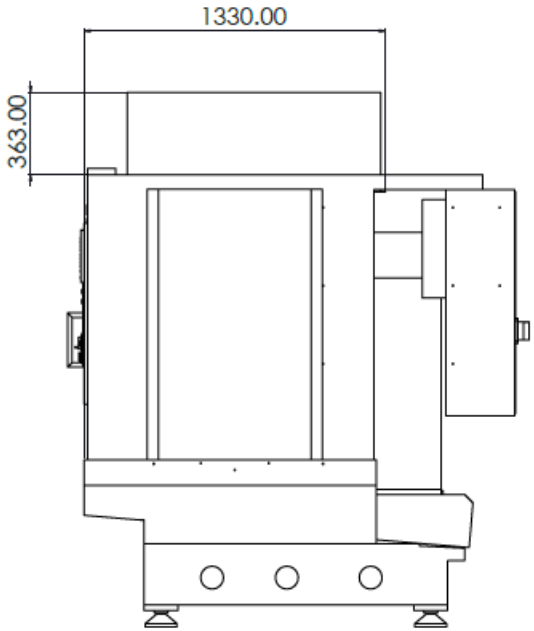
We would love to see your designs and ideas! Please feel free to send them to the RSI email address above but most of all …**have fun!** …and don't forget to enter the competition!











FANUC UK Ltd SAPPHIRE WAY ANSTY PARK COVENTRY. CV7 9DR. UNITED KINGDOM PHONE: +44 (0) 2476 053 000 www.fanuc.eu	FINISHED TOLERANCES ±0.3 mm UNLESS OTHERWISE STATED REMOVE ALL SHARP CORNERS WITH 0.25mm MAXIMUM RADIUS UNLESS OTHERWISE STATED	MATERIAL VARIOUS	TITLE ACADEMIC ROBODRILL	DRAWN BY: RK DATE: 01.02.22 SHEET: 1 OF 1 DRAWING NO.: XXXXXX-XXX-XXX REVISION: 1	REVISION: DATE: REVISED BY: REVISION NOTES: