Robot Hand

Science
- Behaviour of gases under pressure
- Forces
- Friction
- Measuring weight
- Scientific investigation

Design & Technology
- Assembling components
- Evaluating
- Testing before making improvements
- Using mechanisms – levers

Vocabulary
- Circumference
- Cylinder
- Force
- Grip
- Levers
- Manometer
- Mass
- Pressure
- Pump
- Valve
- Weight

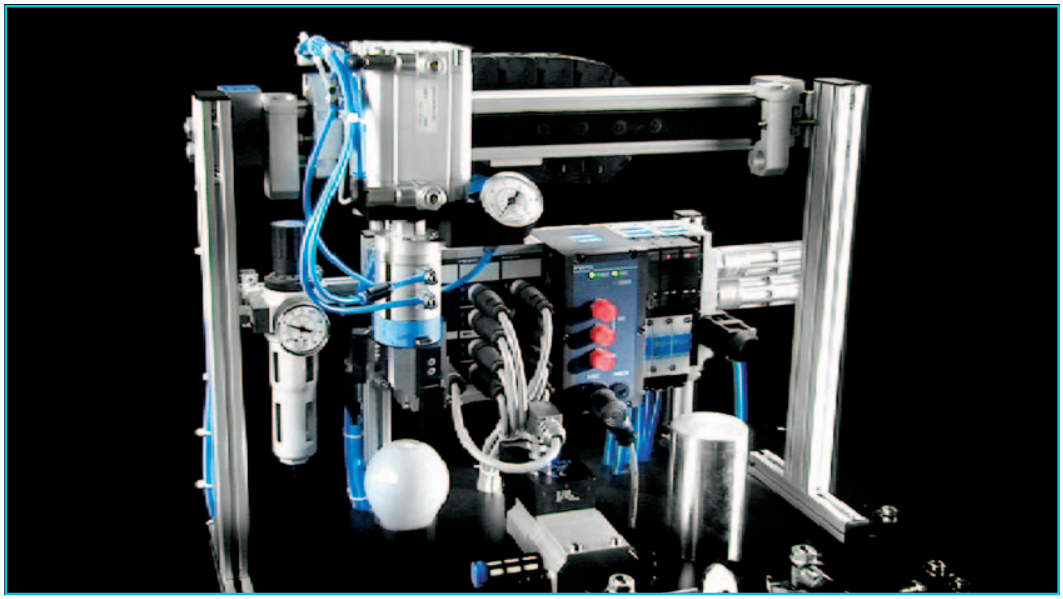
Other materials required
- A collection of small objects of different size and weight
- Plastic cup

Optional
- Modelling clay
- Rubber bands
- Weighing machine

Connect

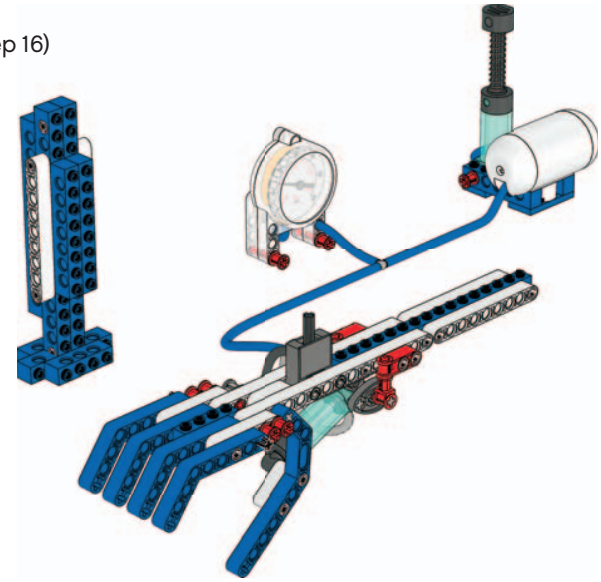
Industry and hospitals often need to handle and move objects that can be dangerous to touch by hand. Metal objects and fragile glass containers, for example, are often handled using pneumatic hands or grippers.

Build the Robot Hand and investigate what pressure is needed to hold different objects without dropping or crushing them.
Let's find out!

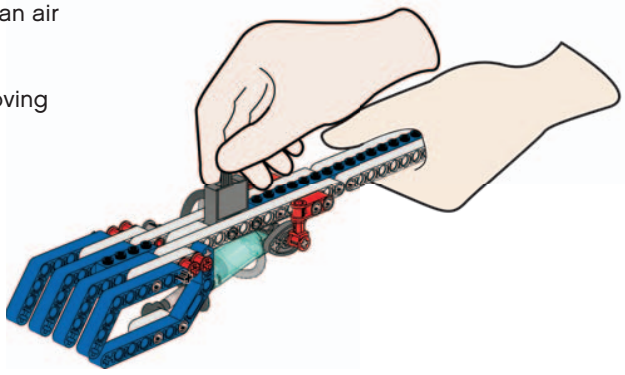


Construct

Build the Robot Hand and the carrier.
(All of book 2A and book 2B to page 10, step 16)



- Pump air into the system and use the manometer to detect whether there is an air leak
- Try the valve settings and check all moving parts to ensure that they move freely



- Then open the hand and empty the air tank

Hint
The easiest way to empty the air tank is to disconnect the tube going from the air tank to the valve.

Contemplate

How good a grip?

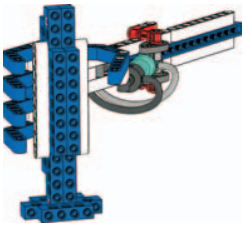
The Robot Hand can pick up the carrier from two different sides – the smooth white side and the studded blue side. Find out how much pressure the Robot Hand needs to pick up the carrier.

First, predict how much pressure the Robot Hand needs to lift carrier A.
Record your findings on the worksheet.

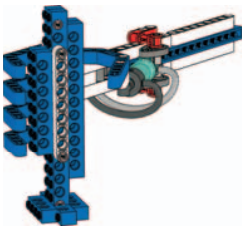
Then, test how much pressure is needed.
Record your findings on the worksheet.

Next, follow the same procedure for Robot Hands B, C and D.
Test several times to make sure your results are consistent.

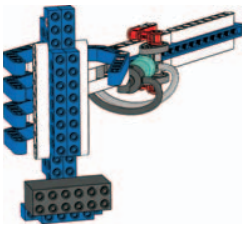
A



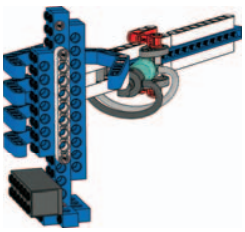
B



C



D



Does weight have an effect?

Have the students reflect on their investigations by asking questions such as:

- What did you predict would happen and why?
- How does the Robot Hand work and what type of lever system does it use?
- What are the limitations of the Robot Hand's grip?

Continue

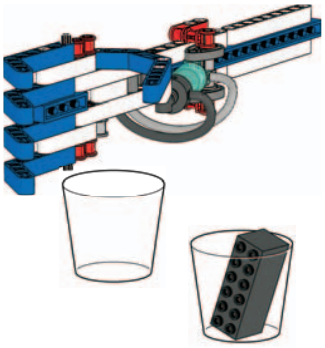
What else can the Robot Hand hold?

Prepare a fragile paper or plastic cup. Find a variety of different objects to put in the cup. Find out how much pressure is needed for the Robot Hand to pick up the cup.

First, predict how much pressure the Robot Hand needs to lift the different objects without damaging them.
Record your prediction on the worksheet.

Then, test how much pressure is needed.
Record your findings on the worksheet.

Test several times to make sure your results are consistent.



Hint
Make an egg-shaped object out of modelling clay. Marks on the clay's surface can be used to record damage caused by pressure.
But remember to wrap it in cling film to keep the elements clean.

Optional: Further investigations

Need a better grip?
Experiment by adding different materials to the Robot Hand for a better and safer grip that also causes less damage.