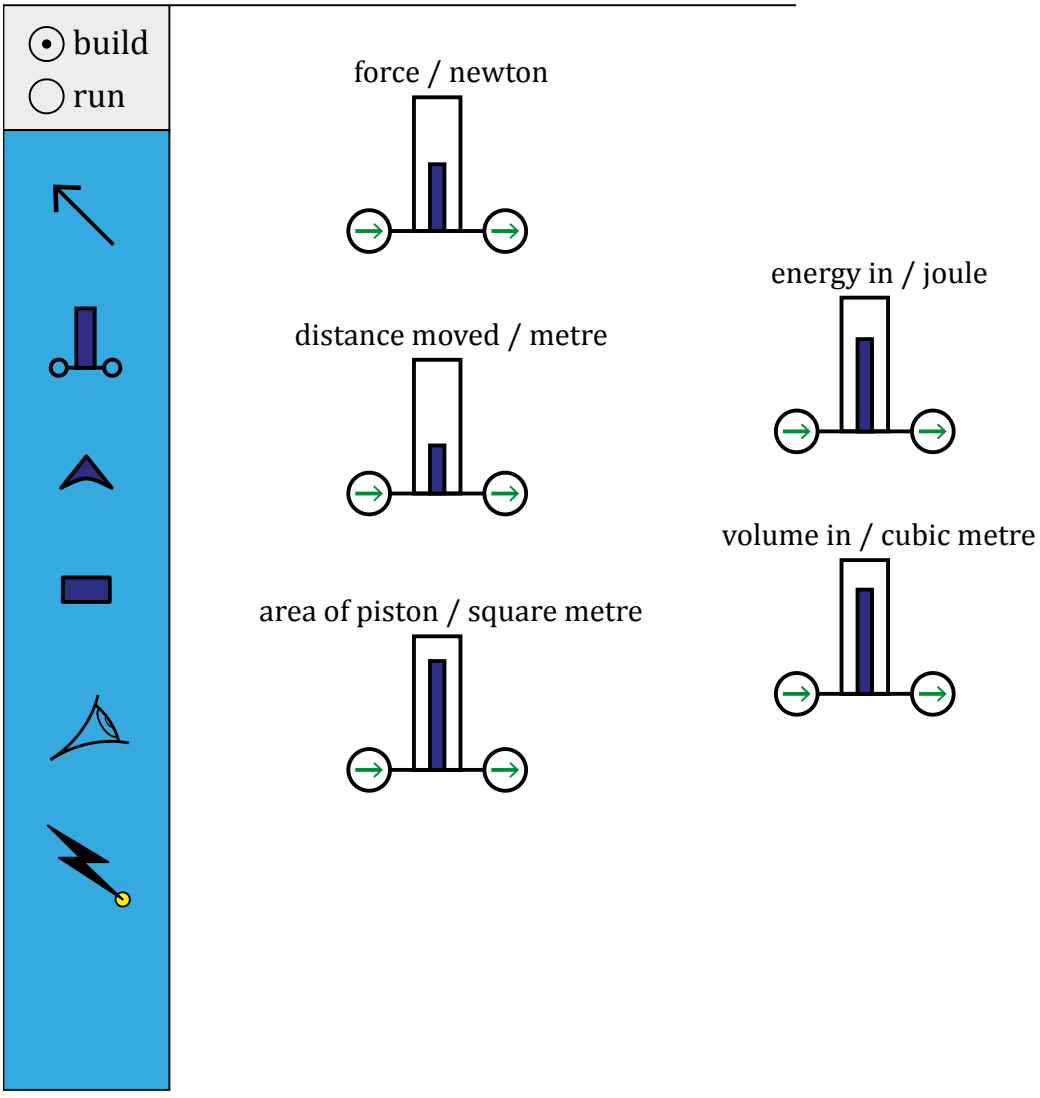
Getting started

Compare the three hydraulic systems that you have been shown. For each cylinder you seem to have three choices—the force exerted by the piston in that cylinder, the distance moved by the piston and the area of the piston. Make three one-way measures in the modelling system VnR to represent these input variables. Now combine these three, after careful thinking, to show how to find the values of two more quantities: the energy input and the volume of fluid that you'll push in.

Here are the variables that you need to link up:

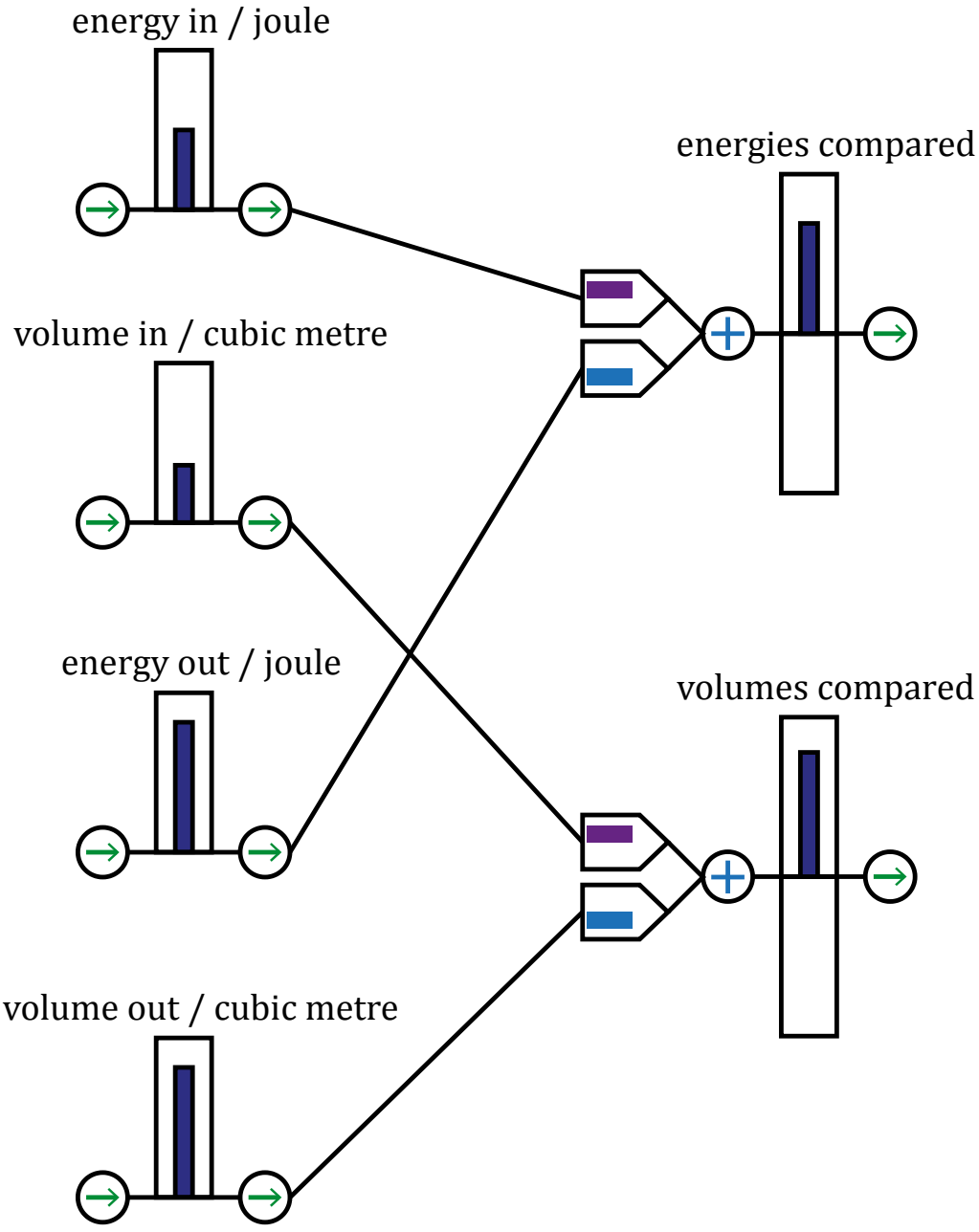


Check that the links that you make behave as you'd expect, by running the model.

Now make another set of quantities, linked in the same way, that show the same pattern for the output piston.

Making links

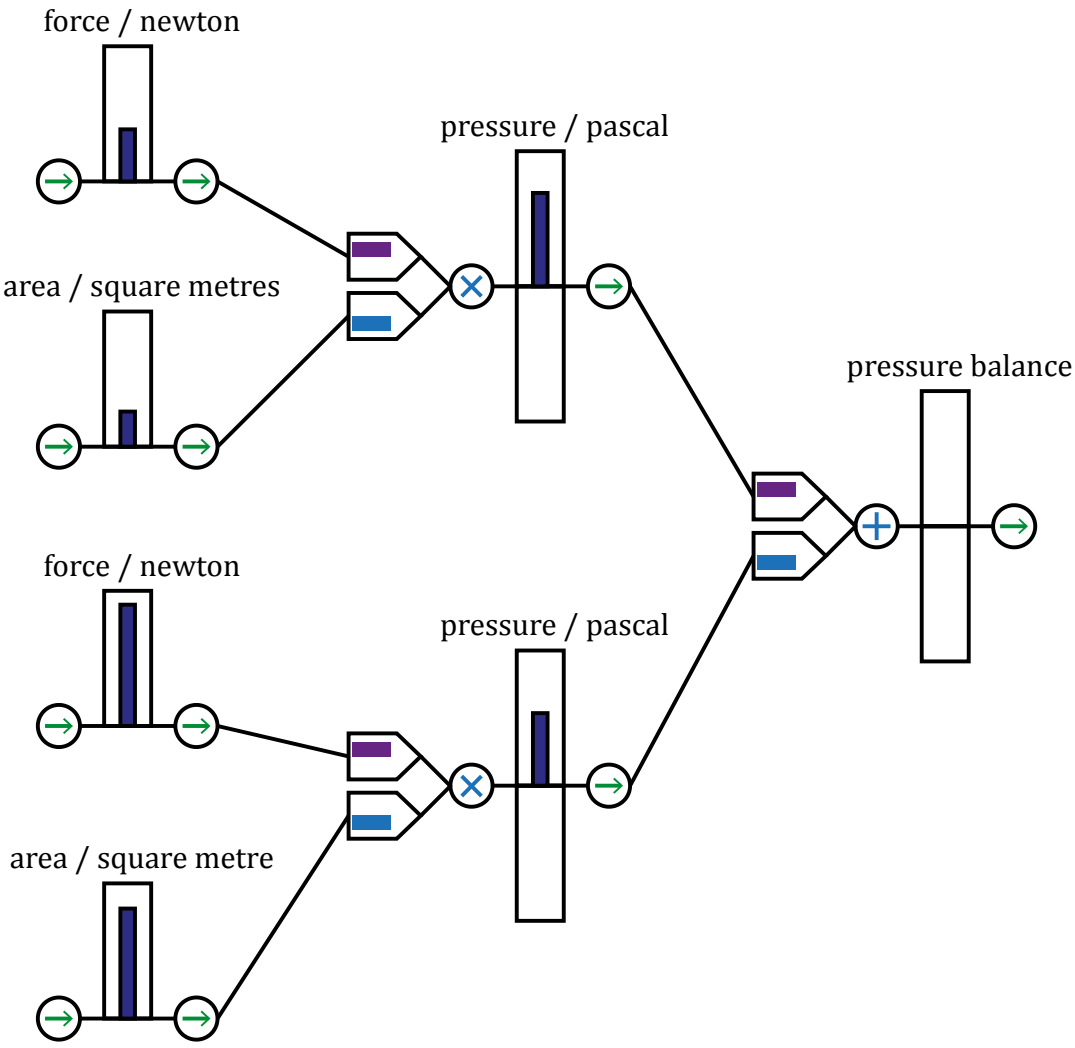
Now link the two energies together, so that you can check that the input is equal to the output—or else energy will not be conserved in the system that you design. Also link the two volumes together, so that you can check that the volume you pump in is equal to the volume that you pump out—otherwise you'll be loosing some fluid.



Now you have a complete model. See if you can arrange the inputs and outputs to match each of the three hydraulic systems that your teacher has shown you on screen. (Three distinct cases, choosing different values of force, distance moved and area, for input and output pistons. Your model will show you the consequences of your choices.)

A shorthand version

You may spot that the distance makes two contributions, and that these might cancel out. This is so, and you can make a simpler model, that tracks a combined measure of energy and volume for each piston: the pressure. Here is the simpler model. Build it and compare how it behaves to the model that you built.



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Modelling hydraulics

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The location

http://supportingphysicsteaching.net/