REUSABLE COMPONENTS

Lecture 1.3

Modelon

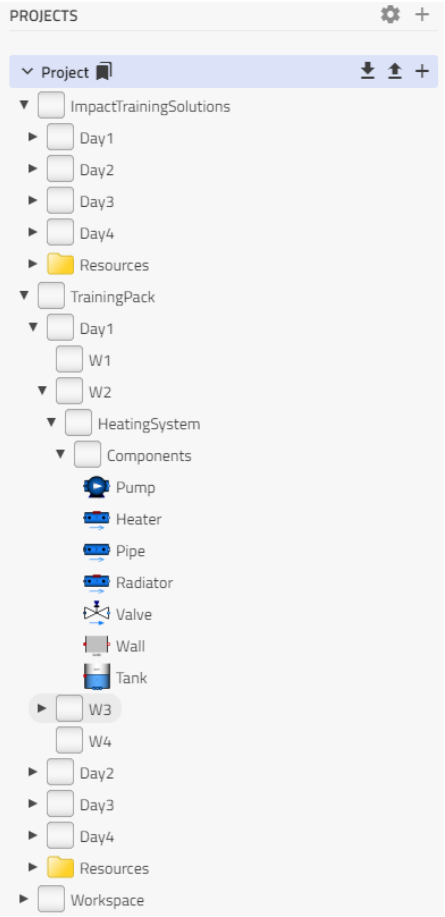
OVERVIEW

- ✓ Library packages
- ✓ Creating reusable subsystems
- ✓ Connector Interface
- ✓ Parameter Interface
- ✓ Component views
- ✓ Documentation and Icon editor

LIBRARY PACKAGES

LIBRARIES

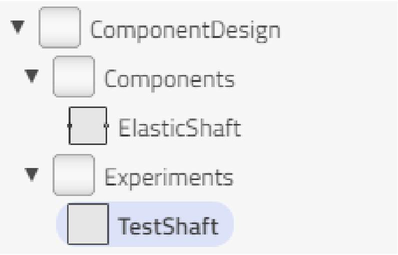
- As you start creating more content its important to organize your work
- Libraries can easily be created and managed in Impact
- Libraries are defined by the modelica class ”package”
- A library can contain several hierarchical levels of packages



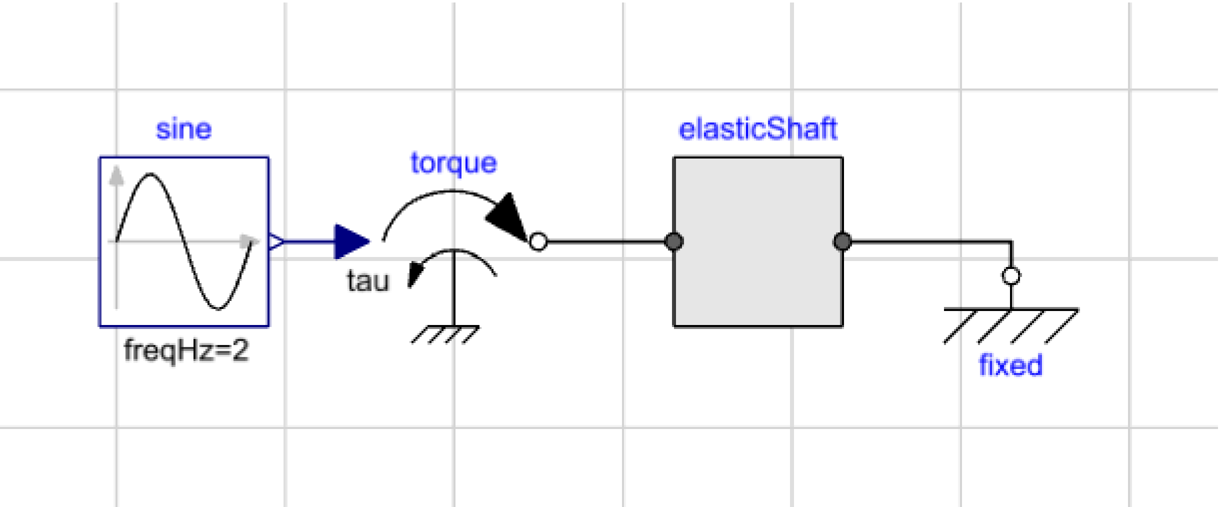
CREATING REUSABLE COMPONENTS

REUSABLE COMPONENT

- In the following example we want to create an elastic drive shaft.
- Then we want to test this component in a test rig.

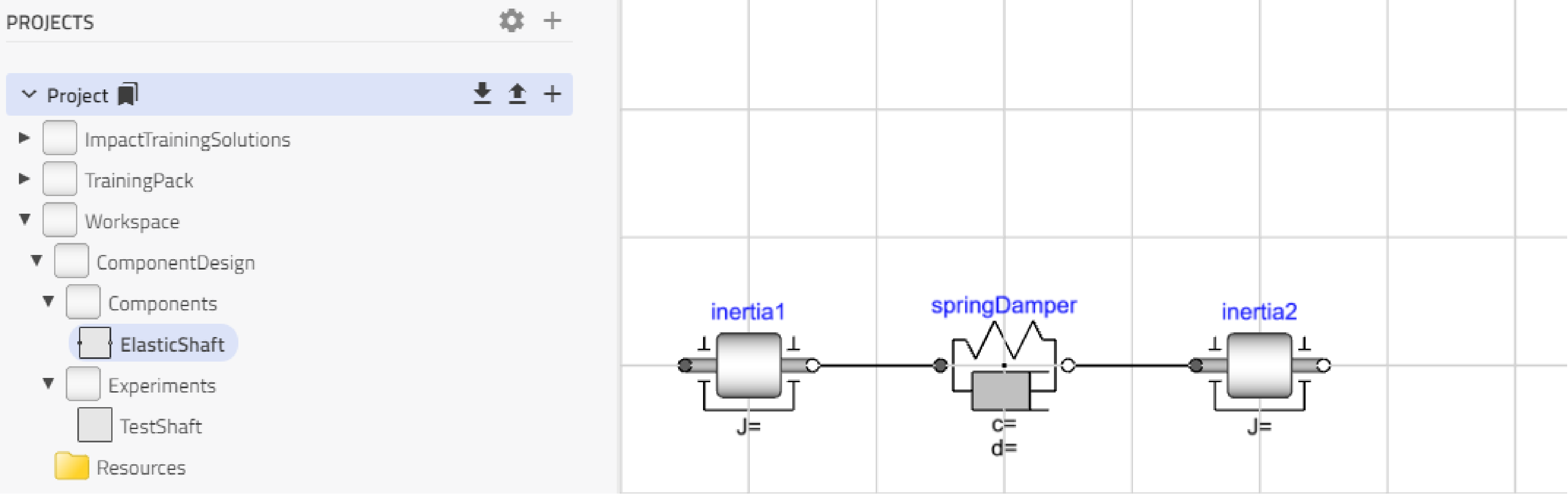


- ComponentDesign
  - Components
    - ElasticShaft
  - Experiments
    - TestShaft



CREATE SHAFT

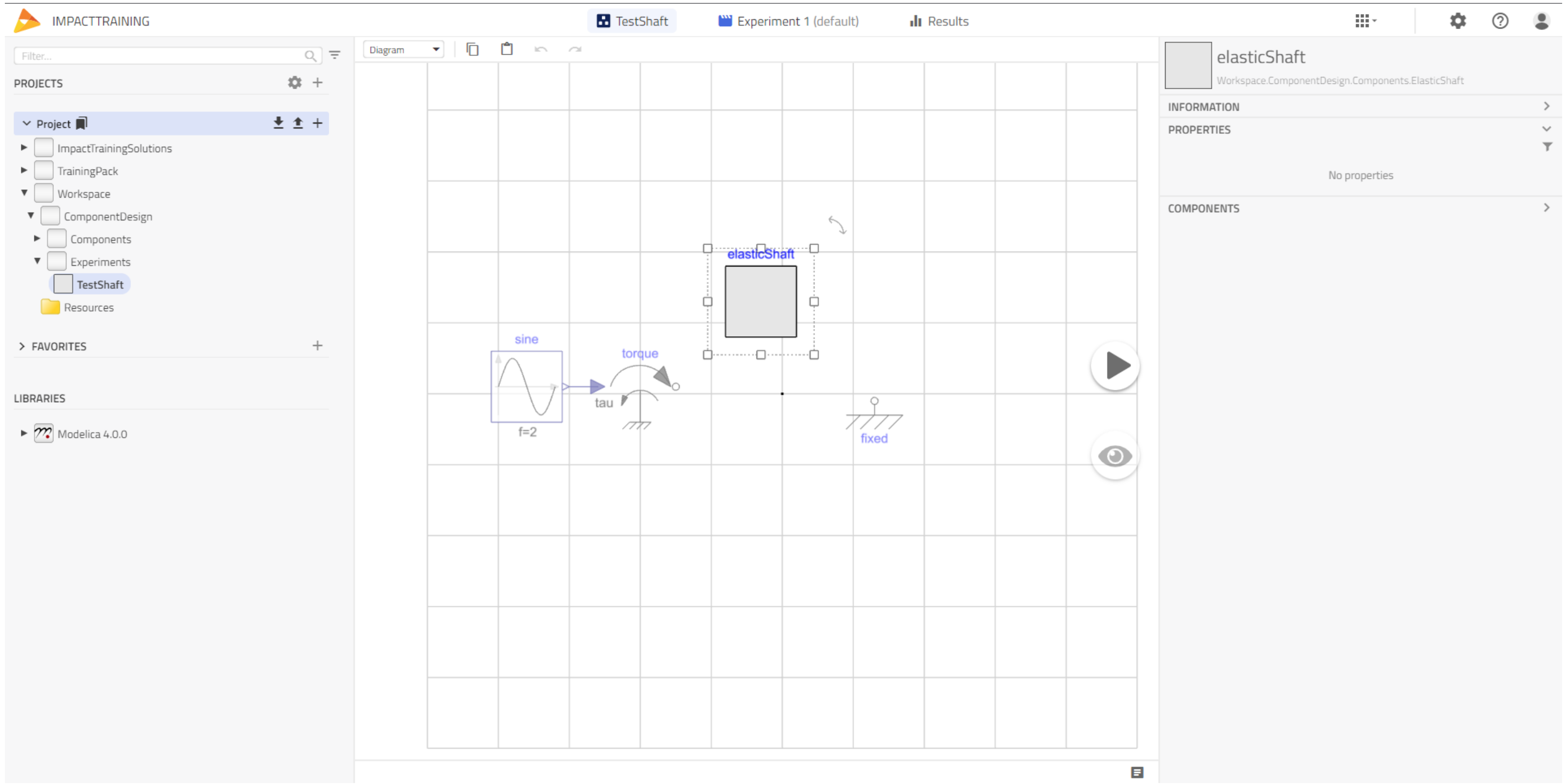
- Create a new model -> ElasticShaft
- Drag, drop and connect the needed components



CREATE SHAFT

- No connectors
- No parameters

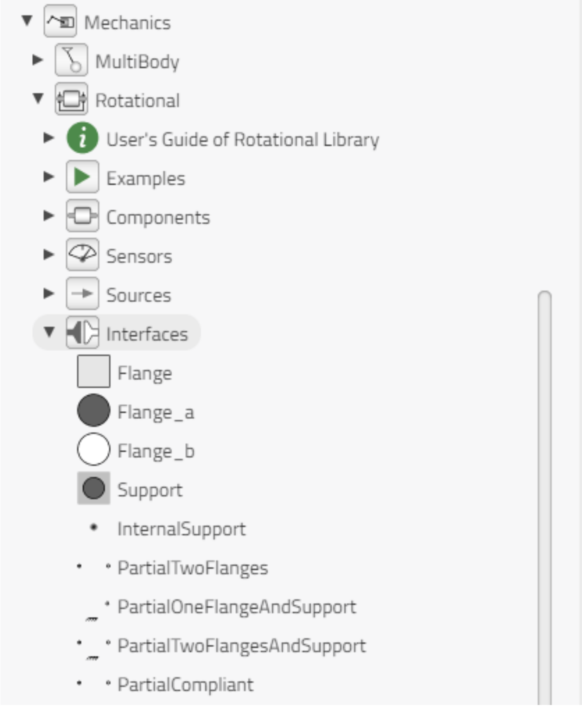
- We need to add that!

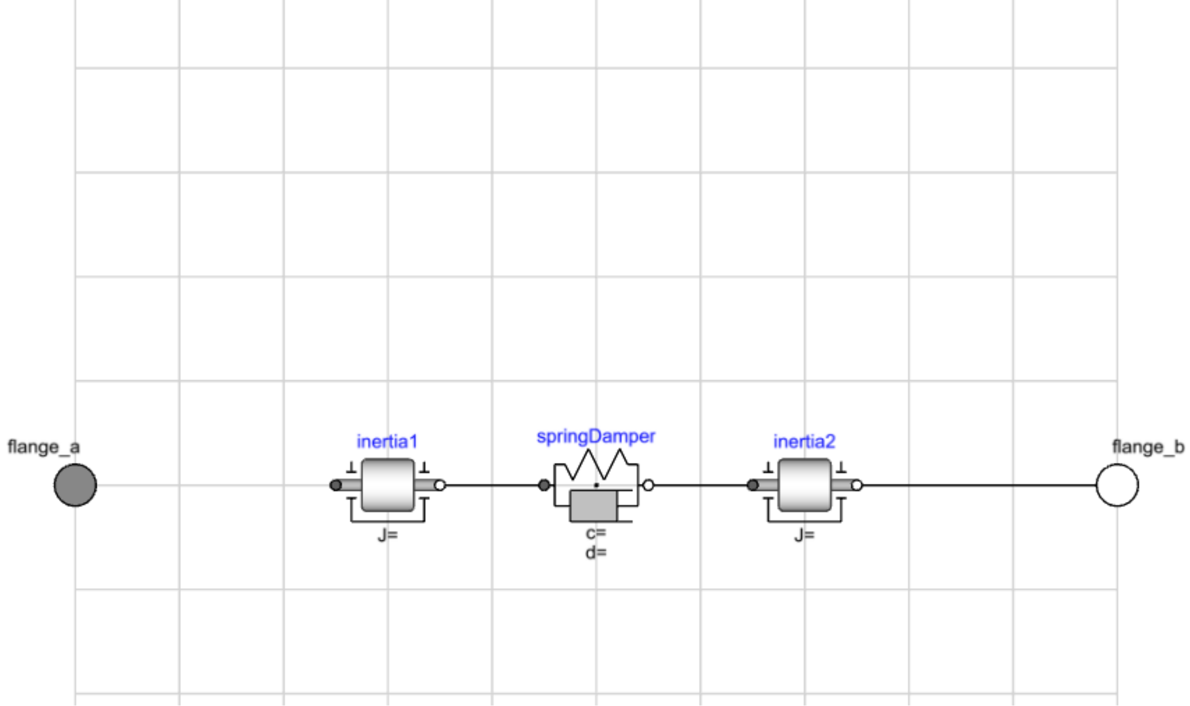


CONNECTOR INTERFACE

CONNECTOR INTERFACE

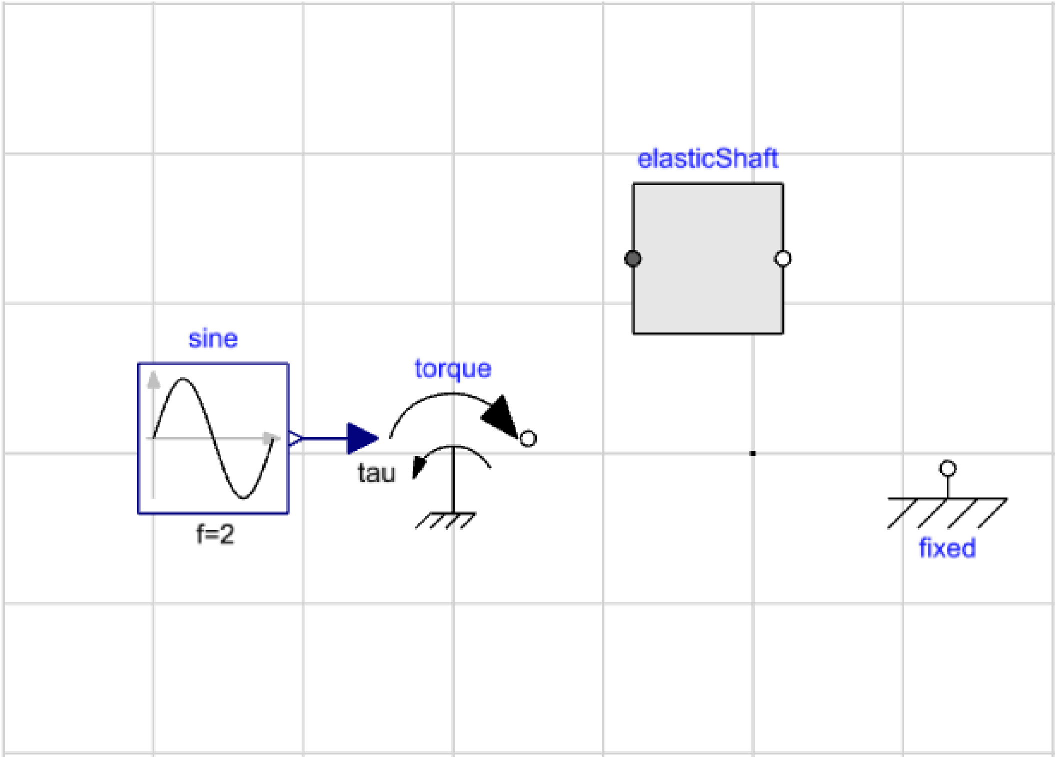
- We find the connectors in the relevant Interface package
- Add and then connect them to the model

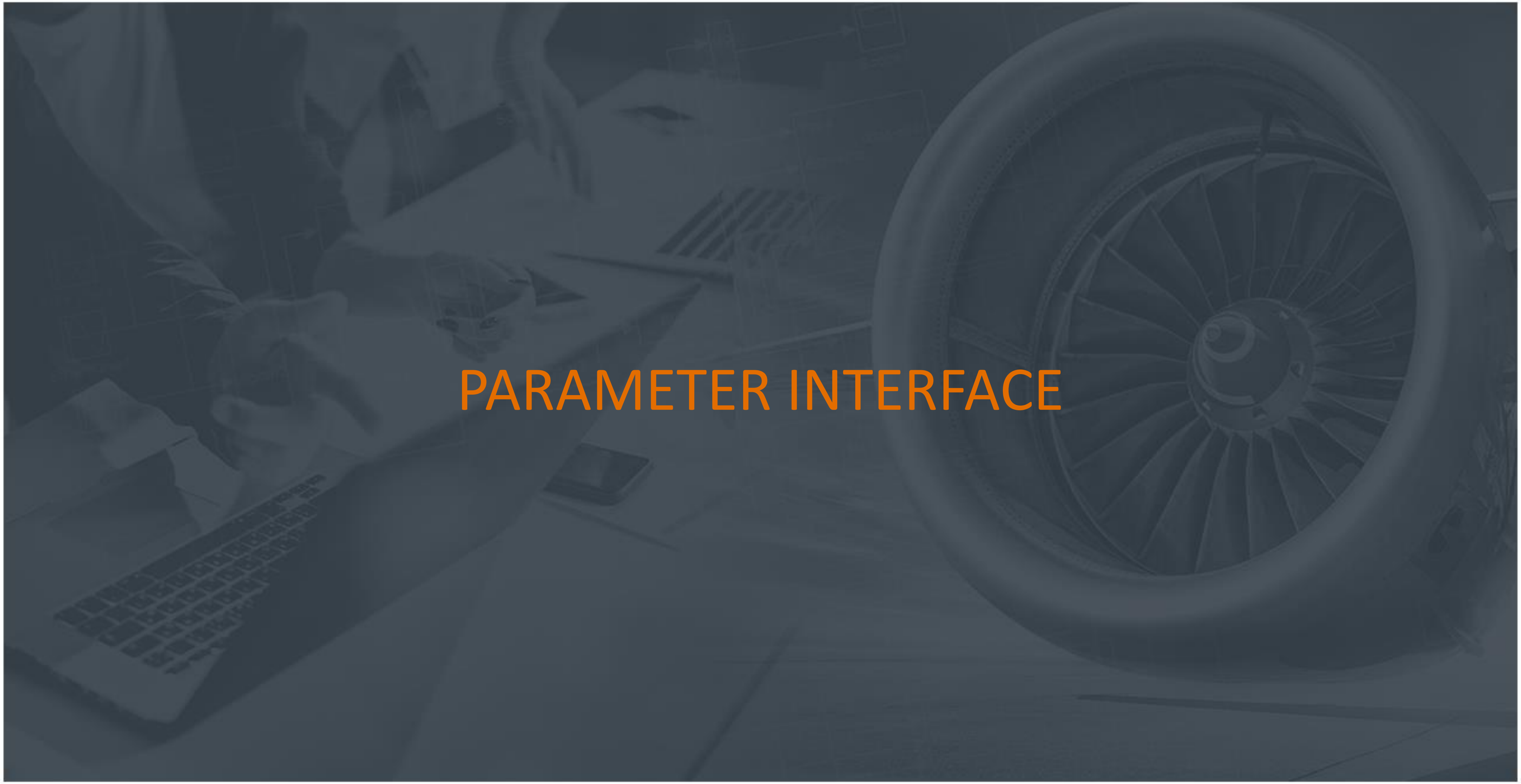




CONNECTOR INTERFACE

- Now we can see that we have the connectors available when using the class





PARAMETER INTERFACE

PARAMETER PROPAGATION

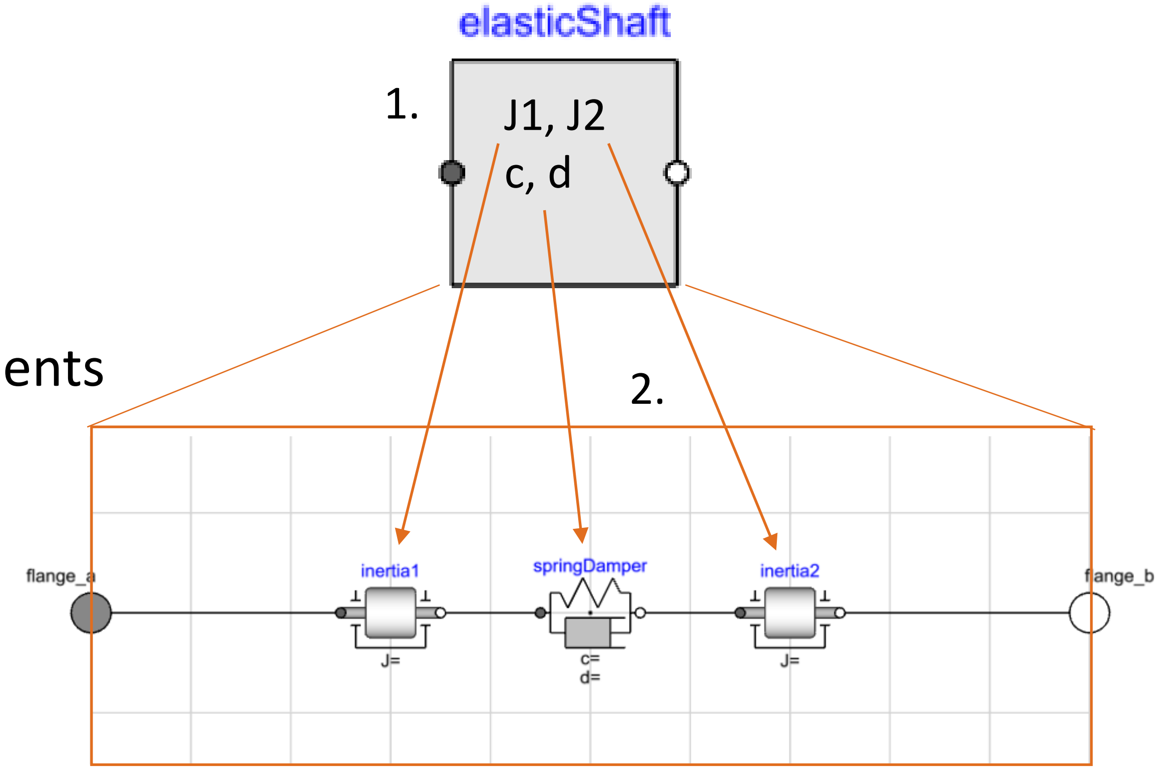
- When we use this model, we would like to be able to set the following properties in ElasticShaft
  - Inertia values, J1 and J2
  - Spring and damper values, c and d.

This can be done by:

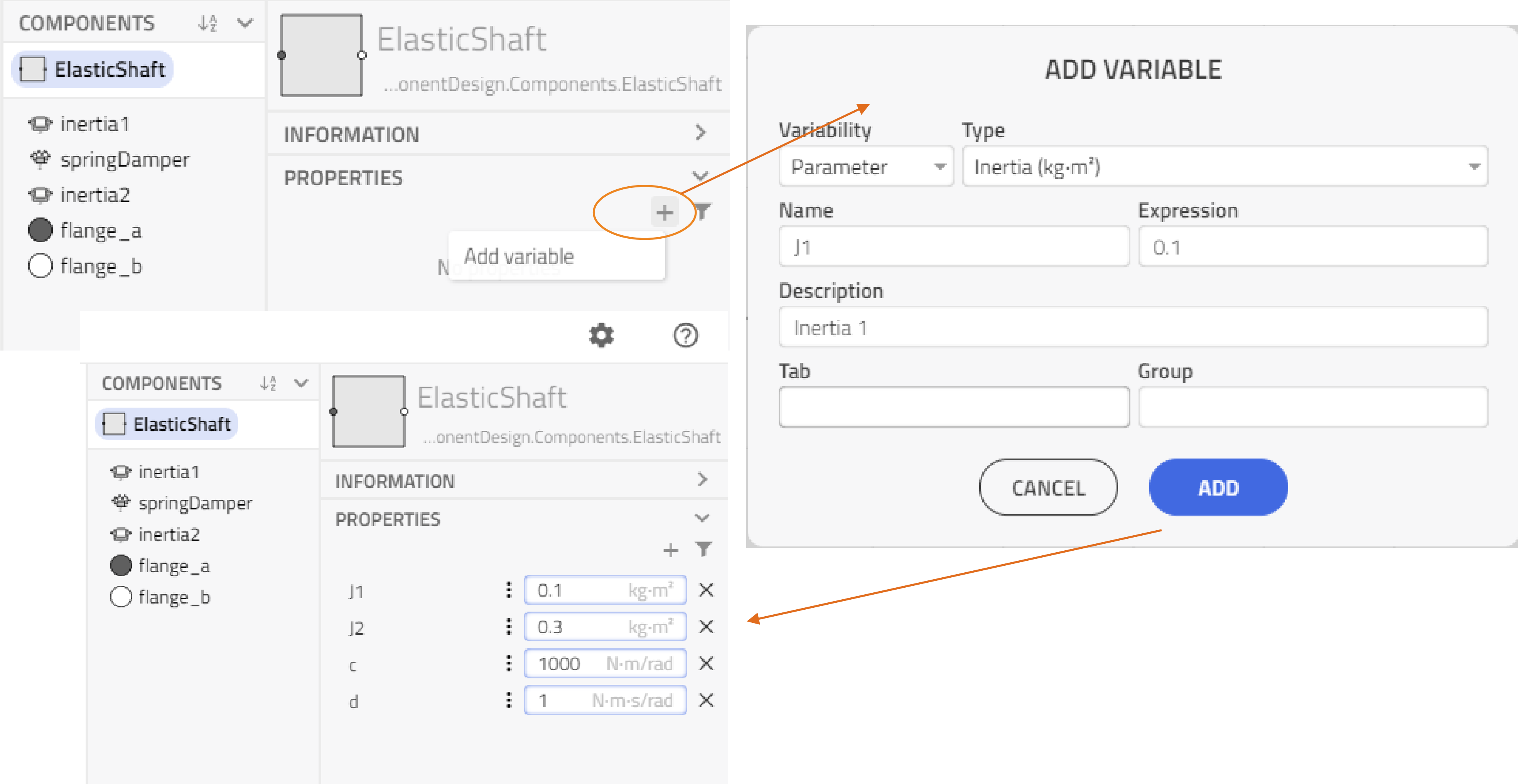
1. Define the parameters in ElasticShaft

2. Use them as modifiers in the sub-components

This is called parameter propagation



CREATING A NEW PARAMETER



ADD VARIABLE

Variability: Parameter

Type: Inertia (kg·m²)

Name: J1

Expression: 0.1

Description: Inertia 1

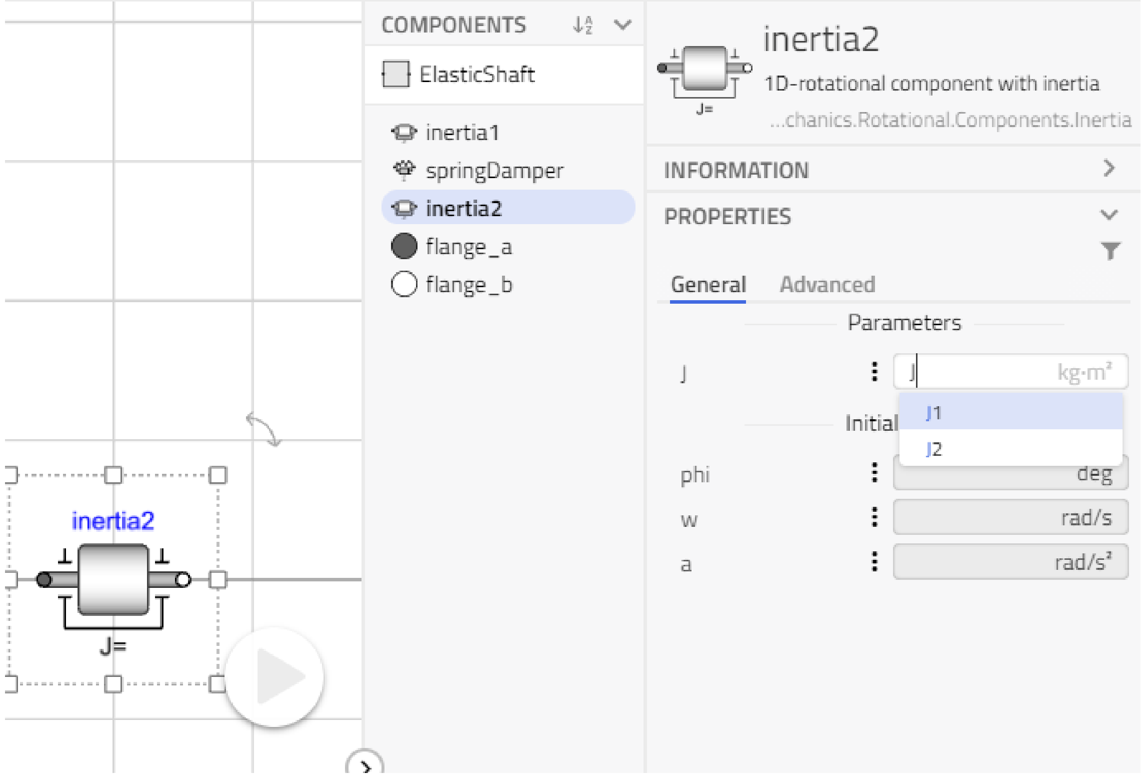
Tab:

Group:

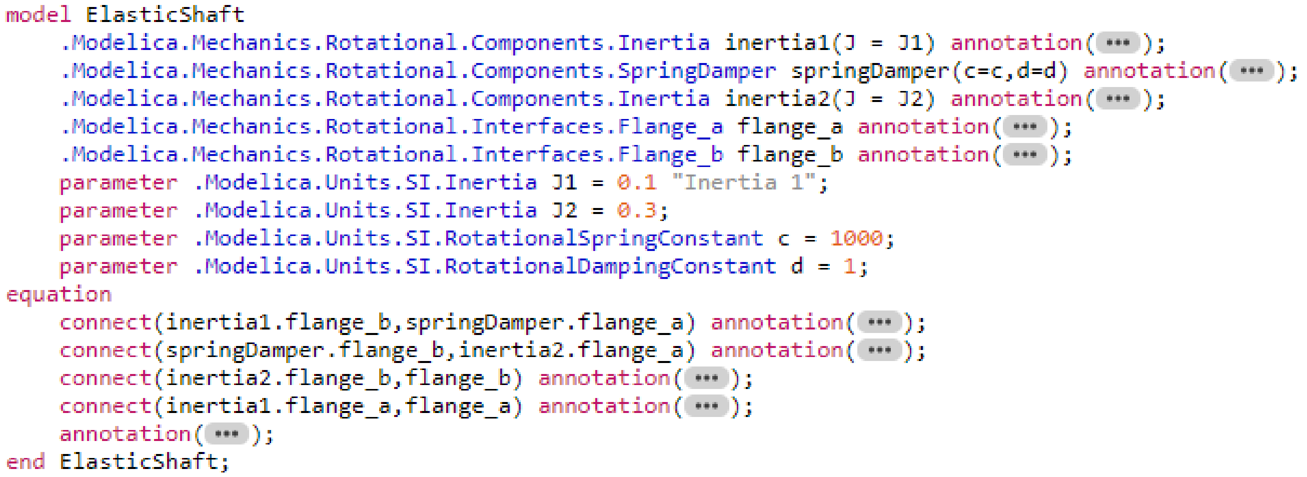
J1	0.1	kg·m²
J2	0.3	kg·m²
c	1000	N·m/rad
d	1	N·m·s/rad

MODIFY THE SUBCOMPONENTS VALUES

In properties tab:



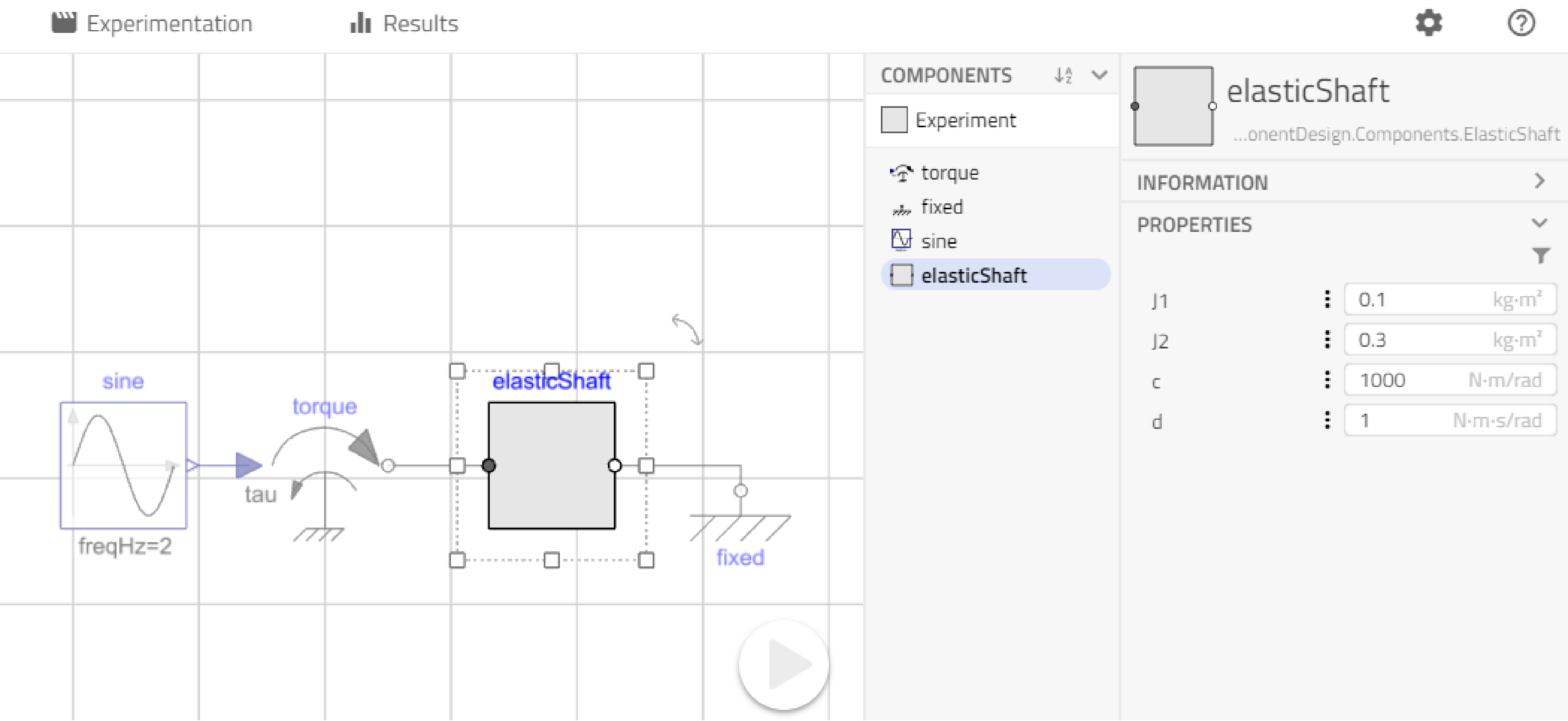
In code editor:



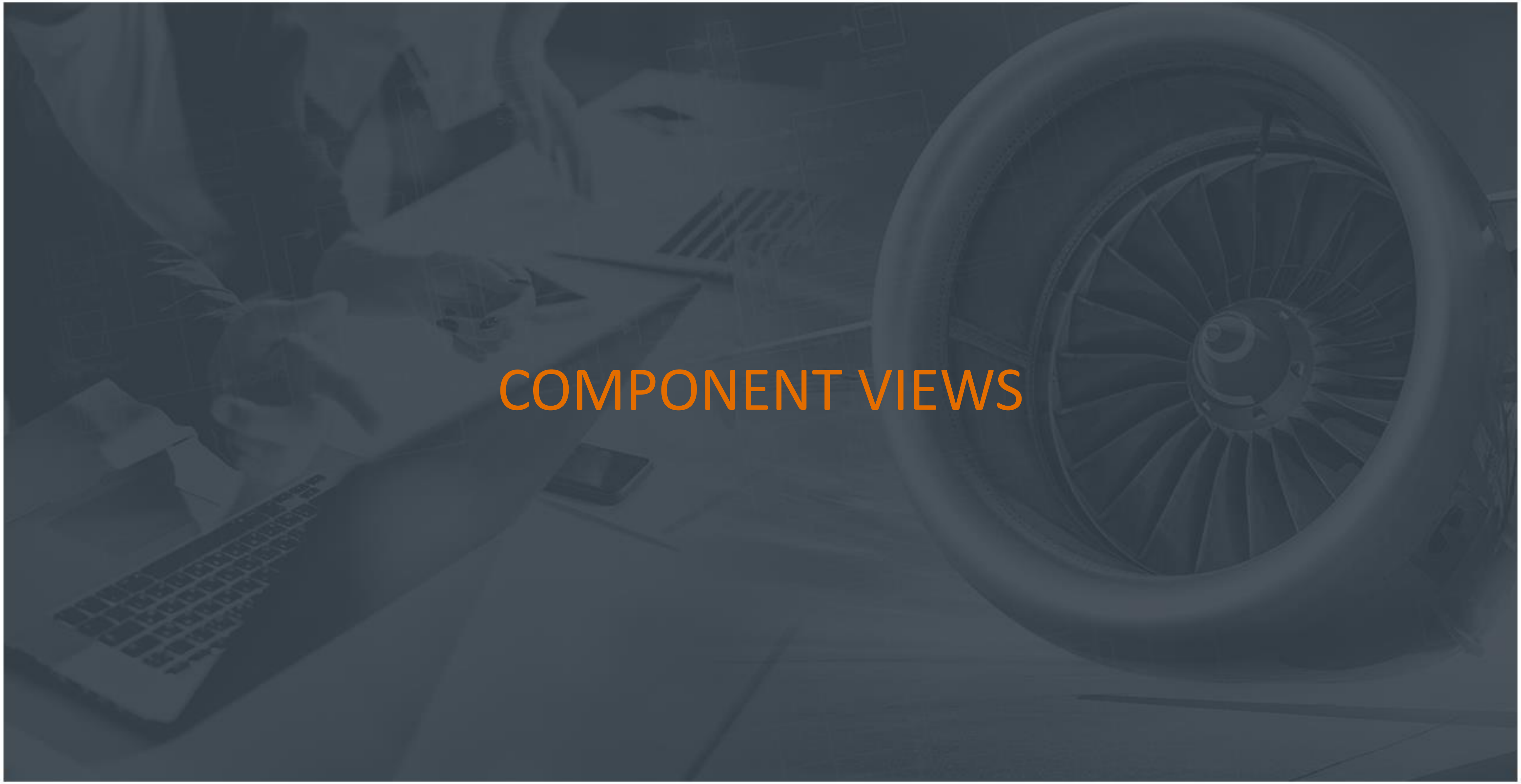
```
model ElasticShaft
    .Modelica.Mechanics.Rotational.Components.Inertia inertia1(J = J1) annotation(•••);
    .Modelica.Mechanics.Rotational.Components.SpringDamper springDamper(c=c,d=d) annotation(•••);
    .Modelica.Mechanics.Rotational.Components.Inertia inertia2(J = J2) annotation(•••);
    .Modelica.Mechanics.Rotational.Interfaces.Flange_a flange_a annotation(•••);
    .Modelica.Mechanics.Rotational.Interfaces.Flange_b flange_b annotation(•••);
    parameter .Modelica.Units.SI.Inertia J1 = 0.1 "Inertia 1";
    parameter .Modelica.Units.SI.Inertia J2 = 0.3;
    parameter .Modelica.Units.SI.RotationalSpringConstant c = 1000;
    parameter .Modelica.Units.SI.RotationalDampingConstant d = 1;
equation
    connect(inertia1.flange_b,springDamper.flange_a) annotation(•••);
    connect(springDamper.flange_b,inertia2.flange_a) annotation(•••);
    connect(inertia2.flange_b,flange_b) annotation(•••);
    connect(inertia1.flange_a,flange_a) annotation(•••);
    annotation(•••);
end ElasticShaft;
```

Both ways are equivalent!

USING THE FINISHED MODEL



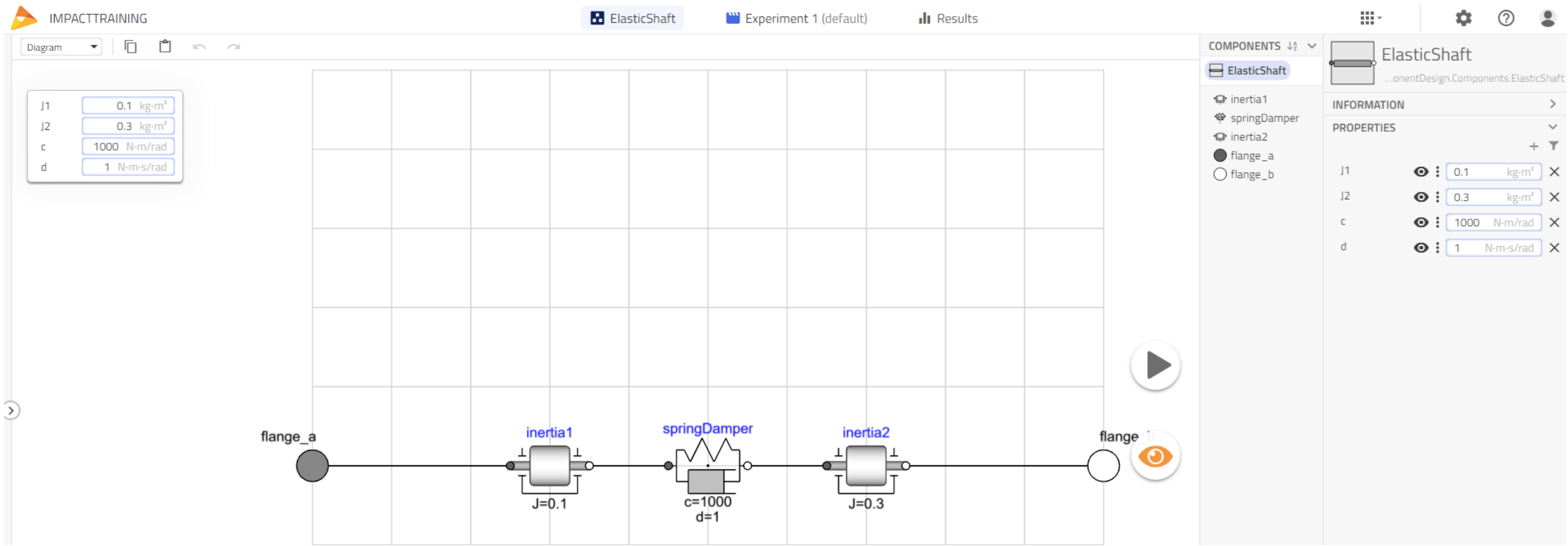
J1	0.1	kg·m²
J2	0.3	kg·m²
c	1000	N·m/rad
d	1	N·m·s/rad



COMPONENT VIEWS

COMPONENT VIEW

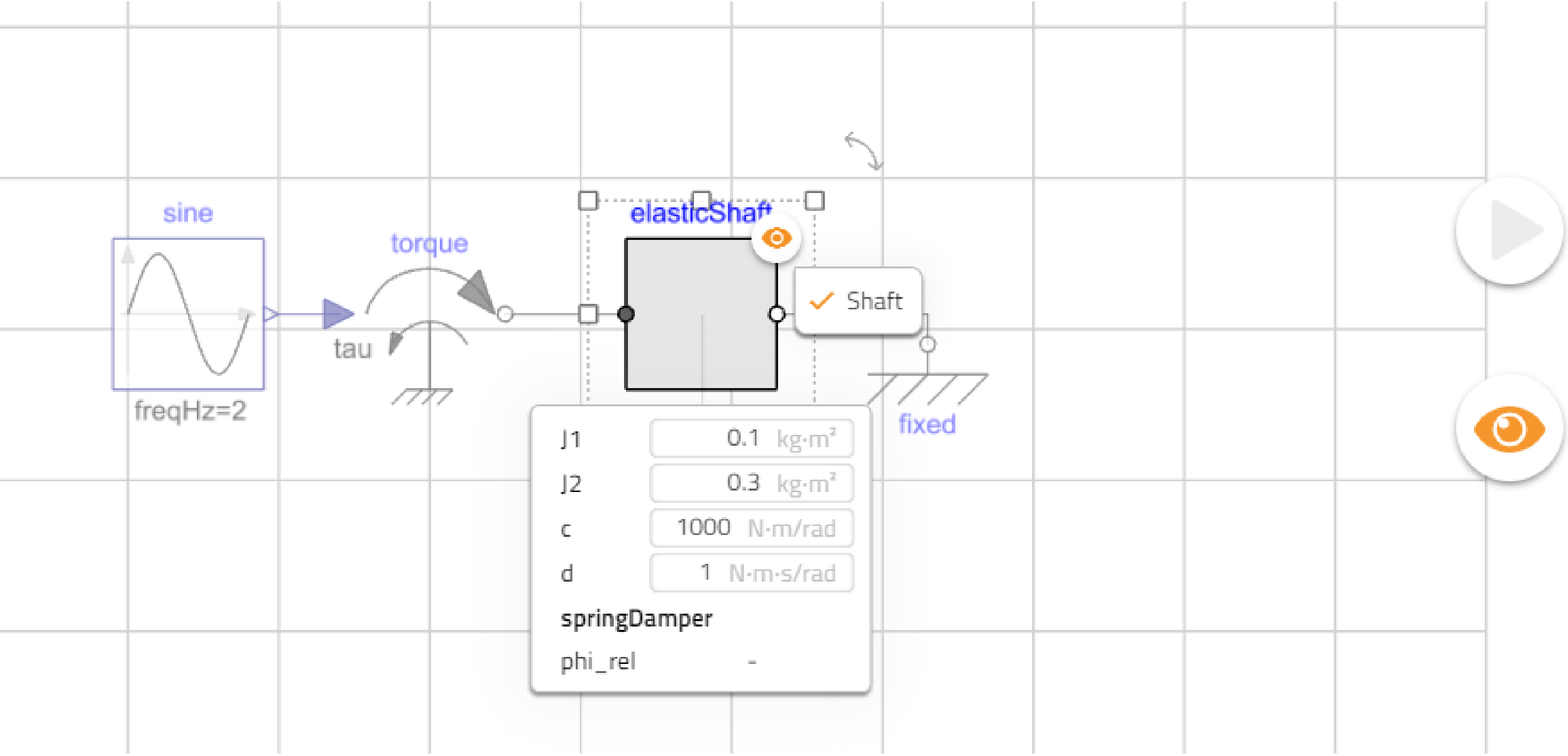
- A view defined inside a component model, can be reused in a system model



J1	0.1	kg·m²
J2	0.3	kg·m²
c	1000	N·m/rad
d	1	N·m·s/rad

COMPONENT VIEW

- The view can be activated by clicking 👁 on the specific instance.



J1 0.1 kg·m²

J2 0.3 kg·m²

c 1000 N·m/rad

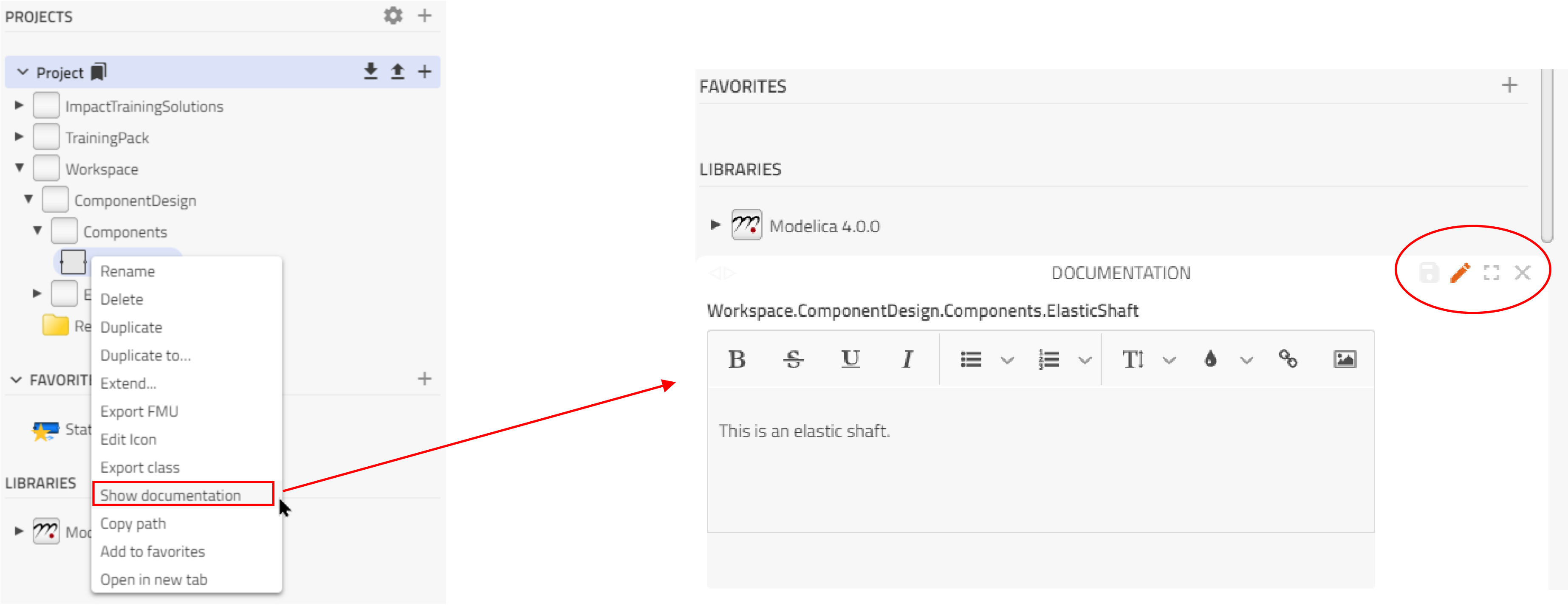
d 1 N·m·s/rad

springDamper

phi_rel -

ICON EDITOR AND DOCUMENTATION EDITOR

DOCUMENTATION EDITOR

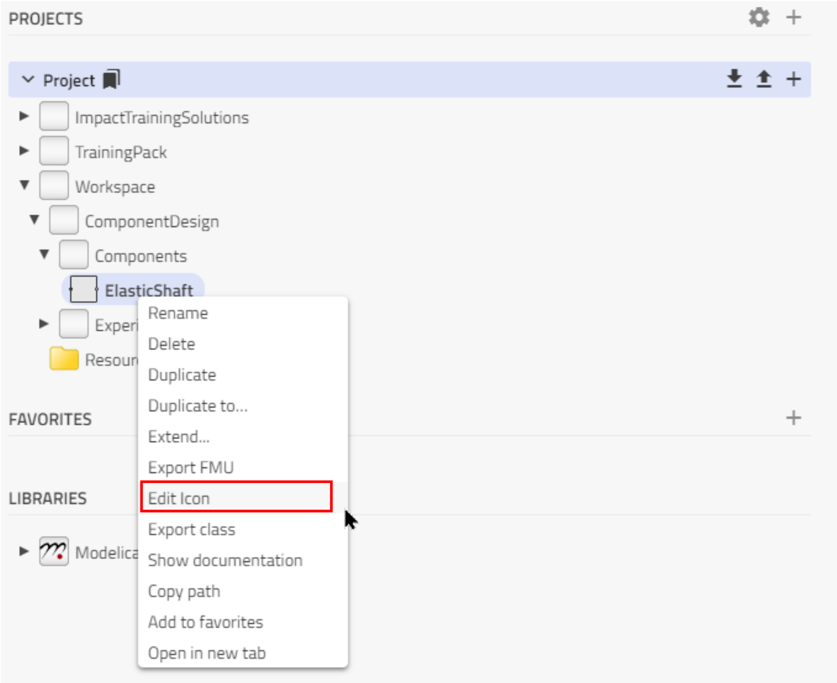


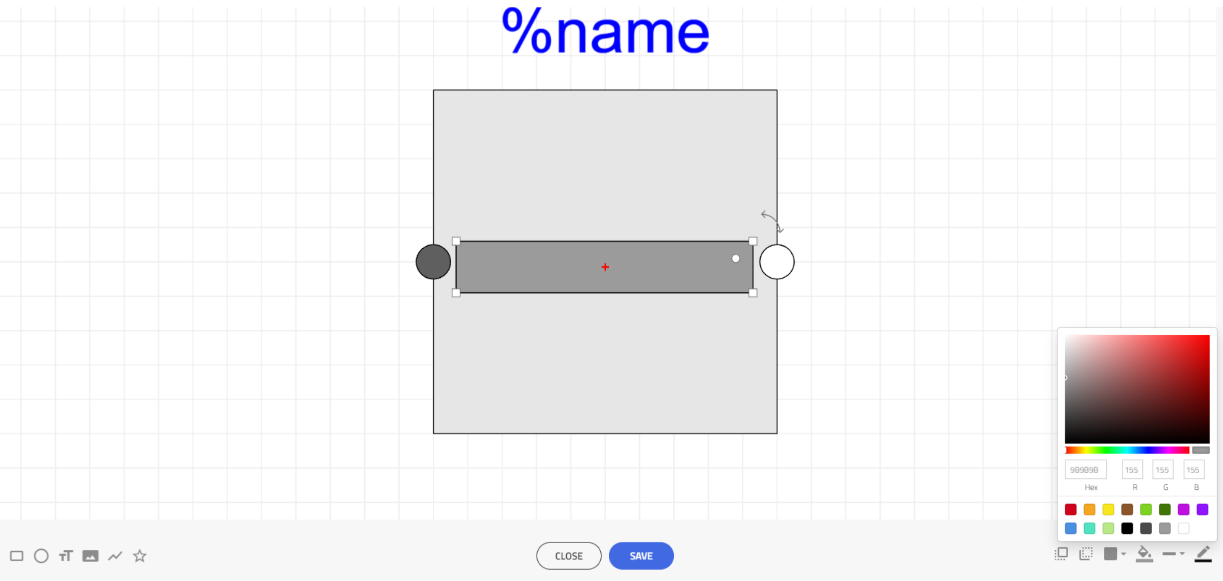
Workspace.ComponentDesign.Components.ElasticShaft

This is an elastic shaft.

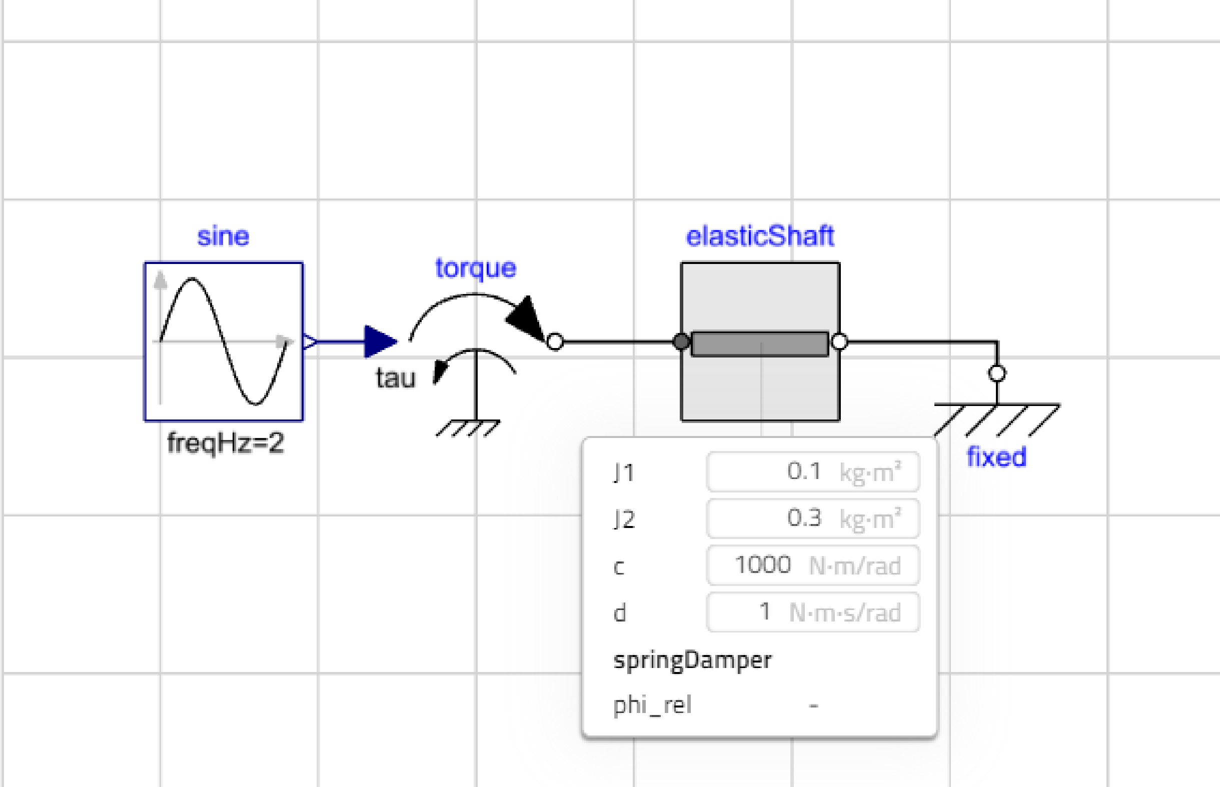
ICON EDITOR

- Draw an icon using simple primitives, or import an image.





COMPONENT READY



J1 0.1 kg·m²

J2 0.3 kg·m²

c 1000 N·m/rad

d 1 N·m·s/rad

springDamper

phi_rel -

WORKSHOP 1.3

In this workshop you will:

- Create a component interface
    - Add connectors
    - Add and propagate parameters
- Test the component in a rig
- Add an Icon and Documentation