



Forward. For all.

Getting the most out of KULI: Tips & tricks

Christoph Plakolm and Ayaka Weiss

2025-15-05 Simulation Conference 2025



Agenda

01 Tricks to use KULI UI Efficiently

02 Pressure Drop at Different Temperatures

03 FMU Co-Simulation

04 Online Library

Tricks to use KULI UI Efficiently

Five Best Tricks

Five Best Tricks

1. Ctrl+C
2. Ctrl+R
3. Move Guidance
4. F1
5. Layout Setting

Icon	Description
	Next you have to create a COM object. Click on the toolbar button Insert COM controller and place the new symbol on the page Circuits / Air Path. Connect your sensor to the COM object. Then double-click on the icon of your COM object in the graphics network. As a result you will see the following dialog.

COM

1.COM object

COM-ID: Coolant Temperature

Comment:

Type:

☐ Input

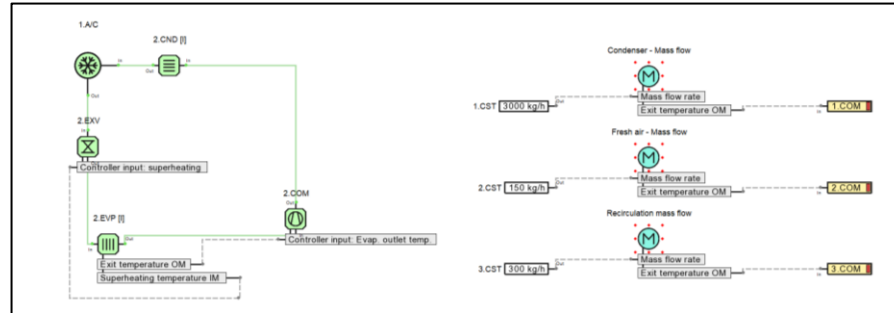
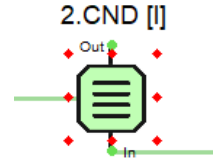
☒ Output

☐ Export connector

Unit: PC

OK Cancel

COM dialogue window



F1



Pressure Drop at Different Temperatures

Preparing Measurement Data for KULI

Background

Pressure drop at different temperatures

Coolant flow	[L/h]	1000	100	500	1000	1500	2000	500	1000
Coolant temperature	[°C]	30	70	70	70	70	70	-20	-20
Pressure drop	[mbar]	130	4	22	55	96	147	298	617

- Measurement data

→ illegal input!

- KULI uses dimensionless value pairs (Re, ζ) internally

$$Re = v \cdot \frac{L}{\nu} \quad \text{and} \quad \zeta = \frac{2 \cdot \Delta p}{v^2 \cdot \rho}$$

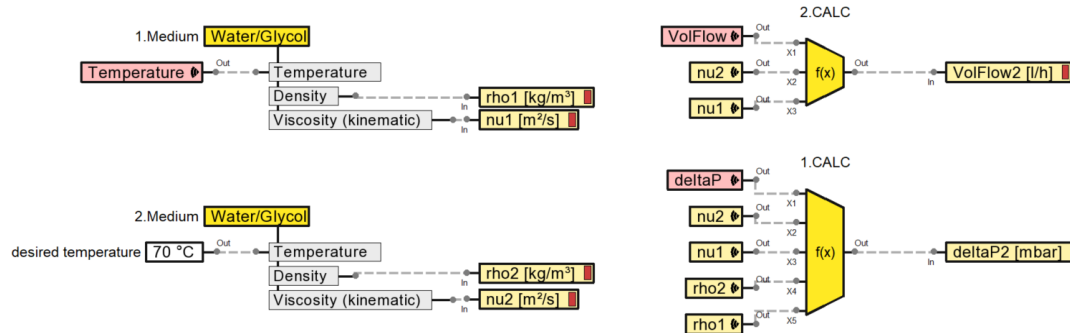
- “Convert” all points to a temperature of 70 °C while keeping the (Re, ζ) -pair the same

KULI Magic

Pressure drop at different temperatures

Coolant flow	[L/h]	23.09	46.18	100	398	500	1000	1500	2000
Coolant temperature	[°C]	70	70	70	70	70	70	70	70
Pressure drop	[mbar]	0.61	1.25	4	20.10	22	55	96	147

- “Convert” all points to a temperature of 70 °C while keeping the (Re, ζ) -pair the same



no undefined points!

Check Out our Online Library

Use the online search function

The screenshot displays the KULI - System generation software interface. The window title is "KULI - System generation [-]". The menu bar includes "File", "Simulation", "Tools", "View", and "Help". The toolbar contains various icons for file operations, simulation, and navigation. The main workspace shows "Simulation parameters" with a red "SP" icon. The right sidebar displays search results for "pressure drops at". The first result, "Pressure drops at different temperatures", is highlighted. Below it are "Heater matrix", "BATTM Convection", and "CCFC calibration".

Pressure drops at different temperatures
Overview
This article is designed to guide users on how to prepare measurement data for pressure differences so that the entire range of measurements can be utilized effectively. In most components in KULI, measurement data input for pressure drop needs to be defined for diff...

Heater matrix
Icon Component name
Heater matrix
The heater matrix is across flow tube heat exchanger which is typically used within a water circuit. This means that the inner side has a coolant medium while the outer side is usually t...

BATTM Convection
Model
The flow situation for the module can be defined for different situations: Flow around the module, Flow through the module

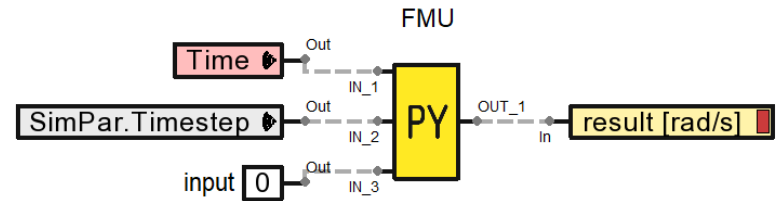
CCFC calibration
On this tab the CCFC can be calibrated to measured data for pressure drop inside / outside and heat transfer. Without successful calibration the component cannot be used for simulation. From Calibration method search bar one of the following options can be selected: Inner...

FMU Co-Simulation

Using the Python Controller (No Coding)

Functional Mock-up Interface

- Standardized interface for simulations
- Functional Mock-up Unit (FMU) = simulation model following FMI standard
- “Black Box”
 - define some inputs for each step in simulation
 - maybe define some parameters
 - receive some outputs
- Known by almost any simulation software
- Supported by KULI
 - export simulation models as FMU
 - include simulation models (using Python interface)



Setting up the Co-Simulation

How to include an FMU into a KULI simulation model

- Select module (.py file)
 - Set functions
 - Define outputs
 - Define units
-
- But... each FMU has different inputs/outputs
 - How to get the Python script without coding?

Component parameters

Python controller ID 1.PYC

Comment FMU

Python module ie_most_out_of_your_KULI\kuli\data\PythonScripts\CoupledClutches_forKULI.py

Function Cosimulate(current_time, kuli_time_step, inputs)

Initialization function setupFMU()

Termination function terminateFMU()

Inputs

Identifier	Function parameter	Comment	Unit
IN_1	current_time		s
IN_2	kuli_time_step		s
IN_3	inputs		-

Outputs

Identifier	Comment	Unit
OUT_1		rad/s

OK Cancel

Thermostat

MATLAB®
Simulink
co-simulation

Export results to
other formats
(.mf4, .csv, ...)

Battery
Charging

Phase
Change
Material

Transient
optimization

Visit our Online Library

<https://kulihelp.magna.com/wiki/spaces/KOL>

Hot Gas
Bypass

Live plots

Octovalve

Heat pumps

control COM
interface

Spray Cooling

Import
boundary
conditions
from Excel®



A long-exposure photograph of a multi-lane highway at night. The road surface is dark asphalt, and a concrete guardrail runs along the left side. In the distance, numerous light trails from cars are visible, creating vibrant streaks of red, yellow, and white against the dark sky. The text "Forward. For all." is overlaid in white on the left side of the image.

Forward.
For all.