Getting started with BatchReactor®

Use Case 1: simulation of the chlorotoluene chlorination

Software & Services In Process Simulation

We guide You to efficiency

ProSim

Introduction

This document presents the different steps to follow in order to simulate a batch reactor synthesis using BatchReactor software.

This presentation is based on a practical example: the chlorination of the chlorotoluene. This example is available on ProSim web site (www.prosim.net) or in the BatchReactor example directory.

The presentation includes 3 parts:

Part 1 – Example description

Part 2 – General description of the software interface

Part 3 – Description of the different steps to follow in order to run the simulation

Part 1 - Example description

Example description:

- Compounds and thermodynamic model
- Description of the reaction system
- Description of the equipment
- Operating mode

Compounds and thermodynamic model

The following compounds are involved in the simulation:

Name	Formula	CAS Number(*)
o-Chlorotoluene	C_7H_7Cl	95-49-8
Chlorine	Cl_2	7782-50-5
Benzyl dichloride	$C_7H_6Cl_2$	98-87-3
Hydrogen chloride	HCl	7647-01-0
Benzotrichloride	$C_7H_5Cl_3$	98-07-7
Nitrogen	N_2	7727-37-9

(*): CAS Registry Numbers® are the intellectual property of the American Chemical Society; and are used by ProSim SA with the express permission of CAS. CAS Registry Numbers® have not been verified by CAS and may be inaccurate

Compounds and thermodynamic model

The “NRTL” thermodynamic profile is selected, with the binary interaction parameters specified as follows (available parameters would be automatically loaded):

- Supplied for the following binaries:

Compounds		Cij0	Cji0	Aij0	CijT	CjiT	ajiT
o-Chlorotoluene	Benzyl dichloride	-707.3	775.31	0.1939	0	0	0
o-Chlorotoluene	Benzotrichloride	-1246	1463.5	0.1584	0	0	0
Benzyl dichloride	Benzotrichloride	64.339	-79.04	0.4097	0	0	0

- Equal to 0 for the other binaries (coming down to considering ideal thermodynamic behaviour)

Description of the reaction system

The reactor is initially composed of liquid chlorotoluene and is fed with vapor chlorine. Two chemical reactions are considered. For each reaction:

- The reaction takes place in the liquid phase
- The reaction heat is calculated from the standard enthalpies of formation
- The reaction is controlled by the kinetic
- The rate constant is calculated by the Arrhenius law:

$$k(T) = k^0 \exp^{\left(\frac{-Ea}{RT}\right)}$$

With:

k^0	Pre-exponential factor → Provided by the user
Ea	Activation energy → Provided by the user
R	Ideal gas constant
T	Temperature

Description of the reaction system

The **main reaction** is the following:

o-Chlorotoluene + Chlorine → Benzyl dichloride + Hydrogen chloride

(C_7H_7Cl) (Cl_2) ($C_7H_6Cl_2$) (HCl)

- Model expressed in molar concentrations
- Partial orders of 1 for the reactants and 0 for the products

Compound	Stoichiometry	Order
Chlorine	-1	1
o-Chlorotoluene	-1	1
Benzyl dichloride	1	0
Hydrogen chloride	1	0

- Kinetic parameters:

Pre-exponential factor (k^0)	$2.7203.10^{17}$ $s^{-1}(mol/l)^{-1}$
Activation energy (Ea)	130320 J/mol

Description of the reaction system

A **side reaction** is considered:

Benzyl dichloride + Chlorine → Benzotrichloride + Hydrogen chloride

($C_7H_6Cl_2$) (Cl_2) ($C_7H_5Cl_3$) (HCl)

- Model expressed in molar concentrations
- Partial orders of 1 for the reactants and 0 for the products

Compound	Stoichiometry	Order
Benzyl dichloride	-1	1
Chlorine	-1	1
Benzotrichloride	1	0
Hydrogen chloride	1	0

- Kinetic parameters:

Pre-exponential factor (k^0)	580 $s^{-1}(mol/l)^{-1}$
Activation energy (Ea)	42200 J/mol

Description of the equipment

Two streams feed the reactor: the first is for the reactant and the second is for nitrogen sweeping.

The reactor characteristics are the following:

- **Vessel**: torispherical vessel with a volume of 3m^3 and a diameter of 1400 mm
- **Mixing device**: 3 retreating-blades impeller with a diameter of 700 mm, located at 450 mm from the bottom and rotating at 90 rpm
- **Wall heat exchanger:** external jacket, 50 mm thick and 1700 mm high
- **Wall materials:** stainless steel 316 with a thickness of 17 mm

Description of the equipment

- **Utility fluid:**
  - Hot utility: 200 kg/h of steam at 6 bar
  - Cold utility: 4000 kg/h of water at 25°C
- **Thermal inertia:** the reactor is made of a material that has a weight of 800 kg and a specific heat of 500 J/kg/K
- **Heat losses:** negligible

Description of the equipment

- The reactor is closed and equipped with a two-stages condenser. A vapor output stream is leaving the second stage
- The liquid condensates are collected in the storage tank
- The characteristics of the first condensation stage are the following:
  - Exchange area: 15 m^2
  - Global heat exchange coefficient: 300 kcal/h/m^2/°C
  - Utility: 3000 kg/h of water at 20°C
- The characteristics of the second condensation stage are the following:
  - Exchange area: 0.5 m^2
  - Global heat exchange coefficient: 300 kcal/h/m^2/°C
  - Utility: 100 kg/h of a thermal fluid composed of ethylene glycol 40% available at 15°C
- Pressure drop in both stages are neglected

Operating mode

The reactor is initially composed of 2400 kg of chlorotoluene at 25°C and atmospheric pressure.

- **First step: heating**

The reactor is heated, maintaining a total reflux, until 58°C is reached. The reactor inerting is performed using a nitrogen stream with a flowrate of 1 kg/h at 25°C and atmospheric pressure. The reactor pressure is kept at atmospheric pressure.

Operating mode

- **Second step: reaction**

The reactor is fed during 13 hours with 60 kg/h of chlorine at 3 bar and 25°C. The nitrogen sweeping is maintained. The reactor temperature is controlled at a value of 62°C by acting on the cooling water flowrate.

A PID controller is used, with the following parameters:

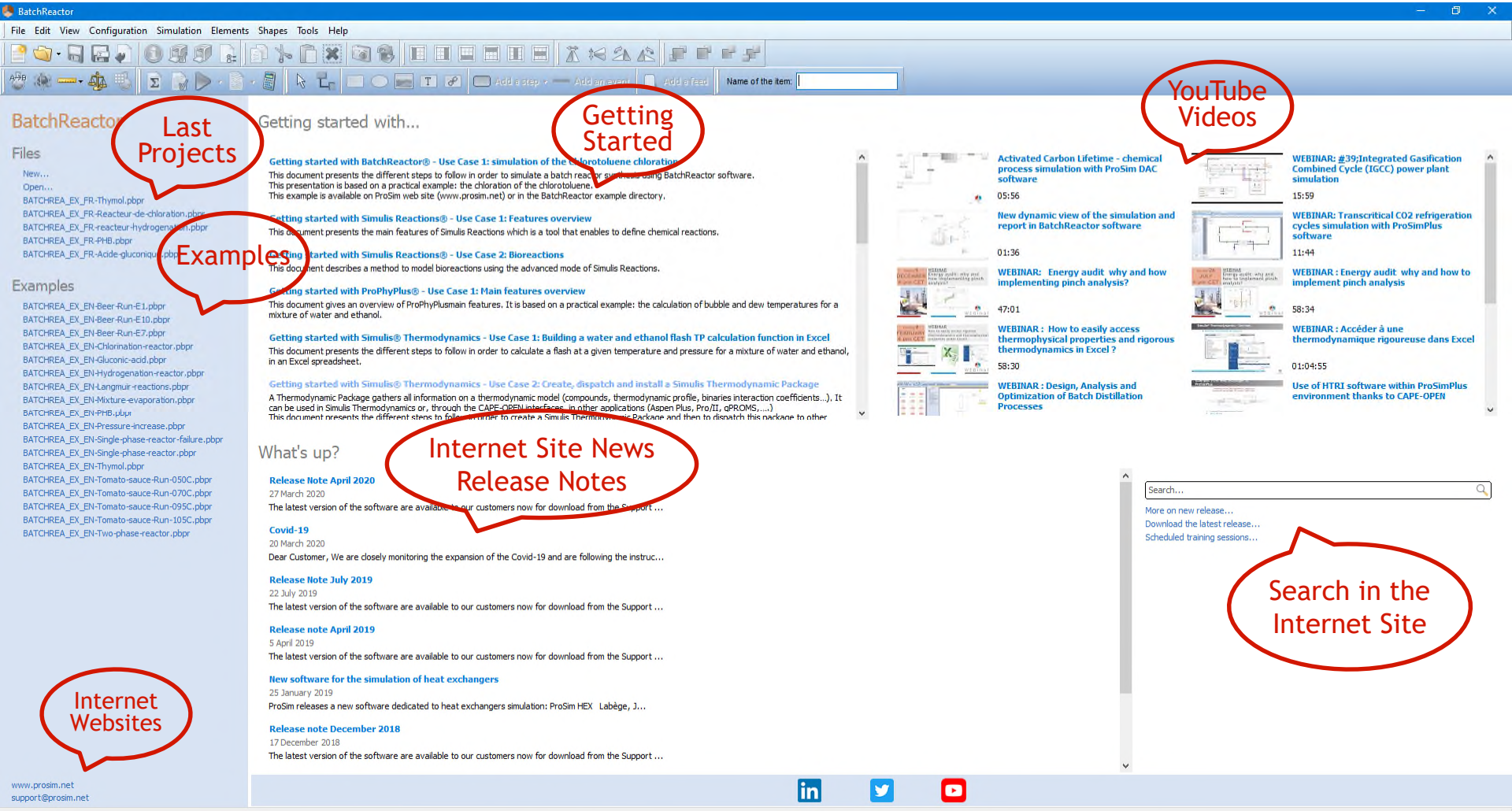
- Minimum / maximum values: 59°C / 65°C
- Type: feedback
- PID parameters: Gain = -5, Ti = 500 s, Td = 0
- Sample rate: 10 s
- Valve regulation: the valve equation is based on an “exponential” type and the Cv equals 30

Part 2 - General description

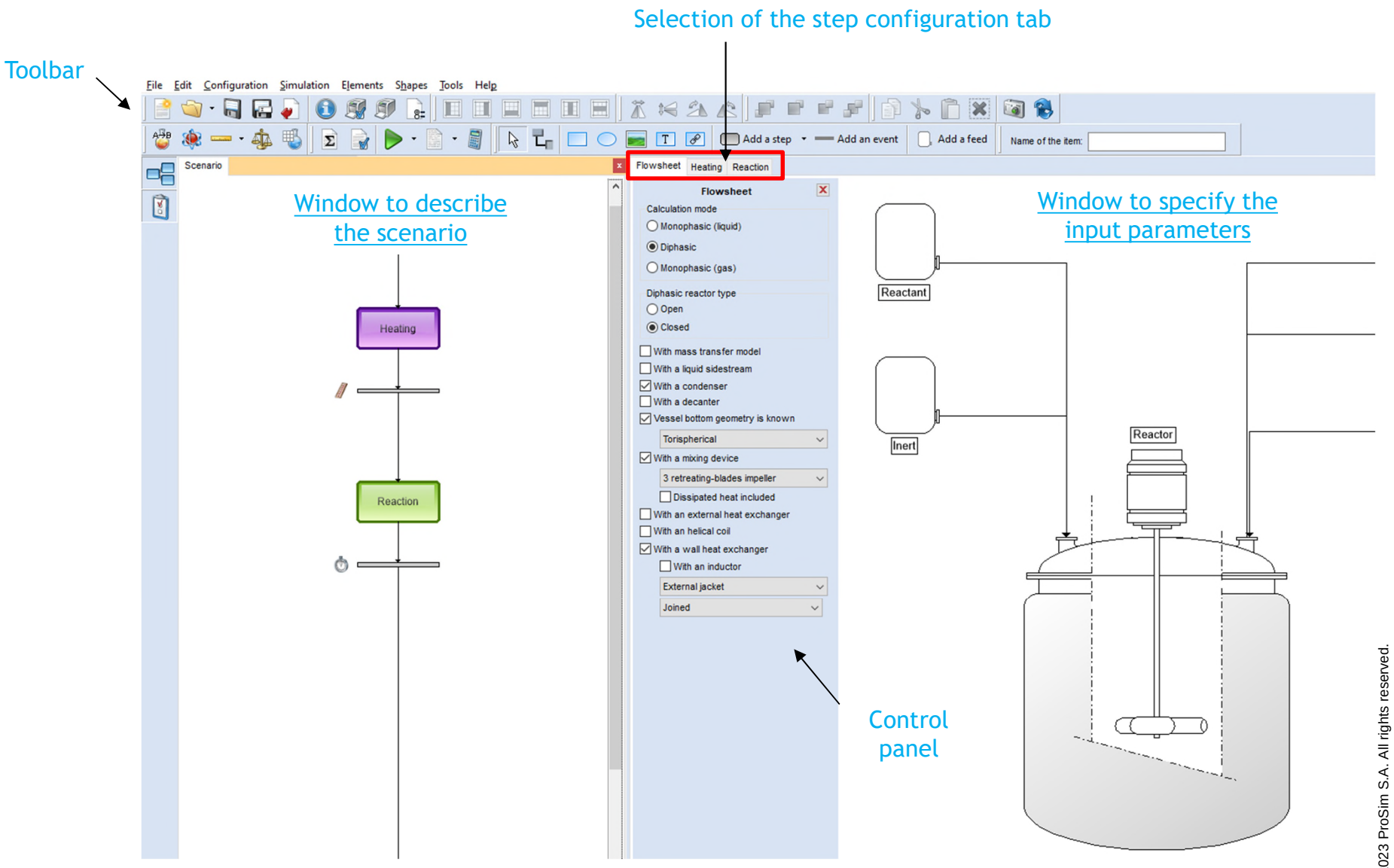
General description of the software interface:

- Home page
- Main window
- Toolbar
- Creating a new simulation file
- Selecting the unit system

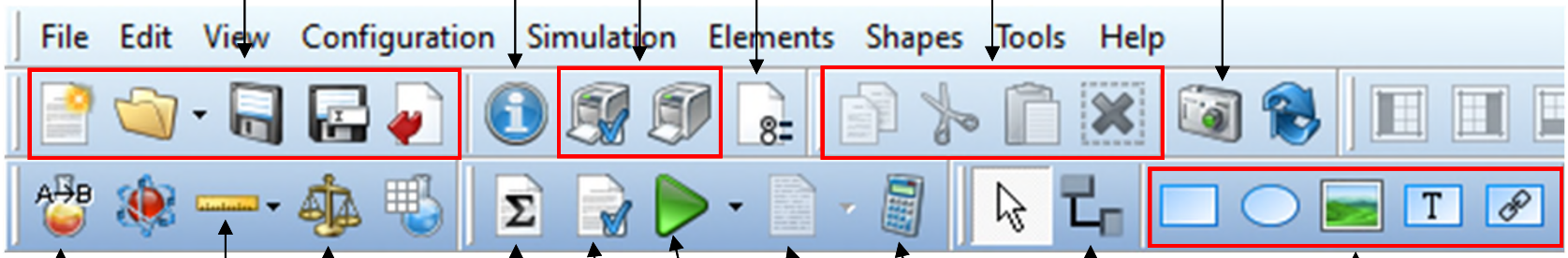
Home page



Main window



Toolbar



Copy the picture of the flowsheet
(to use it in an other document)

Print and print set up

Management
(new, open, save, save as, close)

Sheet properties

Synopsis

Copy, cut, paste,
delete an item

Compounds,
thermodynamics,
chemical reactions

Units
(inlet data and results)

Unit
conversion
tool

Numerical
parameters

Report
parameters

Run a
simulation

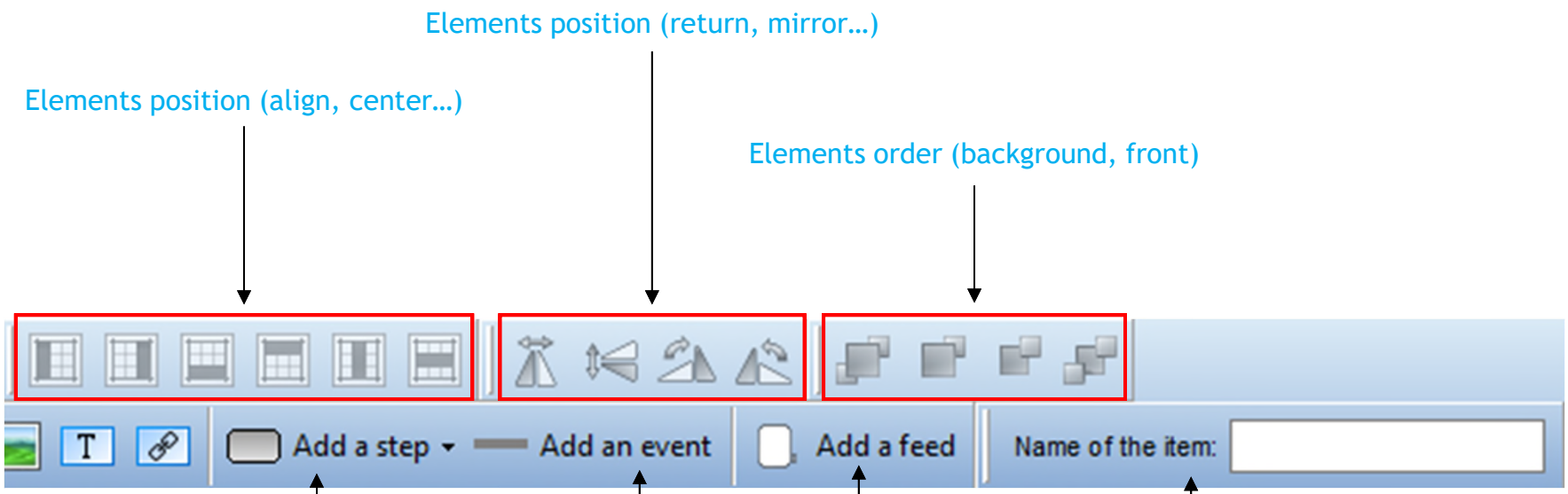
Results of the last
simulation

Calculate

Connection of steps, events

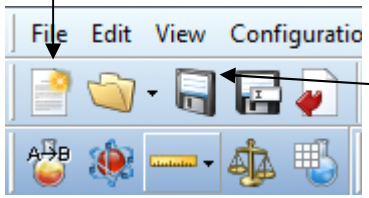
Graphical objects
(forms, pictures, texts, links)

Toolbar



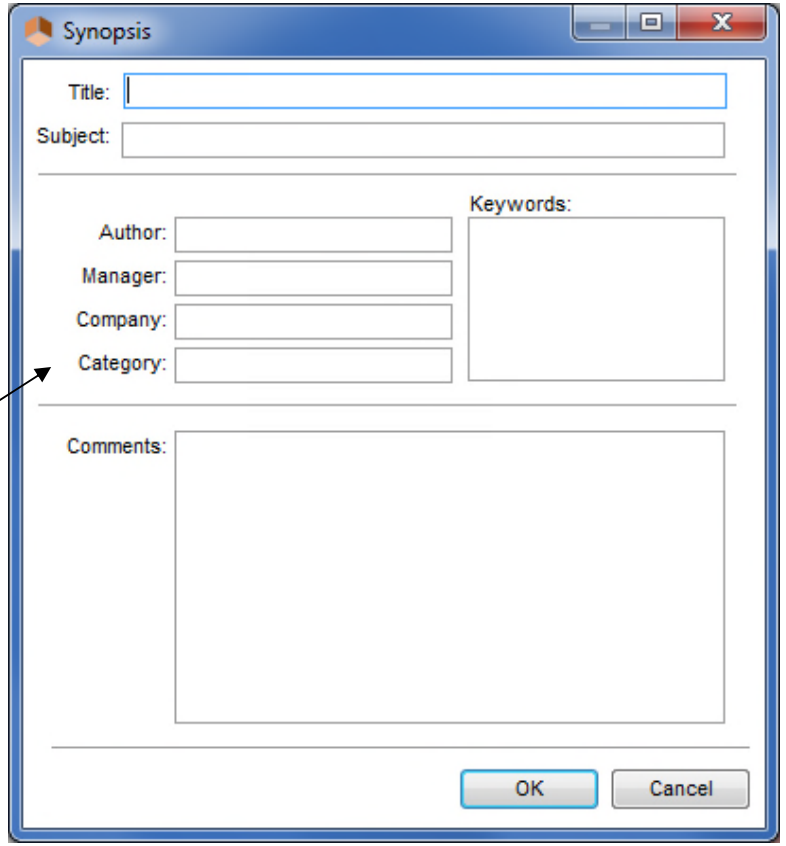
Creating a new simulation file

1- Click on « create a new document »



2- Save the file

3 – Fill the synopsis form (optional)

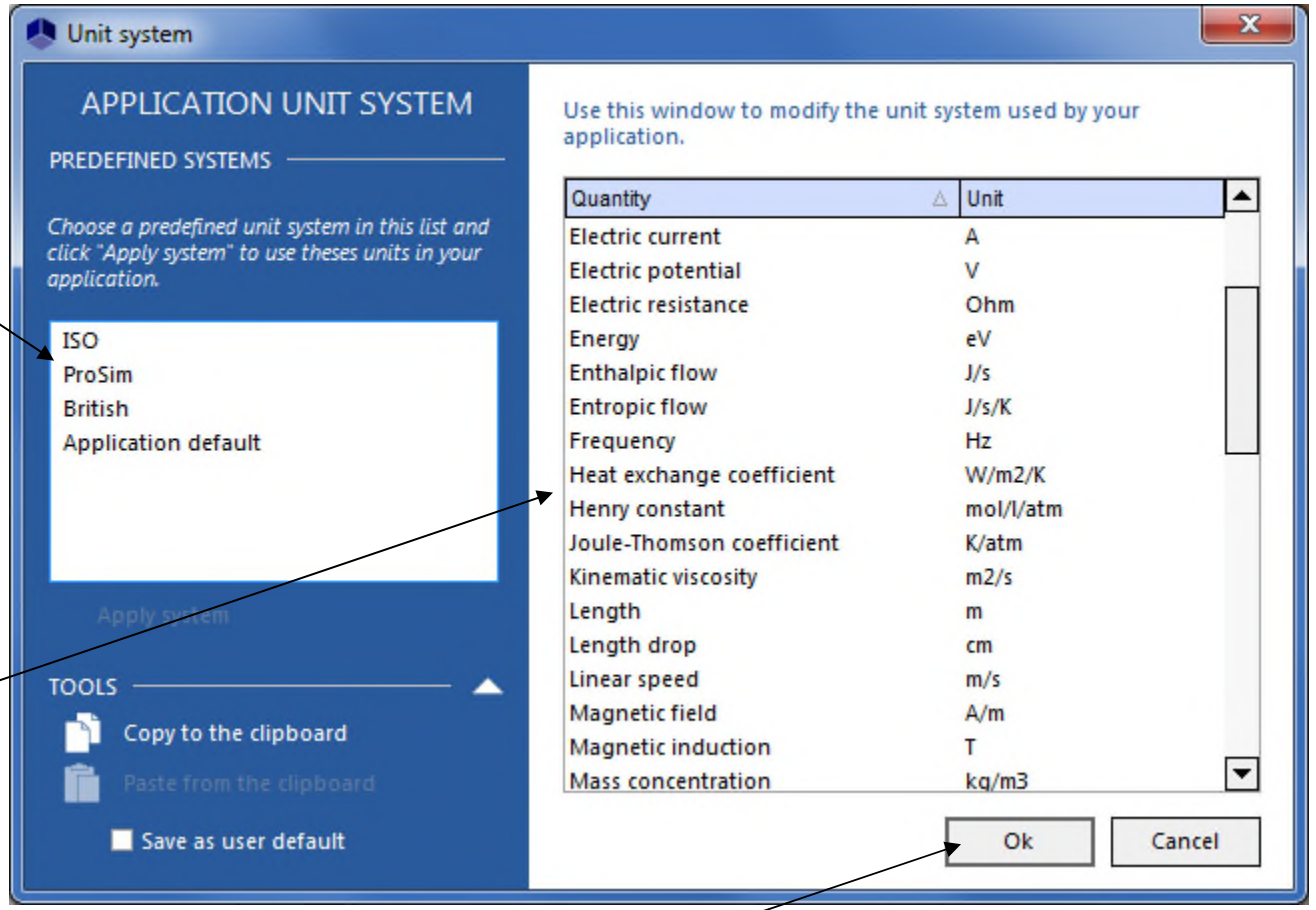


Choosing the unit system

Click on this icon in order to configure the unit system

1- Select a predefined unit system and click on “Apply system”

2- You can then customize the unit system



3- Click on “OK” to validate

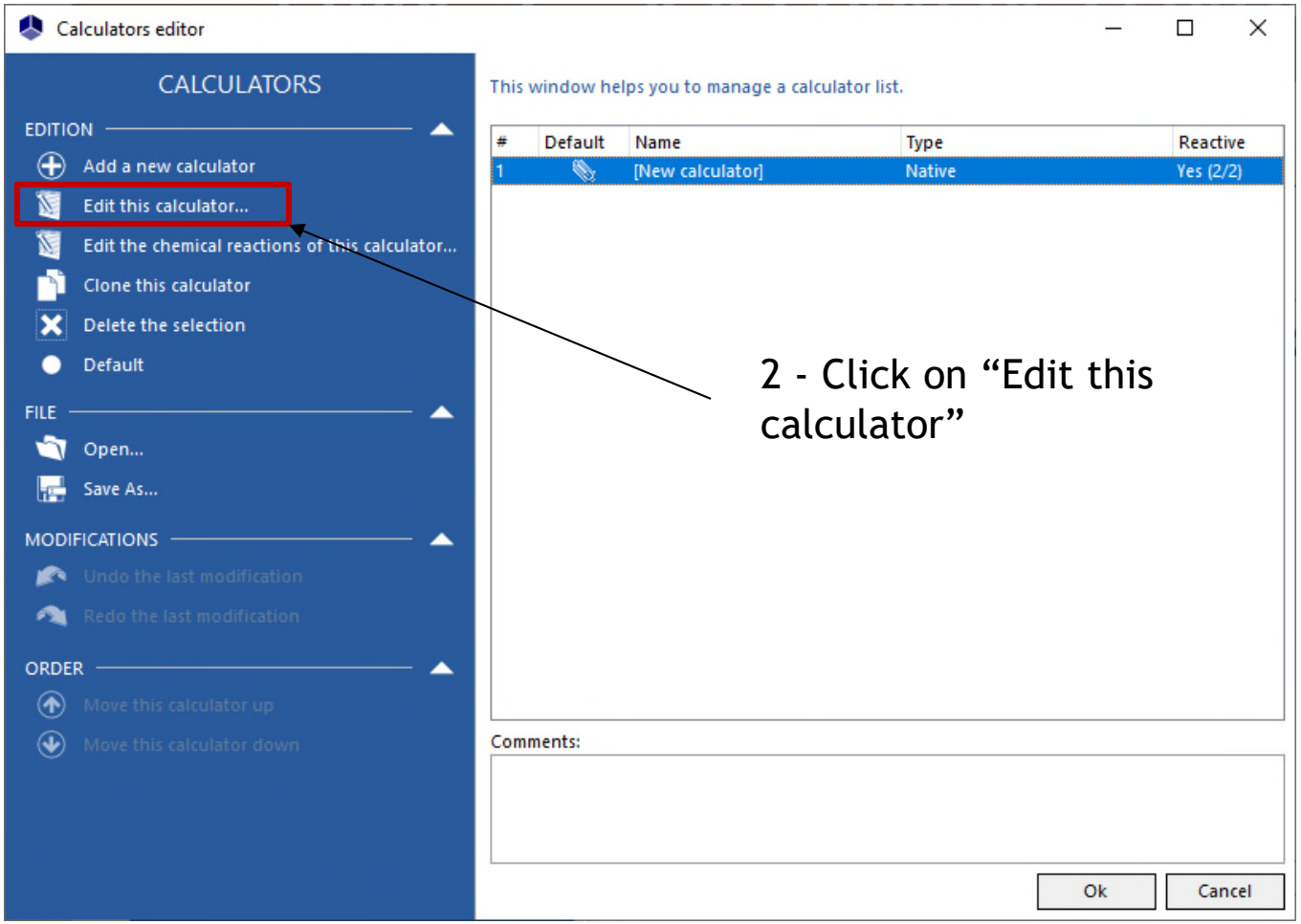
Part 3 - Simulation

Description of the different steps to simulate the example

- Step 1: Select the compounds
- Step 2: Select the thermodynamic model
- Step 3: Describe the chemical reactions
- Step 4: Describe the equipment
- Step 5 : Describe the operating steps
- Step 6: Run the simulation
- Step 7: Analyze the simulation results

Step 1: Select the compounds

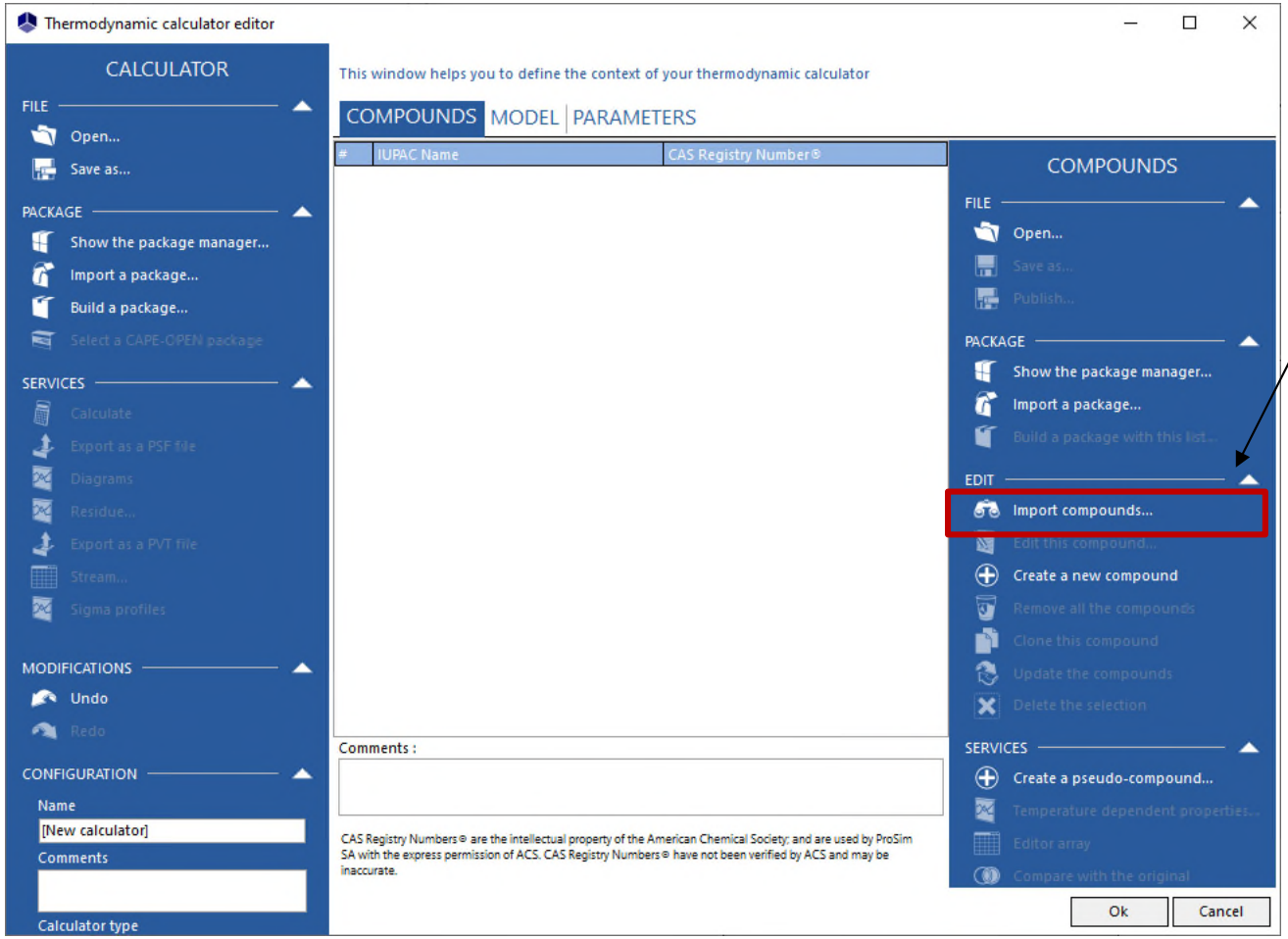
1 - Click on the icon “Edit the thermodynamic and the compounds”



2 - Click on “Edit this calculator”

For more information about selecting and editing the compounds, please consult *“Getting started with Simulis Thermodynamics, use case 1”*

Step 1: Select the compounds

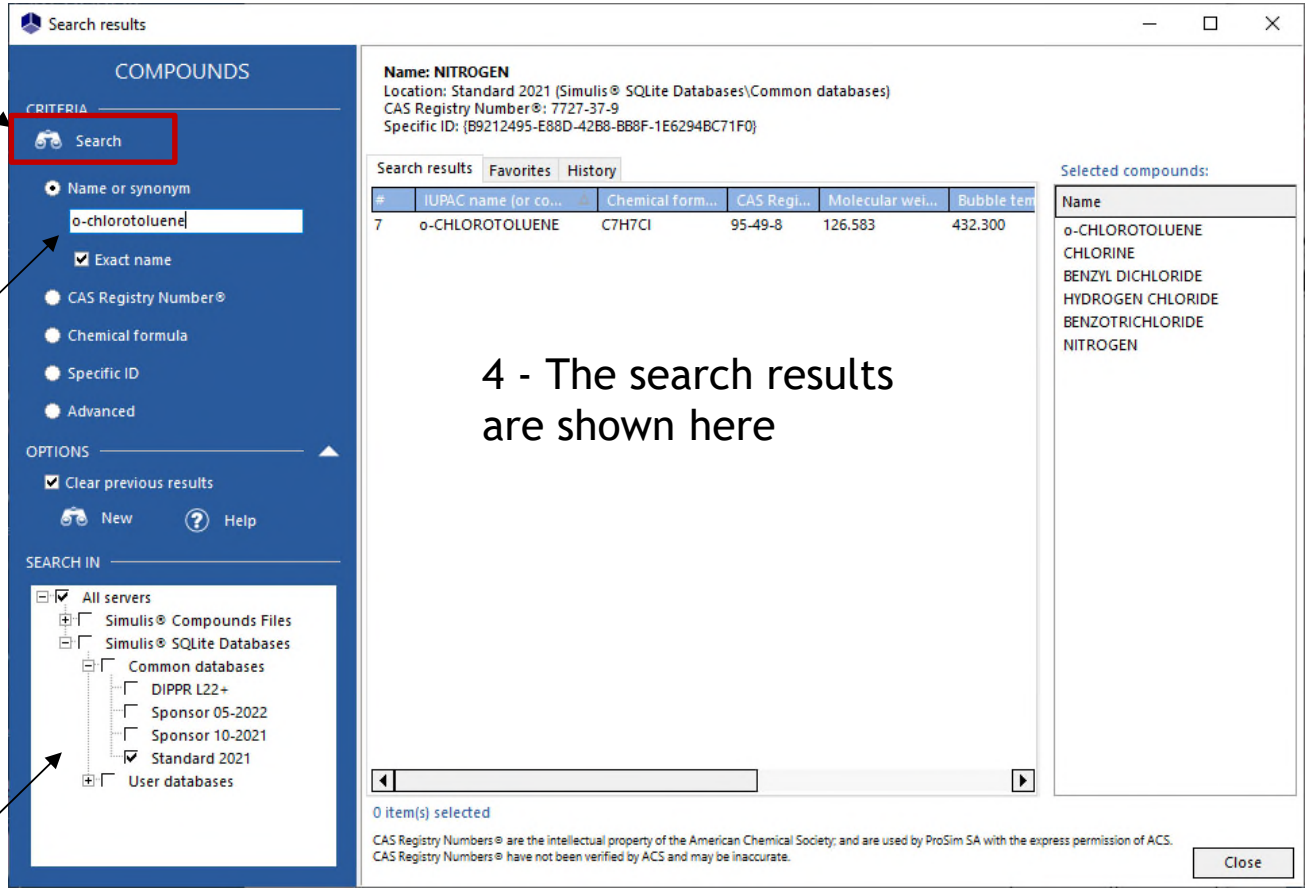


Click here to import the compounds from the database

Step 1: Select the compounds

3 - Press “Enter” or click on “Search” to display the list of compounds that match your criteria

2 - Multiple different research criteria can be used (in the example, research “o-chlorotoluene” by its name)

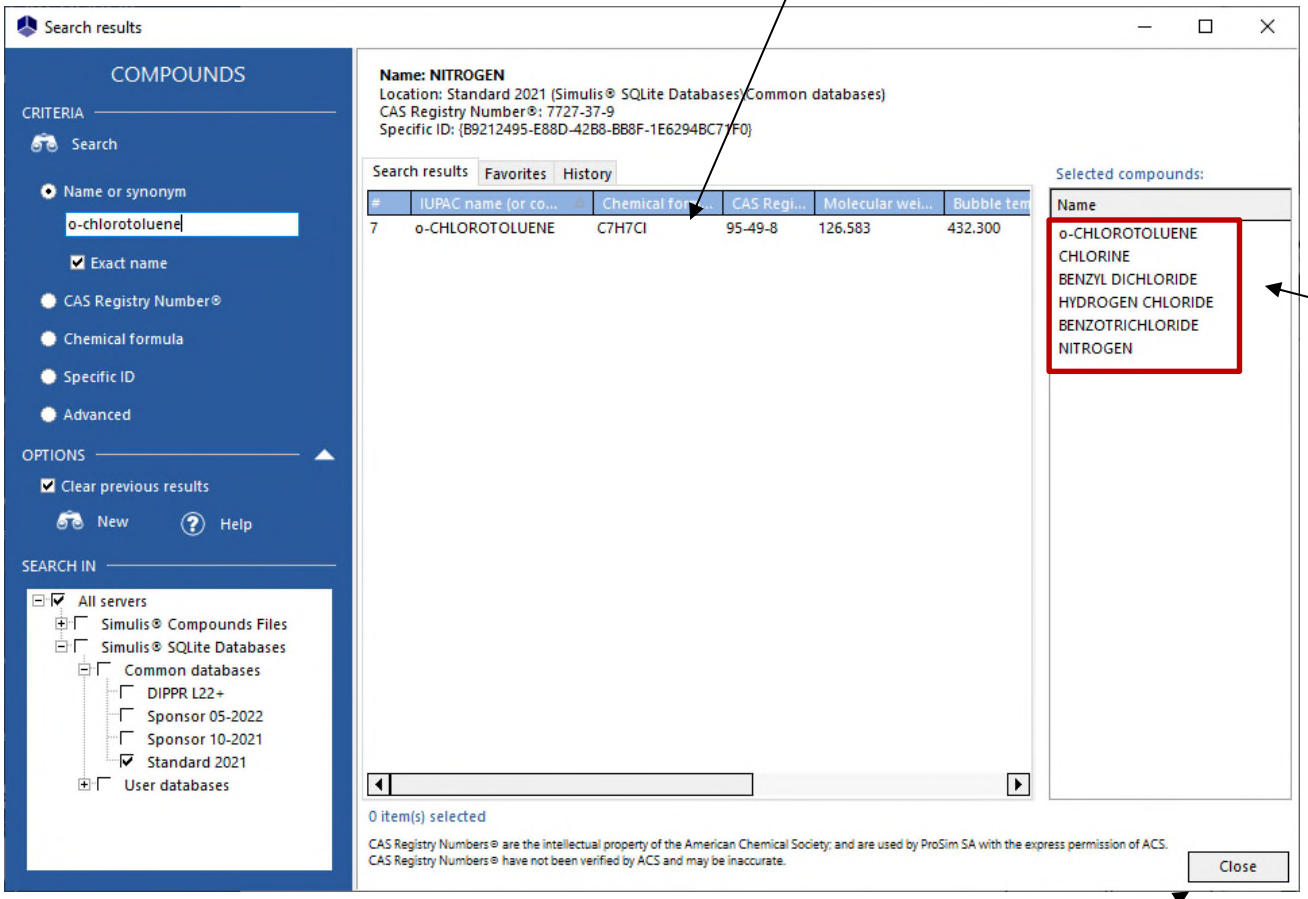


4 - The search results are shown here

1 - Select the compounds server in which you want make the researches (by default, select the most recent one)

Step 1: Select the compounds

1 - Double click on the compound to add it to your final selection



2 - Repeat the operation for the other compounds

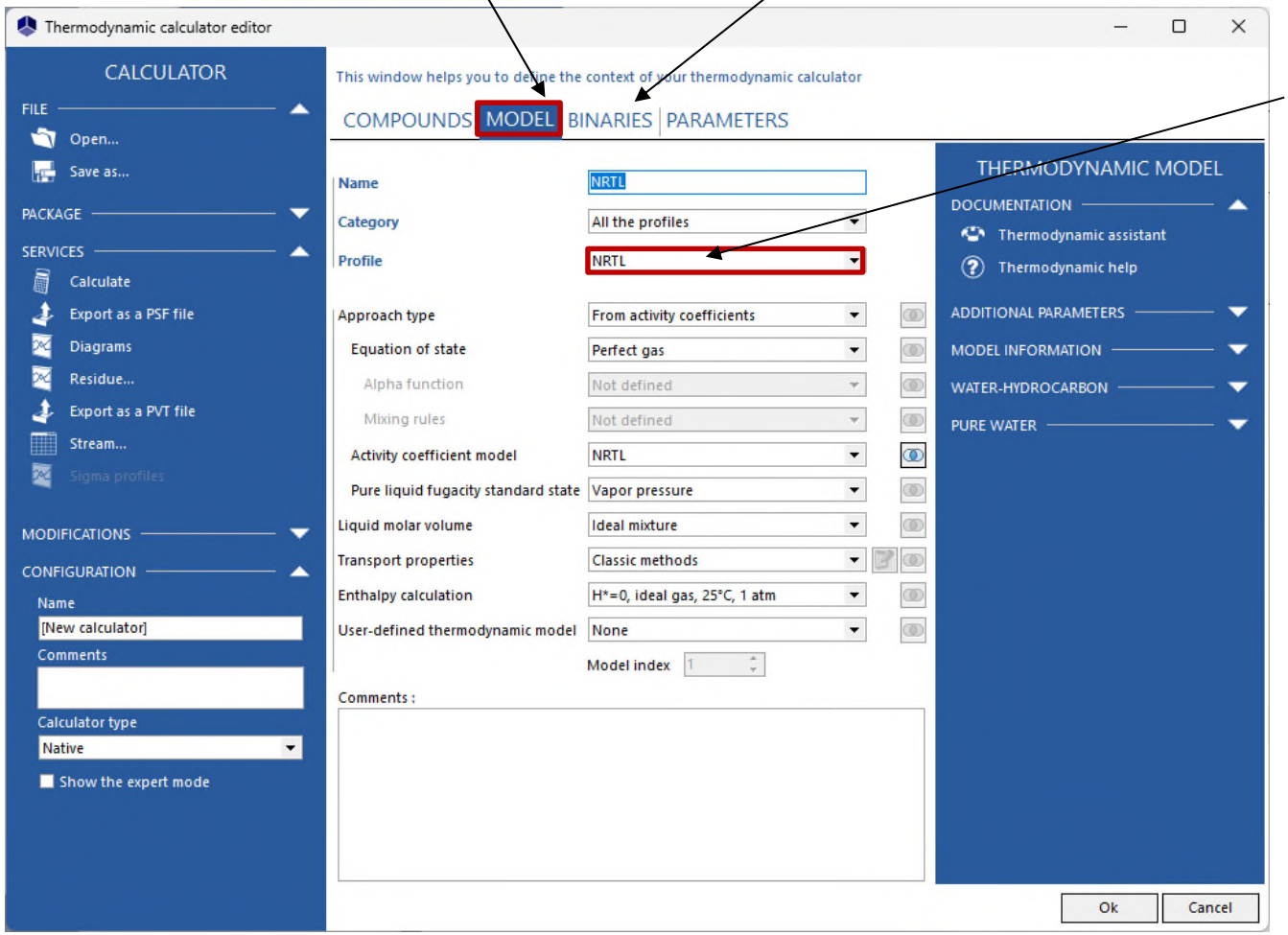
3 - Click on “Close” to end the compounds selection process

Step 2: Select the thermodynamic model

1 - Click on the “Model” tab to access the thermodynamic model editor

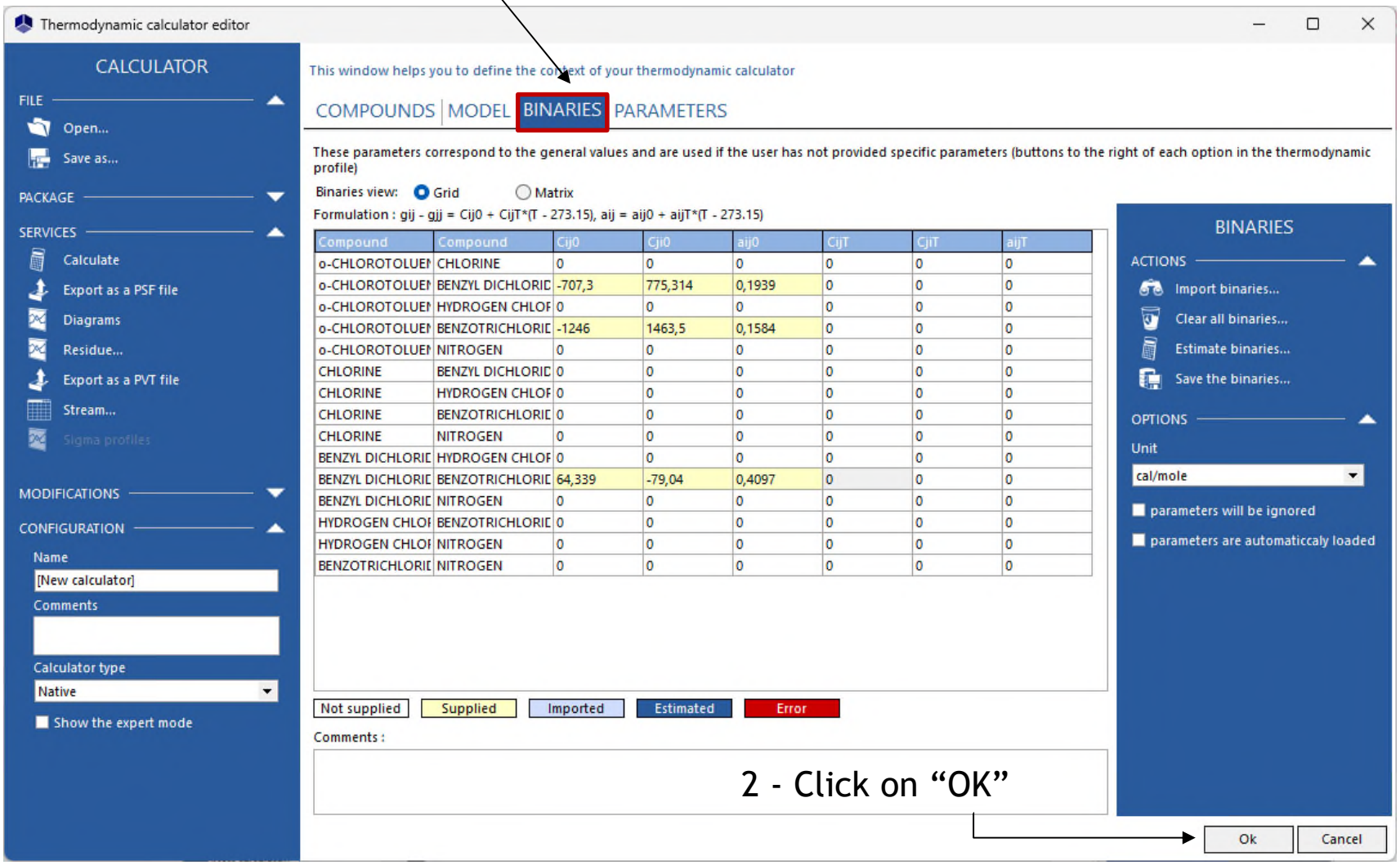
The “Binaries” tab appears automatically when you select a model that requires binary interaction parameters

2 - Select the “NRTL” thermodynamic profile



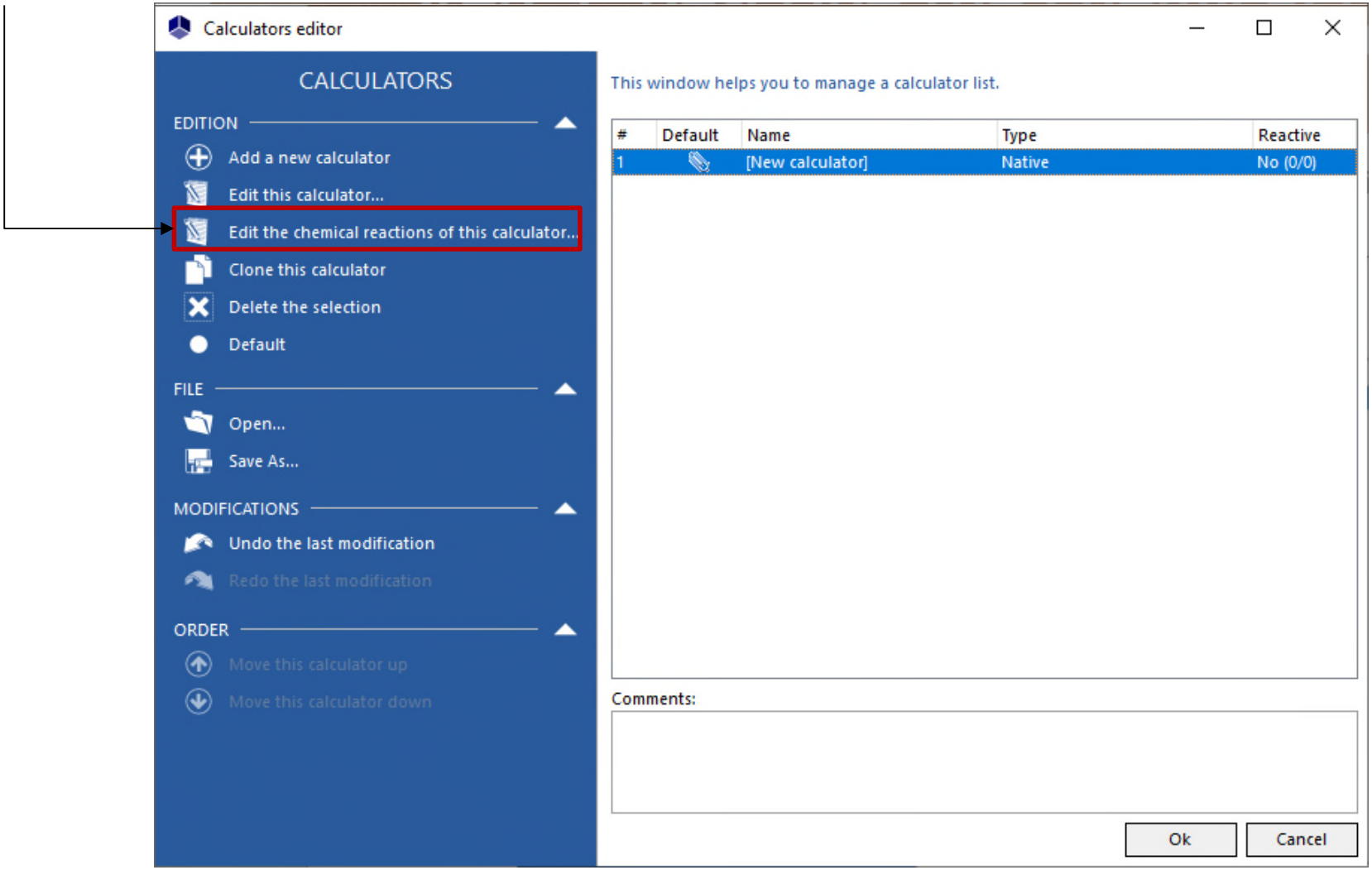
Step 2: Select the thermodynamic model

1 - Click on the “Binaries” tab, then enter the binary interaction parameters



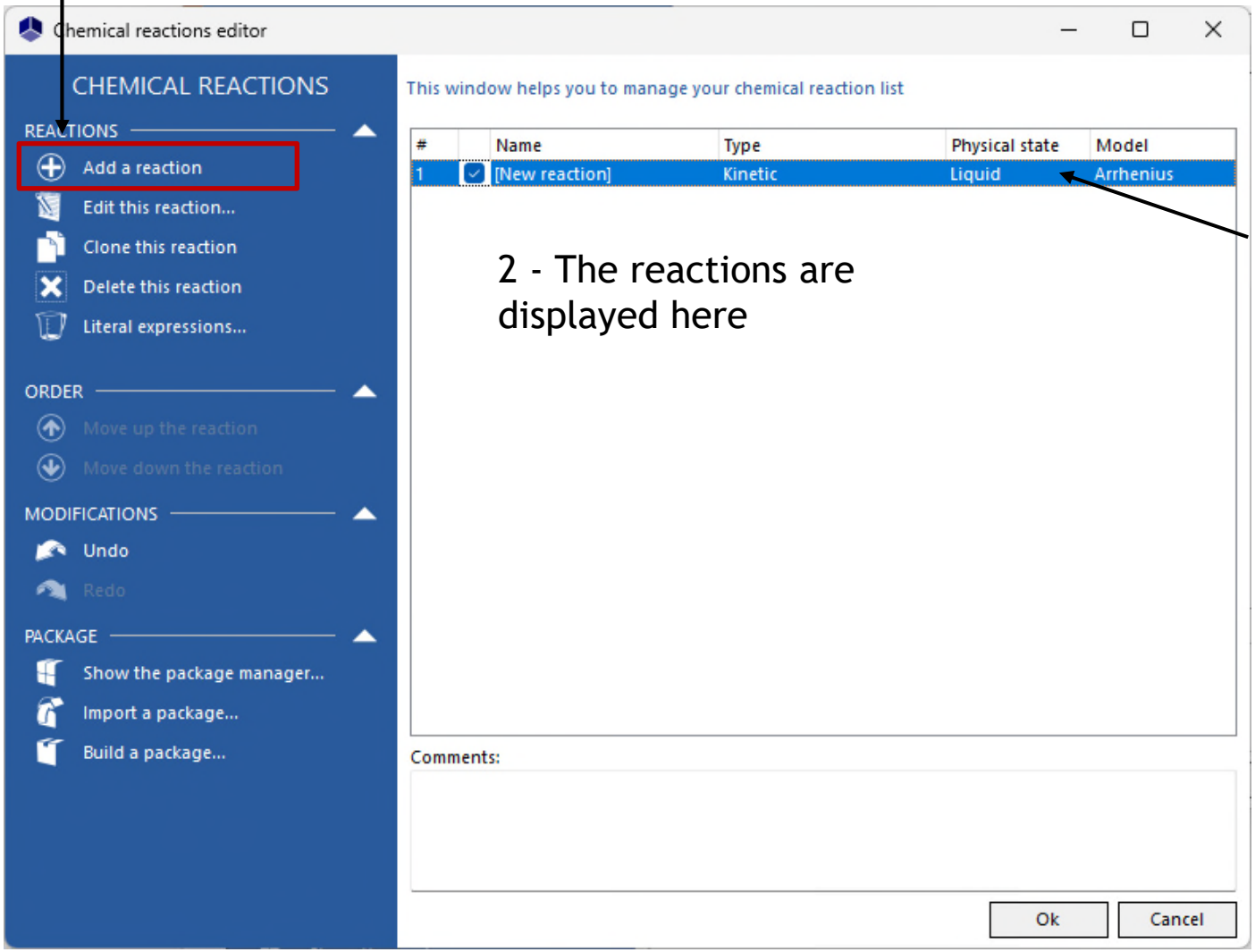
Step 3: Describe the chemical reactions

Back to the “Calculators editor” window, select “Edit the chemical reactions of this calculator”:



Step 3: Describe the chemical reactions

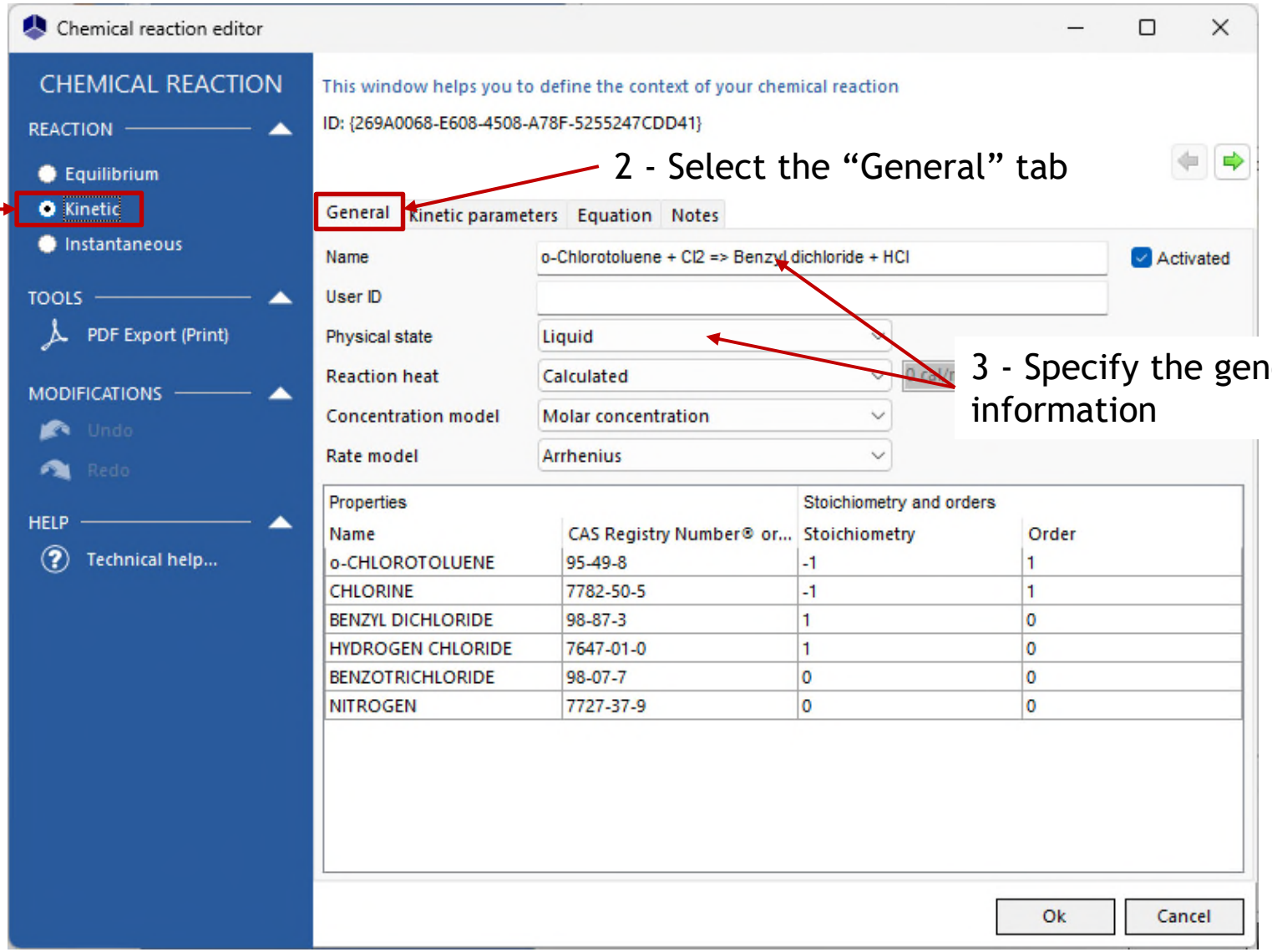
1 - Select “Add a reaction”



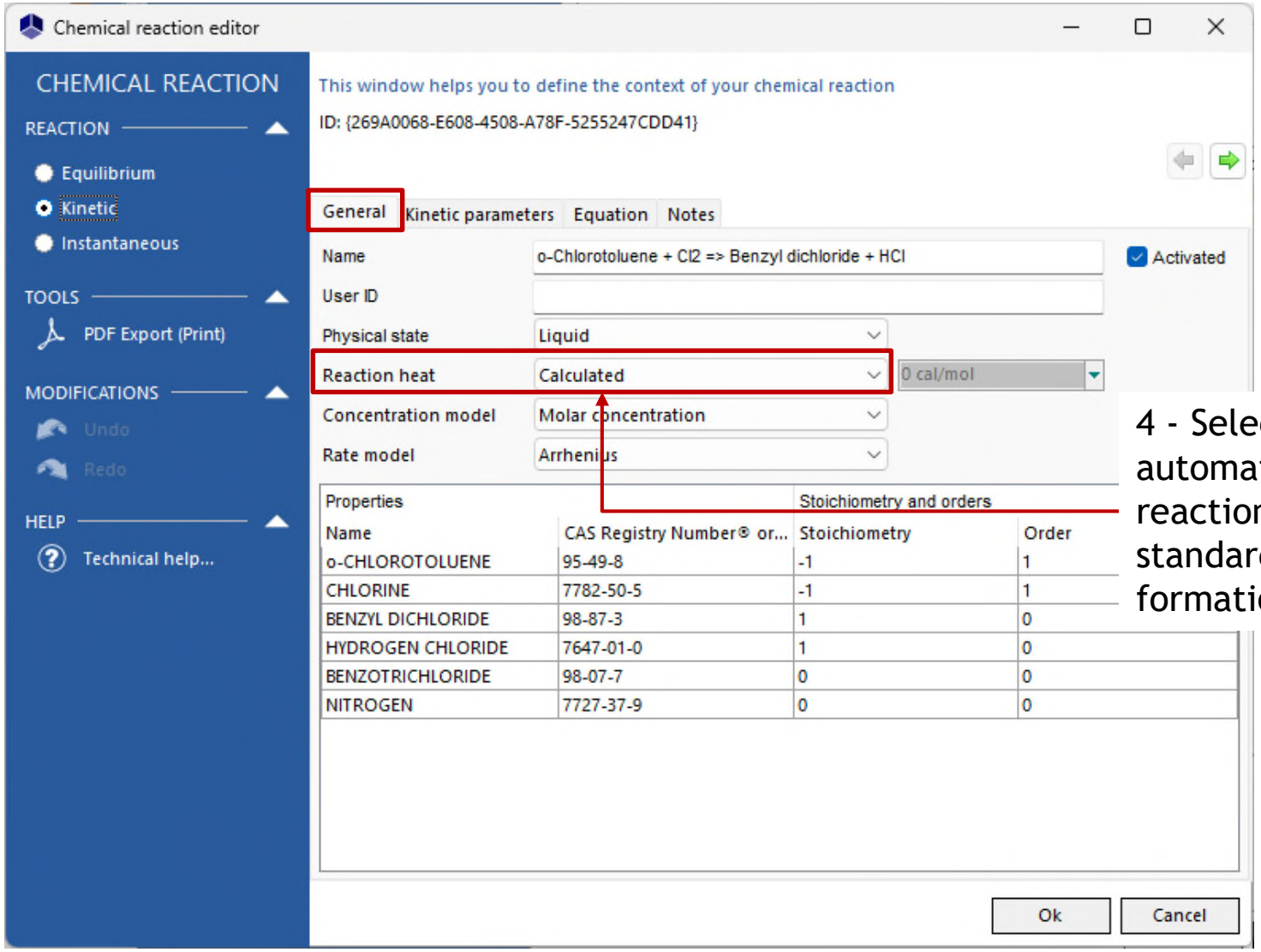
3 - Double click on the reaction to edit it

Step 3: Describe the chemical reactions

1 - Select the “Kinetic” option

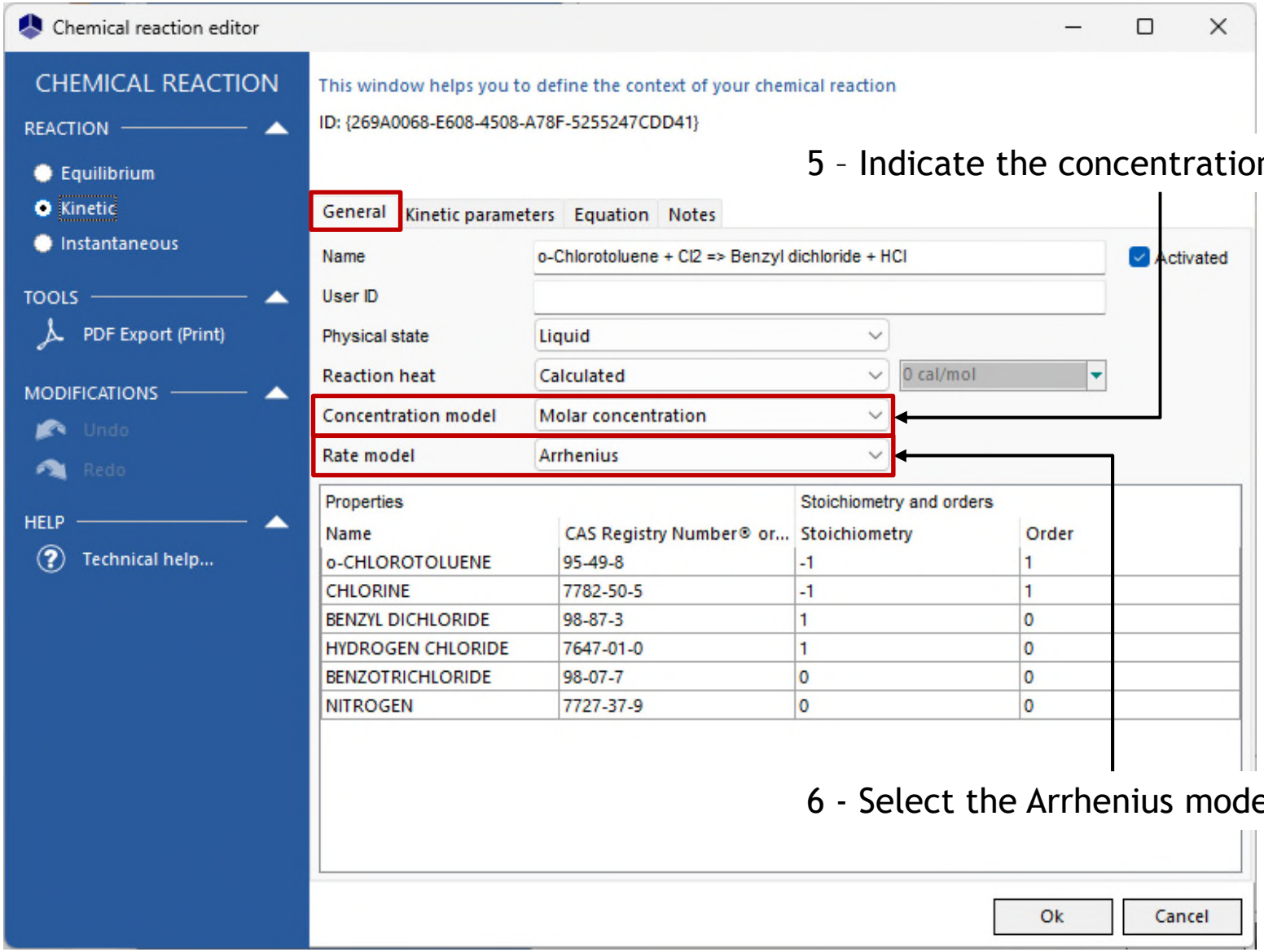


Step 3: Describe the chemical reactions



4 - Select the option to automatically calculate the reaction heat from the standard enthalpies of formation

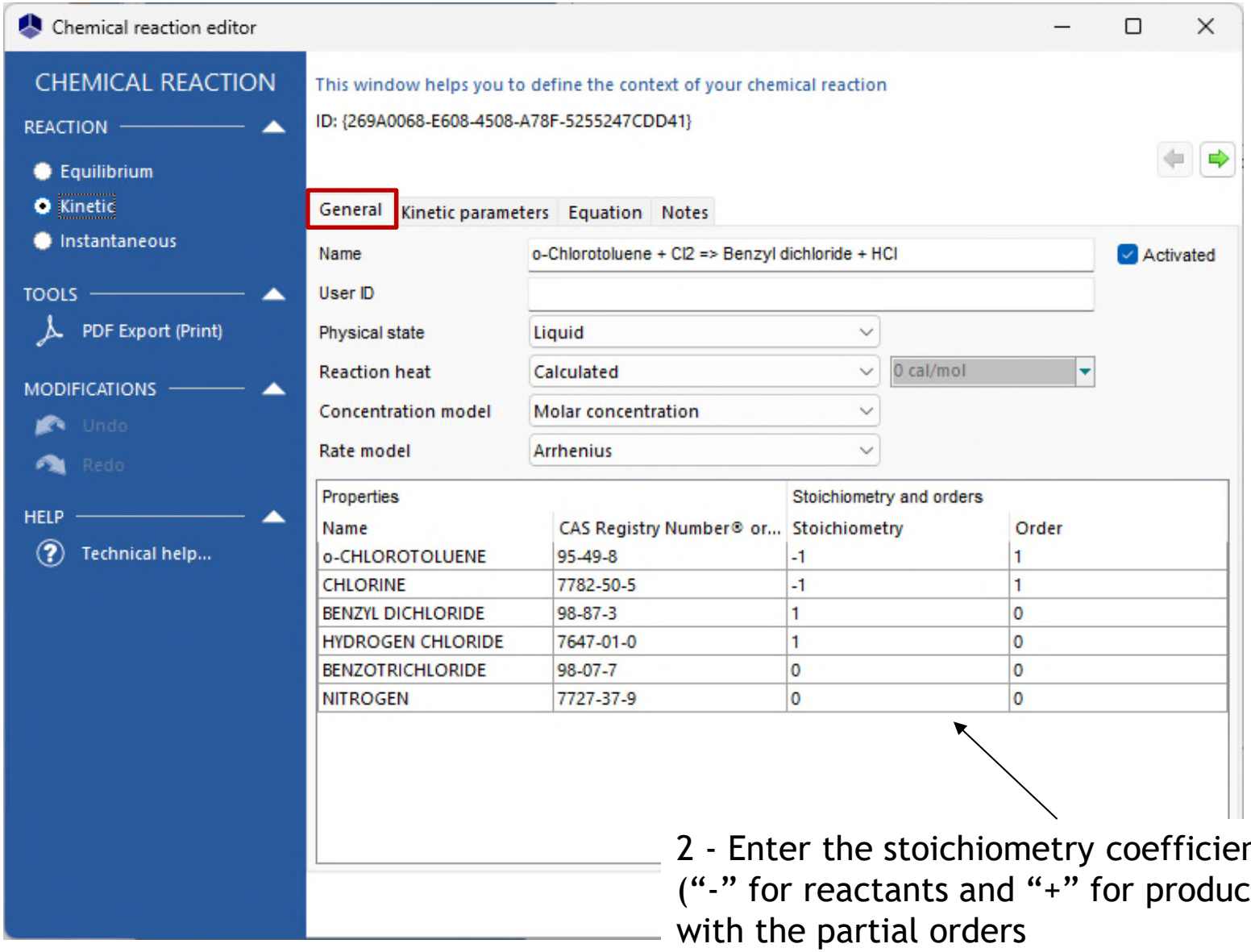
Step 3: Describe the chemical reactions



5 – Indicate the concentration model

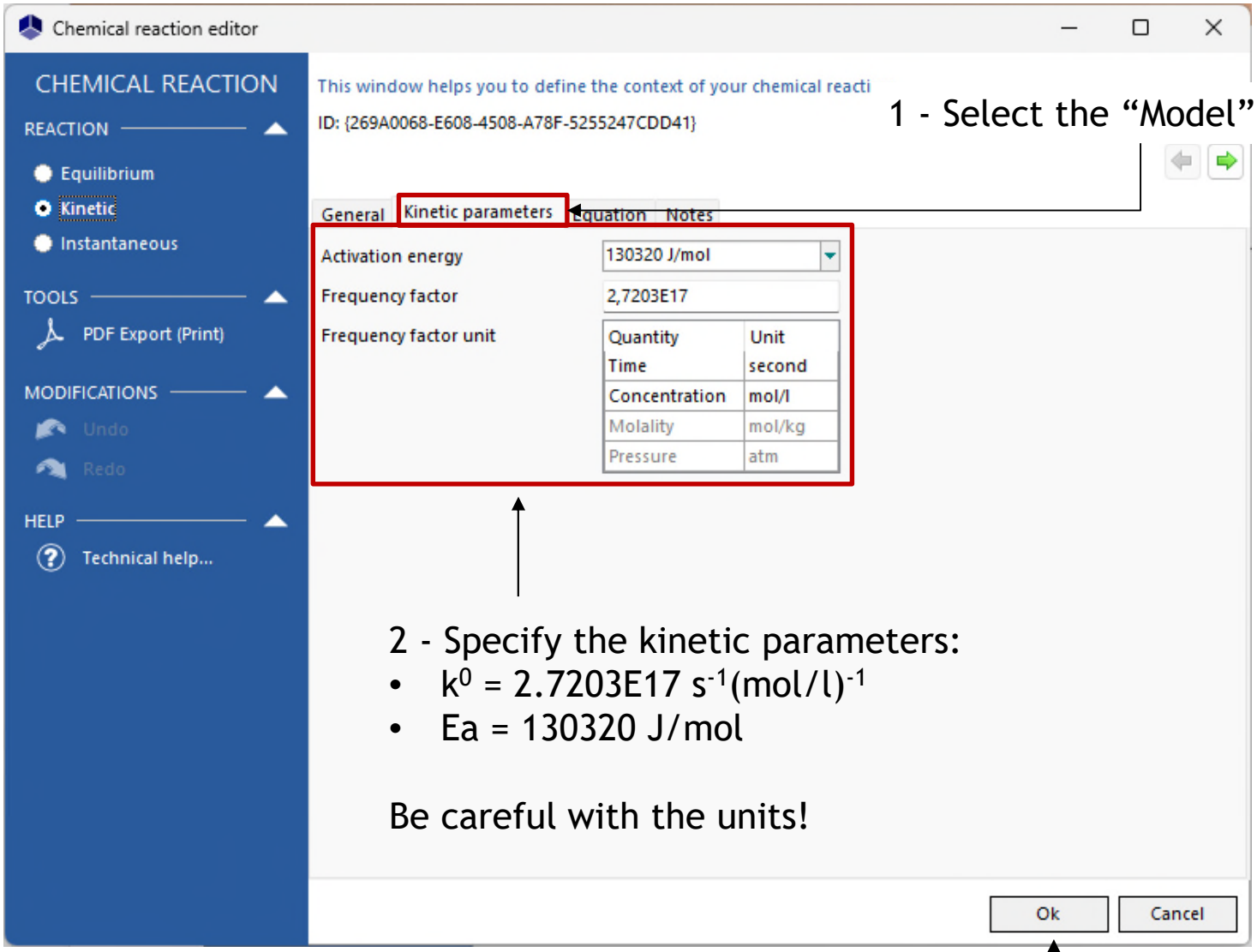
6 - Select the Arrhenius model

Step 3: Describe the chemical reactions



2 - Enter the stoichiometry coefficients ("-" for reactants and "+" for products") along with the partial orders

Step 3: Describe the chemical reactions



1 - Select the “Model” tab

2 - Specify the kinetic parameters:

- k^0 = 2.7203E17 $s^{-1}(mol/l)^{-1}$
- Ea = 130320 J/mol

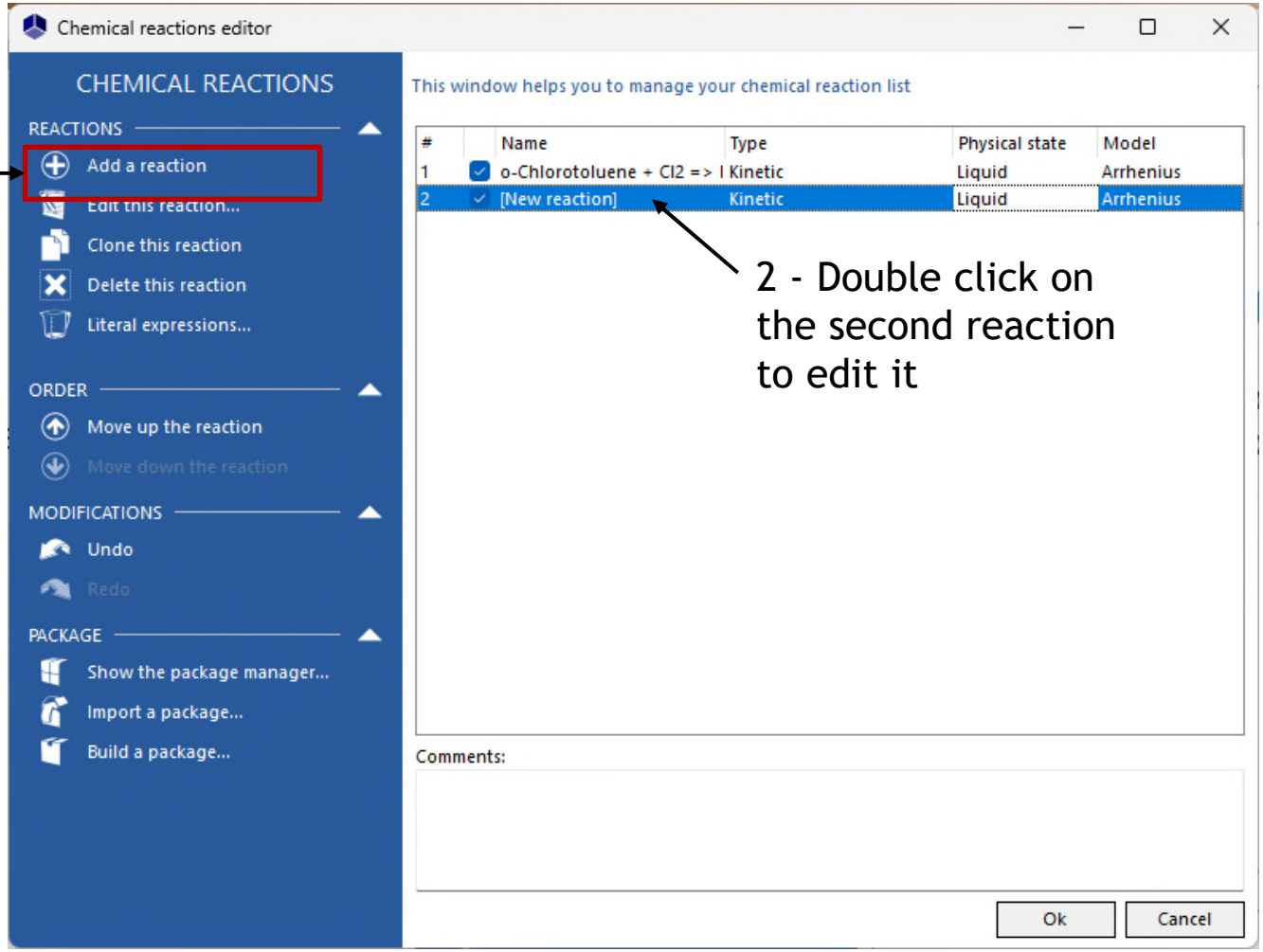
Be careful with the units!

3 - Click on “OK”

Step 3: Describe the chemical reactions

Follow the same procedure for the second reaction:

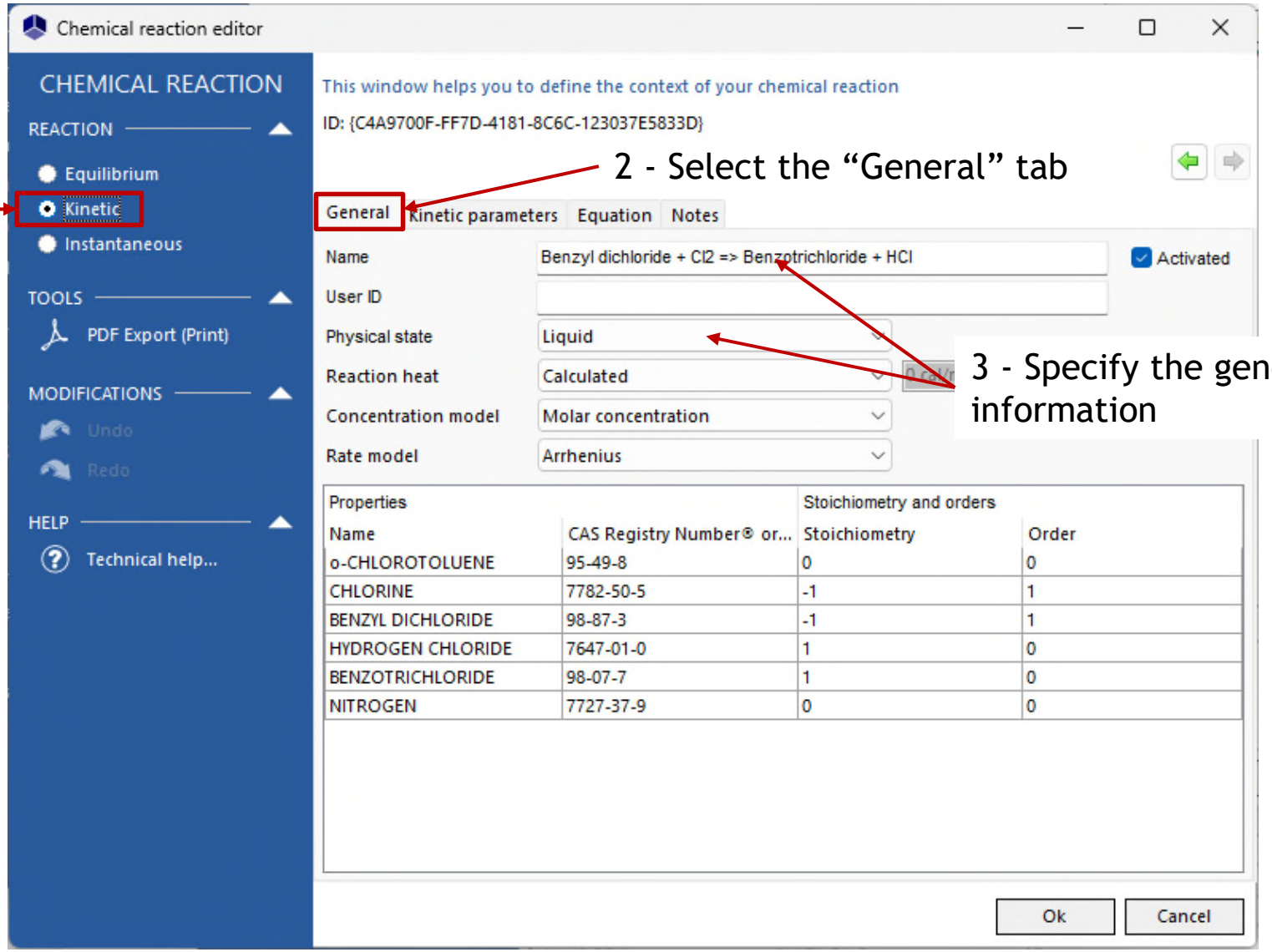
1 - Click on “Add a reaction”



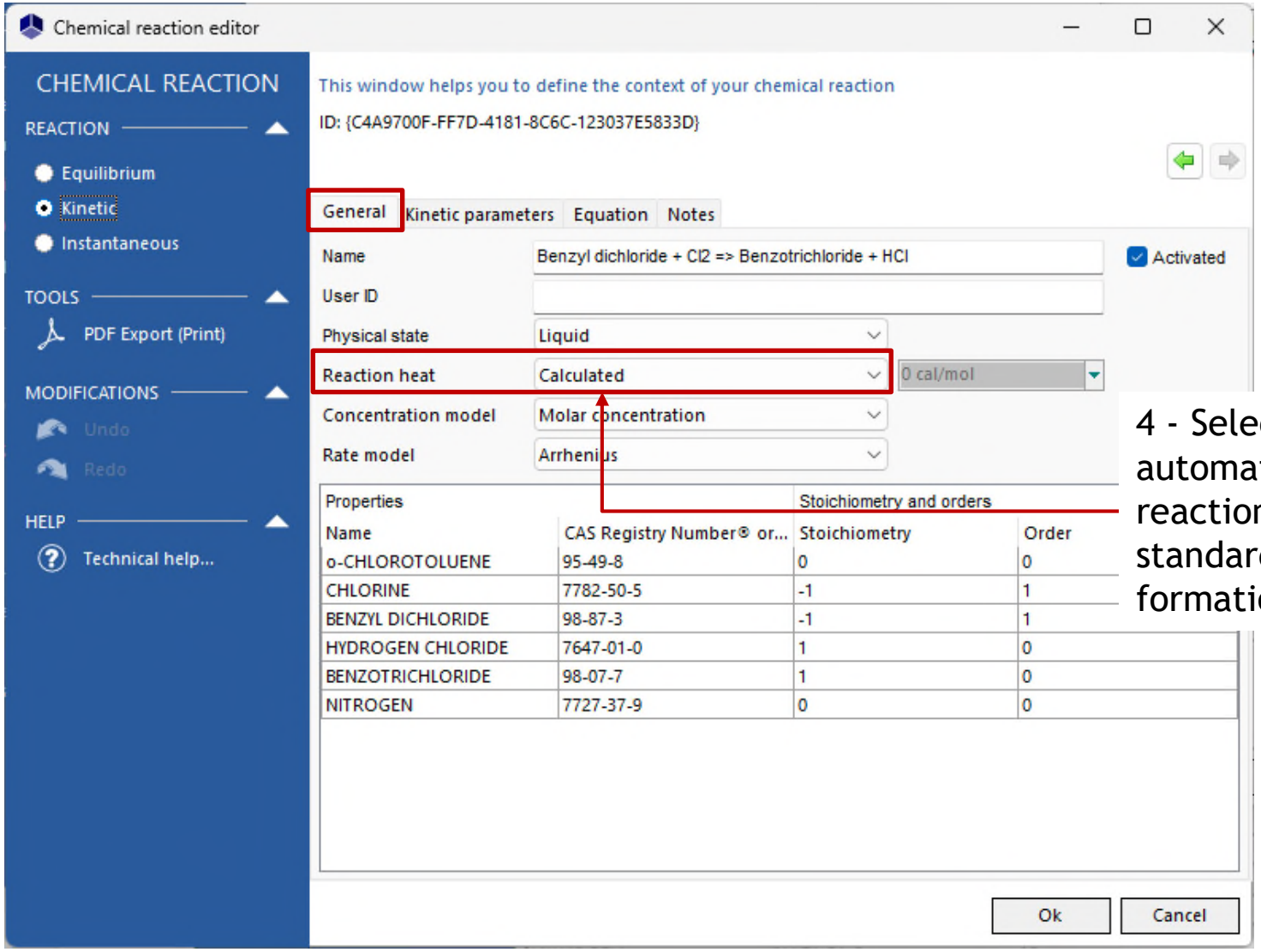
2 - Double click on the second reaction to edit it

Step 3: Describe the chemical reactions

1 - Select the “Kinetic” option

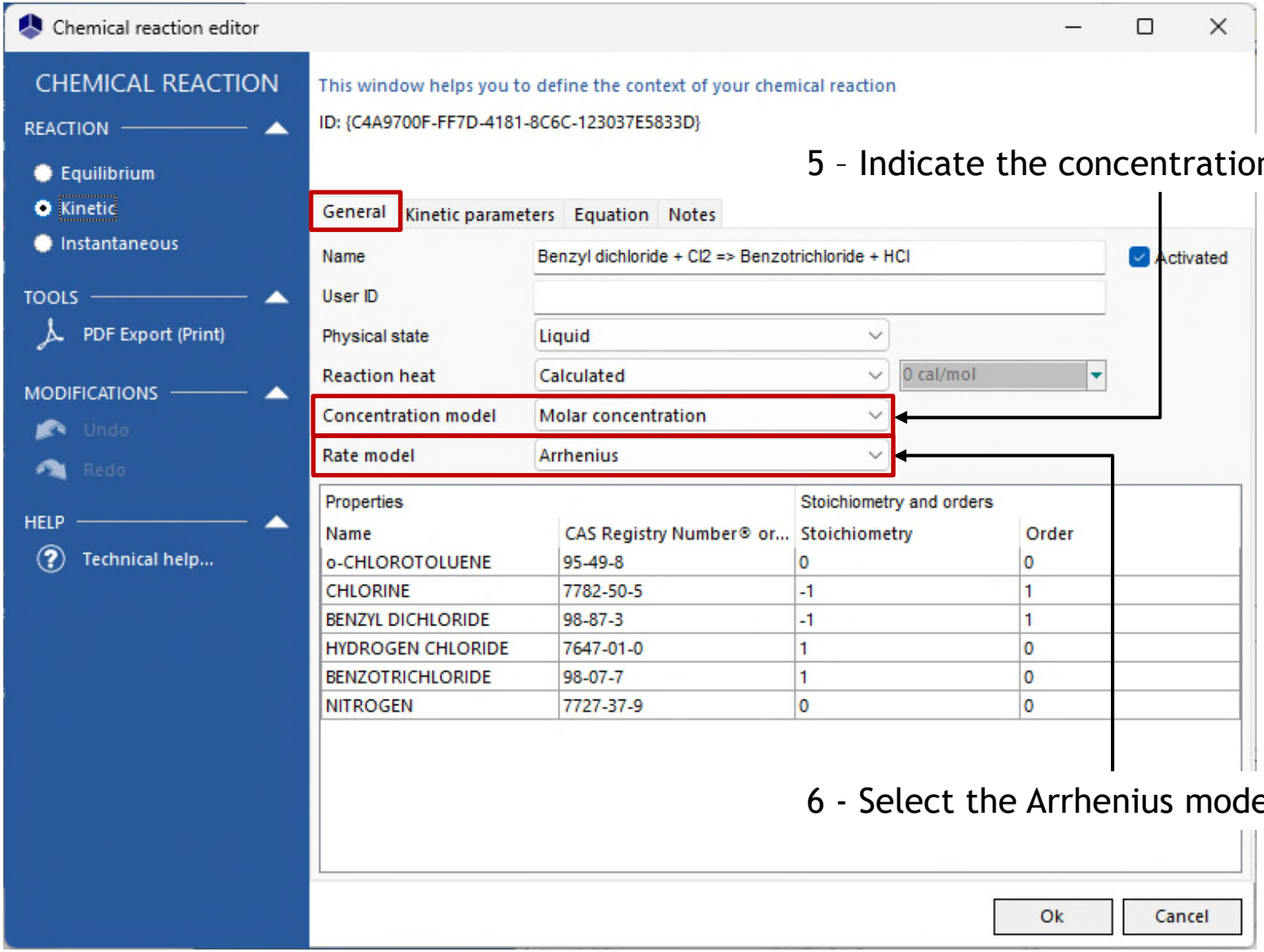


Step 3: Describe the chemical reactions



4 - Select the option to automatically calculate the reaction heat from the standard enthalpies of formation

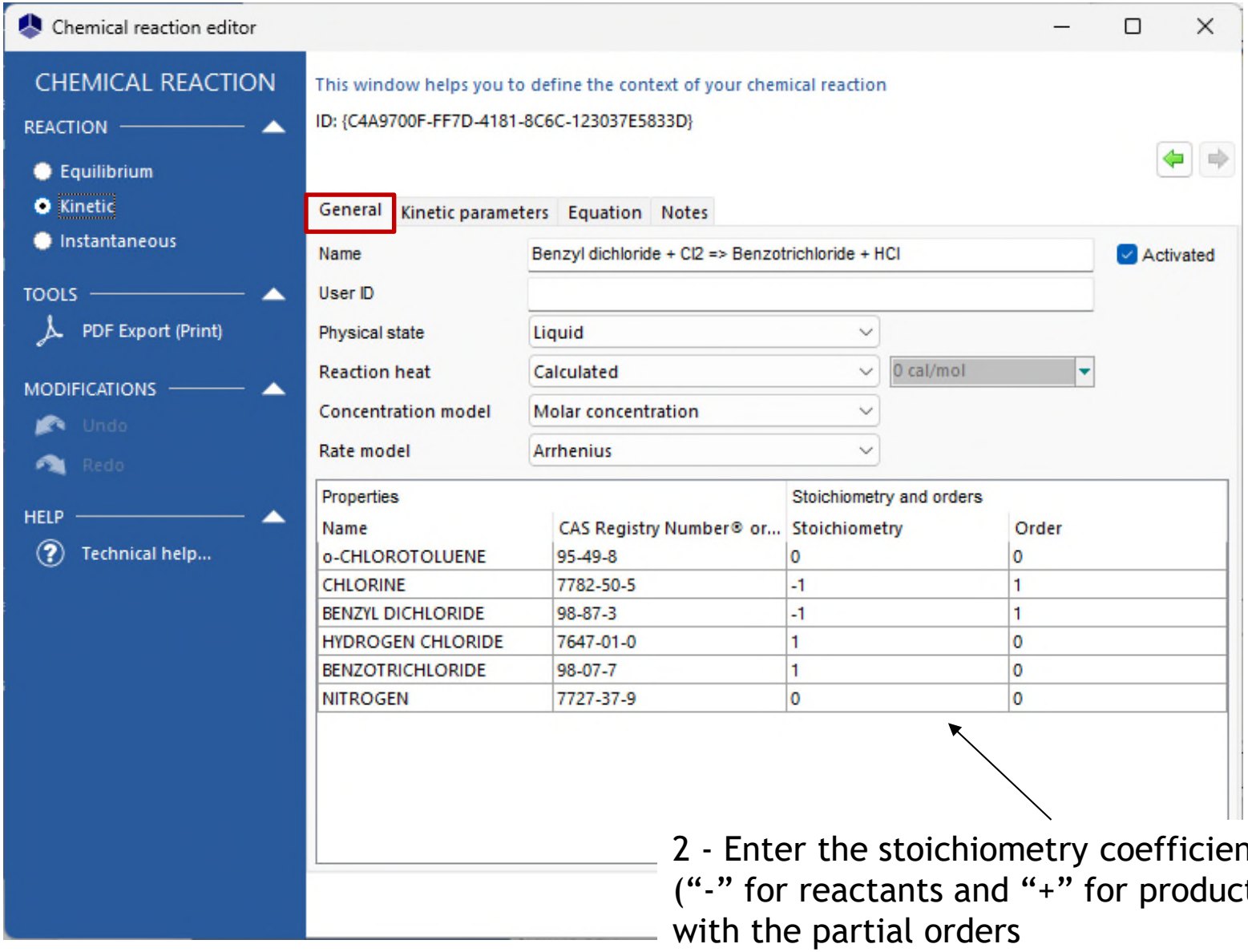
Step 3: Describe the chemical reactions



5 – Indicate the concentration model

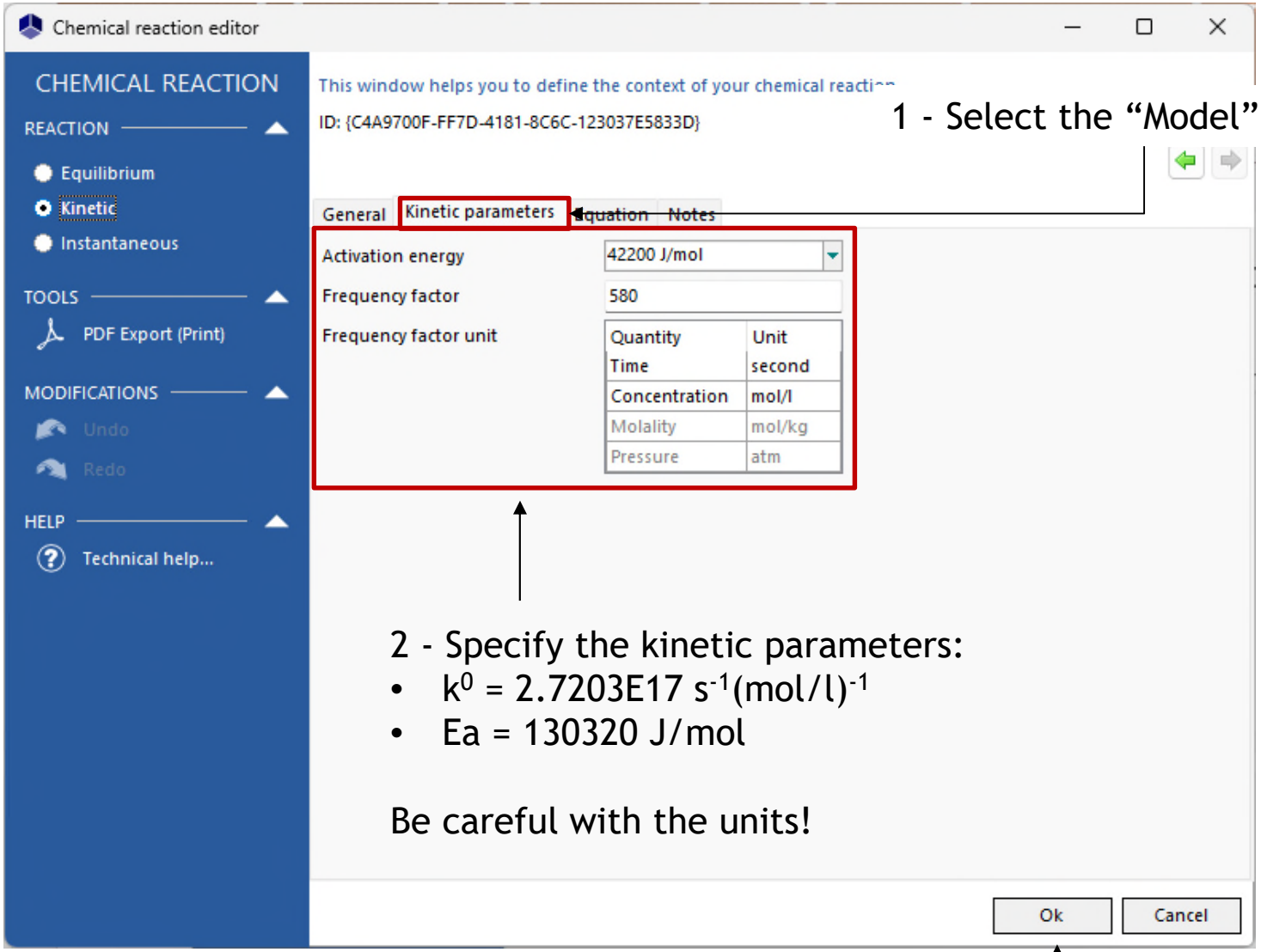
6 - Select the Arrhenius model

Step 3: Describe the chemical reactions



2 - Enter the stoichiometry coefficients ("-" for reactants and "+" for products") along with the partial orders

Step 3: Describe the chemical reactions



1 - Select the “Model” tab

2 - Specify the kinetic parameters:

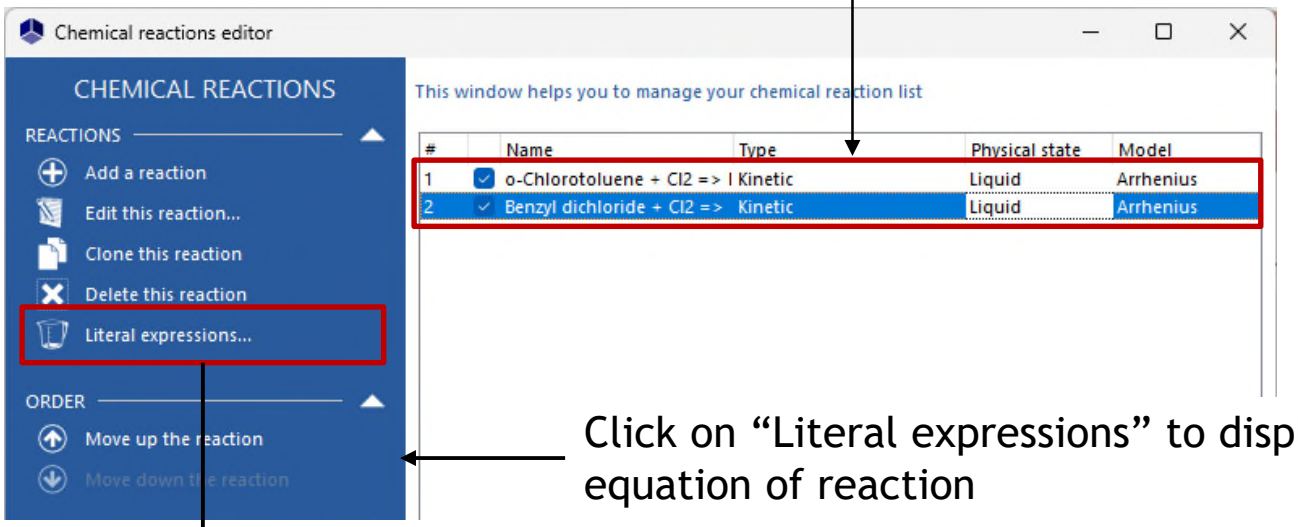
- k^0 = 2.7203E17 $s^{-1}(mol/l)^{-1}$
- Ea = 130320 J/mol

Be careful with the units!

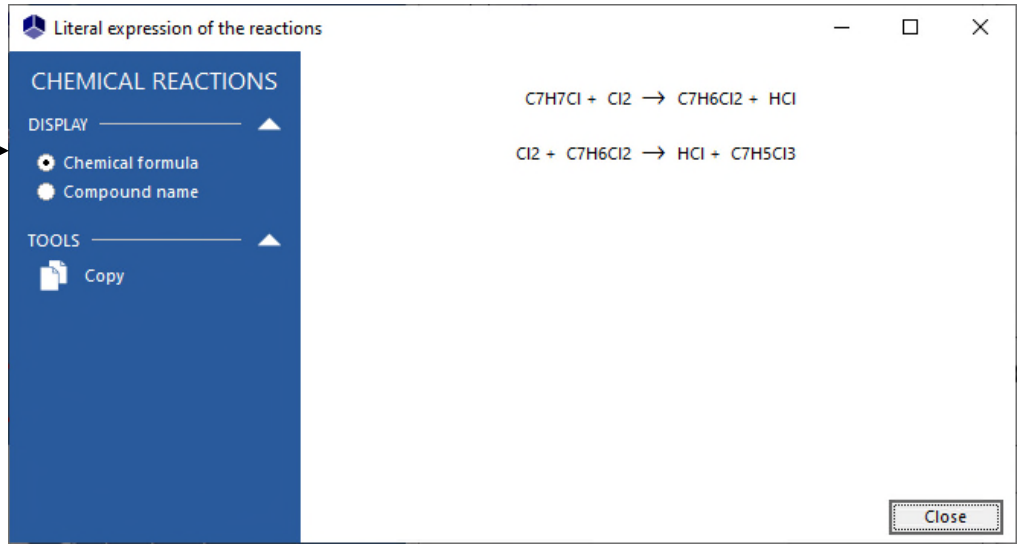
3 - Click on “OK”

Step 3: Describe the chemical reactions

Both reactions are now configured

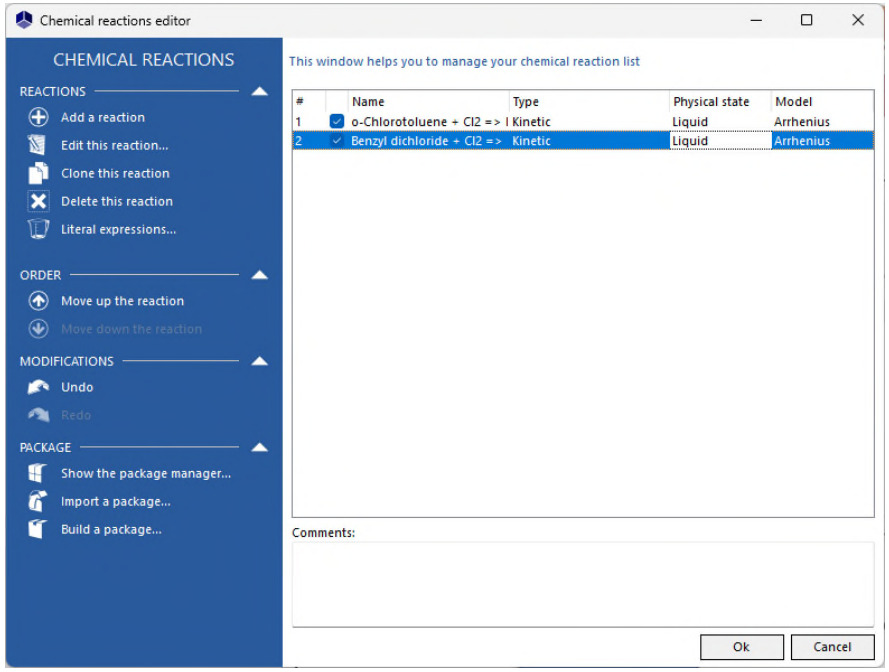


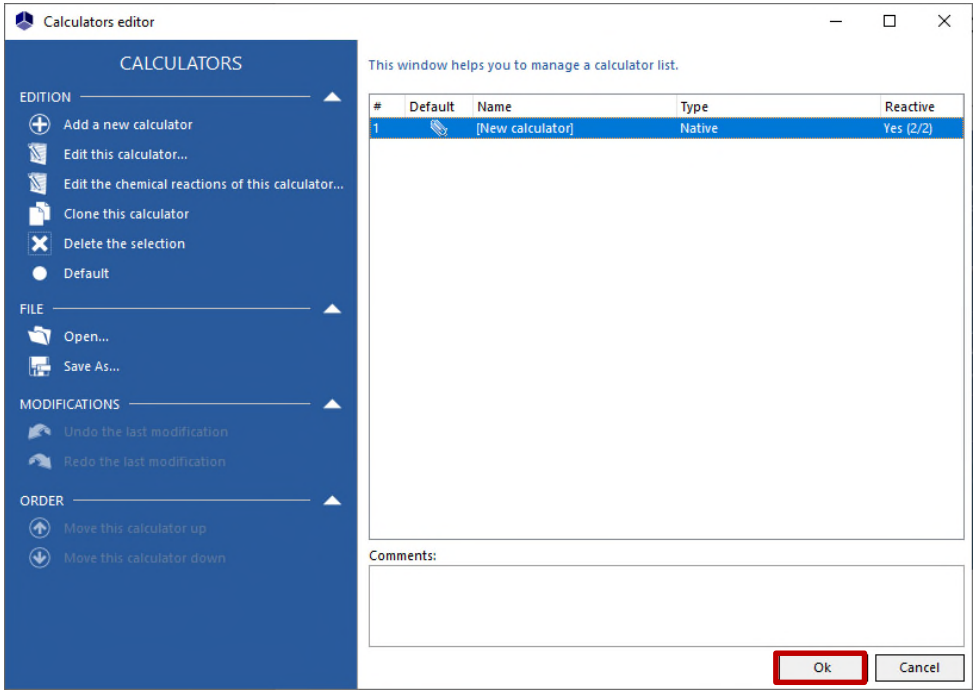
Click on “Literal expressions” to display the equation of reaction



Step 3: Describe the chemical reactions

Click on “OK” to validate the calculator and return to the main window:

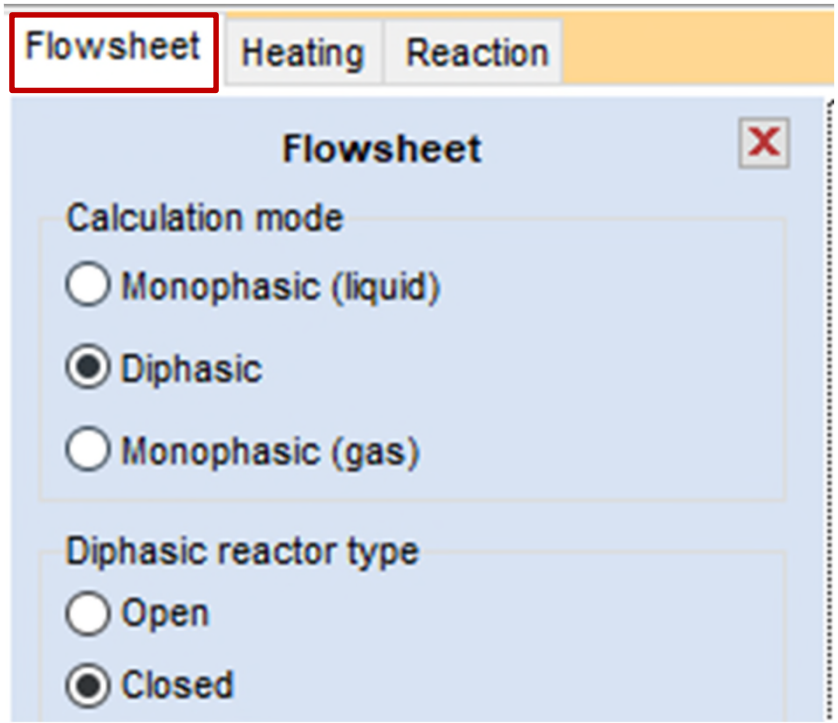




Step 4: Describe the equipment

The “flowsheet” window allows to describe the following features:

- The general topology of the reactor
- The initial conditions inside the reactor
- The equipment characteristics



Step 4: Describe the equipment

Configure the control panel:

1 - Calculation mode: “Diphasic”

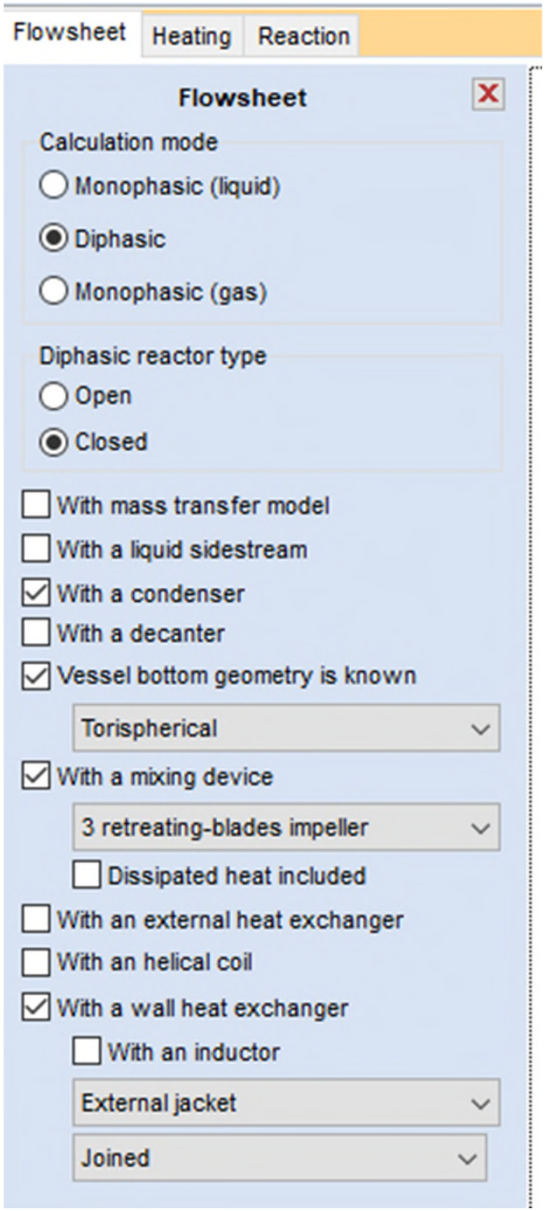
2 - Reactor type: “Closed”

3 - With a condenser

4 - Vessel bottom geometry: “torispherical”

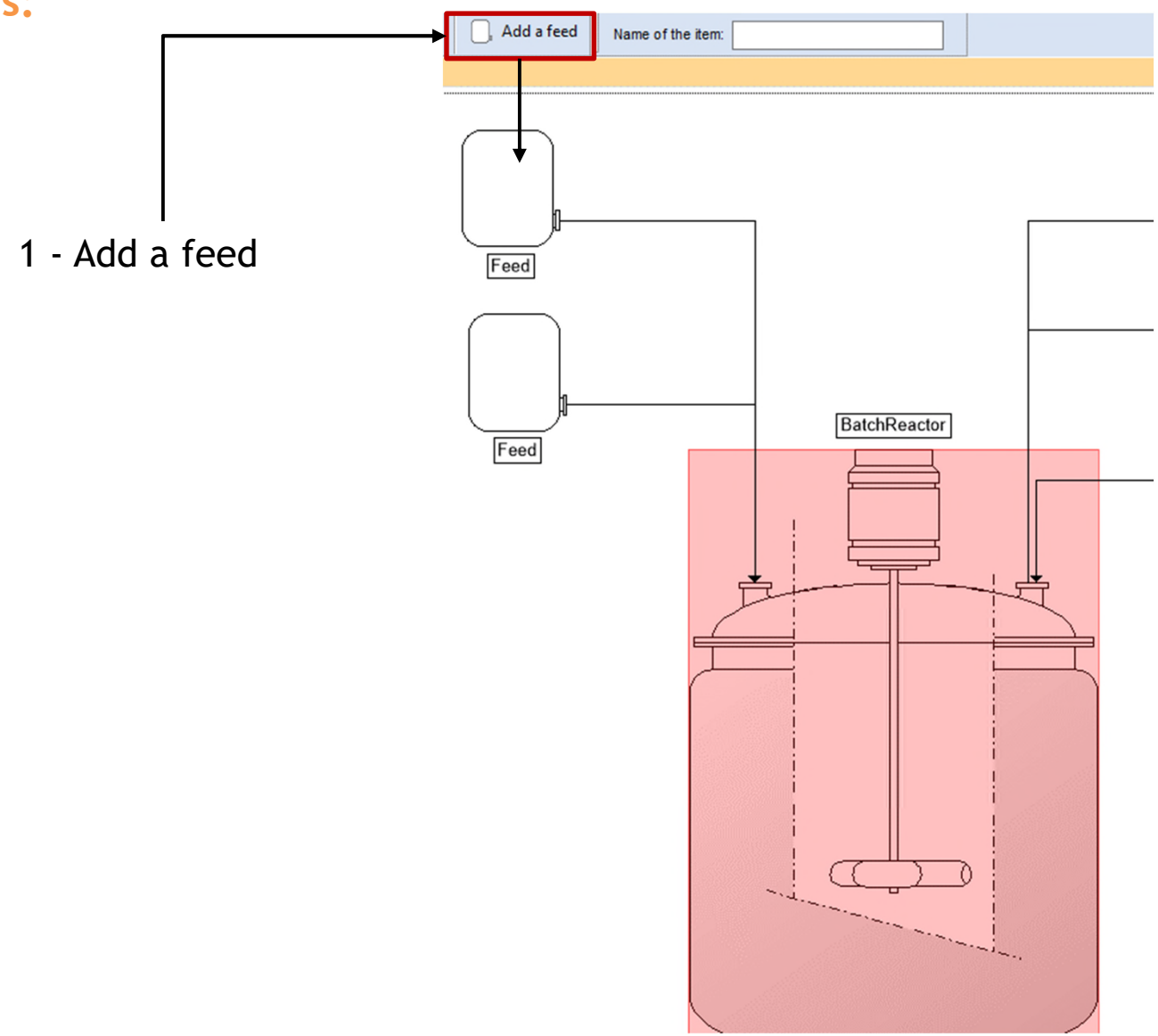
5 - Mixing device: “3 retreating-blades impeller”

6 - With a wall heat exchanger:
- External jacket
- Joined



Step 4: Describe the equipment

Configure the feeds:

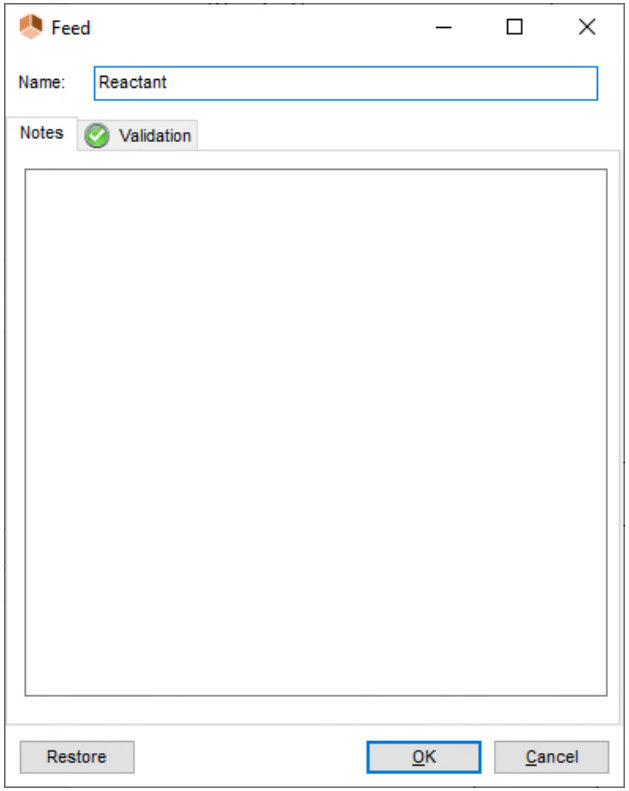


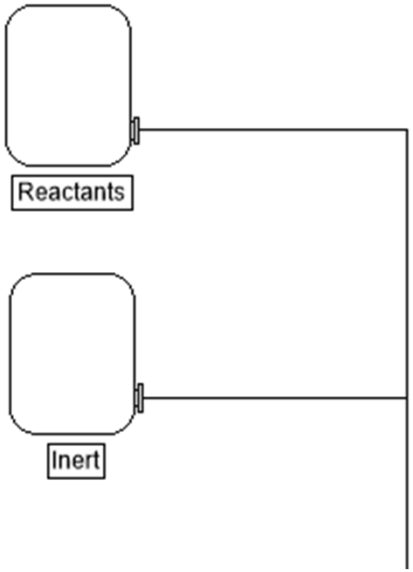
Step 4: Describe the equipment

Configure the feeds:

2 - Double click on the feeds to rename them:

- “Reactant”
- “Inert”

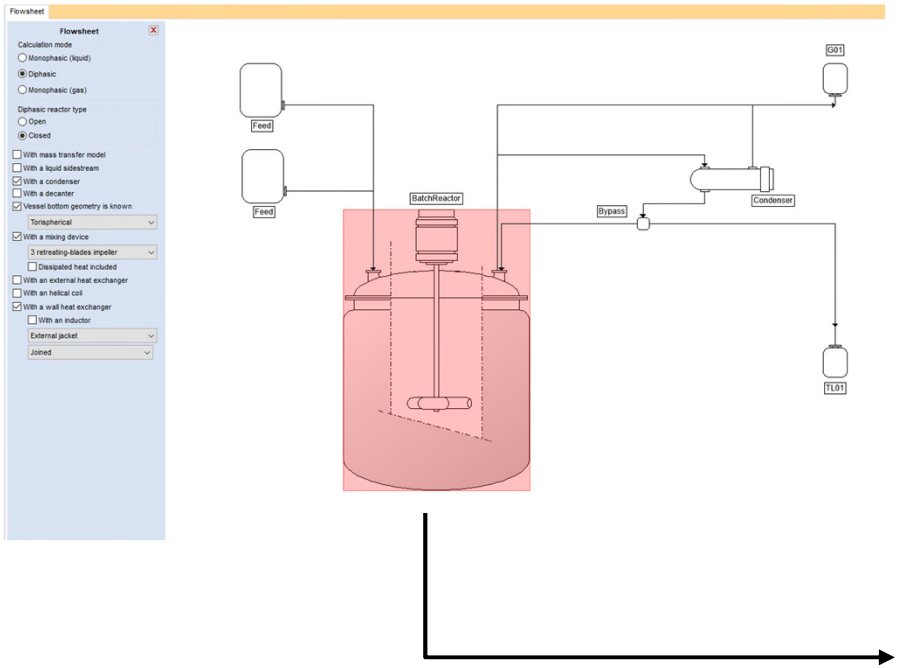


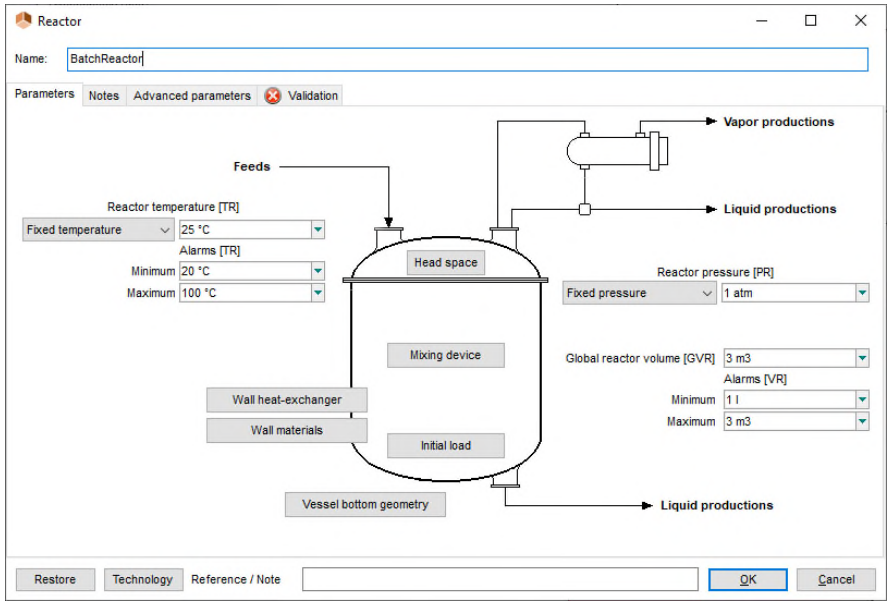


The feed characteristics will be specified in the operating steps

Step 4: Describe the equipment

Double click on the reactor in order to open its configuration window:

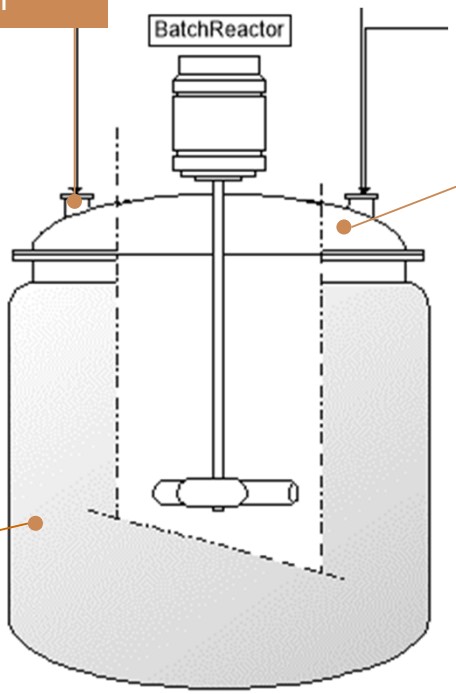




Step 4: Describe the equipment

First, specify the initial conditions as well as the alarms:

Temperature: 25°C
Pressure: 1 atm



Initial head space: nitrogen

Chlorotoluene : 2400 kg

Temperature alarms

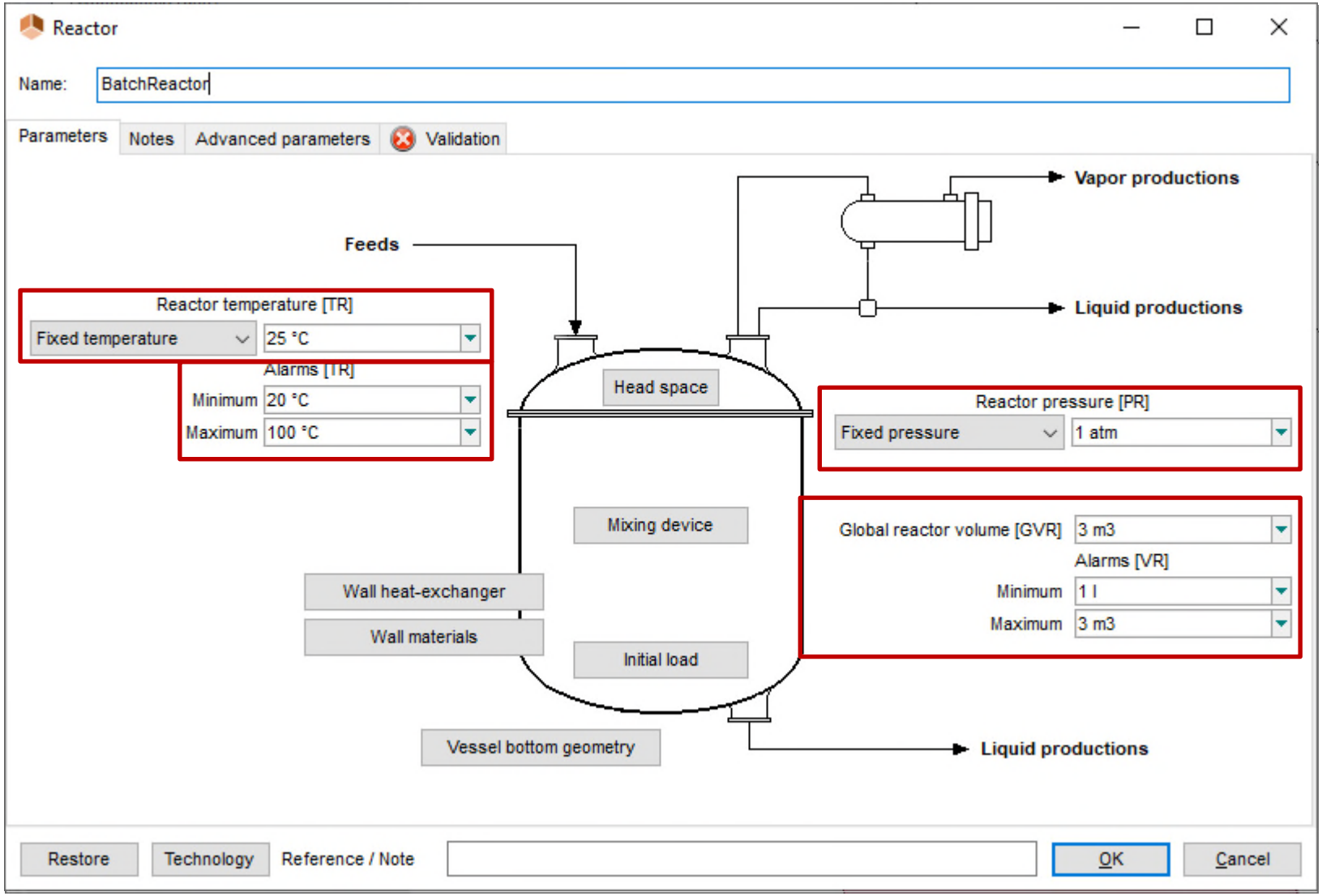
- T_{min} : 20°C
- T_{max} : 100°C

Volume alarms

- V_{min} : 1 l
- V_{max} : 3 m^3

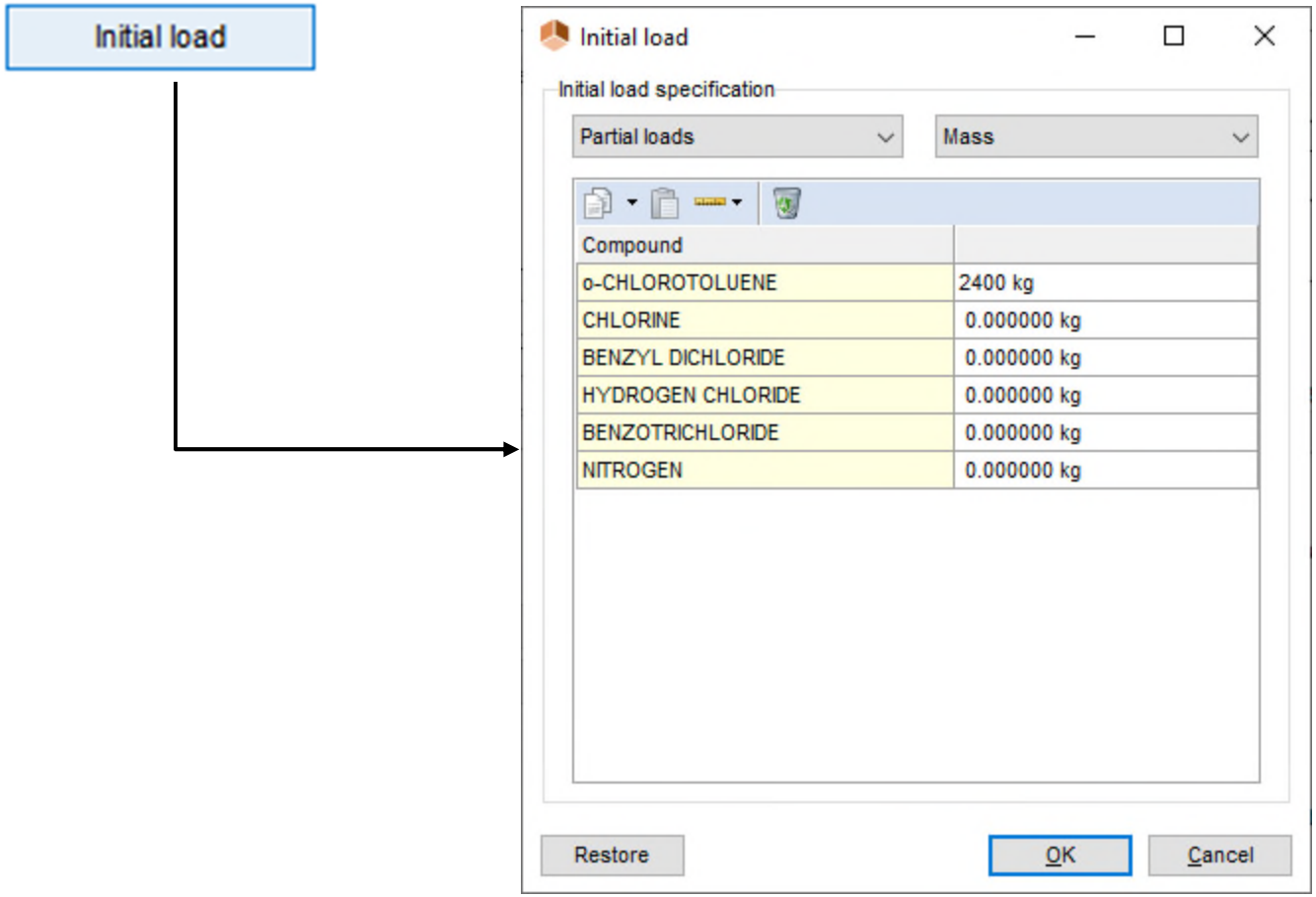
Step 4: Describe the equipment

- Initial conditions and alarms:



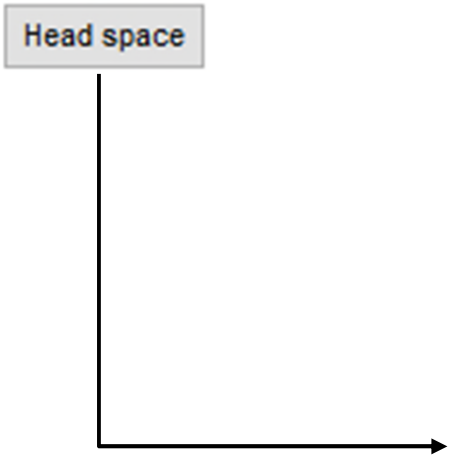
Step 4: Describe the equipment

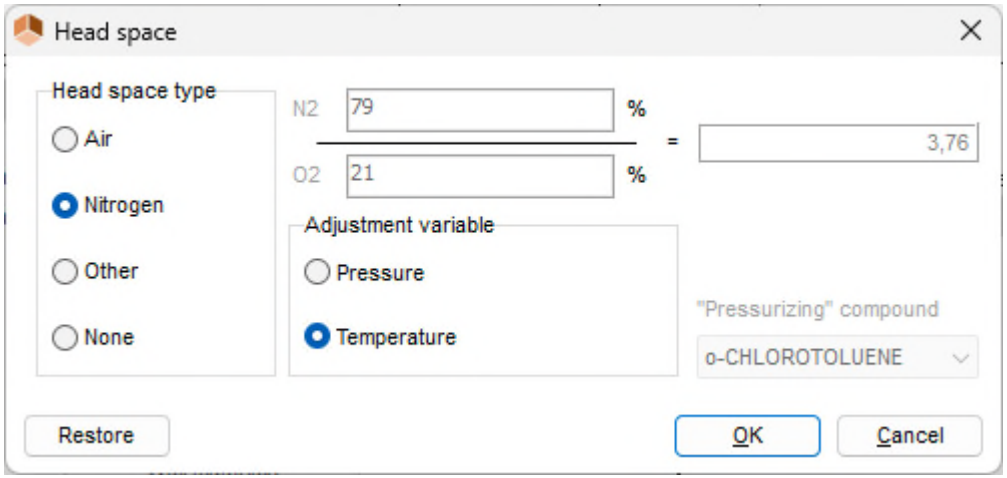
- Initial load:



Step 4: Describe the equipment

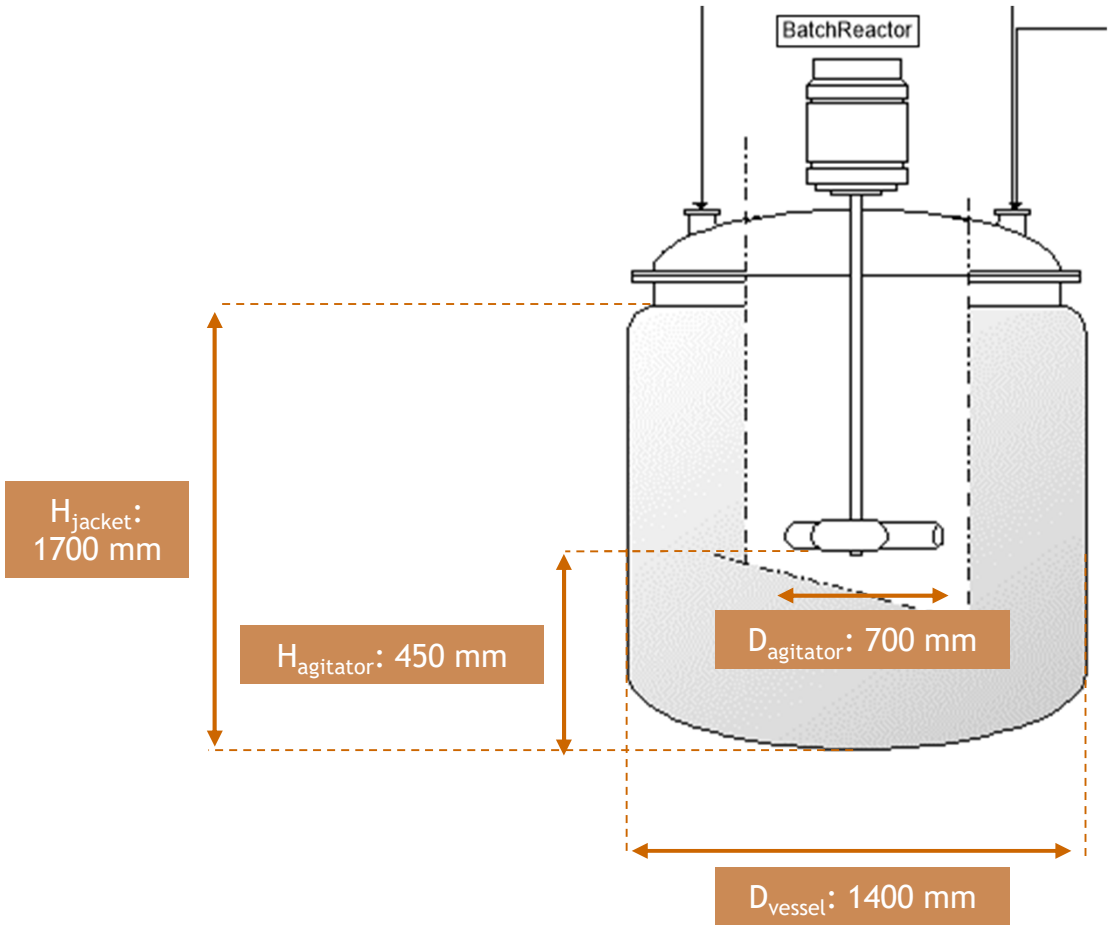
- Head space:





Step 4: Describe the equipment

Configure the equipment geometry:



Vessel:

- Number of baffles: 4
- Diameter: 1400 mm
- Curve radius #1: 1400 mm
- Curve radius #2: 140 mm

Mixing device:

- Diameter: 700 mm
- Height: 450 mm

External jacket:

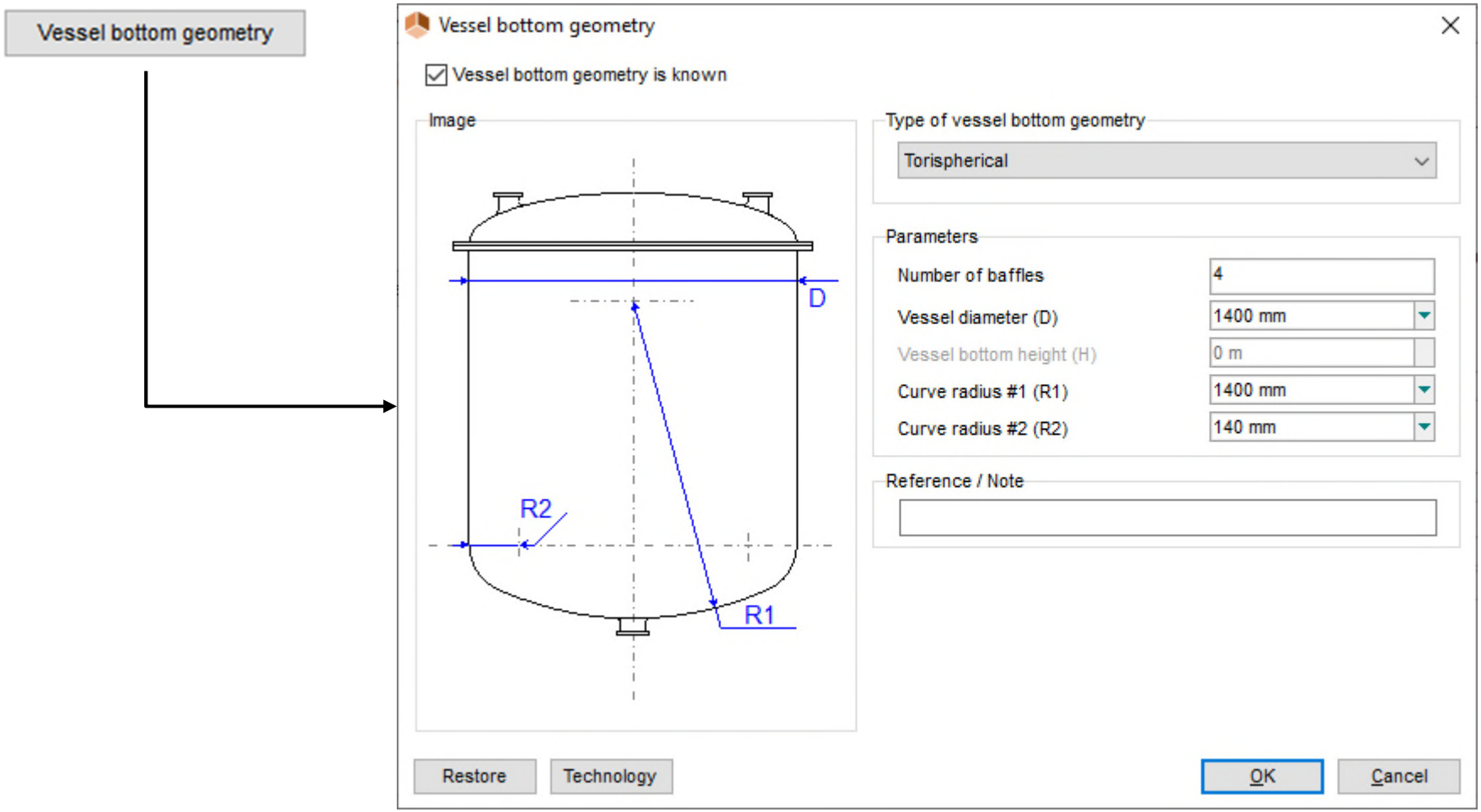
- Height: 1700 mm
- Jacket-vessel distance: 50 mm

Wall materials:

- Thickness: 17 mm
- Weight: 800 kg

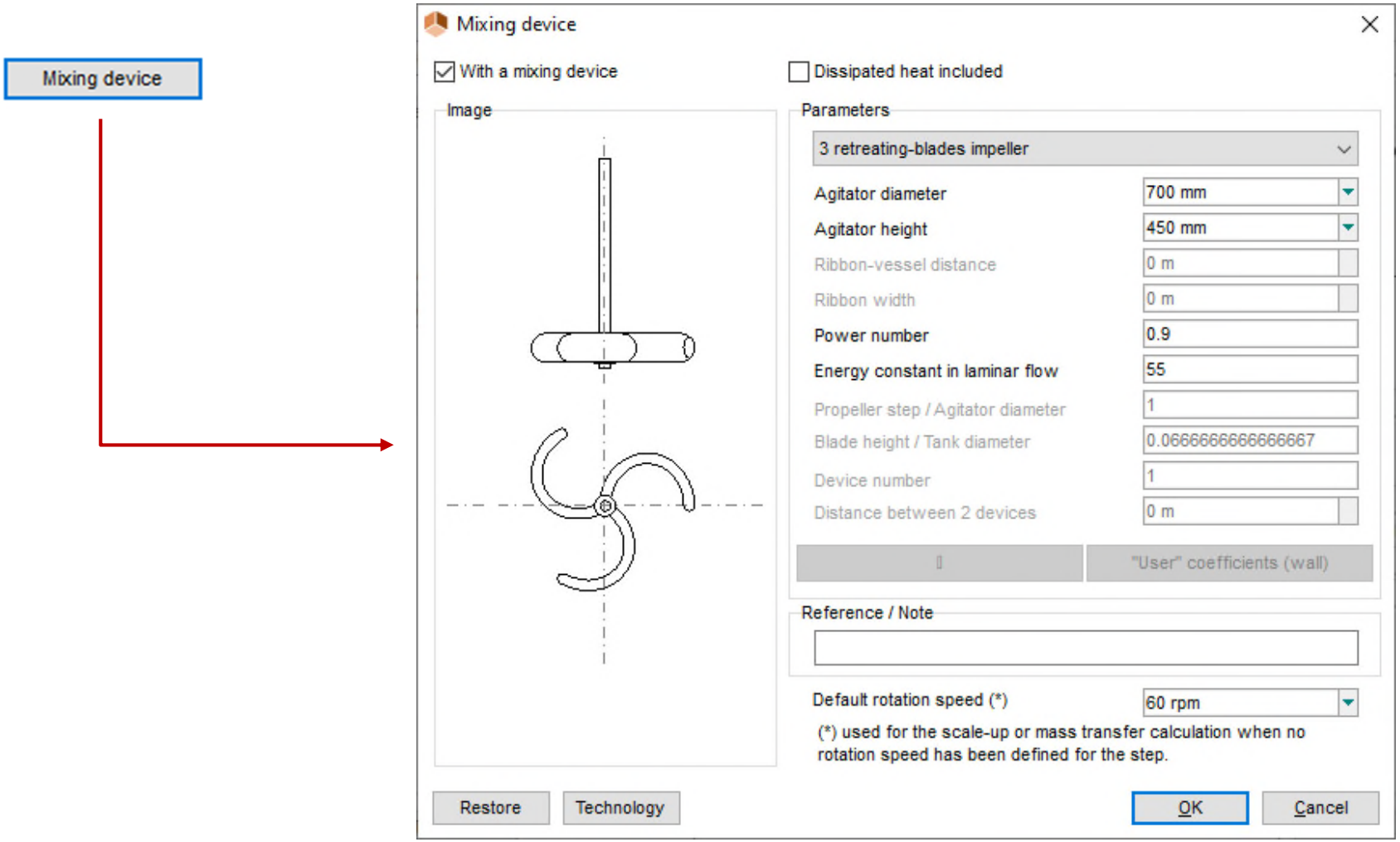
Step 4: Describe the equipment

- Vessel bottom geometry:



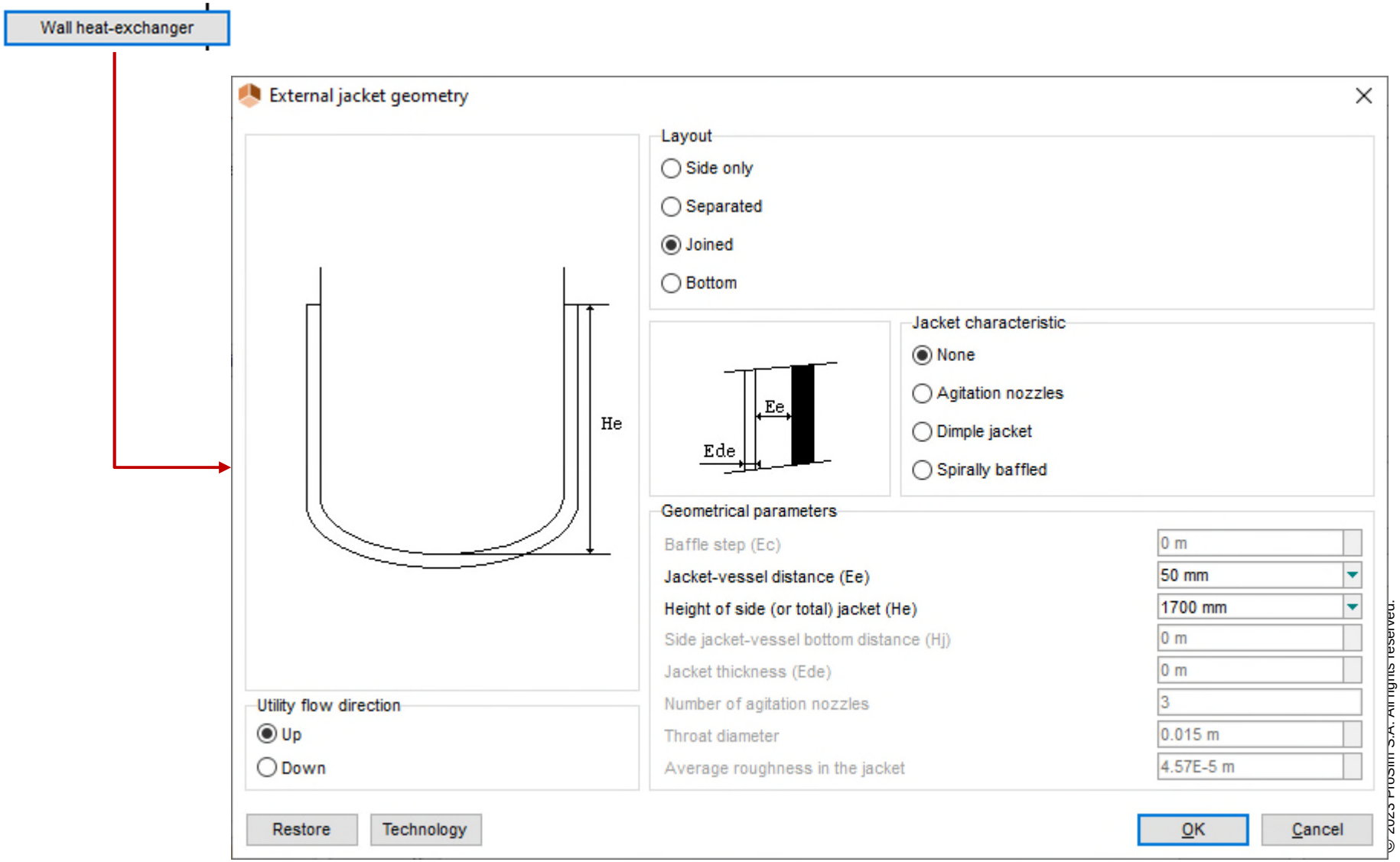
Step 4: Describe the equipment

- Mixing device:



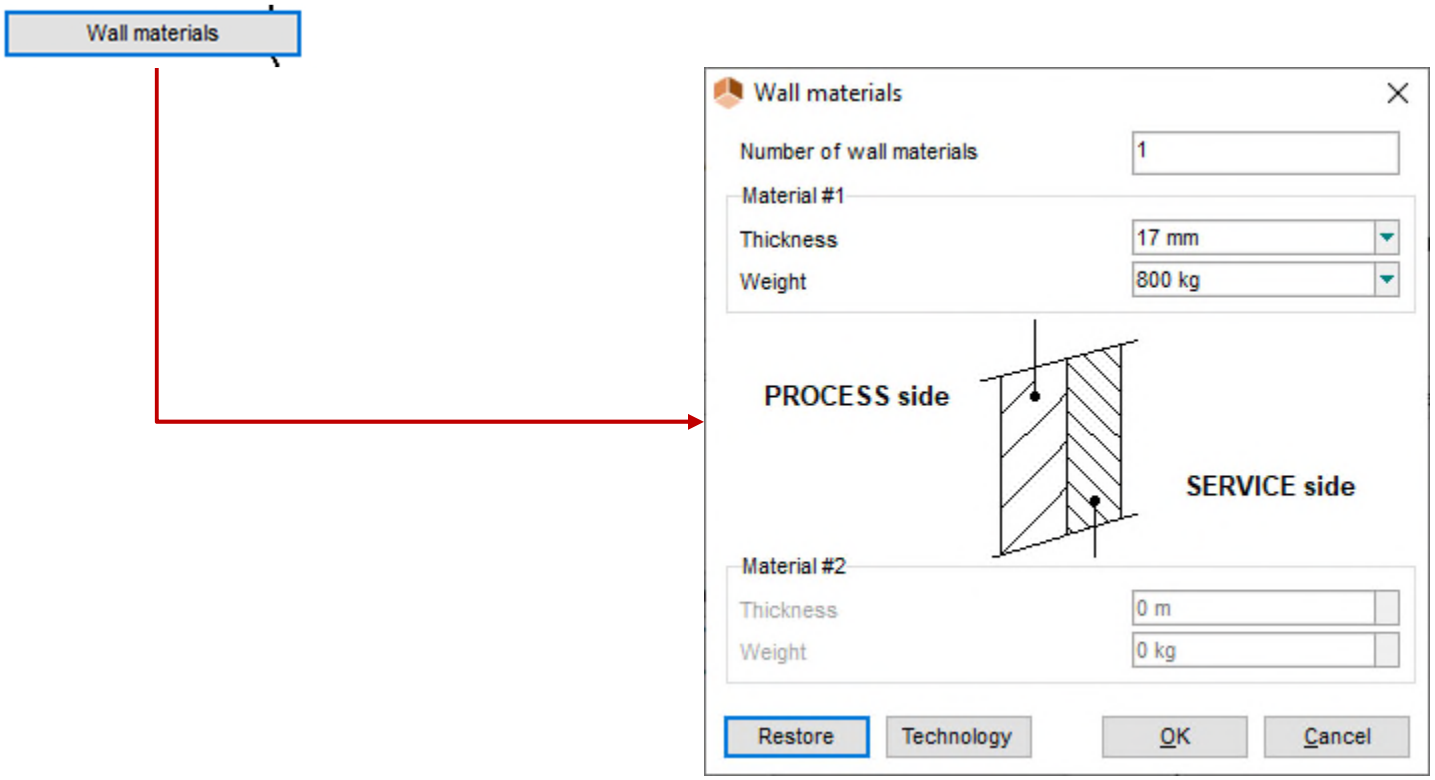
Step 4: Describe the equipment

- Wall heat-exchanger:



Step 4: Describe the equipment

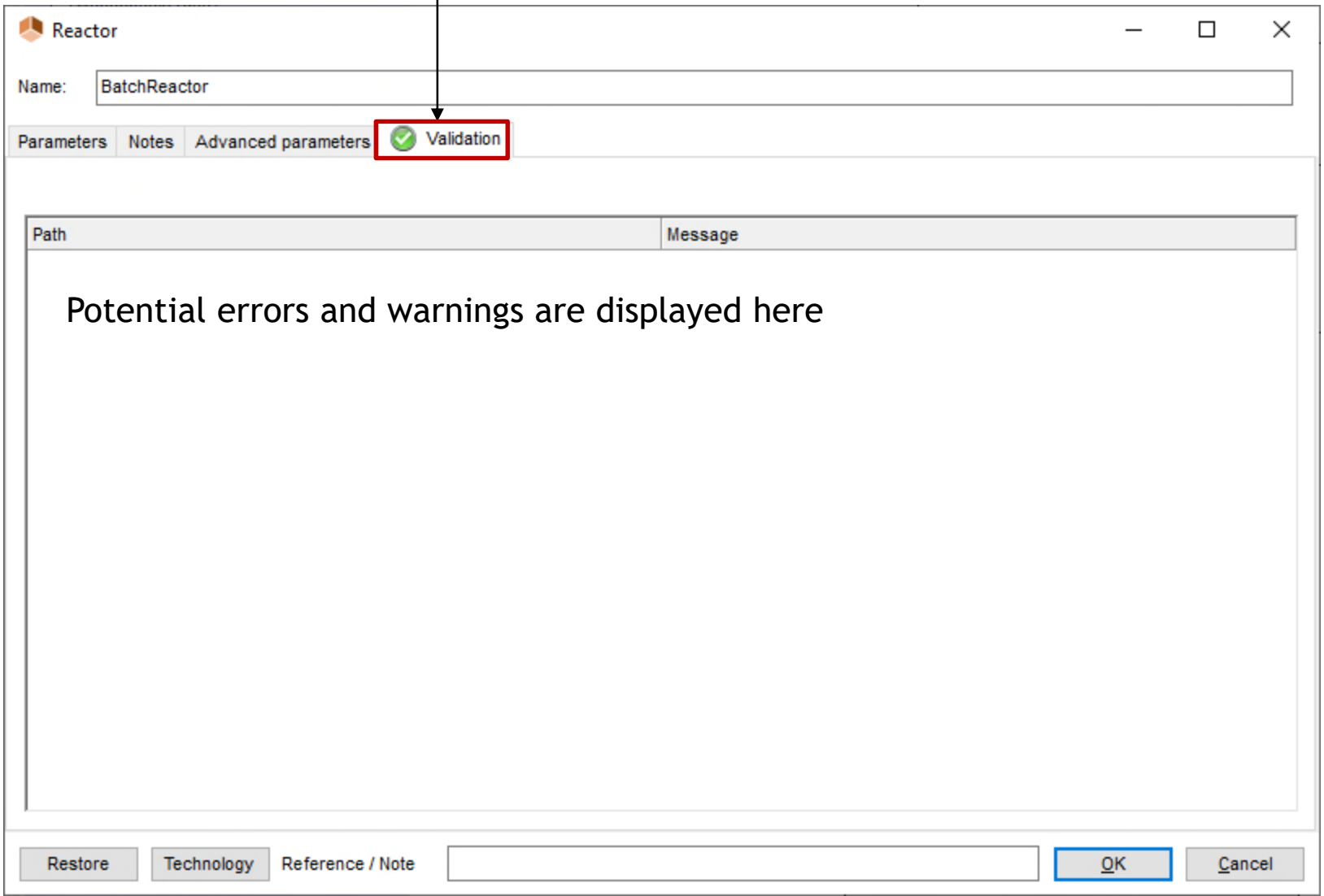
- Wall materials:



Note: it is possible to save/import equipment characteristics by clicking on the “Technology” button

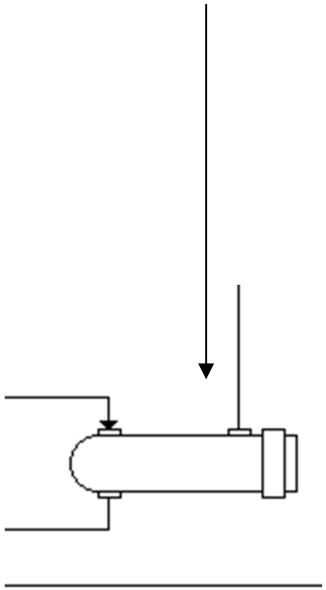
Step 4: Describe the equipment

Click on the “Validation” tab

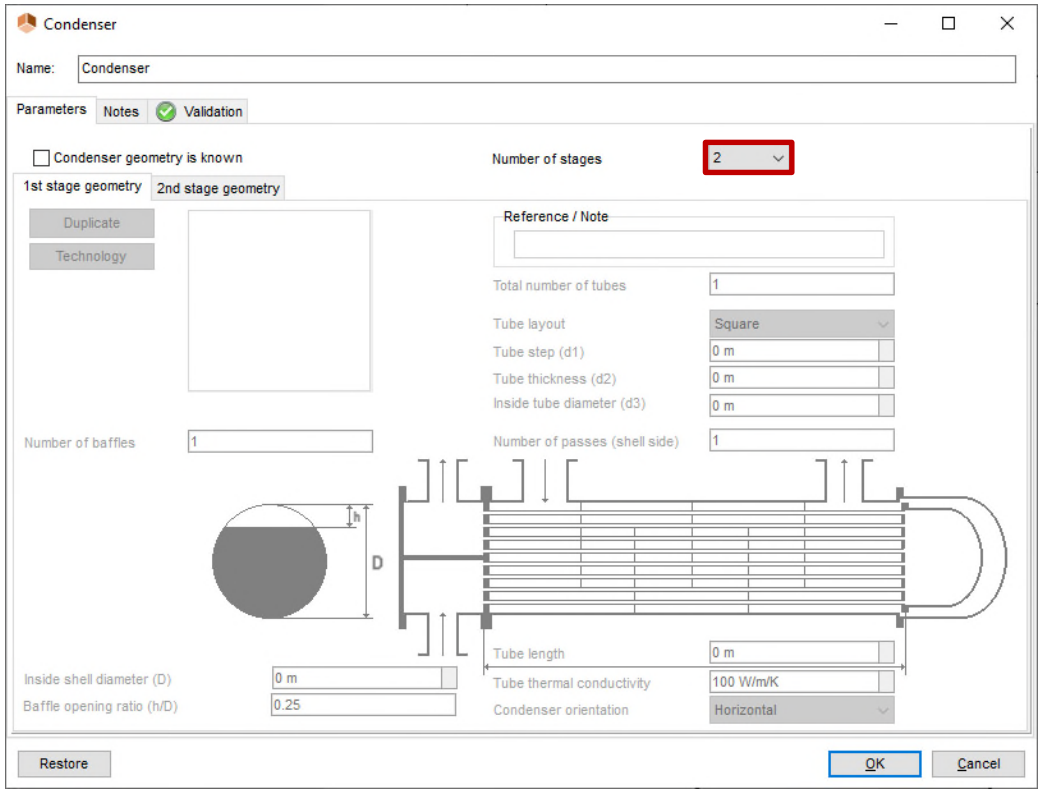


Step 4: Describe the equipment

Double click on the condenser to access its configuration window

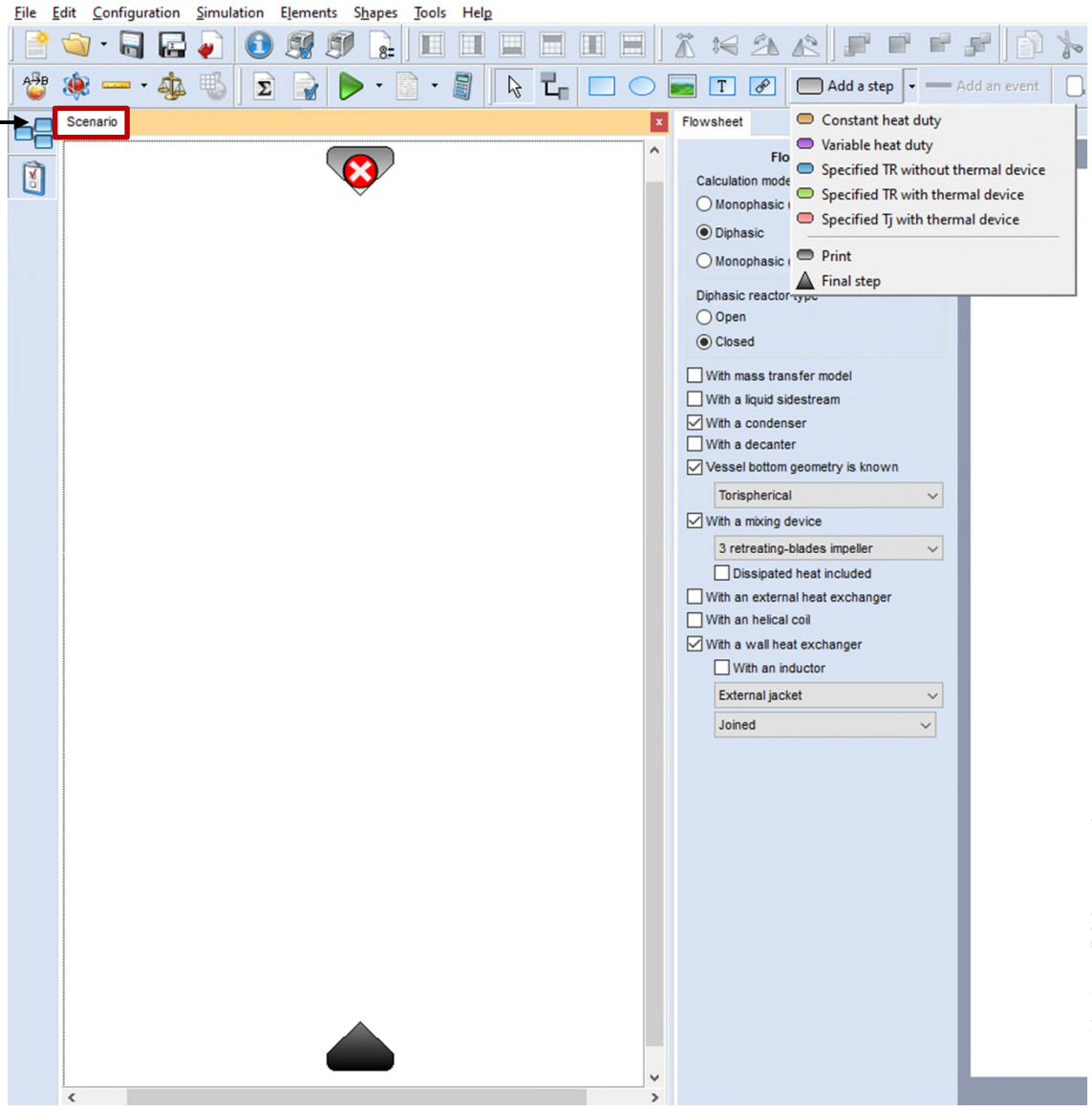


Enter the number of stages: 2
Two condensers in series are then defined



Step 5: Describe the operating steps

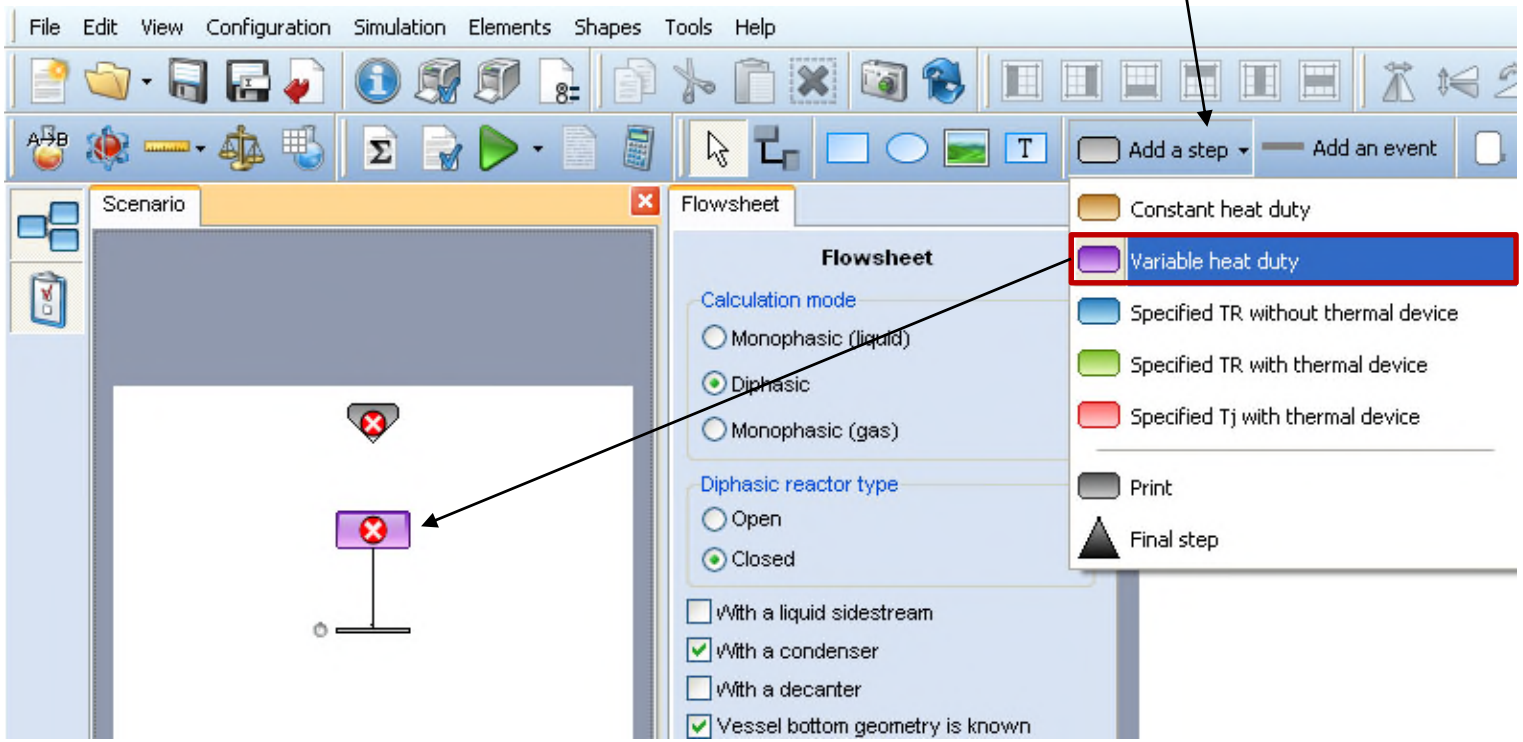
The operating mode is described in the “Scenario” tab and corresponds to a sequence of steps and events



Step 5: Describe the operating steps

- Add the “heating” step:

1 - Click on “Add a step” and then on “Variable heat duty”



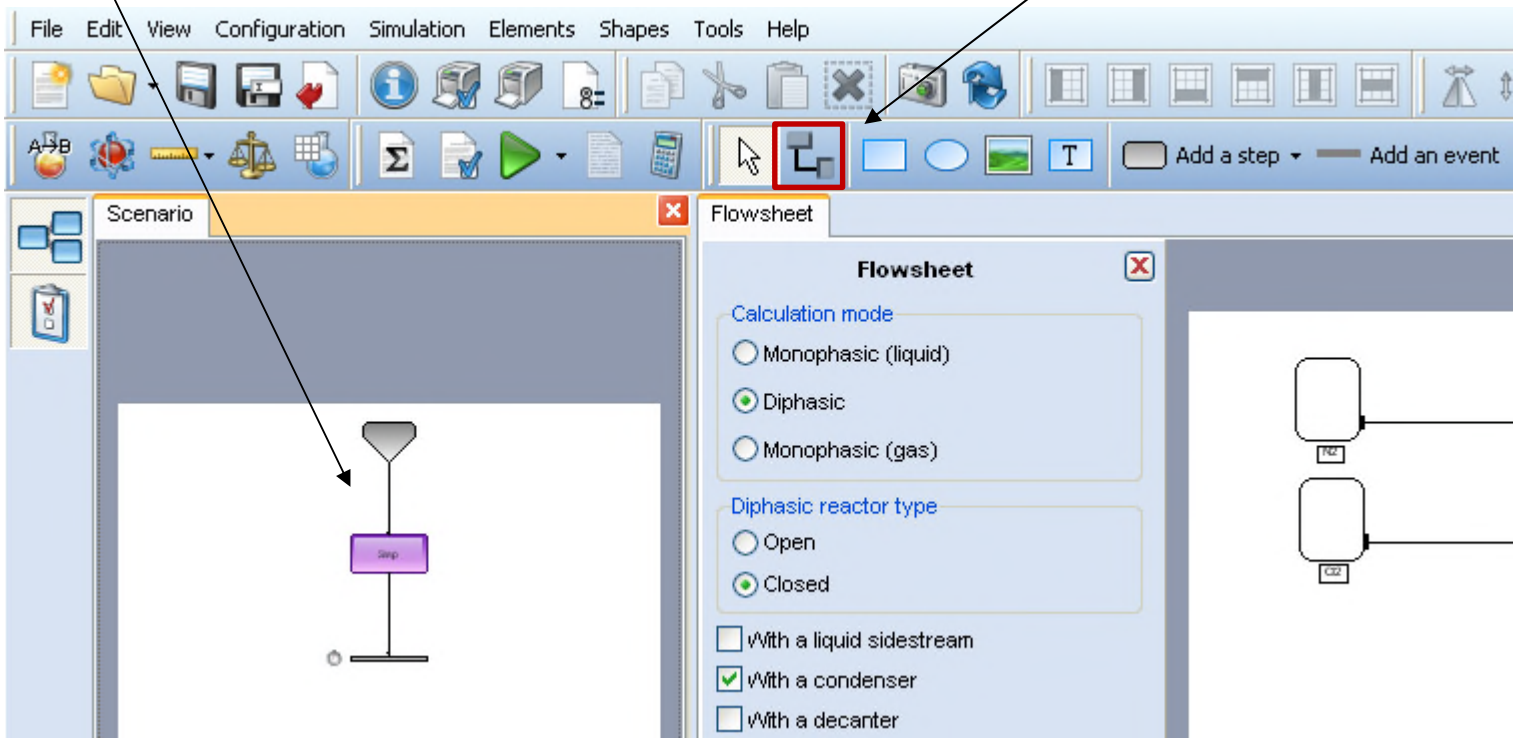
2 - Click on the “Scenario” tab.
A new step and a new event are created

Step 5: Describe the operating steps

- Connect the steps:

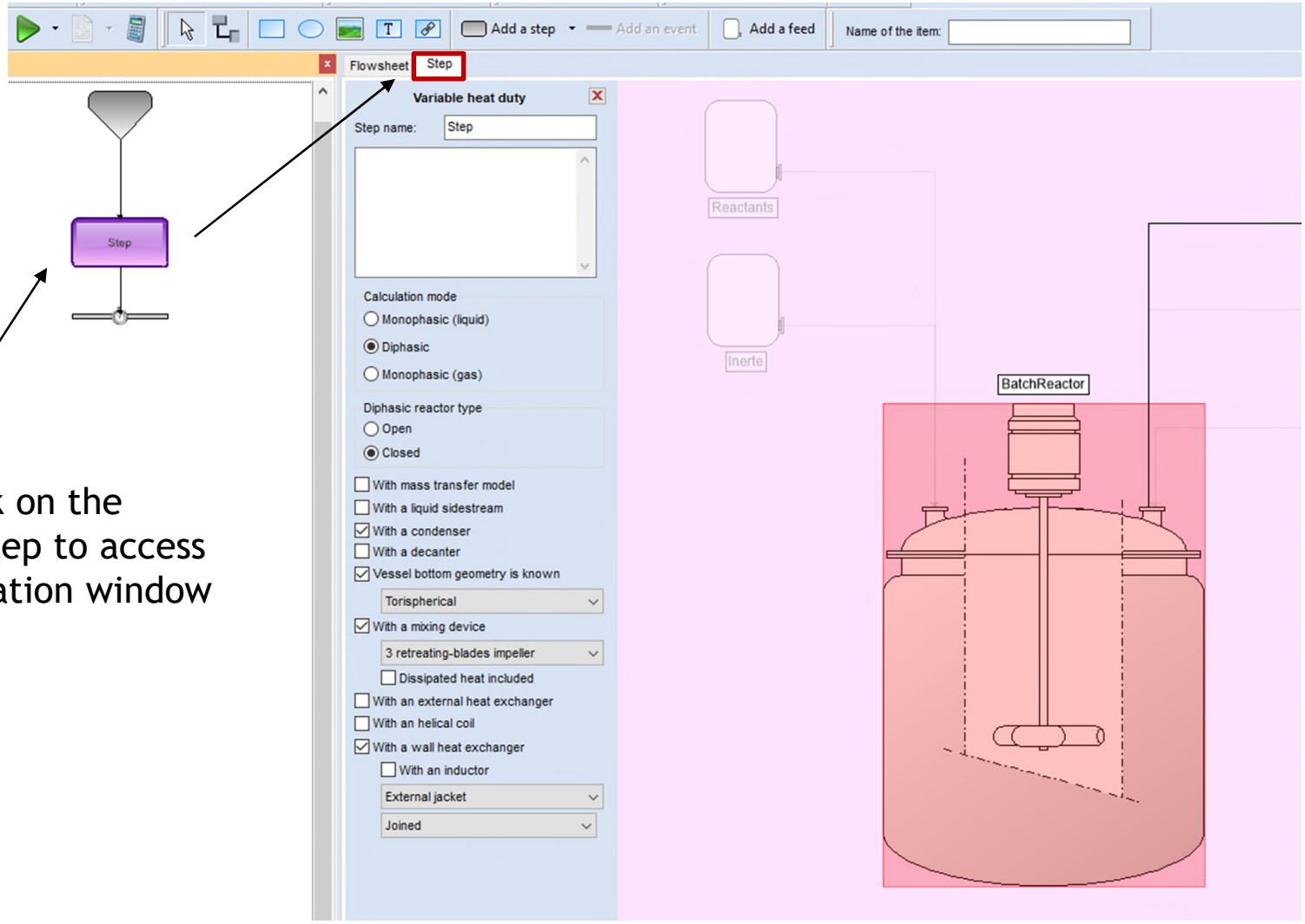
2 - Click on the first triangle (operation start) and then click on the first step.

1 - Click on “connection”



Step 5: Describe the operating steps

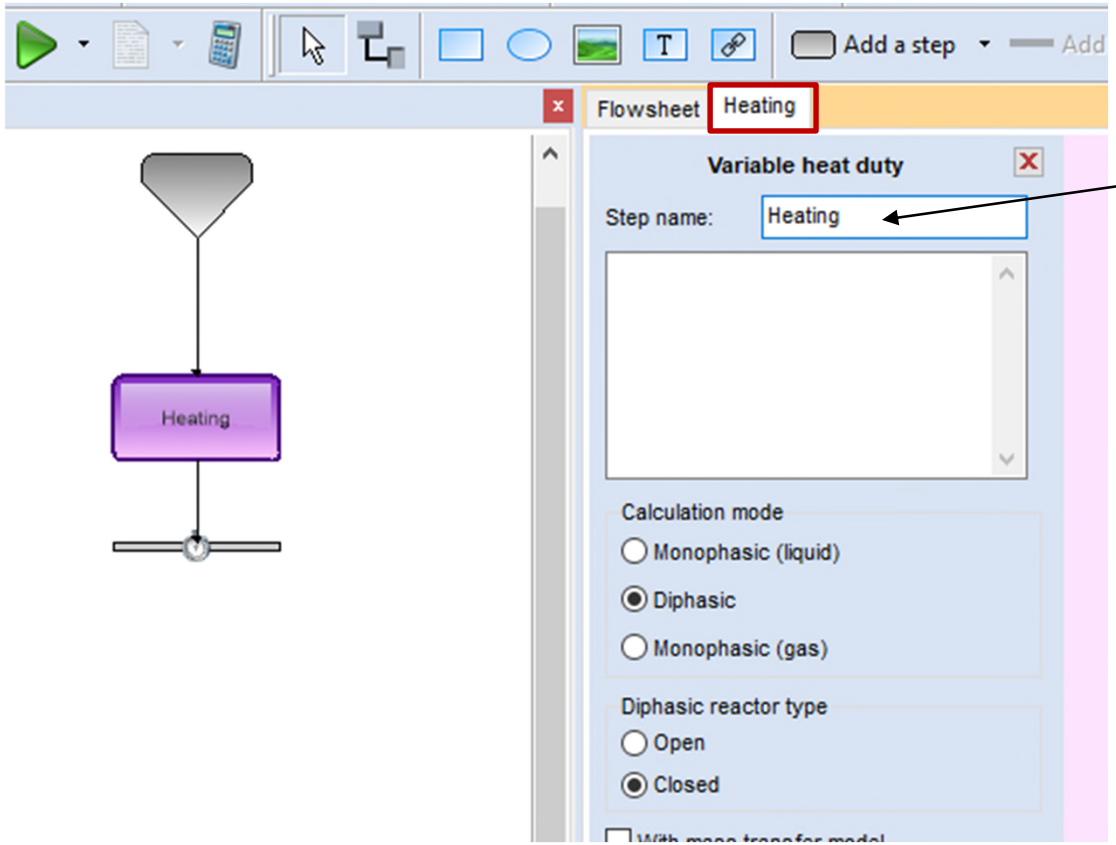
- Configure the “heating” step:



Double click on the operating step to access its configuration window

Step 5: Describe the operating steps

- Configure the “heating” step:



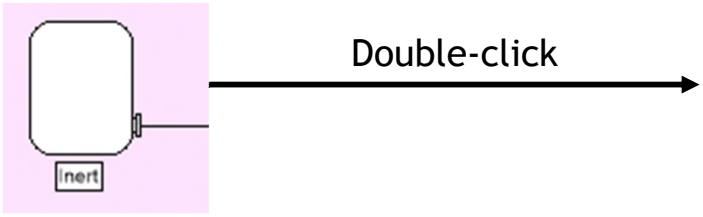
Rename the step “heating”

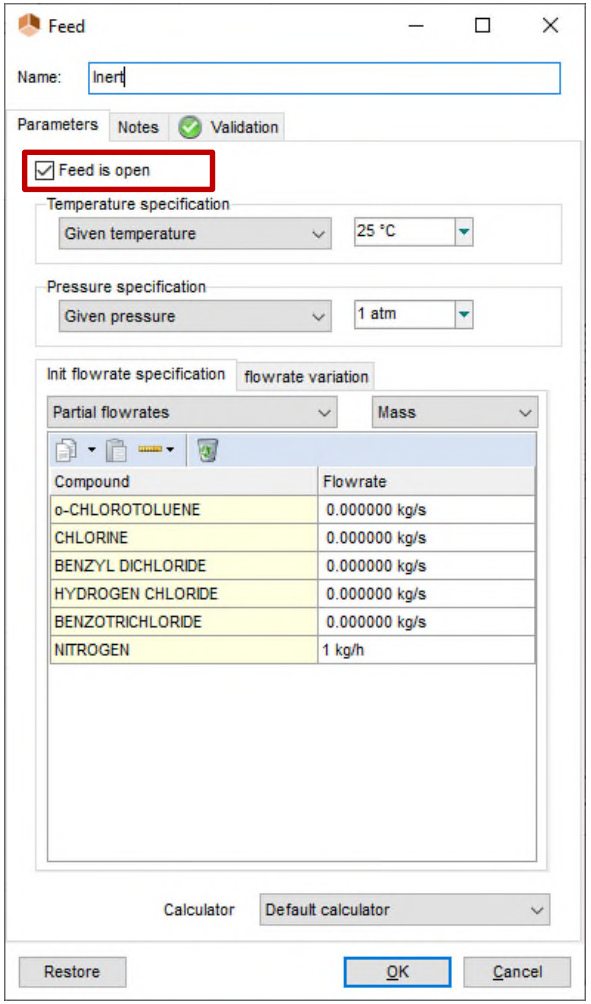
Step 5: Describe the operating steps

- Configure the “heating” step:

Specify the properties of the “inert” feed:

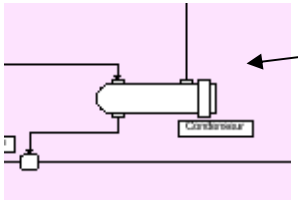
- Check the “Feed is open” option
- Temperature: 25°C
- Pressure: 1 atm
- Nitrogen flowrate: 1 kg/h





Step 5: Describe the operating steps

- Configure the “heating” step:

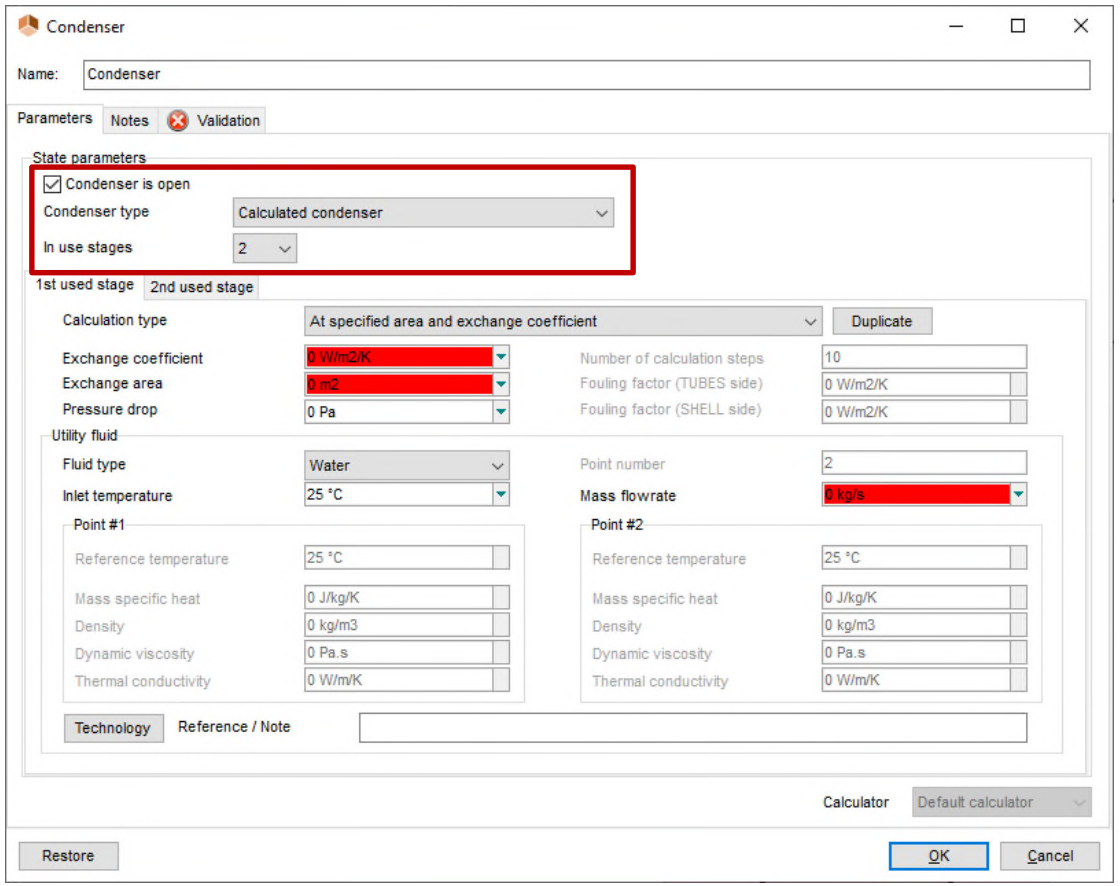


1 - Double click on the condenser to open its configuration window

2 - Check the “condenser is open” box

3 - Condenser type: calculated

4 - In use stages: 2

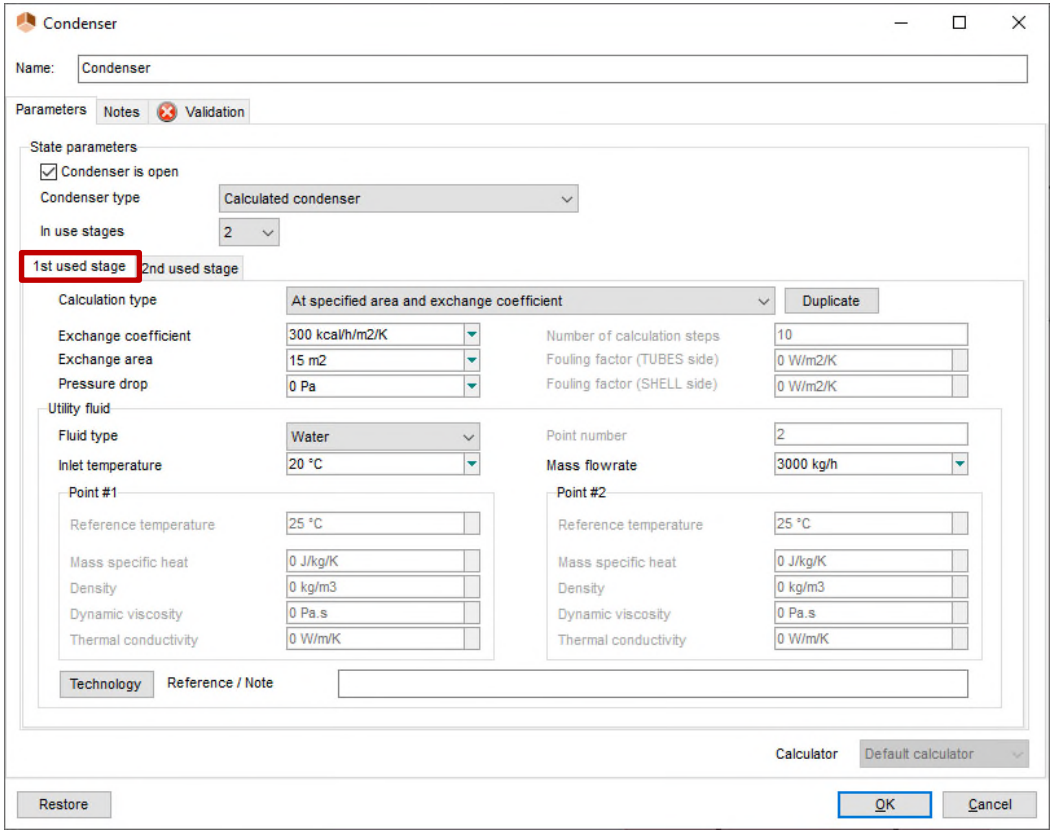


Step 5: Describe the operating steps

- Configure the “heating” step:

Characteristics of the condenser 1st stage:

- Calculation type: at specified area and exchange coefficient
- Exchange coefficient: 300 kcal/h/m²/K
- Exchange area: 15 m²
- Utility fluid:
  - Water
  - Inlet temperature: 20°C
  - Mass flowrate: 3000 kg/h

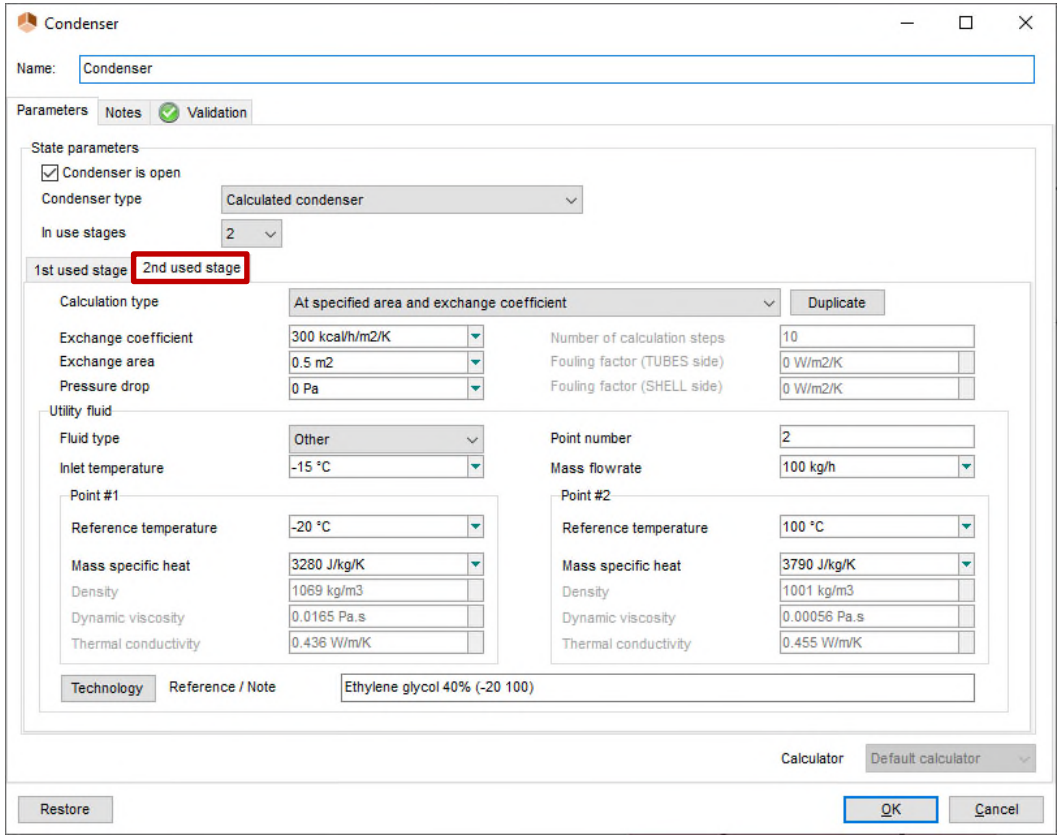


Step 5: Describe the operating steps

- Configure the “heating” step:

Characteristics of the condenser 2nd stage:

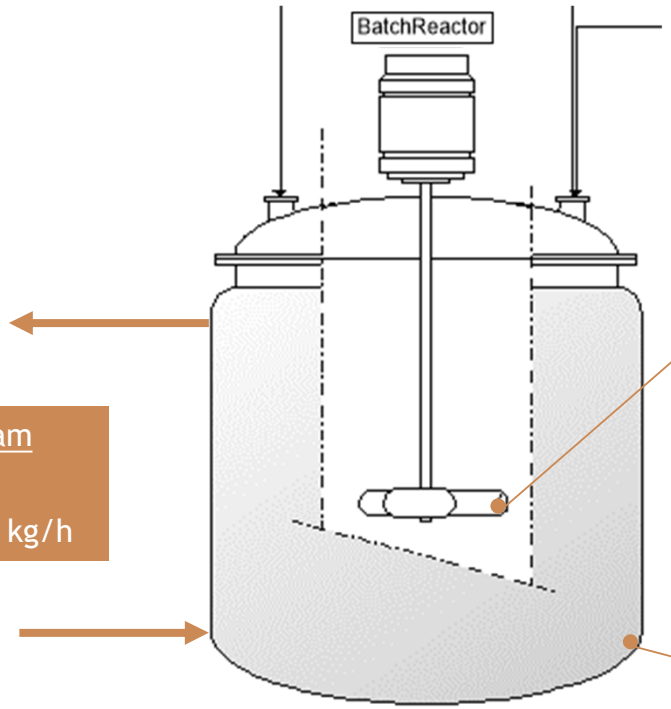
- Calculation type: at specified area and exchange coefficient
- Exchange coefficient: 300 kcal/h/m²/K
- Exchange area: 0.5 m²
- Utility fluid:
  - Click on “Technology” and import « Ethylene glycol 40% » from the database
  - Inlet temperature: -15°C
  - Mass flowrate: 100 kg/h



Step 5: Describe the operating steps

- Configure the “heating” step:

The characteristics of the heating device are the following:



Mixing

Rotation speed: 90 rpm

Saturated steam

P: 6 bar
Max flowrate: 200 kg/h

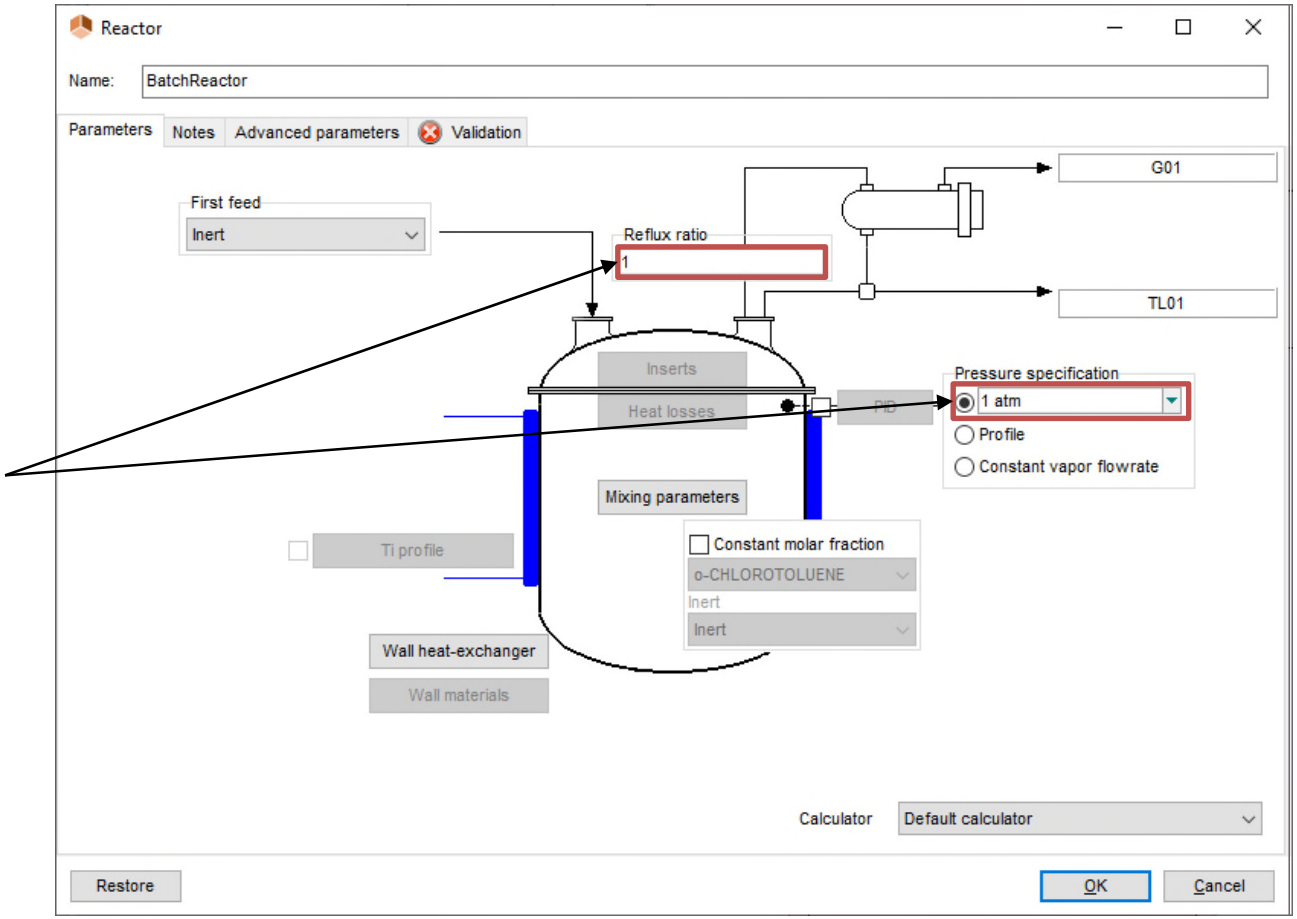
Wall materials

Stainless steel 316

Step 5: Describe the operating steps

- Configure the “heating” step:

1 - Double click on the reactor icon to access its configuration window



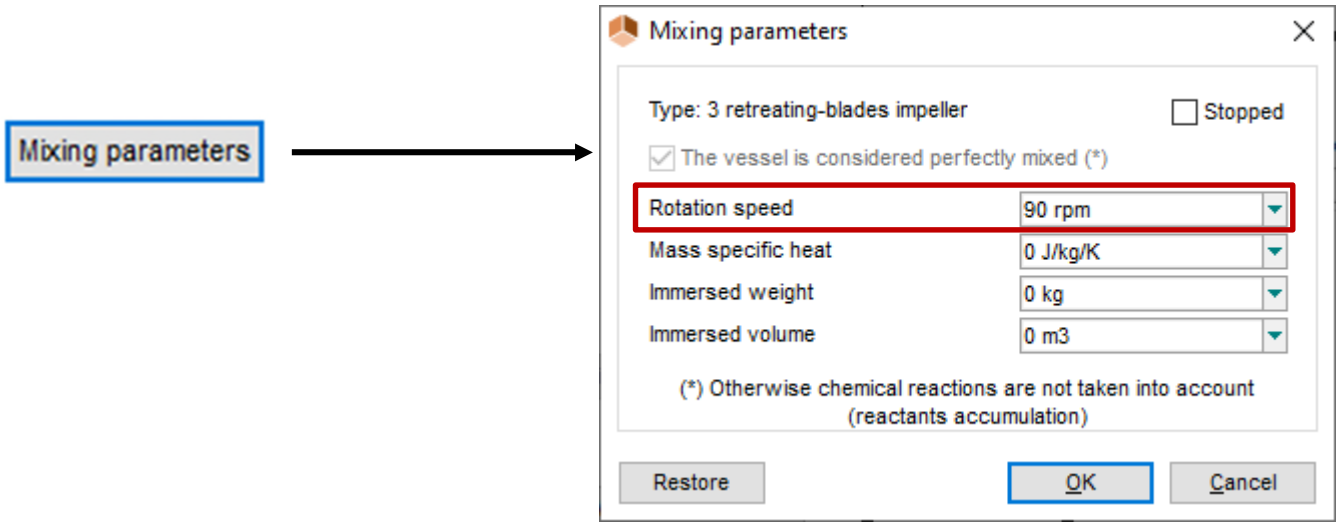
2 - Enter the operating parameters:

- Reflux ratio (1 for 100% reflux)
- Pressure specification

Step 5: Describe the operating steps

- Configure the “heating” step:

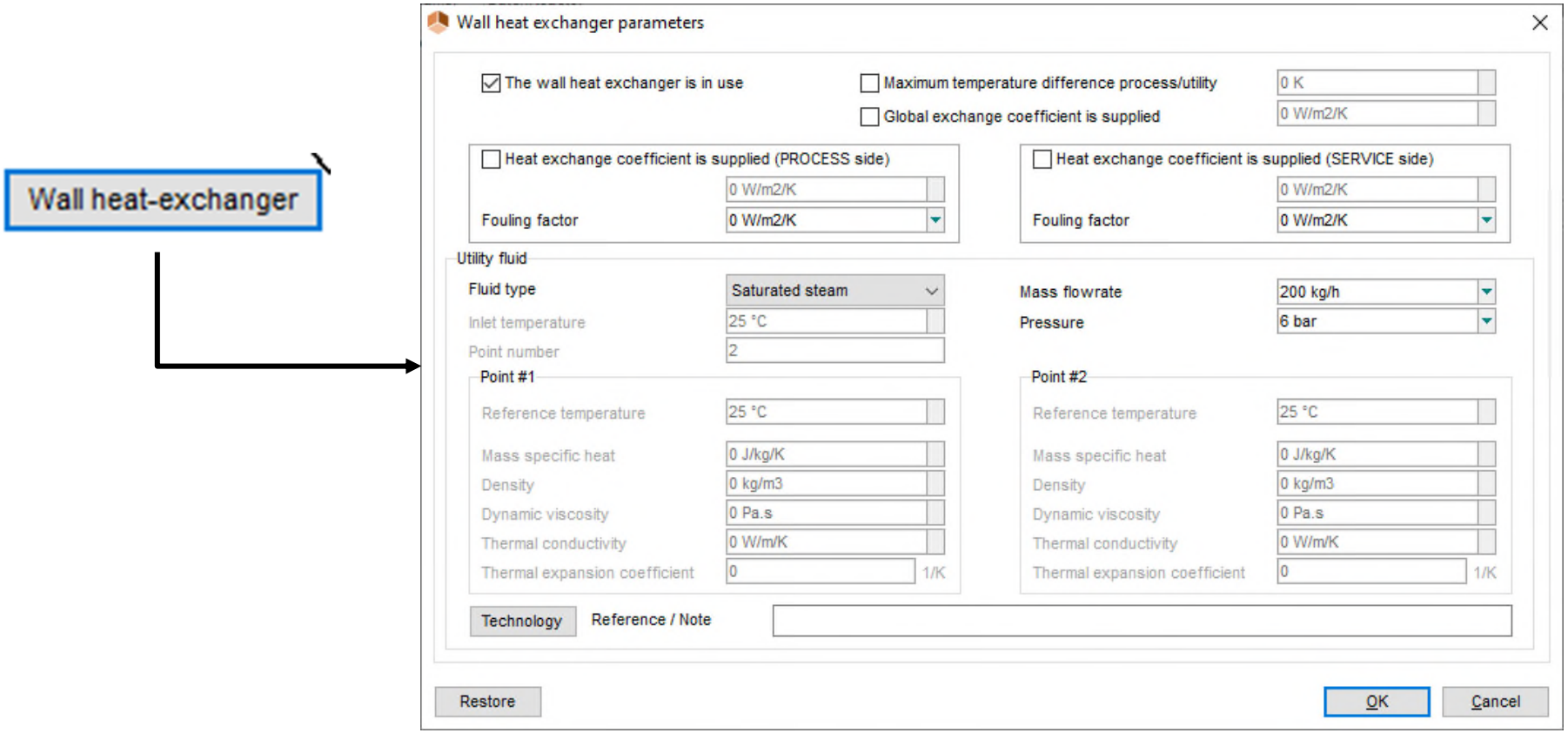
Specify the mixing parameters:



Step 5: Describe the operating steps

- Configure the “heating” step:

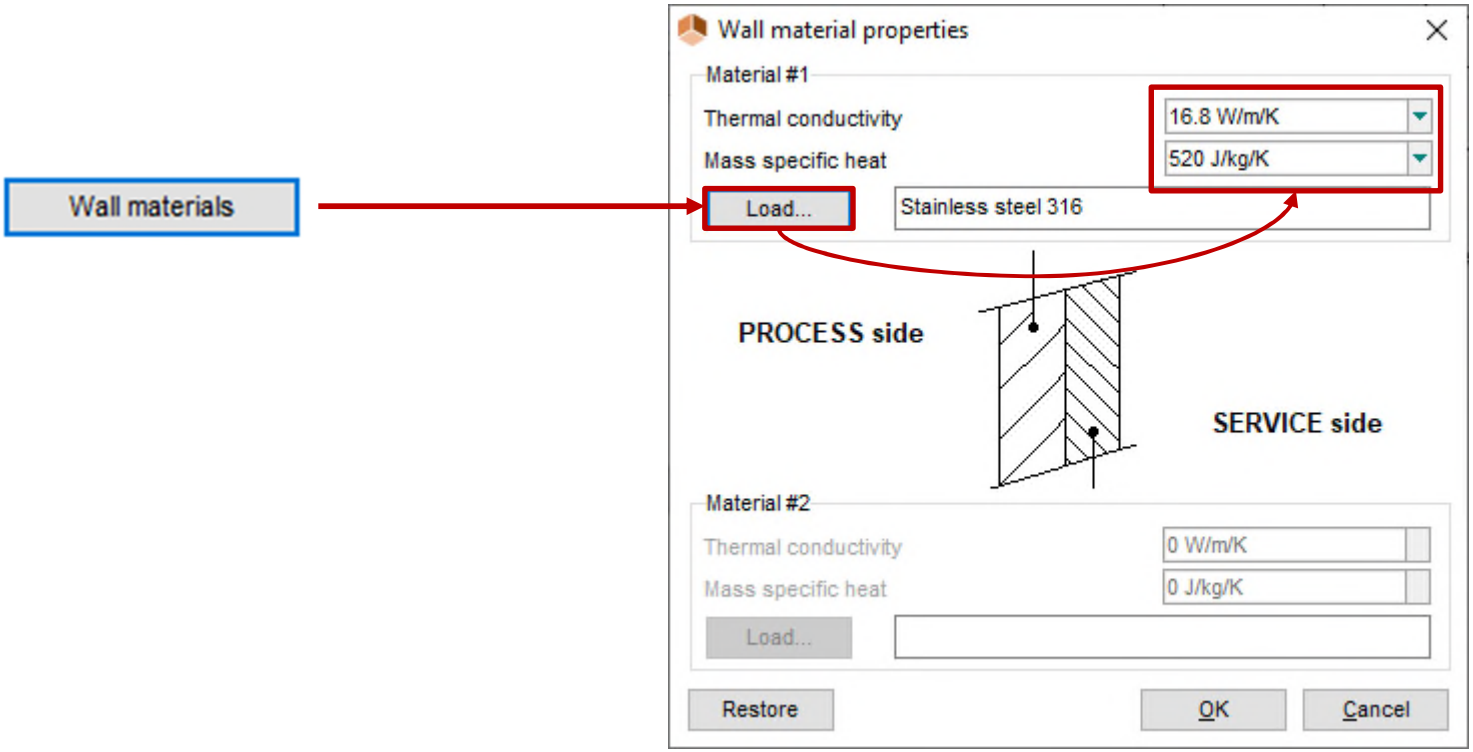
Specify the wall heat exchanger parameters:



Step 5: Describe the operating steps

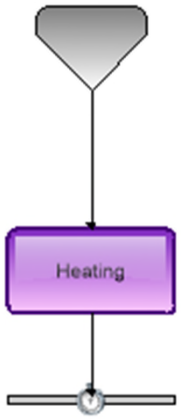
- Configure the “heating” step:

Wall materials: import the characteristics of the “Stainless steel 316” from the database:



Step 5: Describe the operating steps

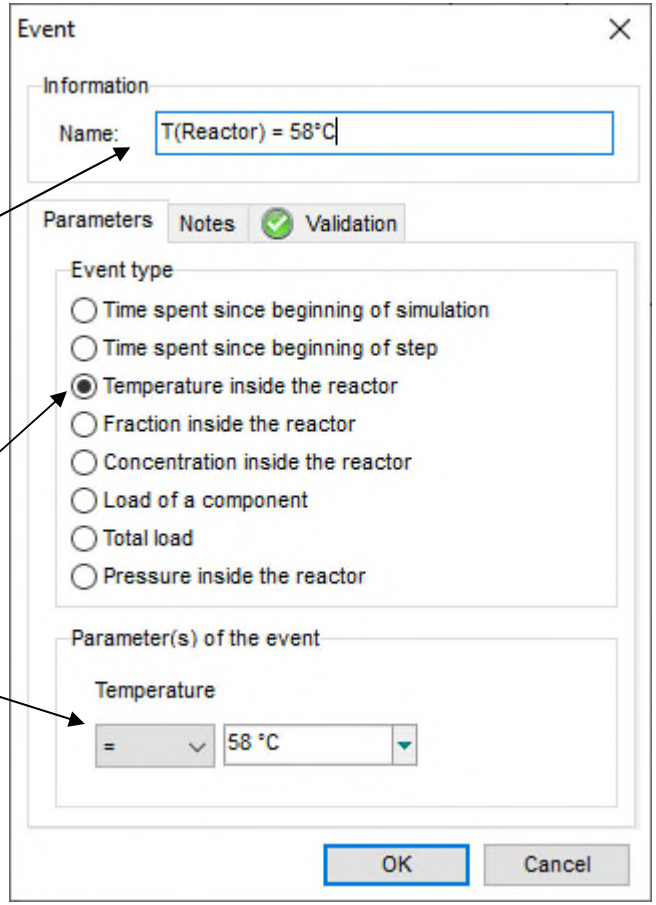
- Configure the “heating” step:



1 - Double click on the end event

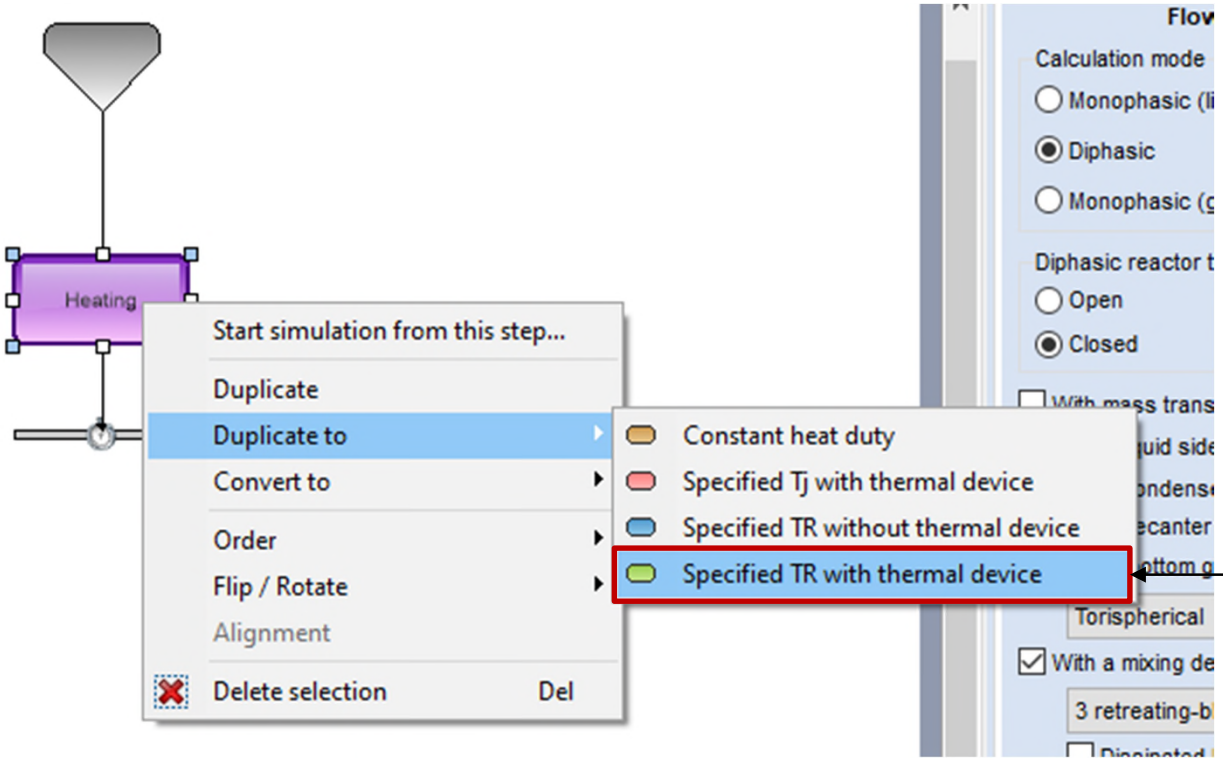
2 - Specify the event name

3 - Select the event type: temperature of 58°C reached inside the reactor



Step 5: Describe the operating steps

- Configure the “reaction” step:



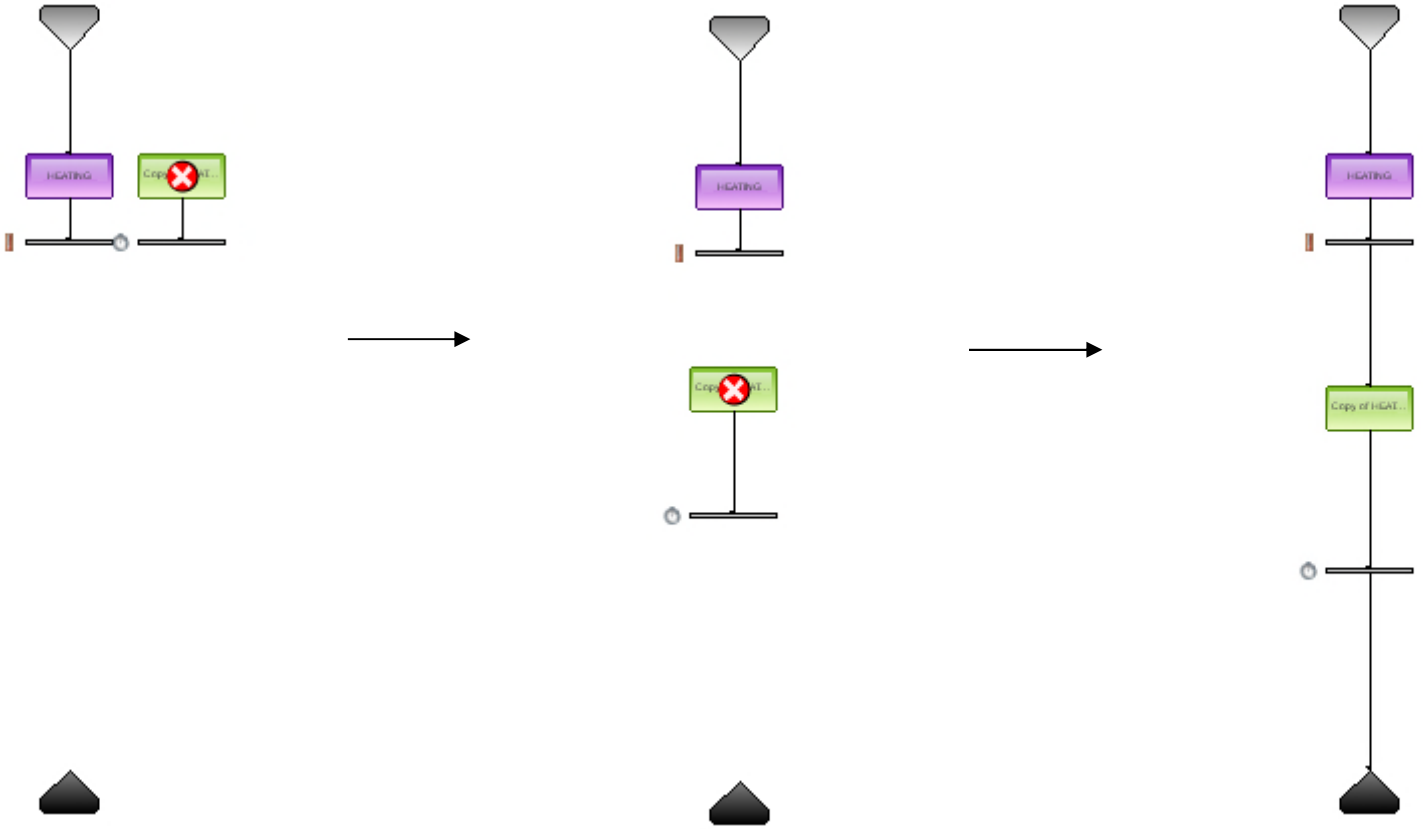
Right click on the first operating step and duplicate it to a new “specified TR with thermal device” step

Duplicating a step prevents from providing a second time the input parameters that are similar in both steps

Step 5: Describe the operating steps

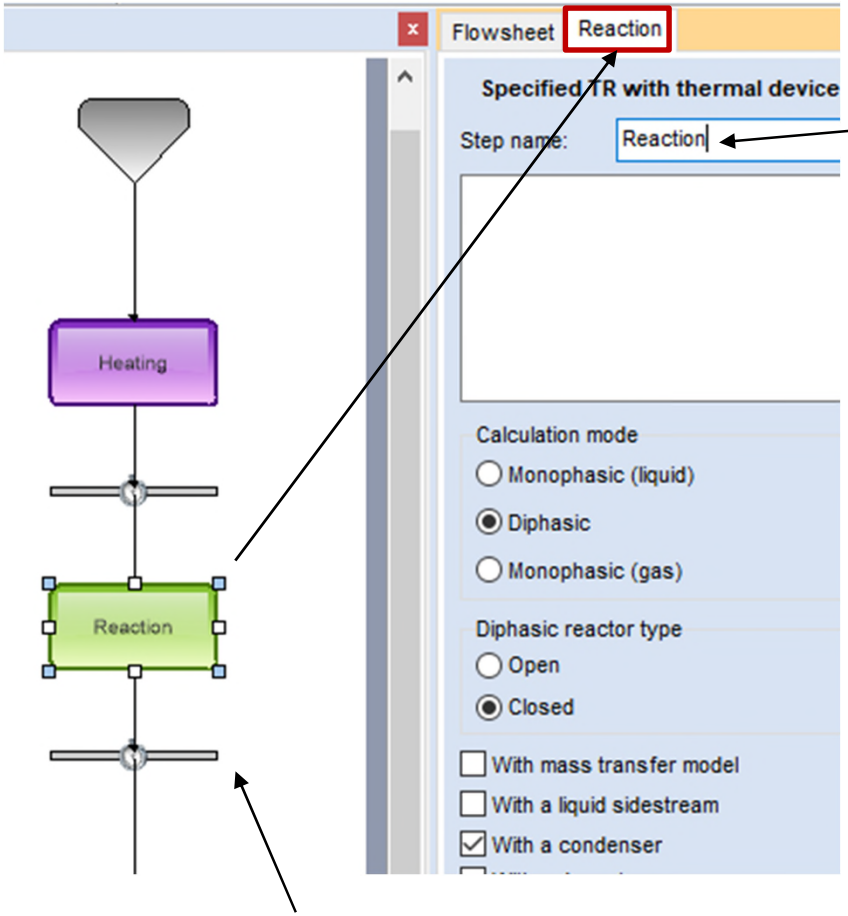
- Configure the “reaction” step:

Connect the new step to the ending event of the heating step and to the ending event of the simulation



Step 5: Describe the operating steps

- Configure the “reaction” step:



2 - Rename the step “Reaction”

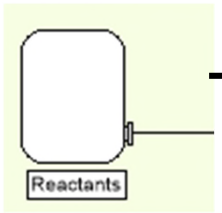
1 - Double click on the new step to access its configuration window

Step 5: Describe the operating steps

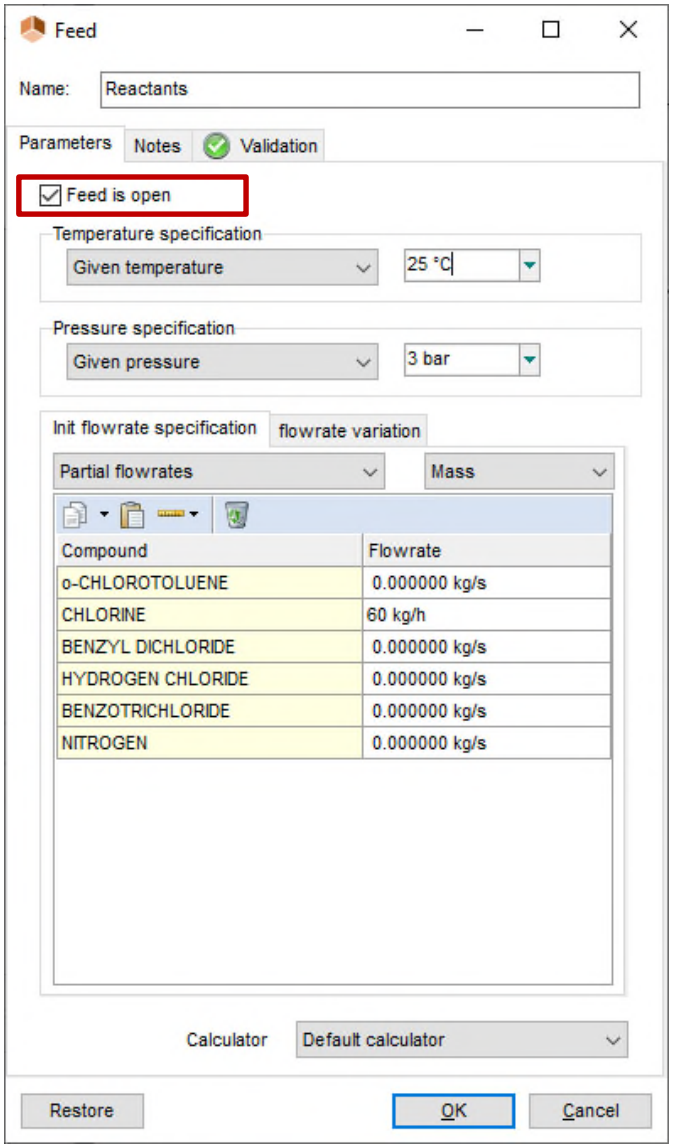
- Configure the “reaction” step:

Specify the properties of the “Reactants” feed:

- Check the “Feed is open” option
- Temperature: 25°C
- Pressure: 3 bar
- Chlorine flowrate: 60 kg/h



Double-click

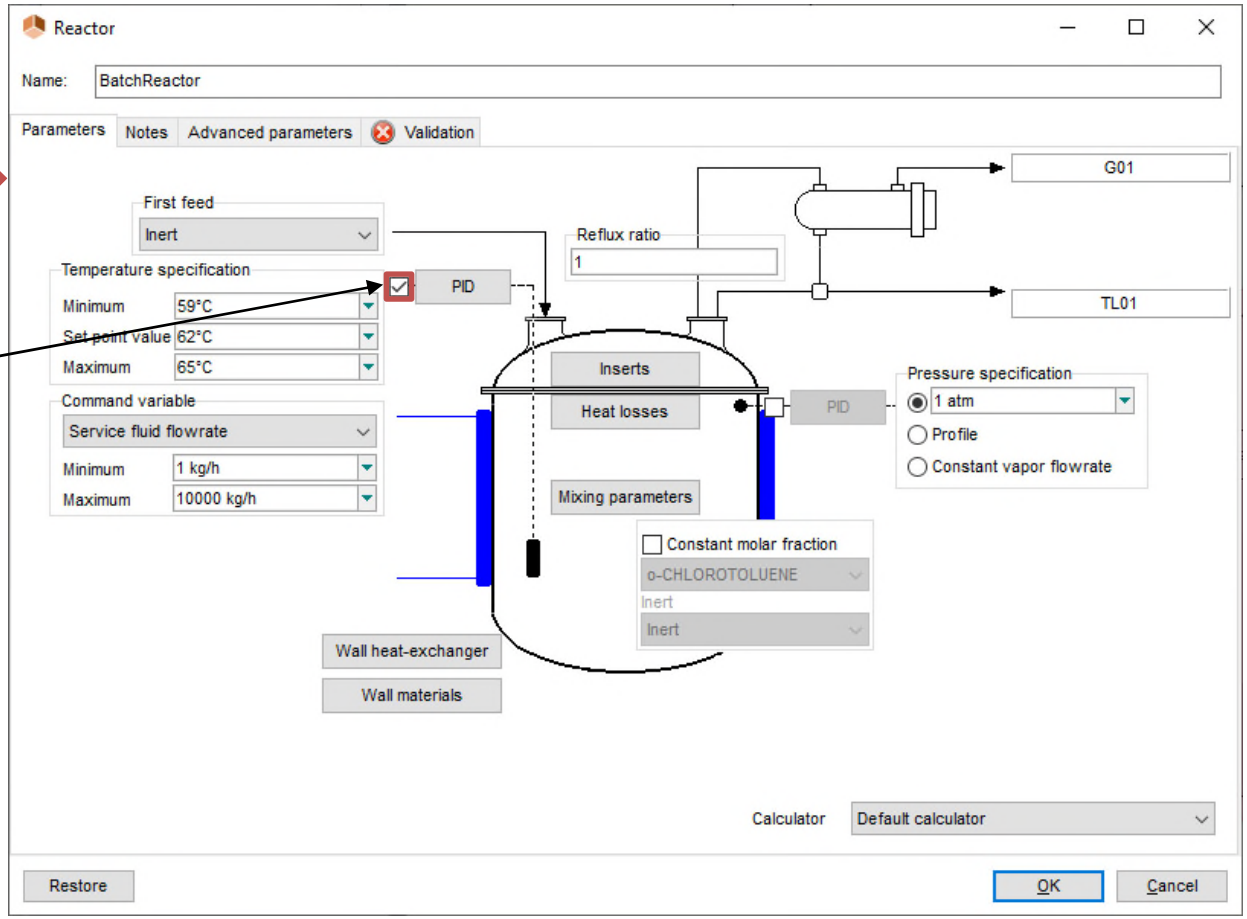


Step 5: Describe the operating steps

- Configure the “reaction” step:

1 - Double click on the reactor icon to access its configuration window

2 - Check the “PID” option



Step 5: Describe the operating steps

- Configure the “reaction” step:

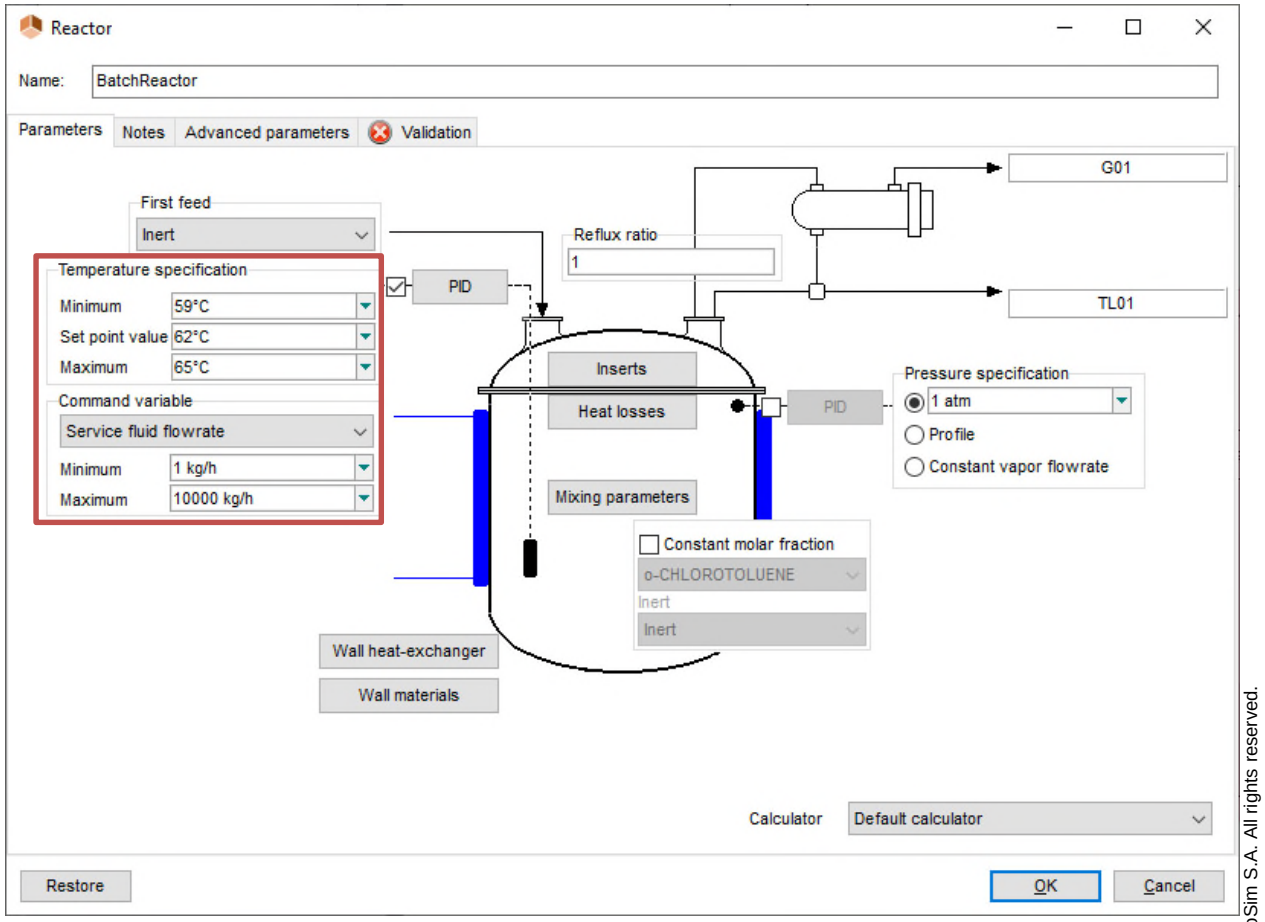
3 - Specify the PID parameters:

<u>Temperature specification:</u>

- Set point value: 62°C
- Minimum value: 59°C
- Maximum value: 65°C

<u>Command variable:</u>

- Command variable: Service fluid flowrate
- Minimum value: 1 kg/h
- Maximum value: 10 t/h



Step 5: Describe the operating steps

- Configure the “reaction” step:

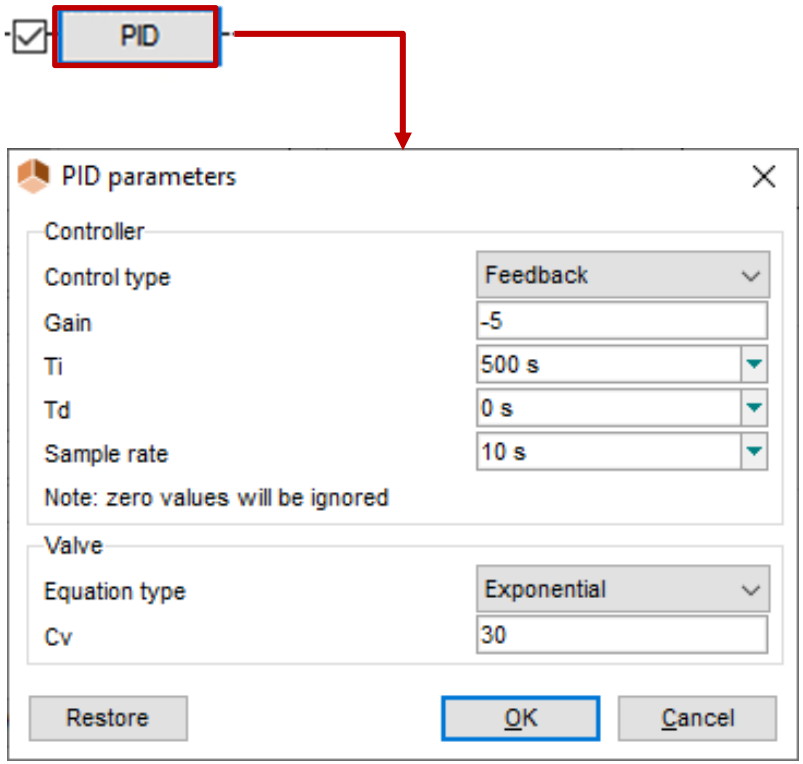
4 - Click on “PID” in order to specify the following parameters:

<u>Controller:</u>

- Control type: Feedback
- Gain: -5
- T_i: 500 s
- T_d: 0 s
- Sample rate: 10 s

<u>Valve:</u>

- Equation type: exponential
- Cv : 30



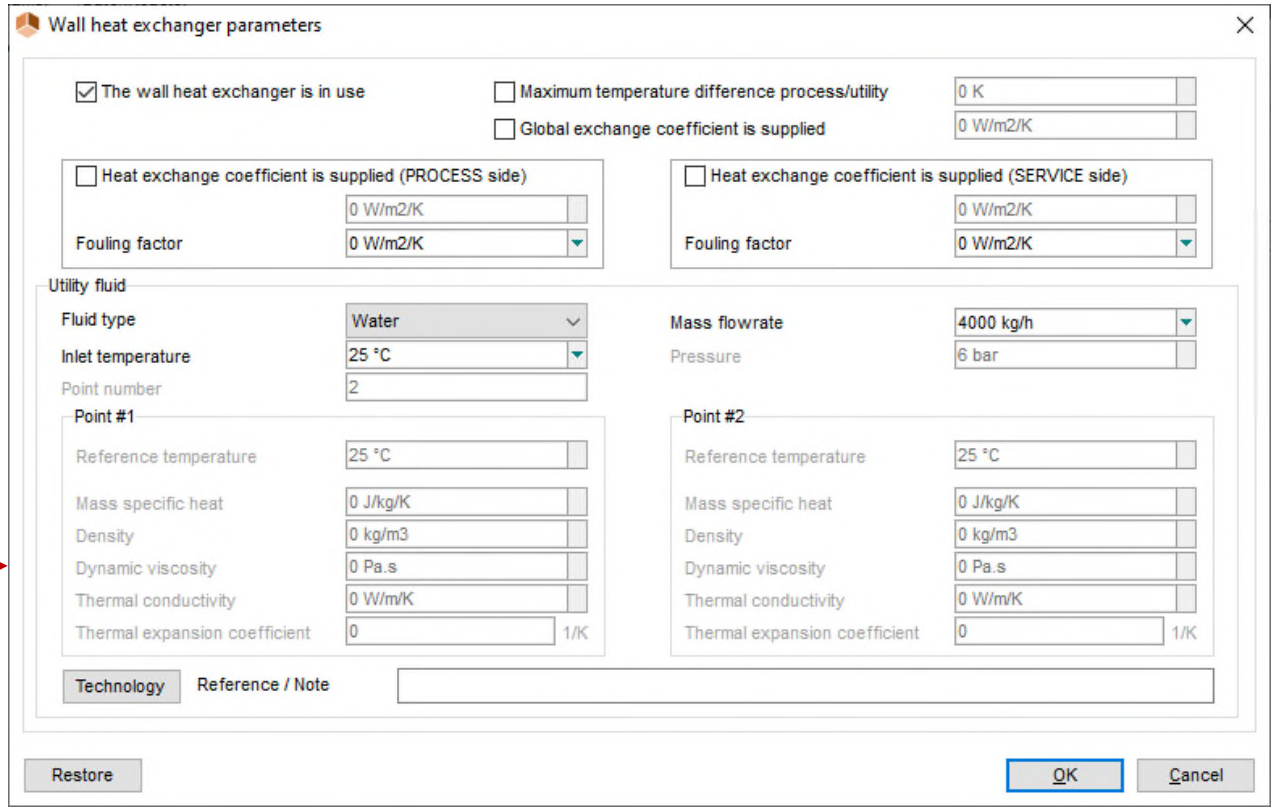
Step 5: Describe the operating steps

- Configure the “reaction” step:

Specify the characteristics of the cooling system:

- Water
- Temperature: 25°C
- Mass flowrate: 4000 kg/h

Wall heat-exchanger



Step 5: Describe the operating steps

- Configure the “reaction” step:

It is not necessary to configure the following elements that are identical to the first operating step:

- Mixing parameters
- Wall materials
- Reflux
- Pressure specification
- Condenser characteristics

Step 5: Describe the operating steps

- Configure the “reaction” step:

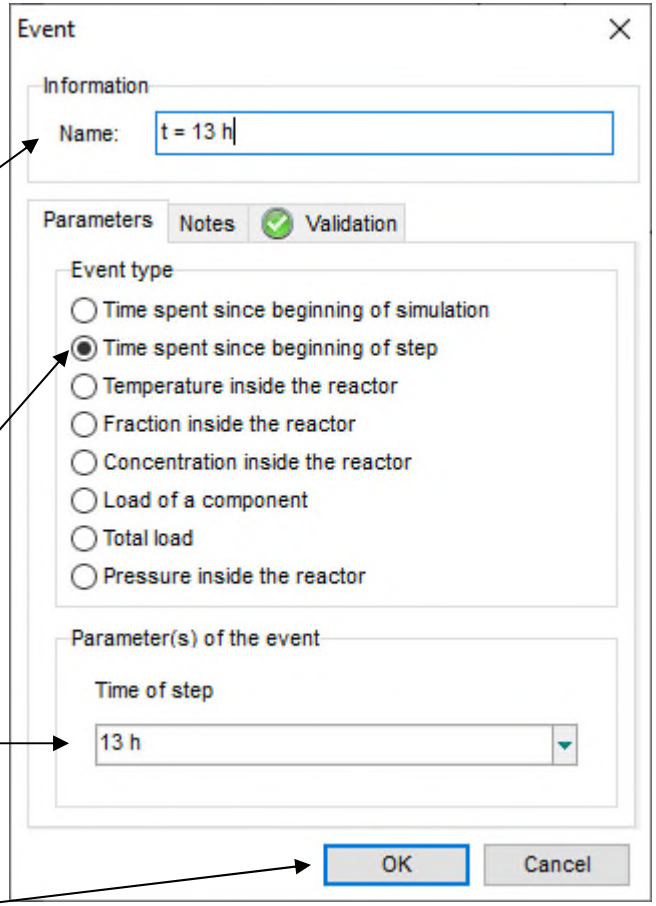
1 - Double click on the event

2 - Enter the event name

3 - Select “time spent since beginning of step”

4 - Enter the time of step

5 - Click on “OK”

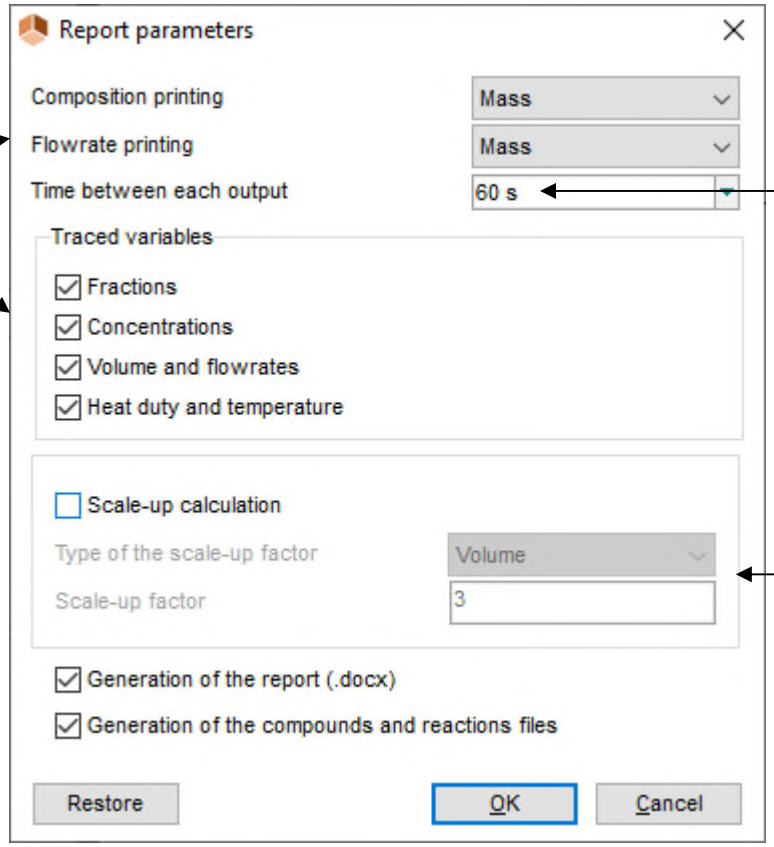


Step 6: Run the simulation

1 - Click on the “Report parameters”

2- Set up the general report parameters

3 - Change the “time between each output” to 60 s in order to get smoother curves



Possibility to perform scale-up calculations

4 - Save the file

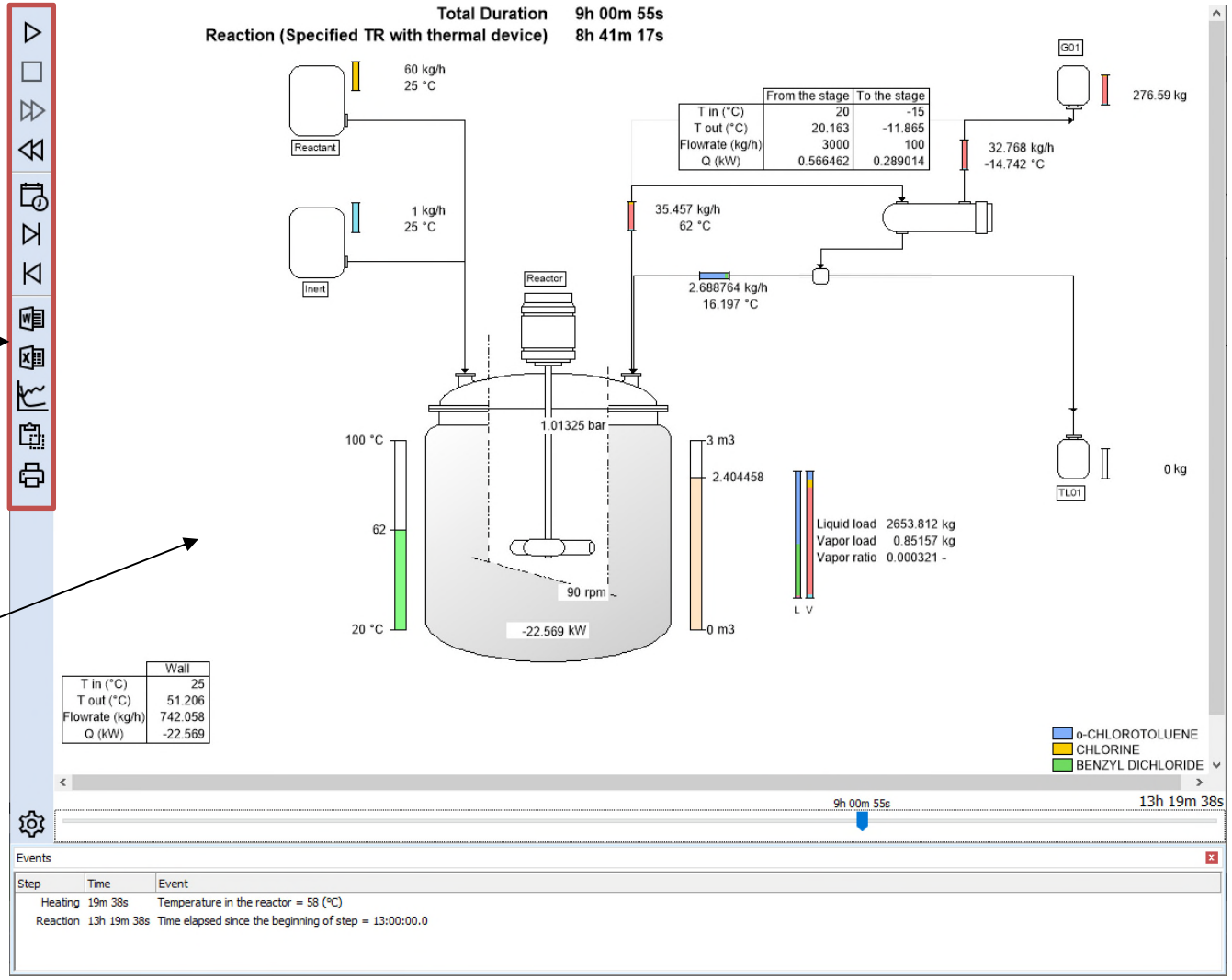
5 - Run the simulation

Step 6: Run the simulation

The following window displays in real time the process operating variables:

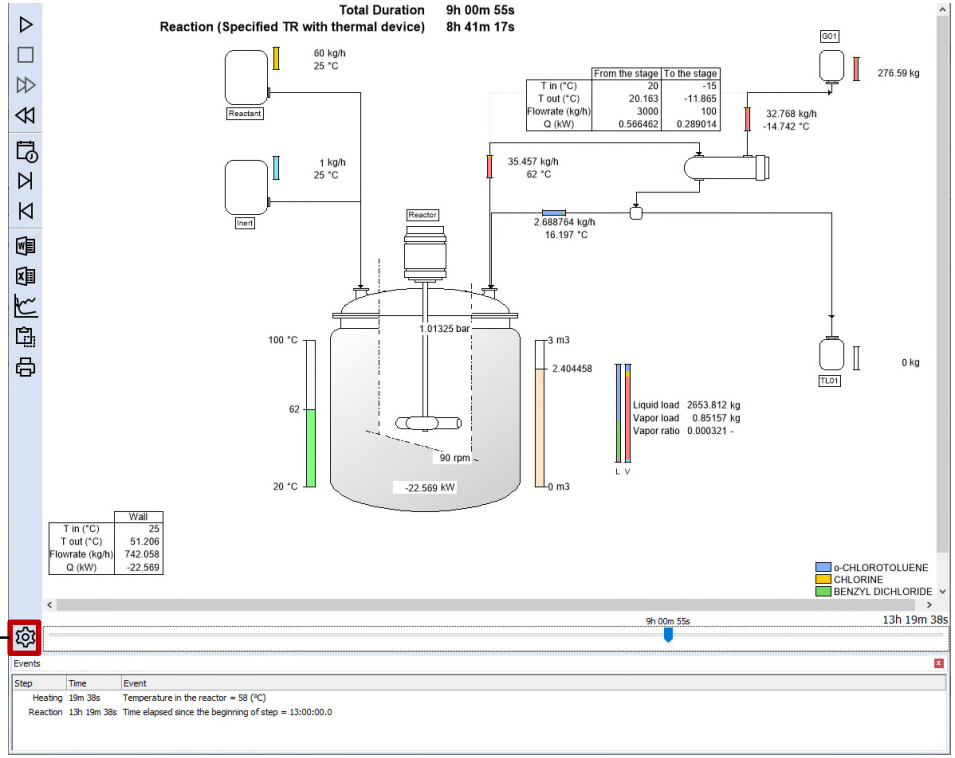
Toolbar that is used to pause, go to the next step, access the graphical settings, etc…

Operating parameters are displayed here (temperatures, pressures, flowrates, compositions, etc…)

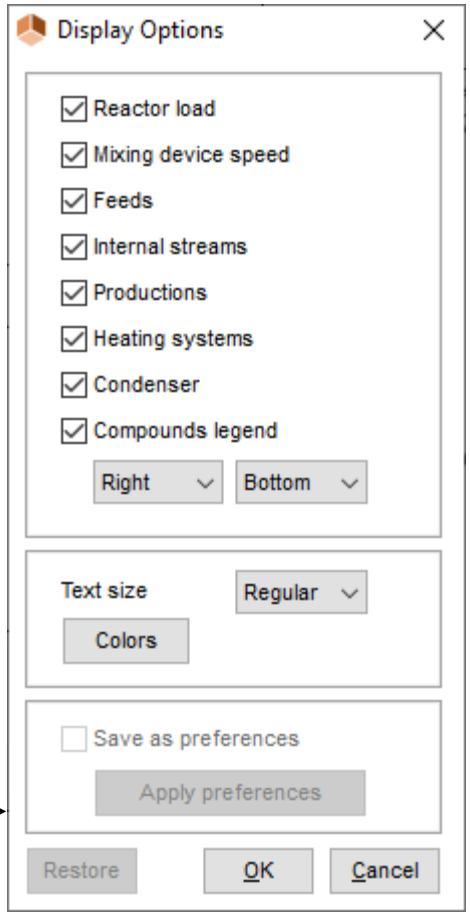


Step 6: Run the simulation

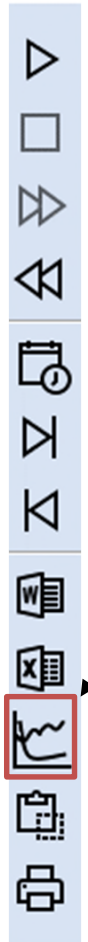
The following window displays in real time the process operating variables:



Click here to access the display options

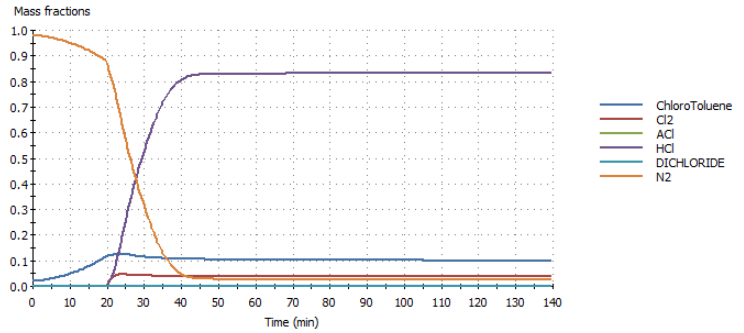


Step 7: Analyze the simulation results

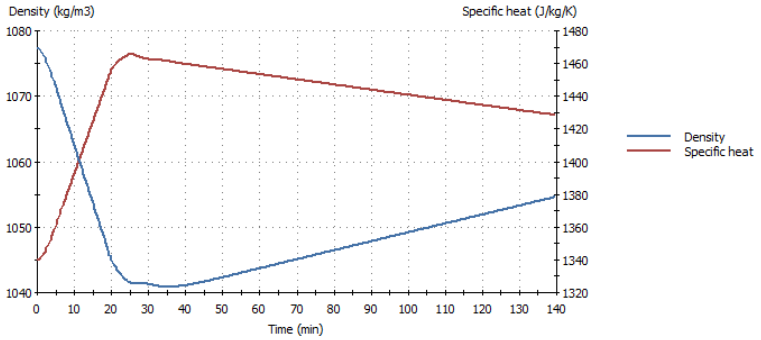


Once the simulation is complete, click on "Open the graph report" to analyze the evolution as a function of time of the variable parameters (pressure, temperature, flowrates, compositions, heat duties, physical properties, etc…)

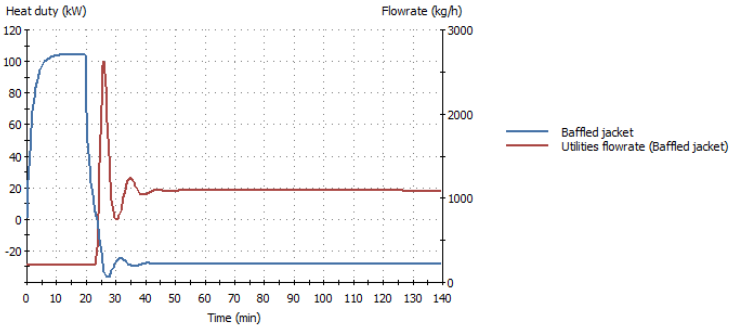
Vapor mass fractions



Physical properties

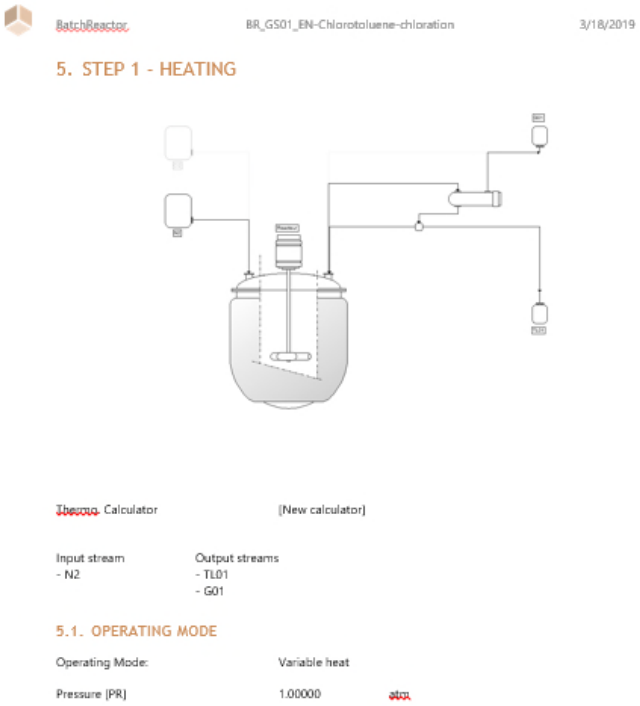


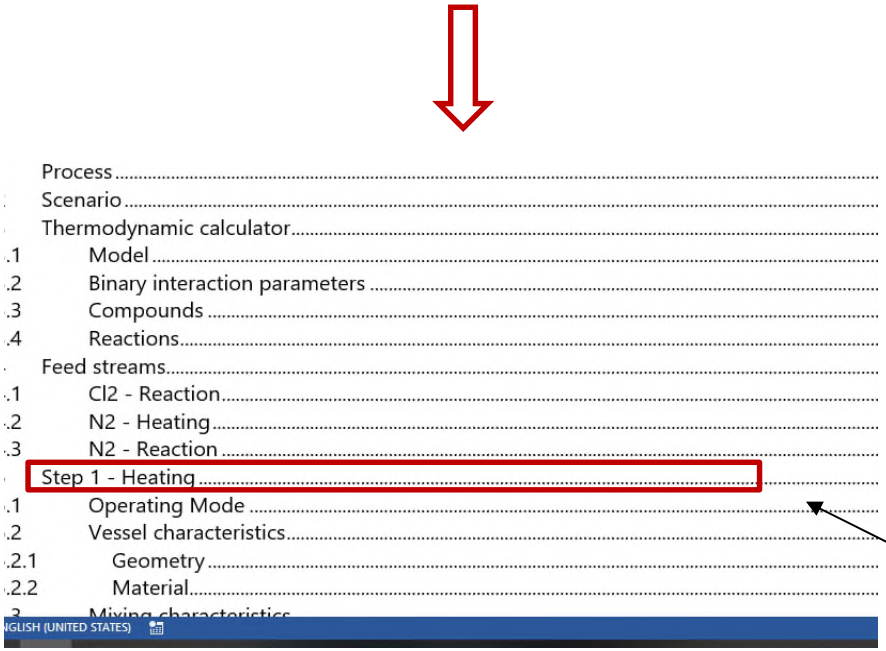
Heat duty - Utilities flowrate



Step 7: Analyze the simulation results

Click on "Open the report" to open the full simulation report in MS-Word format. It includes the input data (equipment and operating scenario) as well as the numerical and graphical results





The detailed table of content provides a convenient access to the results

Step 7: Analyze the simulation results

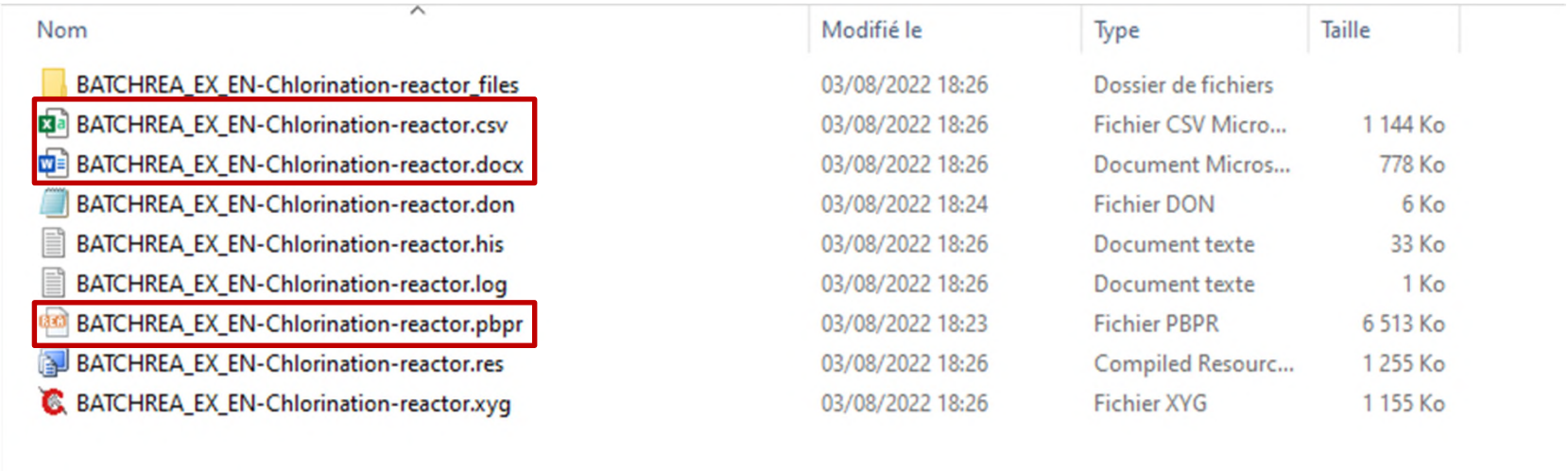
Click here to access the simulation report in MS-Excel format. It includes the evolution of the process variables as a function of time

2413	Time (h)	Liquid volume (m3)	Feed flowrate (kg/h)	Liquid sidestream (kg/h)	Vapor sidestream (kg/h)	Vapor distillate (kg/h)	liquid distillate (kg/h)	Reflux (kg/h)
2414	1.67E-04	2.2278891	1	0	0	1.0052927	0	2.00E-02
2415	1.67E-02	2.2286754	1	0	0	1.3371409	0	2.73E-02
2416	3.33E-02	2.230627	1	0	0	1.5397891	0	3.36E-02
2417	5.00E-02	2.2332999	1	0	0	1.6559845	0	3.94E-02
2418	6.67E-02	2.2364167	1	0	0	1.7185781	0	4.53E-02
2419	8.33E-02	2.239802	1	0	0	1.7493801	0	5.13E-02
2420	0.1	2.243351	1	0	0	1.7614792	0	5.76E-02
2421	0.116667	2.2470044	1	0	0	1.7625298	0	6.43E-02
2422	0.133333	2.2507285	1	0	0	1.757826	0	7.16E-02
2423	0.15	2.2544892	1	0	0	1.7492106	0	7.94E-02
2424	0.166667	2.2582715	1	0	0	1.7412496	0	8.80E-02
2425	0.183333	2.2620693	1	0	0	1.7278169	0	9.70E-02
2426	0.2	2.2658796	1	0	0	1.7193188	0	0.10702215
2427	0.216667	2.2697004	1	0	0	1.7098734	0	0.11781666
2428	0.233333	2.2735296	1	0	0	1.7007094	0	0.12949264
2429	0.25	2.2773661	1	0	0	1.6923622	0	0.14214939
2430	0.266667	2.2812092	1	0	0	1.6844712	0	0.15582606
2431	0.283333	2.2850585	1	0	0	1.6773023	0	0.17061809
2432	0.3	2.2889139	1	0	0	1.6706803	0	0.18658742
2433	0.316667	2.2927754	1	0	0	1.6645653	0	0.20381152

Step 7: Analyze the simulation results

Multiple different files are created in the folder where the simulation file is stored, in particular:

- The simulation file (*.pbpr)
- The simulation report in MS-Word format (*.docx)
- The simulation report in MS-Excel format (*.csv)



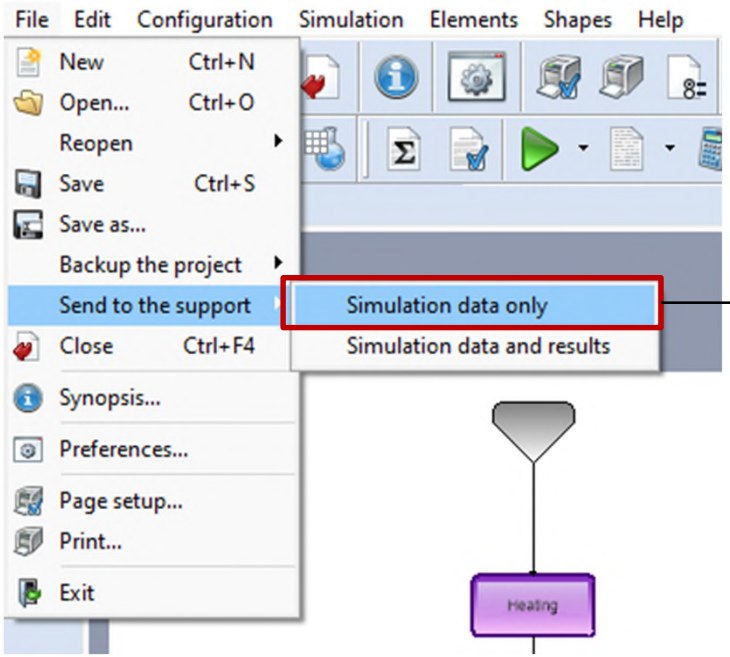
Nom	Modifié le	Type	Taille
BATCHREA_EX_EN-Chlorination-reactor_files	03/08/2022 18:26	Dossier de fichiers	
BATCHREA_EX_EN-Chlorination-reactor.csv	03/08/2022 18:26	Fichier CSV Micro...	1 144 Ko
BATCHREA_EX_EN-Chlorination-reactor.docx	03/08/2022 18:26	Document Micros...	778 Ko
BATCHREA_EX_EN-Chlorination-reactor.don	03/08/2022 18:24	Fichier DON	6 Ko
BATCHREA_EX_EN-Chlorination-reactor.his	03/08/2022 18:26	Document texte	33 Ko
BATCHREA_EX_EN-Chlorination-reactor.log	03/08/2022 18:26	Document texte	1 Ko
BATCHREA_EX_EN-Chlorination-reactor.pbpr	03/08/2022 18:23	Fichier PBPR	6 513 Ko
BATCHREA_EX_EN-Chlorination-reactor.res	03/08/2022 18:26	Compiled Resourc...	1 255 Ko
BATCHREA_EX_EN-Chlorination-reactor.xyg	03/08/2022 18:26	Fichier XYG	1 155 Ko

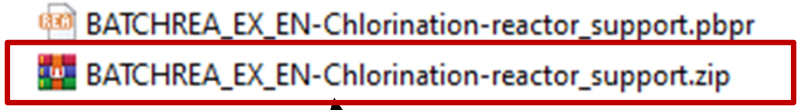
Step 7: Analyze the simulation results

For any questions, please contact ProSim technical support by sending an email to support@prosim.net, with:

- The objectives of your simulation
- Your simulation file

To facilitate the sending of the simulation file by email, a zip file can be automatically generated by clicking on “send to support”





A zip file is created in the folder where the simulation file is stored

ProSim

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