software for balance method

© TU WIEN, JUNE 2023

TU Wien
Institute for Water Quality and Resource Management
Karlsplatz 13/226
A-1040 Vienna
Tel.: +43-1-58801-22657 (Oliver Cencic)
E-Mail: oliver.cencic@tuwien.ac.at
https://www.tuwien.at/en/cee/iwr

Contents

Installation **1**

System Requirements 1

Supported Operating Systems 1

Additional Software 1

Components 1

Demo Mode 1

Server Installation 1

Step 1 – Installation of Database Server 2

Step 2 – BIOMA Installation (on Server) 8

Step 3 – Creation of Database 10

Step 4 – Server Configuration (only in multi-user operation) 11

Client Installation 16

Step 1 – BIOMA Installation (on Client) 16

Step 2 – Configure Client Database Connection 17

Trouble Shooting 19

Changing of Server Authentication Mode (existing SQL-SERVER installations) 19

Quick Start with BIOMA **23**

Demo Mode 23

Login (u) 23

Install License (a) 23

Open Plant Document (u) 24

Edit Plant Configuration (a) 25

Import Configuration 1 (a) 28

Import Configuration 2 (a) 30

Import Data (u) 31

Use Graphical User Interface (u) 31
Export Report Package (a) 34
Import Report Package (a) 35
Menu Description **36**
Menu Overview (linked) 36
File 36
Login (u) 36
Logout (u) 37
Open Plant Document (u) 37
New Plant Document (e) 37
Exit (u) 37
Edit 38
Edit Plant Configuration (a) 38
Edit Oven Line Properties (a) 41
Import Operation Data (u) 43
CSV Import Configuration (a) 44
Edit Operation Data (e) 45
Calculate (u) 46
Show Generated Source (d) 46
Edit Calculation Source (d) 47
Reporting 47
Export / Edit Report Package (a) 47
Import Report Package (a) 50
Building Reports (e) 50
Export Calculation Results (a/e) 51
Export Online Calculation Results (e) 52
Reference Systems (e) 53
Extras 54
Options (a) 54

Change Log (e) 56

Administration (a/e) 56

Help 62

About (a) 62

Appendix **64**

Comparison of Export Features 64

Permission Groups 65

Command Line Tool 65

BIOMA Job Server 67

Automatic Import and Export with the “BIOMA Job Server“ 67

Configuration of scheduled import 67

Configuration of scheduled export of calculated values 69

INSTALLATION

When installing BIOMA, you have to distinguish between client and server installation:

- Server installation refers to installing on a computer that serves as a database server.
- Client installation refers to installing on a computer that only hosts the BIOMA software alone.

If you install for a single user, both installations will be carried out on the same computer.

SYSTEM REQUIREMENTS

SUPPORTED OPERATING SYSTEMS

- Windows 7
- Windows 8
- Windows Server 2003
- Windows Server 2008
- Windows 8.1 to Windows 11 (32/64 Bit)
- Windows Server 2012 bis Windows Server 2019

ADDITIONAL SOFTWARE

- Microsoft Excel (to process exported data)

COMPONENTS

Usually, the components needed to run BIOMA are already included in the above-mentioned operating systems. If not, click the following links to download the required part:

- .NET Framework 3.5 Service Pack 1 (EOL 9. Jan 2029)

If you are using Windows 10, Windows Server 2016, or Windows Server 2019, we recommend installing .NET Framework 3.5 through the control panel.

DEMO MODE

For running BIOMA in demo mode, no database installation is required. Thus, it is necessary to follow the installation guidelines under Client Installation only!

SERVER INSTALLATION

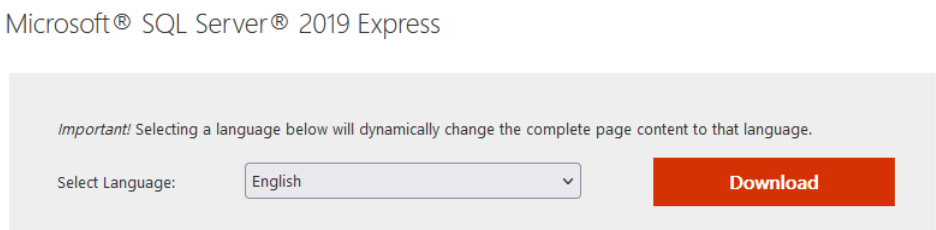
Microsoft SQL Server 2019 is the recommended database server. If this database server is not available on your system, you can use the free **Microsoft SQL Server 2019 Express Edition**.

BIOMA 2.6.401 also works with every other Microsoft SQL Server version that supports compatibility level 100 (Microsoft SQL Server 2008 to 2019).

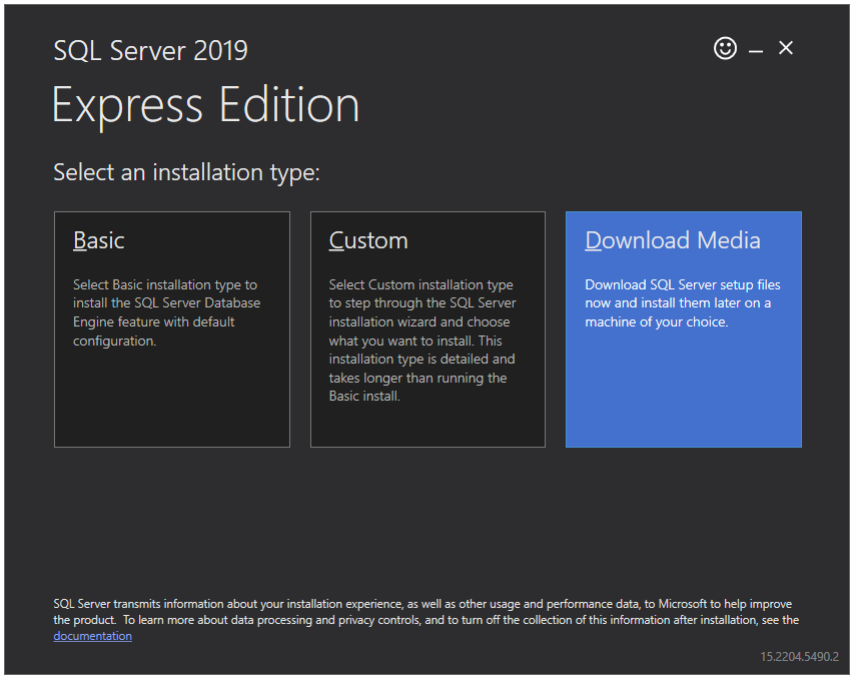
It is recommended (but not necessary) to backup the BIOMA database on your old SQL server before installing Microsoft SQL Server 2019.

STEP 1 – INSTALLATION OF DATABASE SERVER

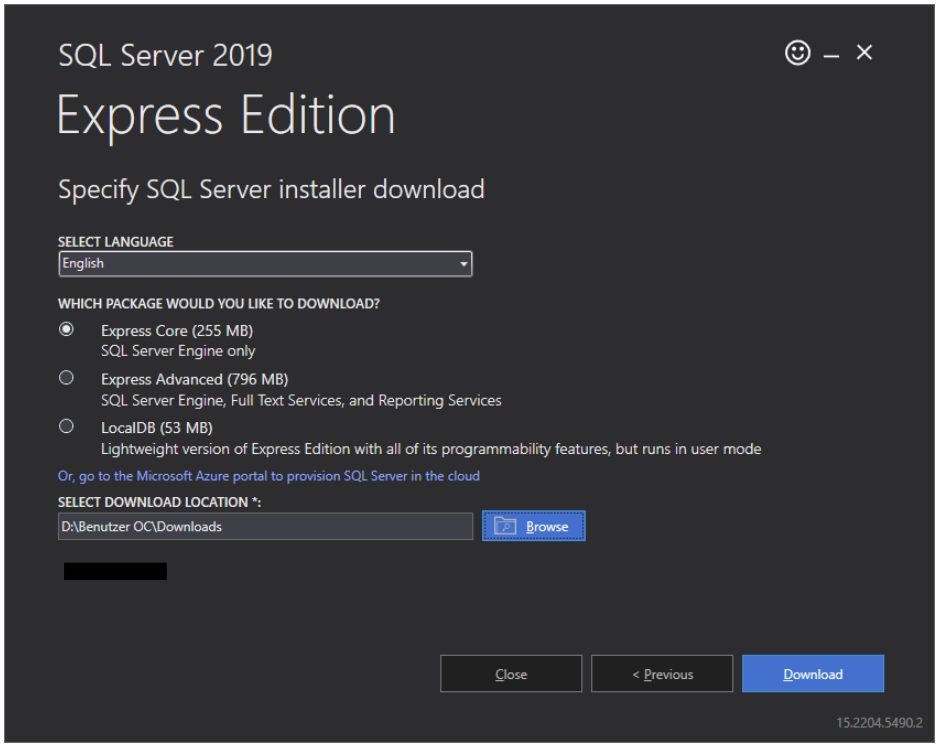
- **Download** the SQL Server 2019 Express installer (SQLServer2019-SSEI-Expr) from Microsoft SQL Server 2019 Express Edition that, when executed, will present options to perform an installation or download media only.



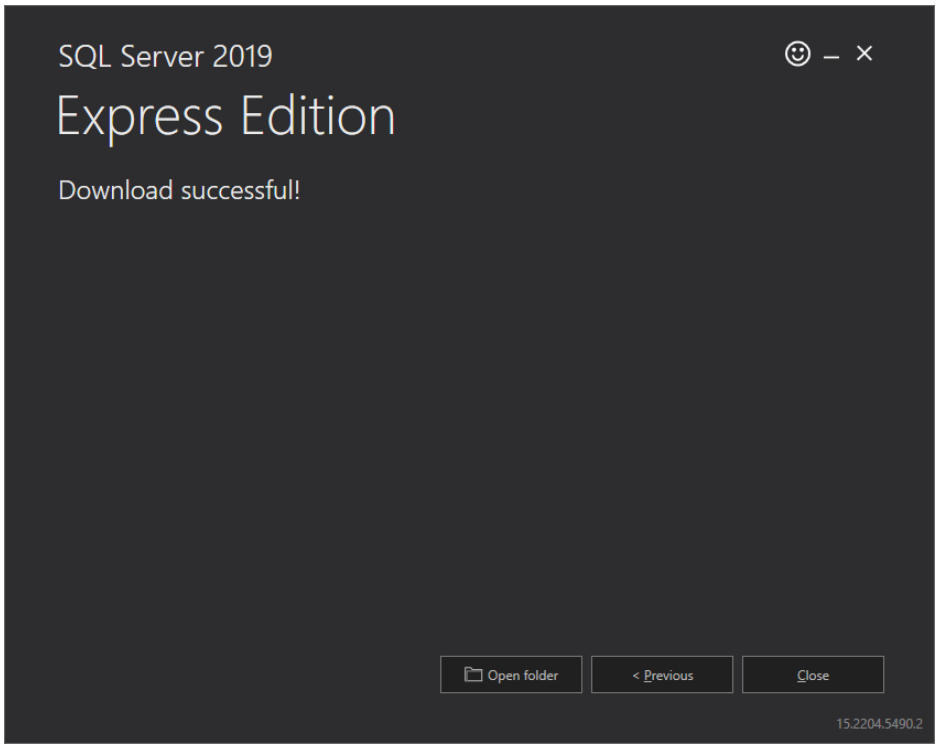
- Execute the downloaded file **SQL2019-SSEI-Expr.exe**.
- Select **Download Media**.



- To download the needed setup file (SQLEXPR_x64_ENU.exe), select language **English**, package **Express** Core, the desired **Download Location**, and click **Download**.

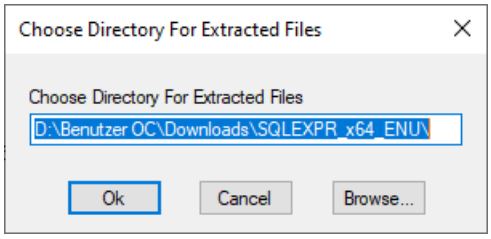


- Click **Close**.

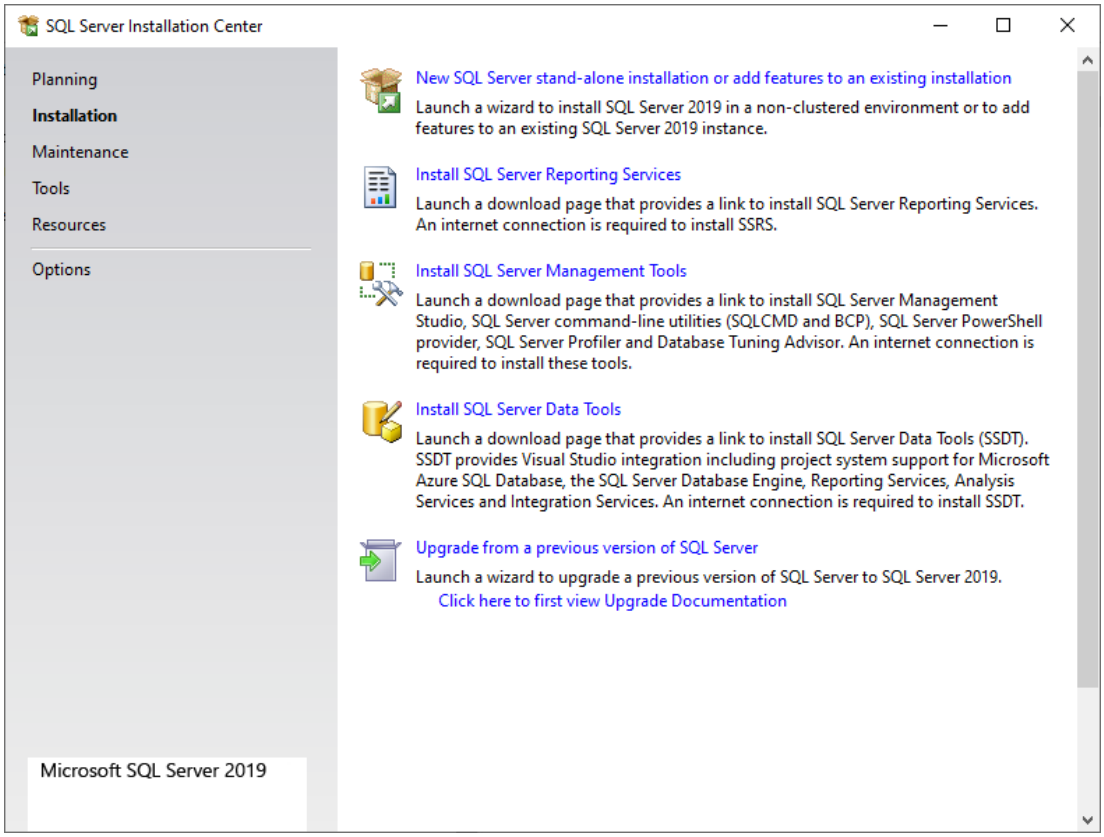


- Execute the downloaded setup file **SQLEXPR_x64_ENU.exe**.

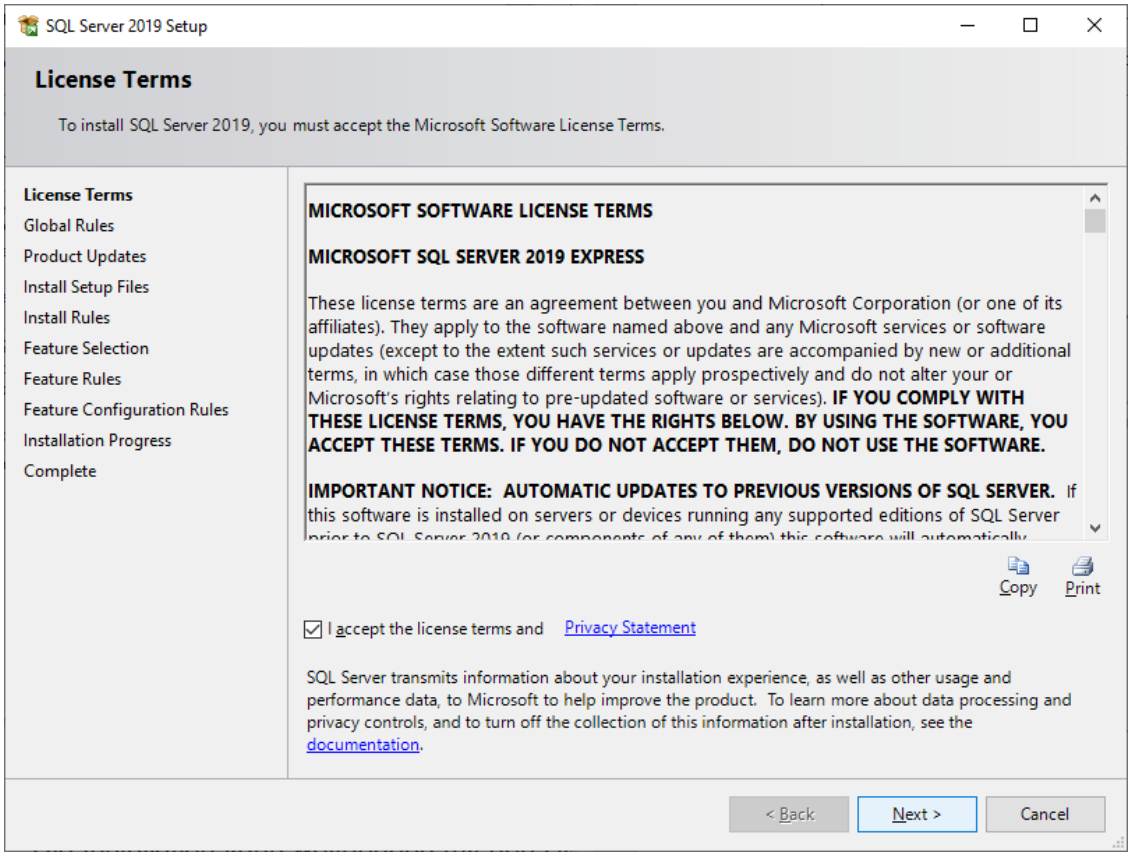
- Choose the **directory** to extract the file to and click **OK**.



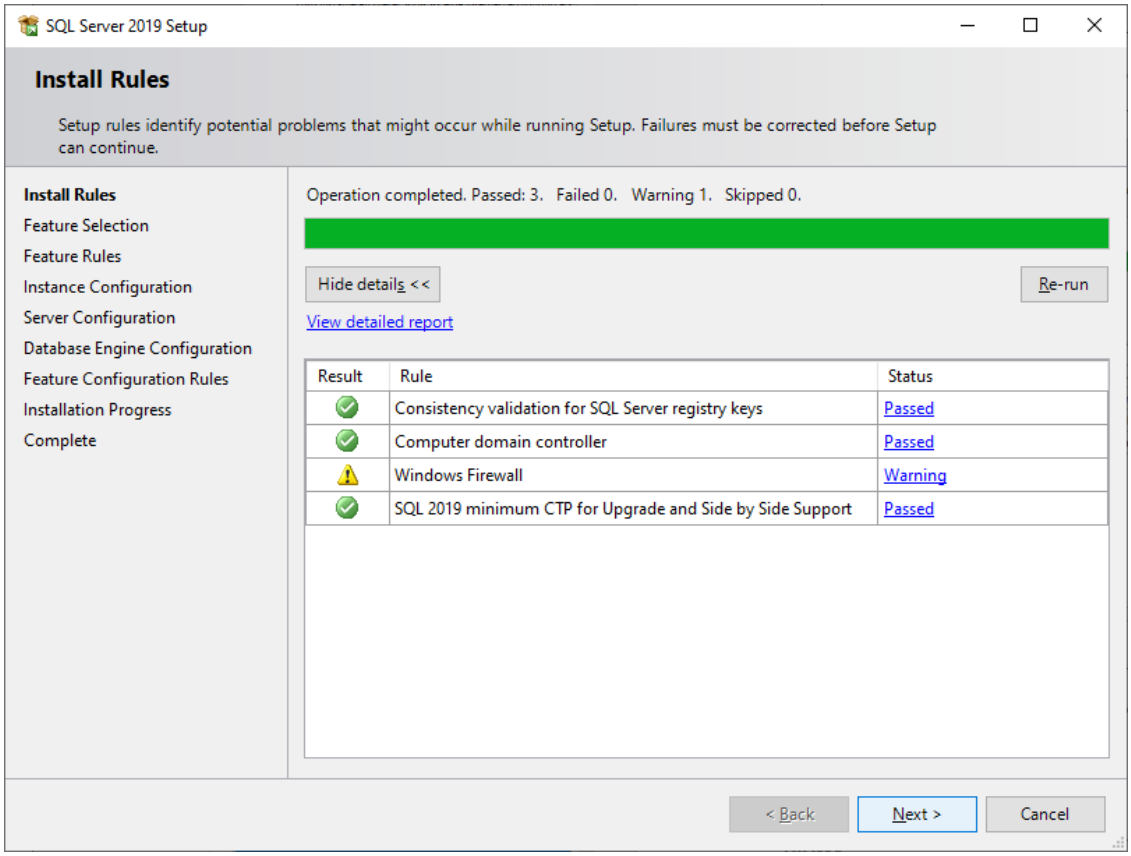
- Select **New SQL Server stand-alone installation or add feature to an existing installation**.



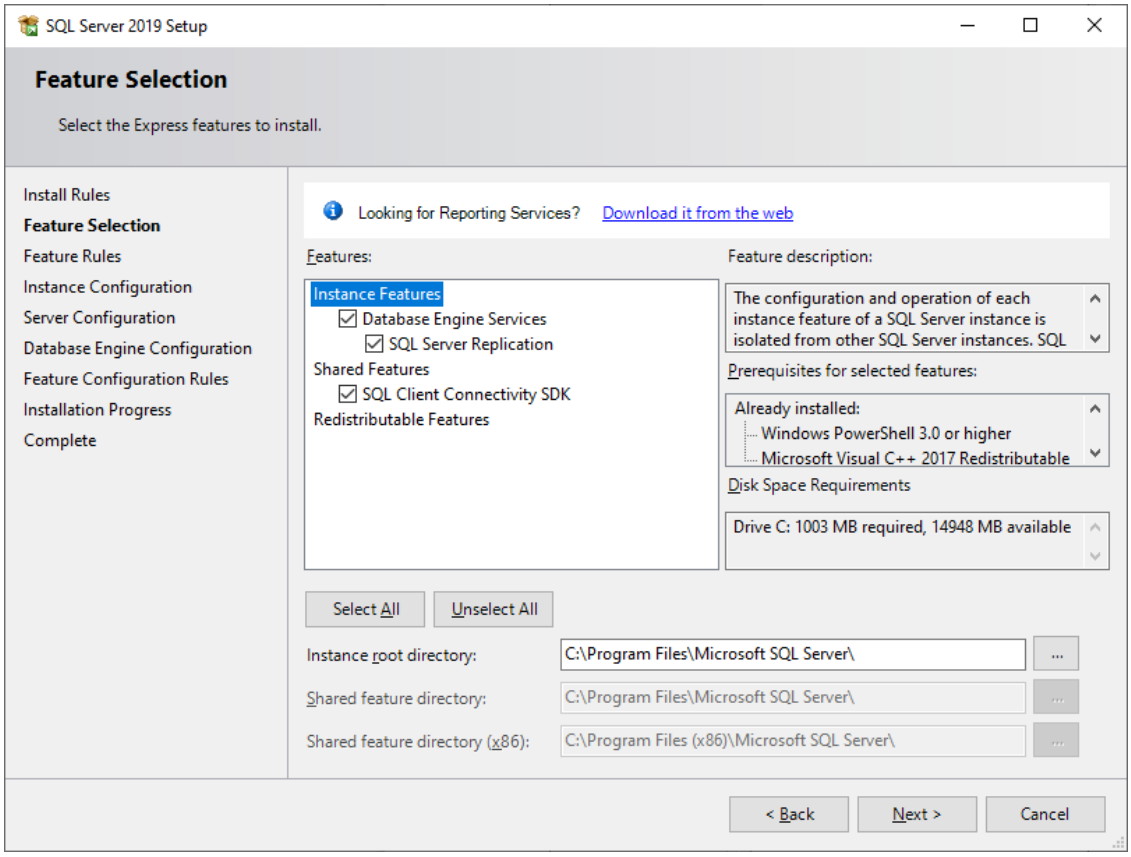
- **Accept** the license terms and click **Next**.



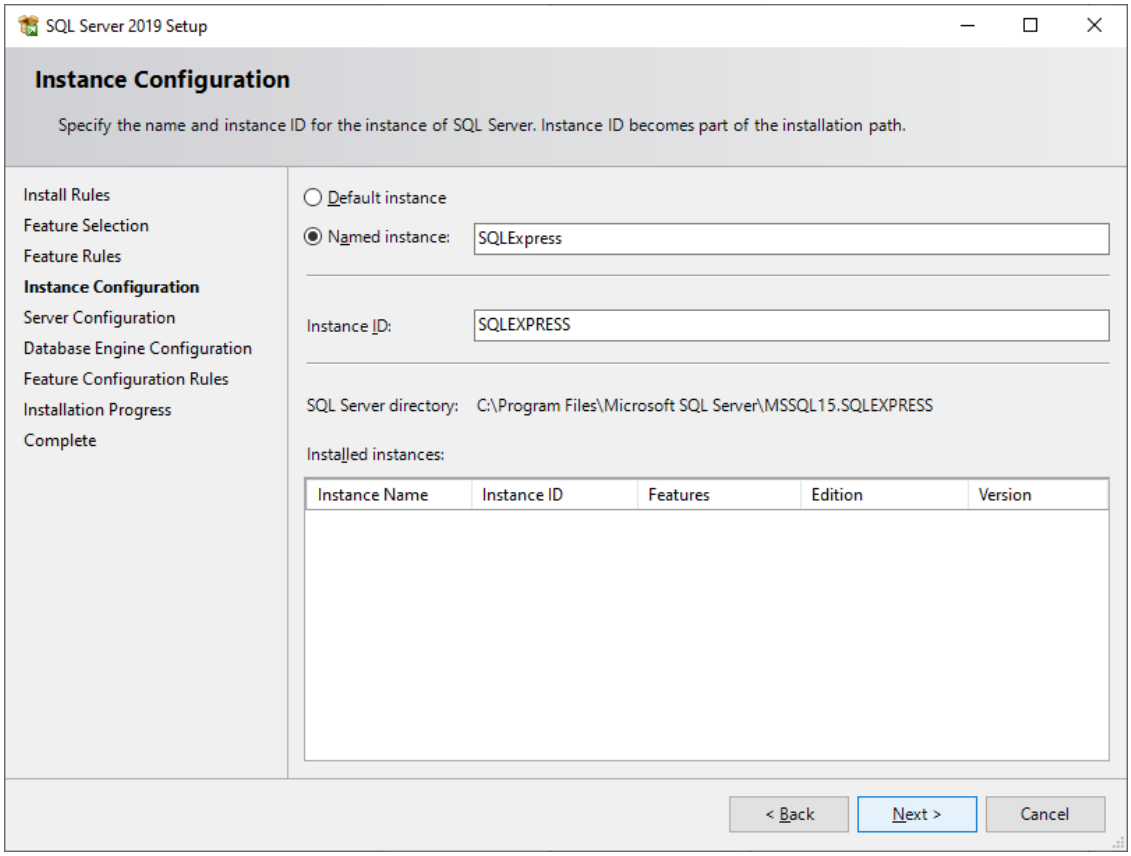
- The firewall warning can be ignored. Click **Next**.



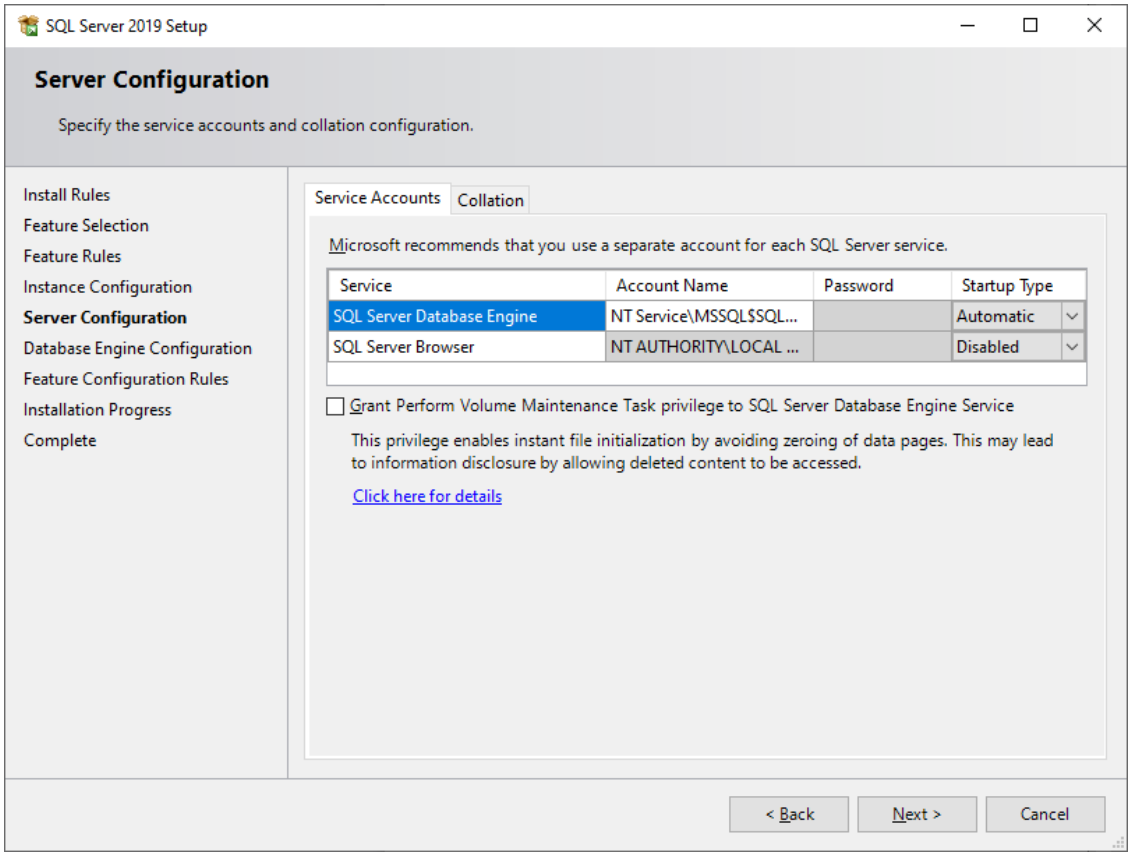
- Click **Next**.



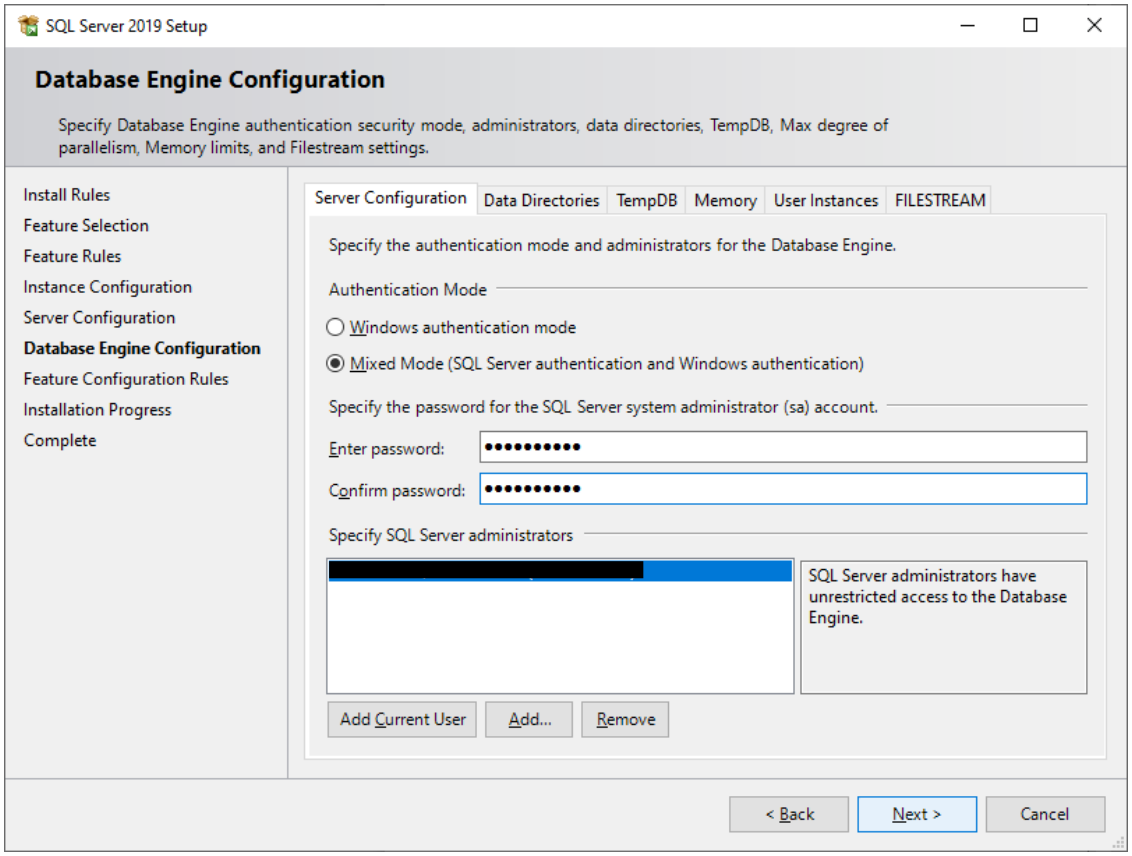
- Click **Next**.



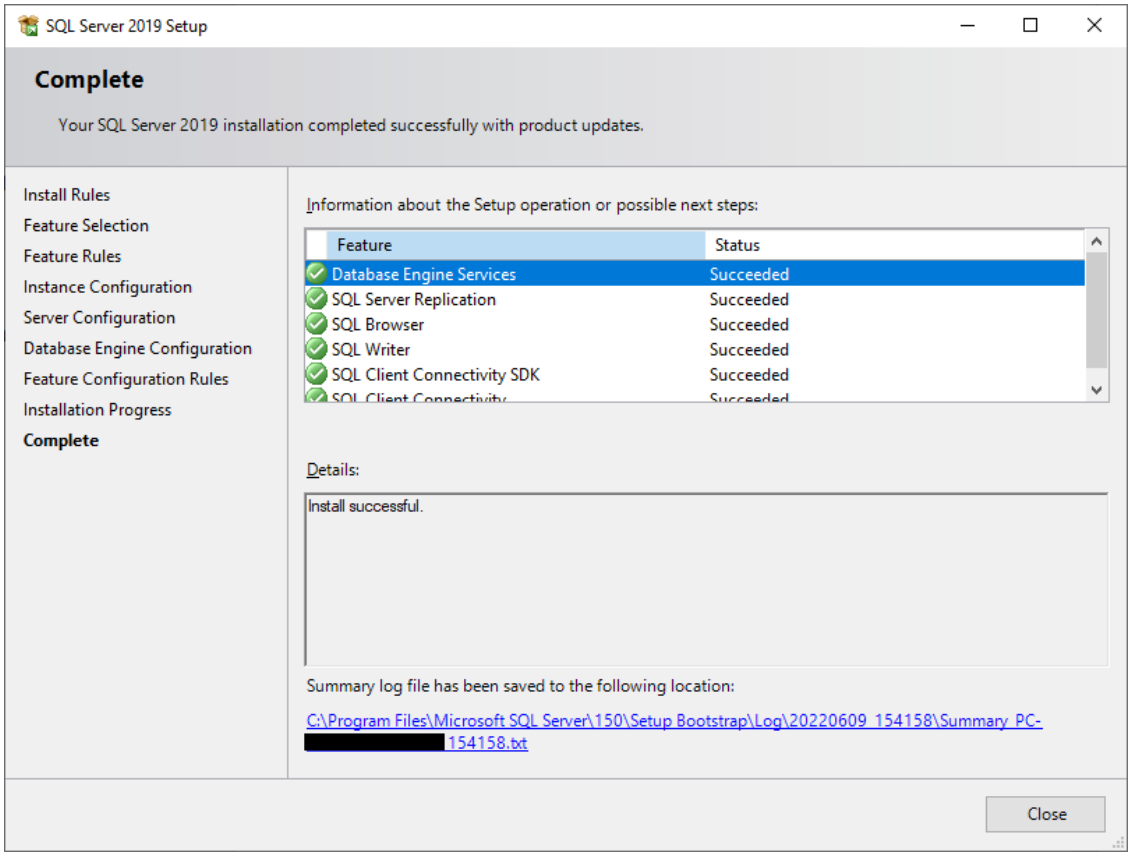
- Click **Next**.



- Select **Mixed mode,** type an **administrator password** (for admin **sa**) and press **Next**.



- When the installation is completed, click **Close**.



STEP 2 – BIOMA INSTALLATION (ON SERVER)

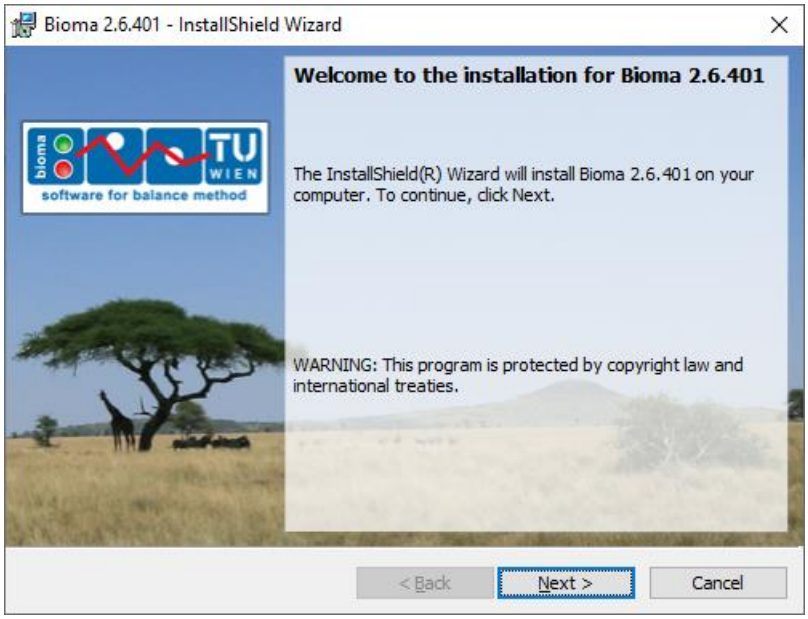
It is necessary to install BIOMA directly on the server because, together with the BIOMA software, an additional tool called **BIOMA Database Setup Utility** is installed, which can be used to create the database (cf. Step 3 – Creation of Database).

WARNINGS:

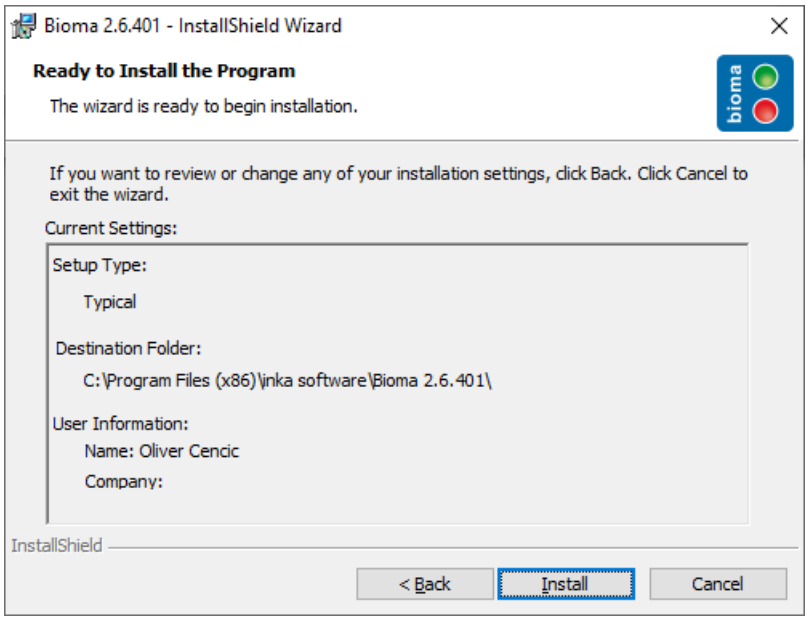
1. Running the setup program of BIOMA 2.6.401 will delete all older versions of BIOMA on this computer! So, if you want to test BIOMA 2.6.401 before deleting any older version, you can, alternatively,
    a. install and run BIOMA for testing reasons in a virtual machine, or
    b. install BIOMA on a different computer (where no BIOMA has been installed before), and copy the content of the folder C:\Program Files (x86)\inka software\BIOMA 2.6.401 to the computer with the old BIOMA version. Note that with the latter procedure, no icons will be added to the desktop of the start menu, the file extensions of BIOMA are not automatically assigned to the new version, the BIOMA Job Server is not installed automatically, and you have to start BIOMA manually by clicking WteClient.exe in the folder BIOMA 2.6.401.
2. To migrate the data of a plant document, it is recommended to start the old version of BIOMA and export a report package (cf. Export / Edit Report Package (a)) with a reporting period set that includes all available data in the database (cf. Edit Operation Data (e)). For this reason, it is not necessary to set any manual inputs. This exported report package can be imported later in the new version of BIOMA.

- Execute **setup.exe** in the BIOMA folder.

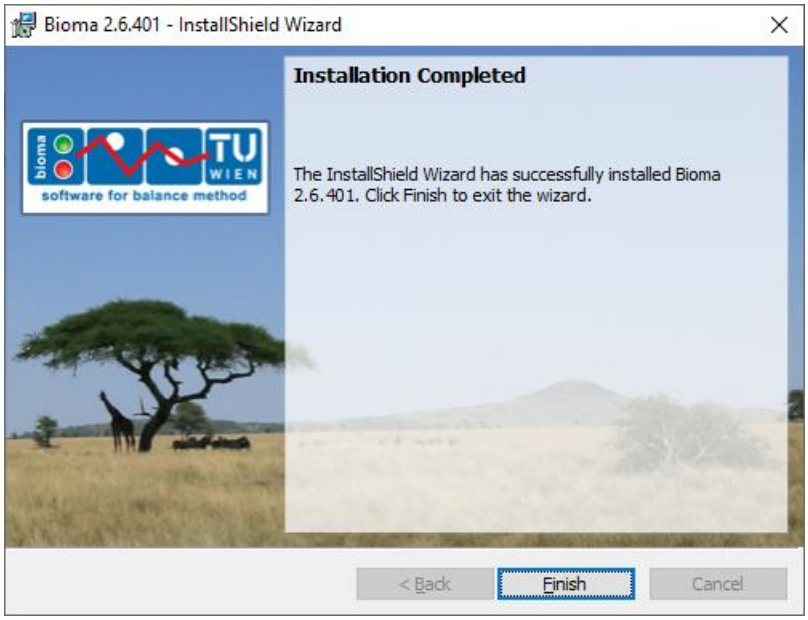
- Click **Next.**



- Click **Install**.



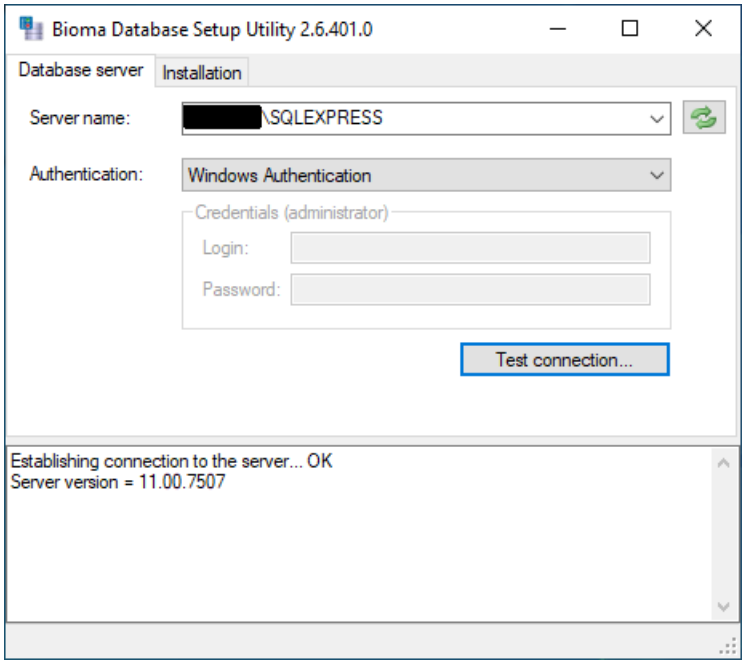
- When the installation is completed, click **Finish** to exit the installation



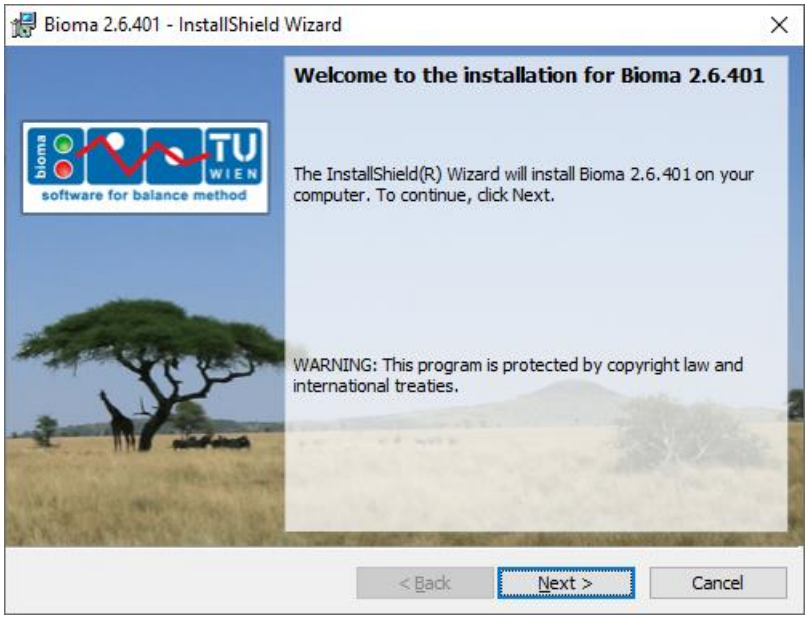
STEP 3 – CREATION OF DATABASE

To create a database, the **BIOMA Database Setup Utility** can be used. It is, of course, also possible for a database admin to create the database manually.

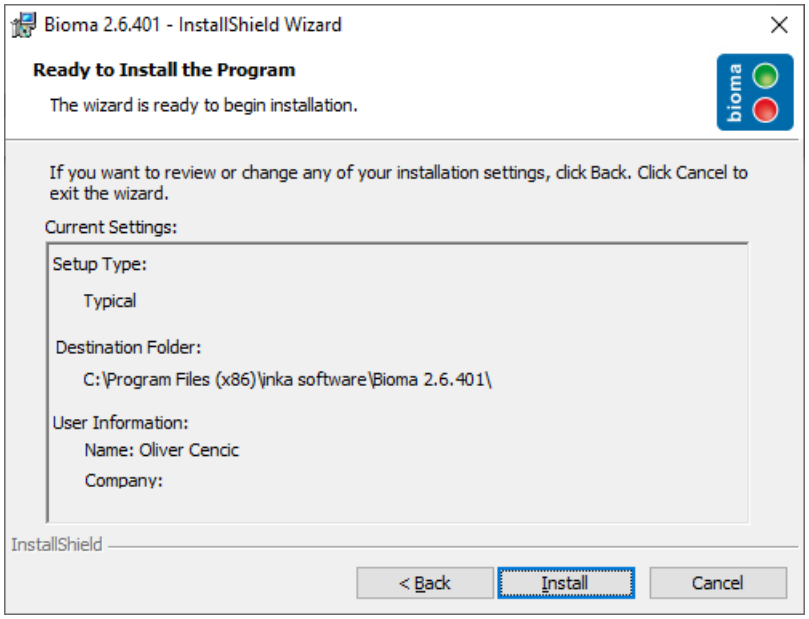
- Select **START** > **All Programs** > **BIOMA 2.6.401** > **Database Setup Utility**.
- On tab **Database server**, click **Test connection**. If you choose a different mode than **Windows Authentication**, the login (**sa**) and password data from Step 1 – Installation of Database Server have to be used.



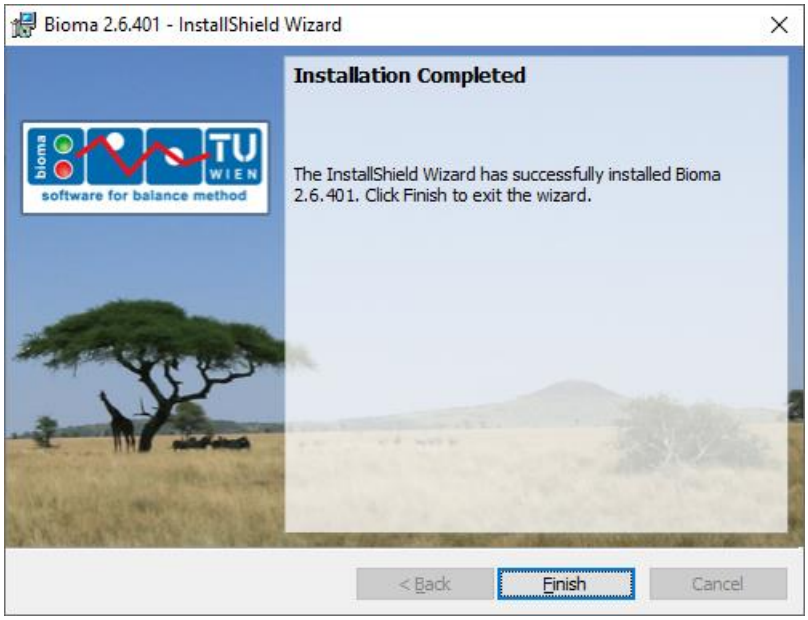
- On tab **Installation**, click **Create database** and confirm the warning with **Yes**. If the user name and password for the BIOMA client are changed here, these changes must be considered during the configuration of the database connection on the client computer (cf. Click **Next.**



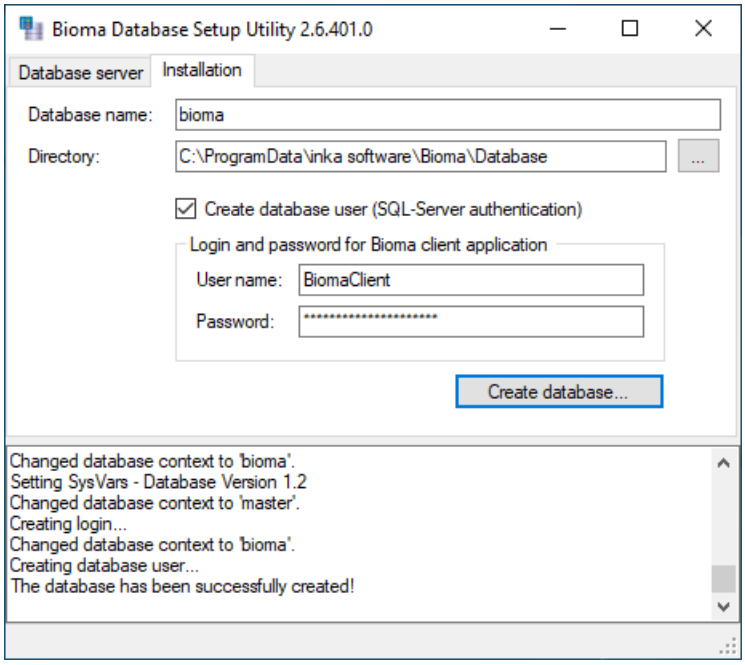
- Click **Install**.



- When the installation is completed, click **Finish** to exit the installation



- Step 2 – Configure Client Database Connection).



- Check if the database has been created successfully (last line of text above).

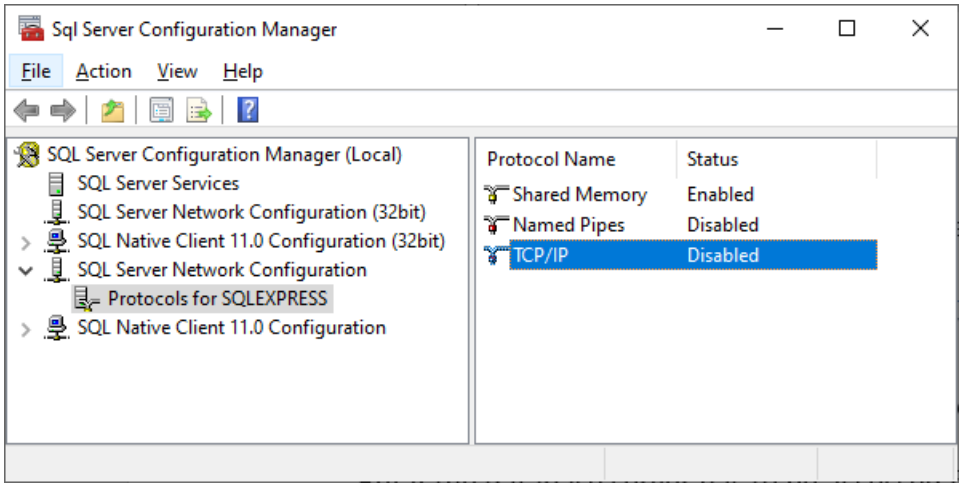
STEP 4 – SERVER CONFIGURATION (ONLY IN MULTI-USER OPERATION)

If the BIOMA software should run on the computer that is hosting the database server only, you can skip Step 4.

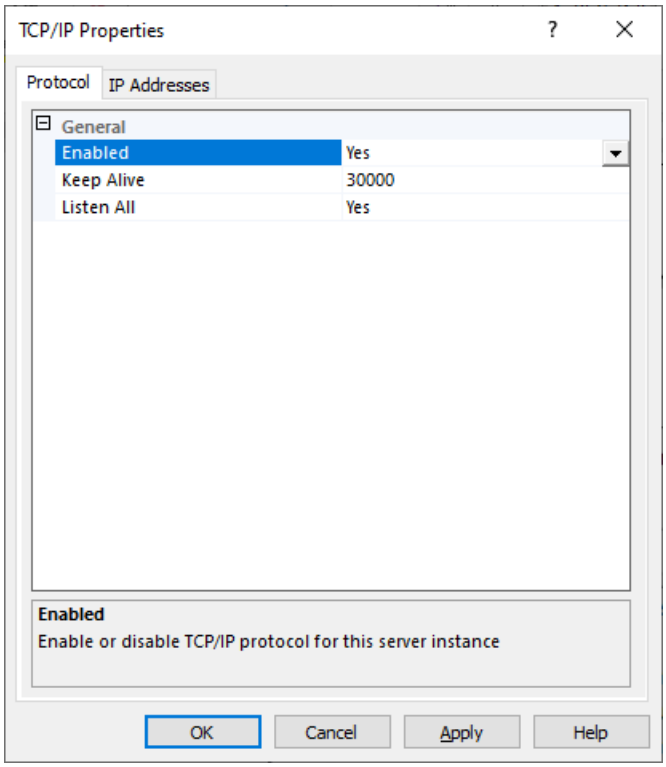
But if the database server has to be accessed from a different computer (client), the server must be reachable from within the network. The necessary configurations can be carried out with **SQL Server Configuration Manager,** which is also part of **Microsoft SQL Server 2019 Express Edition**.

- Select **START** > **All Programs** > **Microsoft SQL Server 2019** > **SQL Server Configuration Manager**.

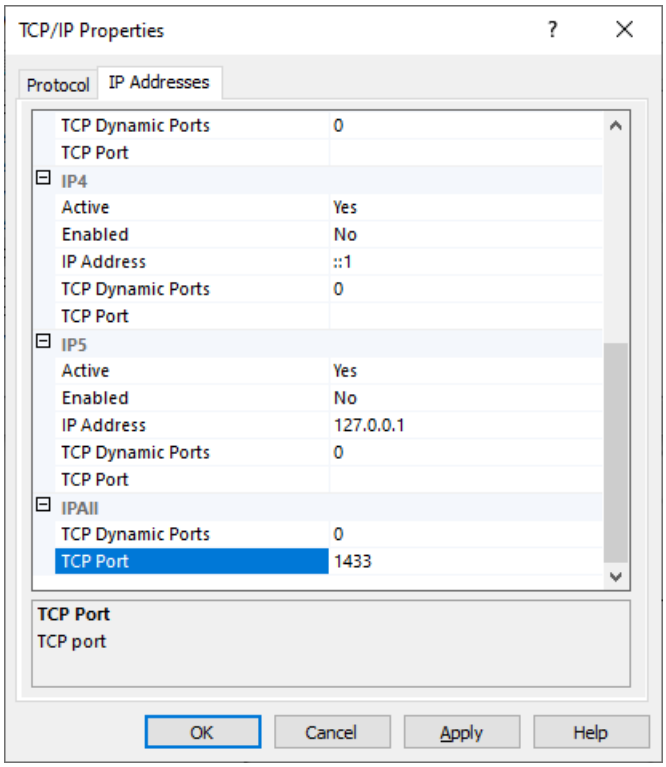
- Select **SQL Server Network Configuration** > **Protocols for SQLEXPRESS**. Right-click **TCP/IP** and select **Properties**.



- On tab **Protocol**, set **Enabled** to **Yes**.



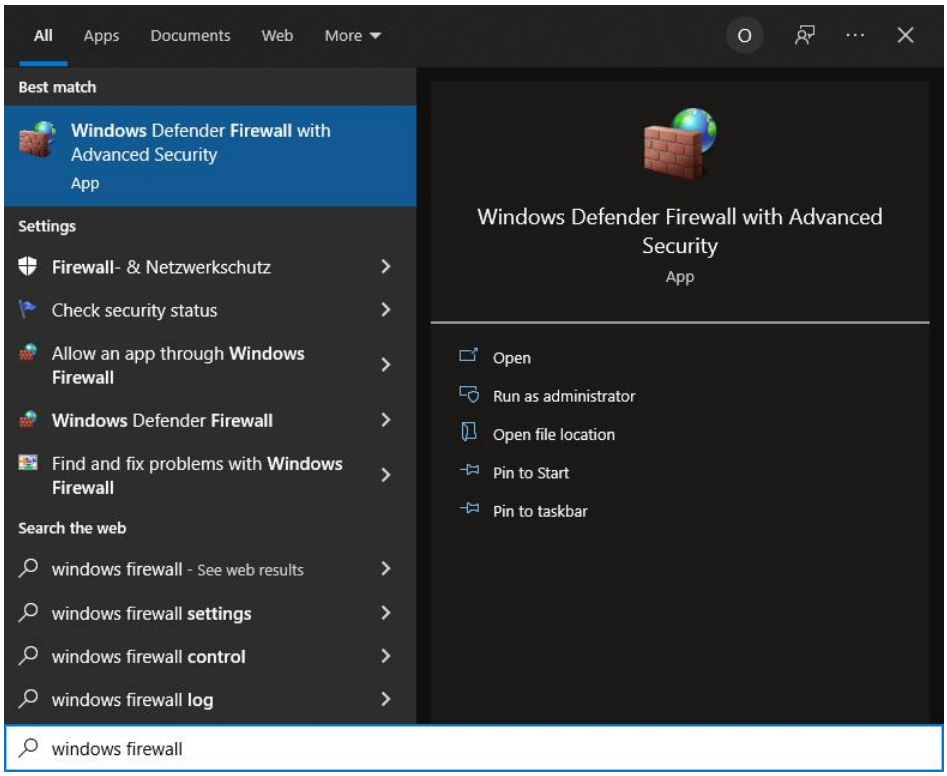
- On tab **IP Addresses**, under **IP All**, set **TCP Port** to **1433**. Click **OK**.



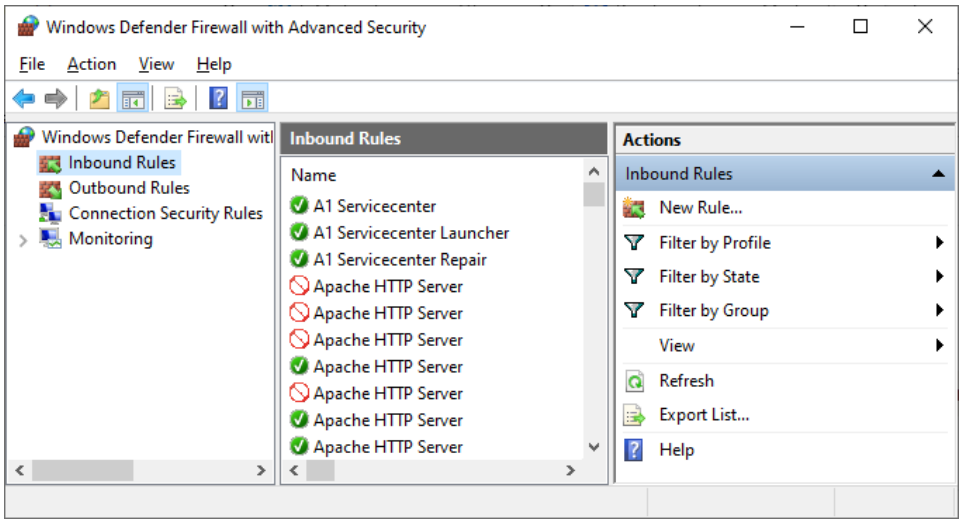
- **Close** the SQL Server Configuration Manager.

Additionally, configure an exception for TCP port 1433 in your firewall. The following description is for Windows 10:

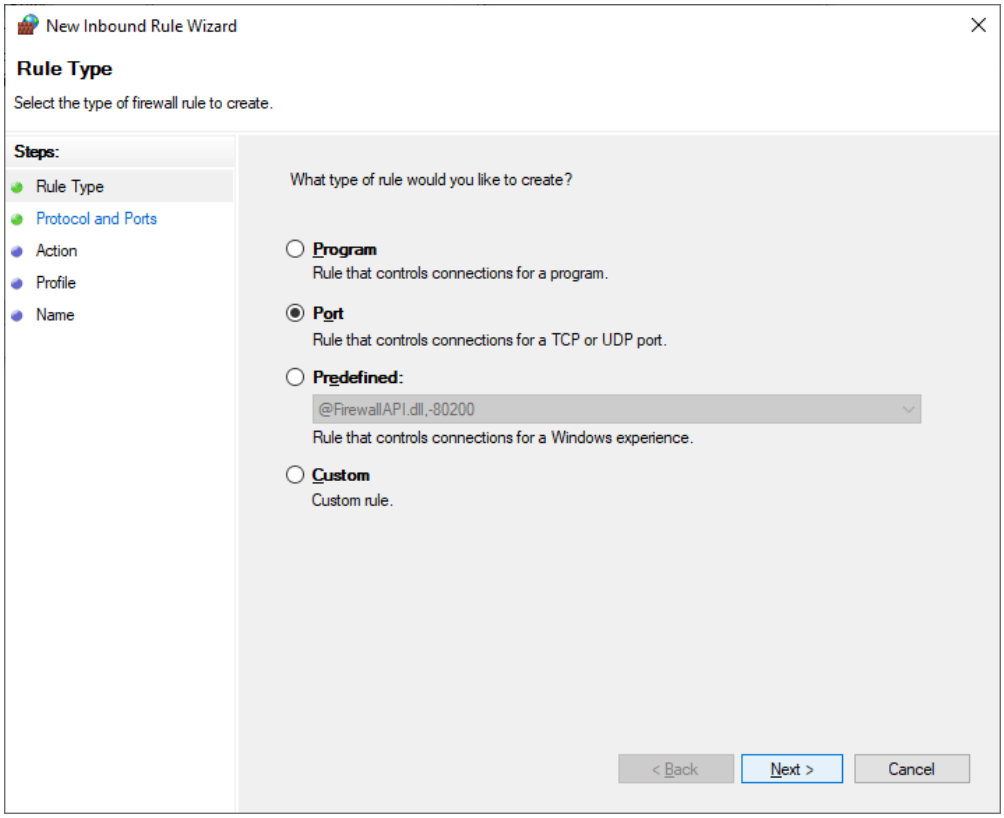
- Click **START**. Enter **windows firewall** in the **Search** field. Select **Windows Defender Firewall with Advanced Security** from the search results.



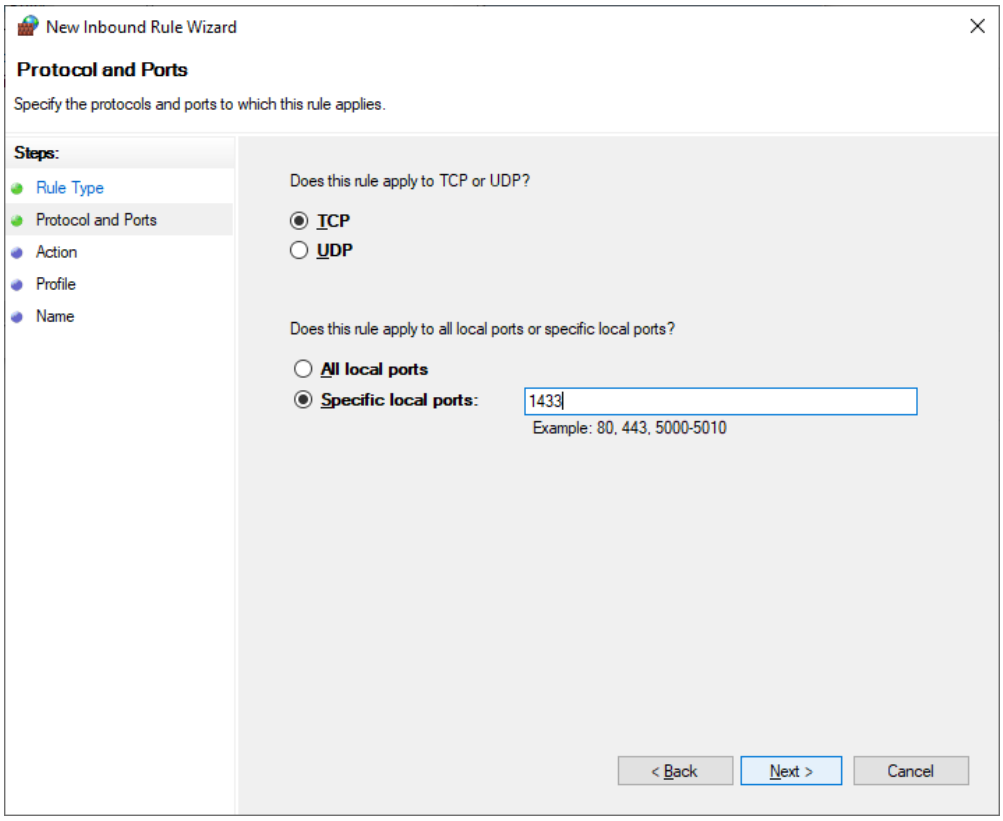
- Select **Inbound Rules** and click **New Rule**.



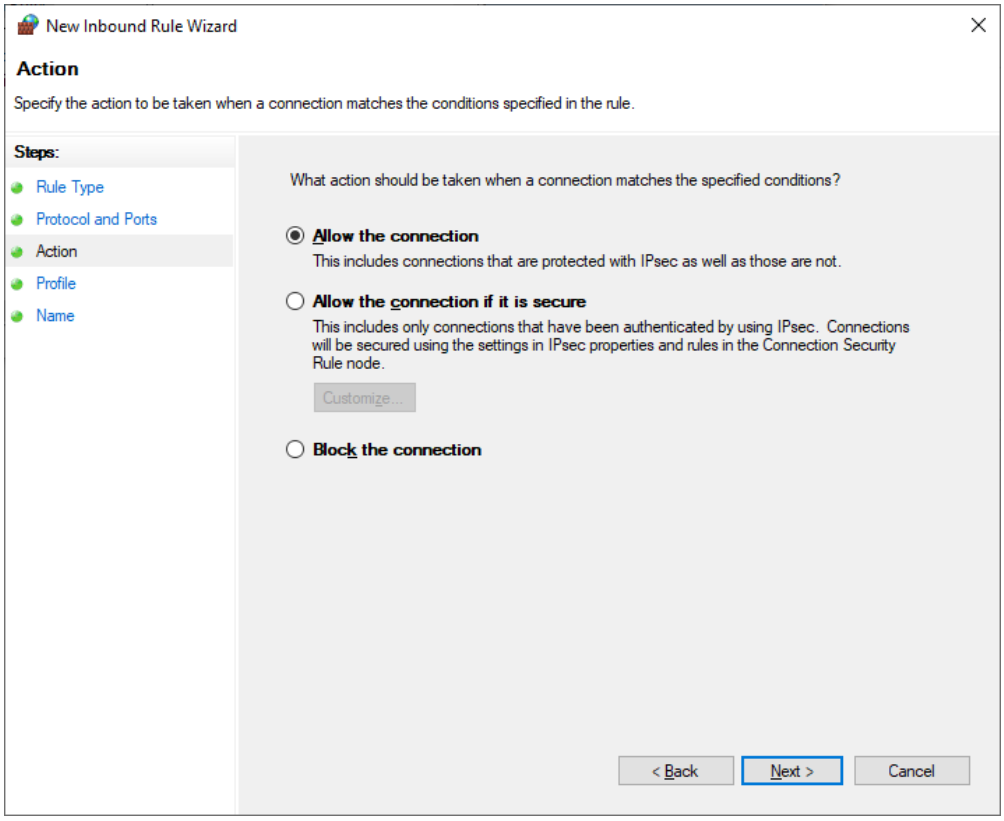
- Click **Rule Type** and select **Port**. Click **Next**.



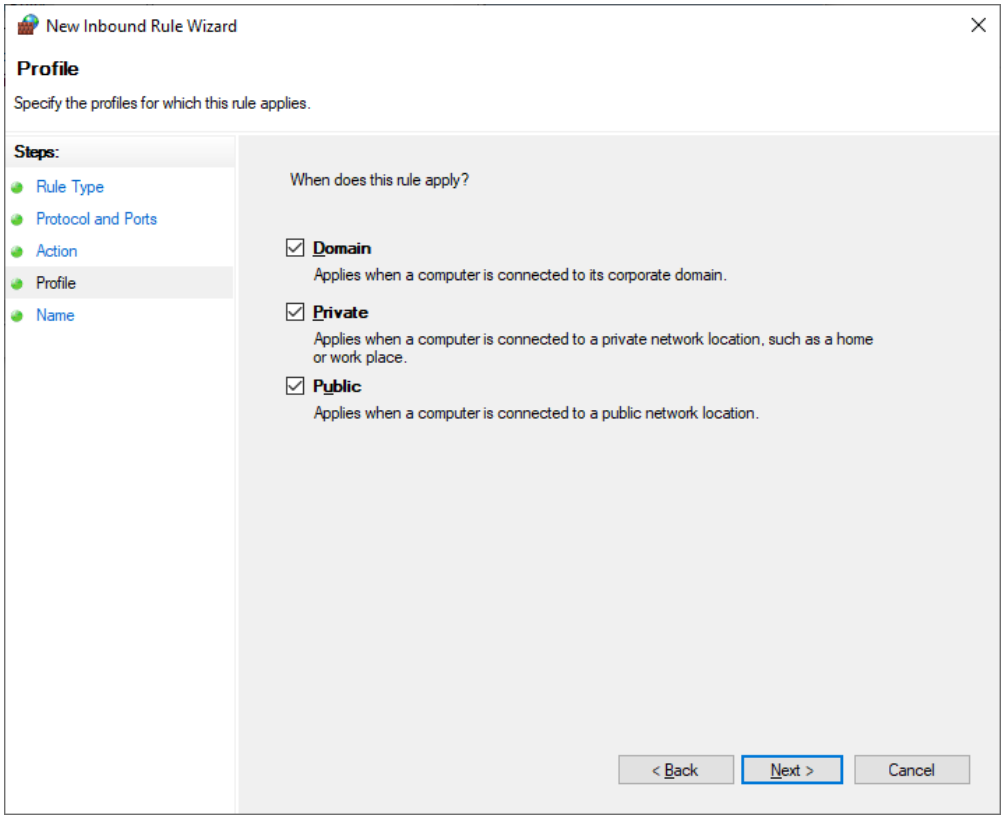
- Click **Protocol and Ports**, select **TCP** and enter **1433** under **Special local ports**. Click **Next**.



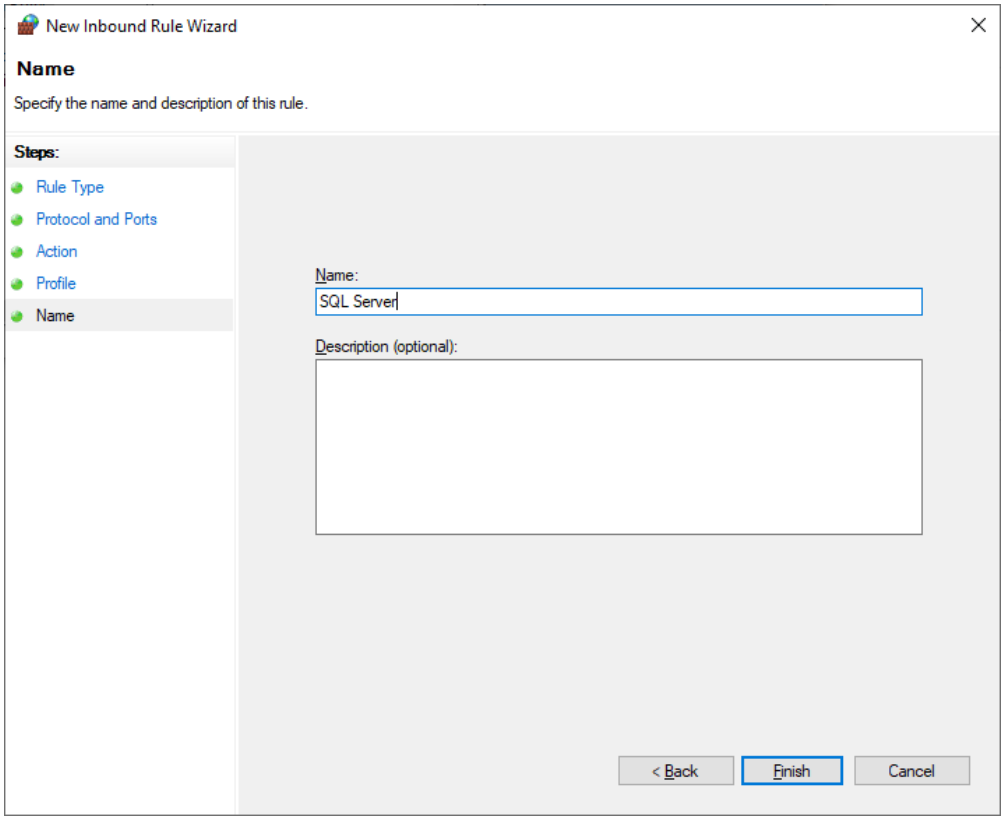
- Select **Allow the connection** and click **Next**.



- Click **Next**.

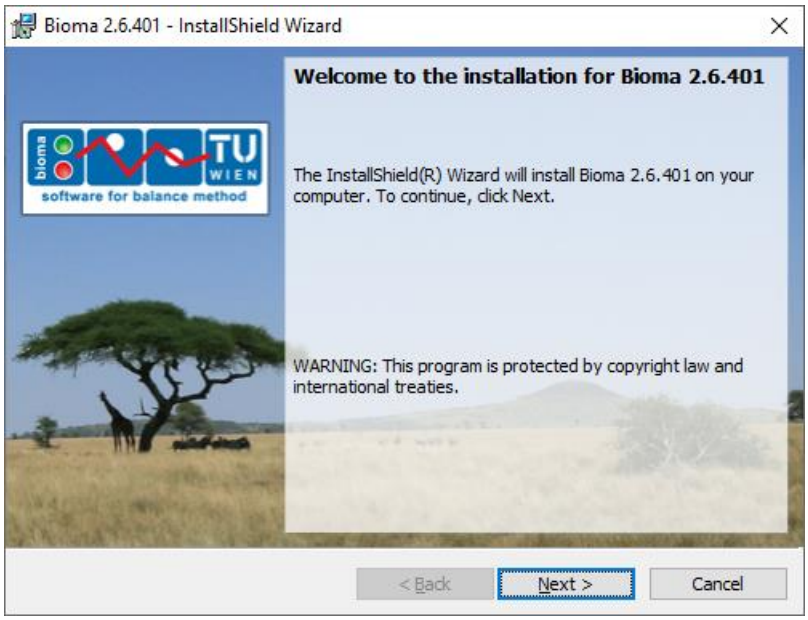


- Enter a **Name** for the exception rule and click **Finish**.

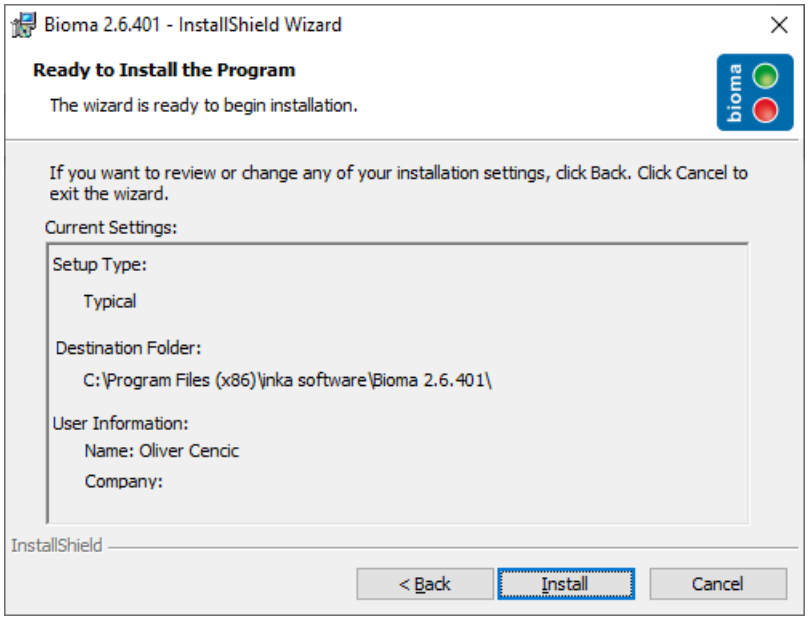


CLIENT INSTALLATION

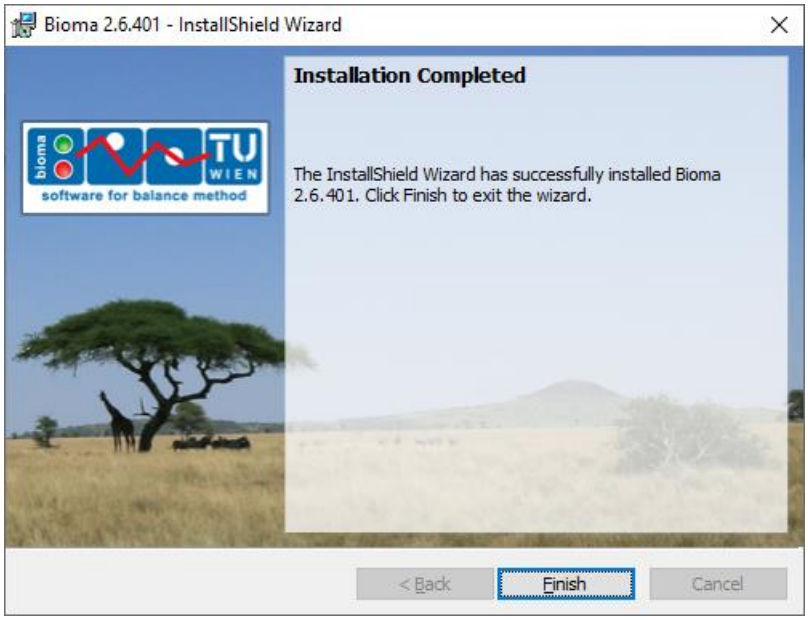
- If the BIOMA software should run on the computer that is hosting the database server, you can skip Step 1 – BIOMA Installation (on Client) because the software should be already installed there. In this case, continue with Click **Next.**



- Click **Install**.



- When the installation is completed, click **Finish** to exit the installation



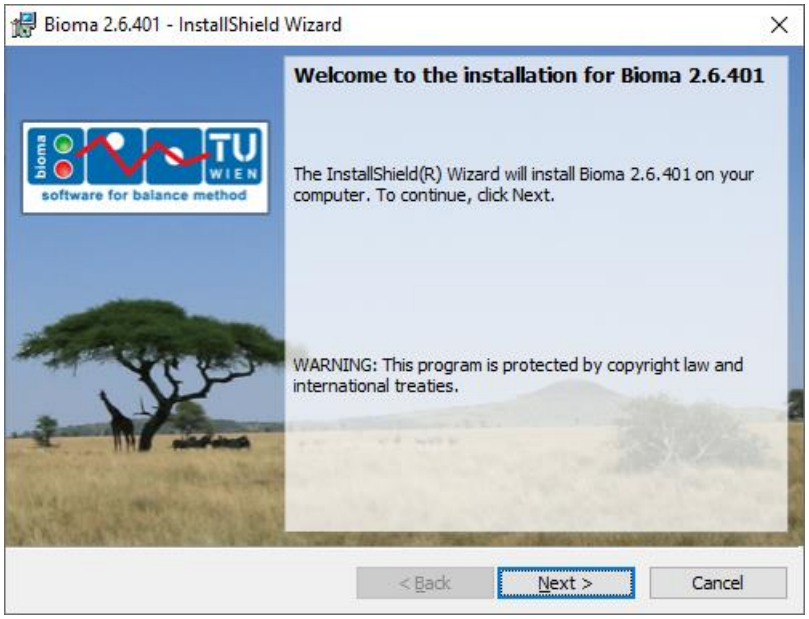
- Step 2 – Configure Client Database Connection.

STEP 1 – BIOMA INSTALLATION (ON CLIENT)

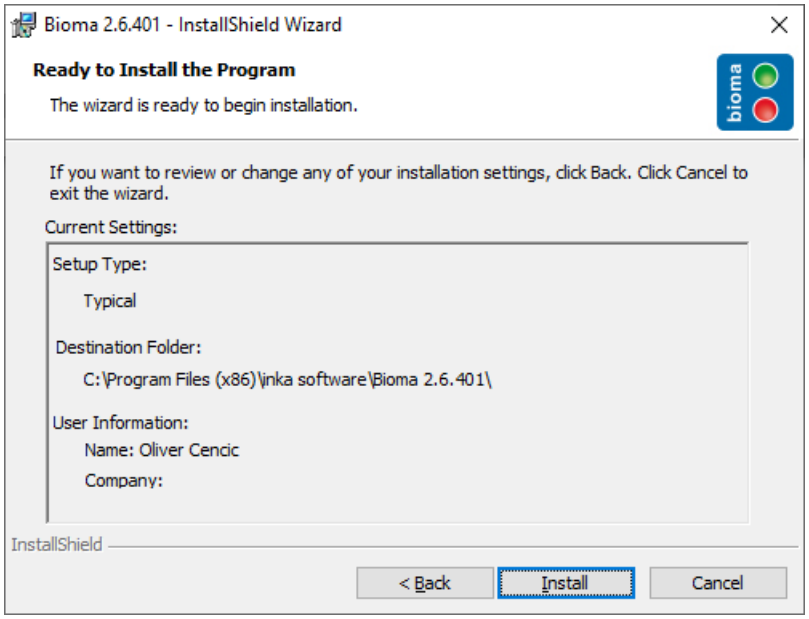
WARNINGS:

1. Running the setup program of BIOMA 2.6.401 will delete all older versions of BIOMA on this computer! So, if you want to test BIOMA 2.6.401 before deleting any older version, you can, alternatively,
    a. install and run BIOMA for testing reasons in a virtual machine, or
    b. install BIOMA on a different computer (where no BIOMA has been installed before), and copy the content of the folder C:\Program Files (x86)\inka software\BIOMA 2.6.401 to the computer with the old BIOMA version. Note that with the latter procedure, no icons will be added to the desktop of the start menu, the file extensions of BIOMA are not automatically assigned to the new version, the BIOMA Job Server is not installed automatically, and you have to start BIOMA manually by clicking WteClient.exe in the folder BIOMA 2.6.401.
2. To migrate the data of a plant document, it is recommended to start the old version of BIOMA, and export a report package (cf. Export / Edit Report Package (a)) with a reporting period set that includes all available data in the database (cf. Edit Operation Data (e)). For this reason, it is not necessary to set any manual inputs. This exported report package can be imported later in the new version of BIOMA

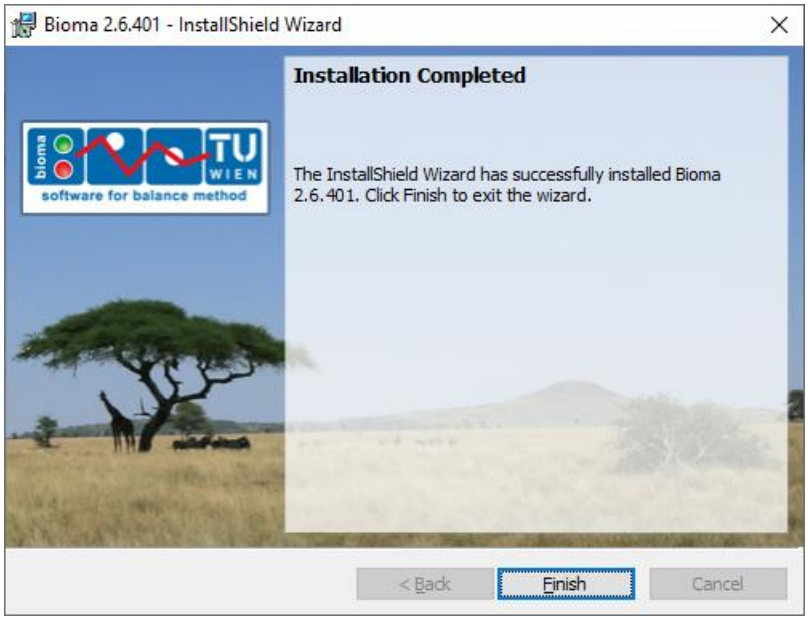
- Execute **setup.exe** in the BIOMA folder.
- Click **Next.**



- Click **Install**.



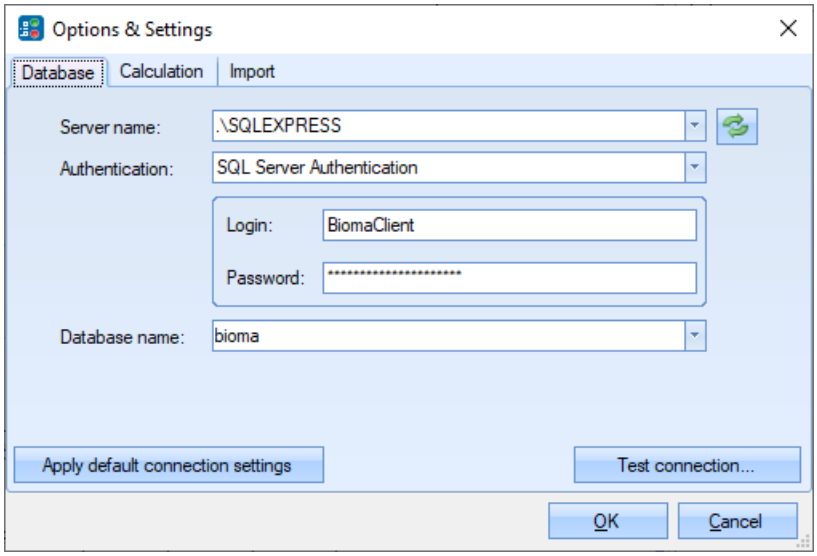
- When the installation is completed, click **Finish** to exit the installation



STEP 2 – CONFIGURE CLIENT DATABASE CONNECTION

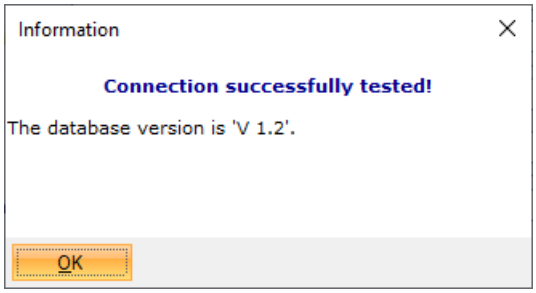
If the standard installation of the database server has been performed, nothing has to be changed. If a different database server is accessed or e.g., windows authentication is used, the settings have to be adjusted.

- Start **BIOMA**.
- Login with user name **expert** and default password **demo**.
- Select **Extras** > **Options**.



- On tab **Database**, state the **Server name** that should be used.

- Click **Test connection**.



- Click **OK**.

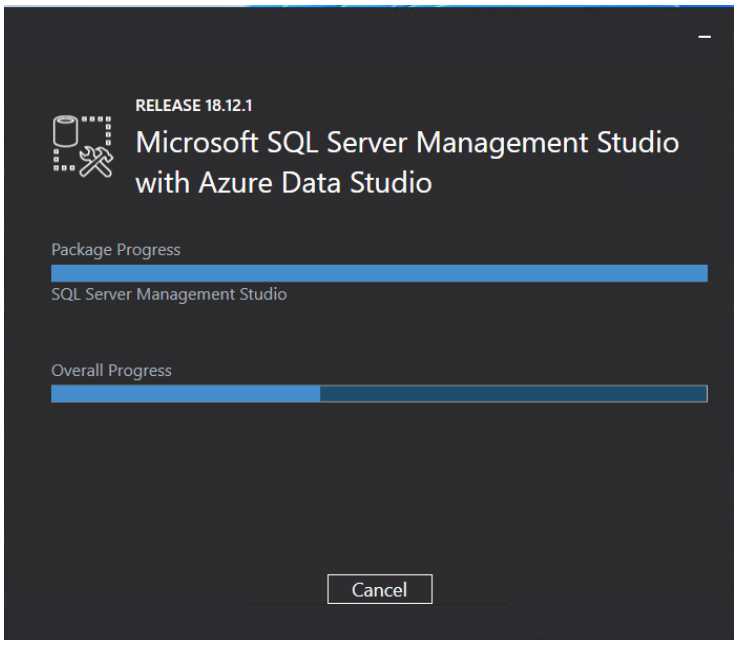
If the warning **Error establishing database connection!** is displayed, the server is not configured for **SQL Server Authentication,** and **Windows Authentication** should be used.

TROUBLE SHOOTING

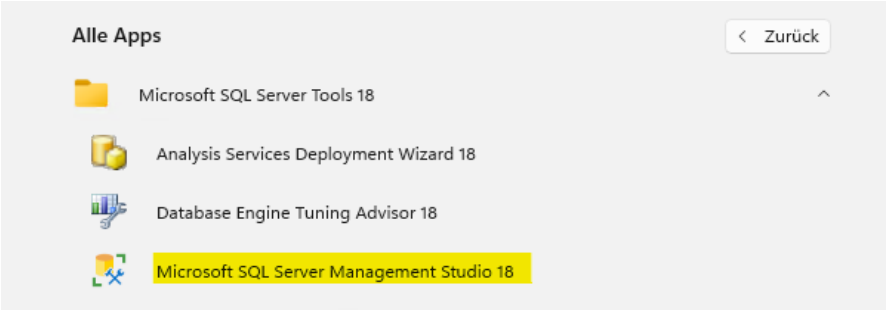
CHANGING OF SERVER AUTHENTICATION MODE (EXISTING SQL-SERVER INSTALLATIONS)

By default, BIOMA uses “SQL Server Authentication” when connecting to the database server. If "Windows Authentication" was selected during the installation of the SQL-Server, you can change this later with the free tool “Microsoft SQL Server Management Studio (SSMS)”.

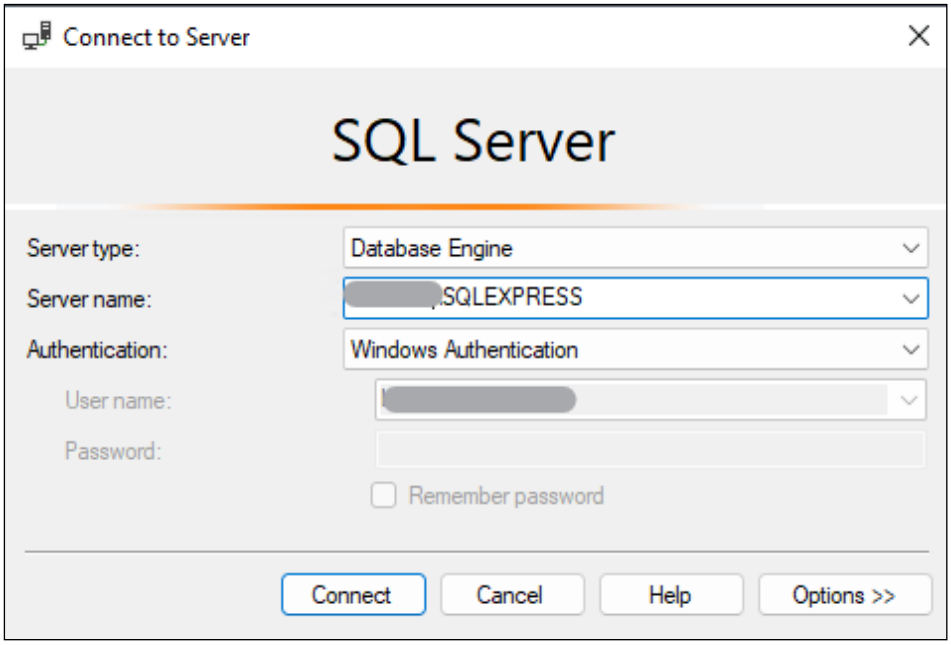
- Download and install “SSMS-Setup.ENU.exe”



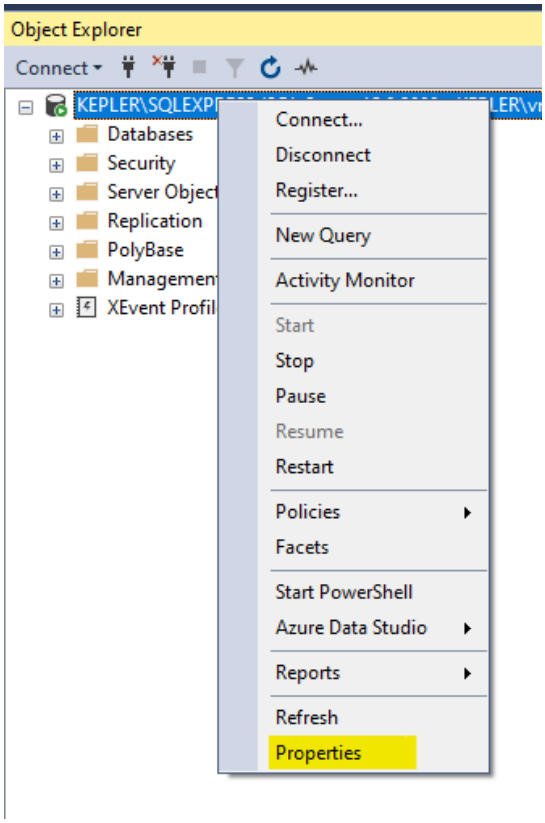
- Start “SQL Server Management Studio 1”



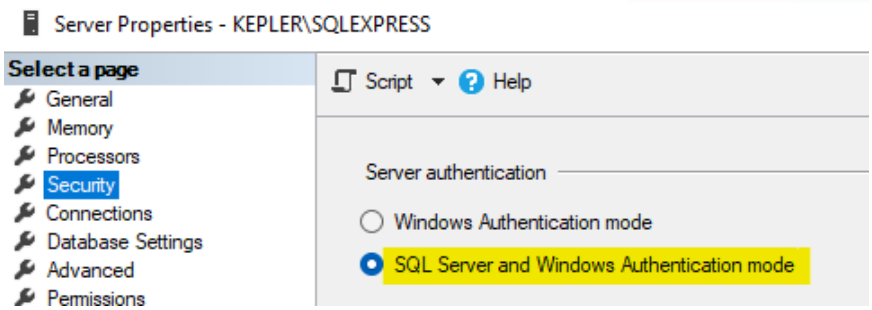
- Click “Connect”.



- Right click the database server and choose “properties”.



- Select “Security”, choose “SQL Server and Windows Authentication mode” and click “OK”.



- Close the “SQL Server Management Studio Express” window.

QUICK START WITH BIOMA

Here, you find quick-start instructions on how to work with BIOMA. For more detailed information, see Menu Description.

The letter in the brackets directly after a headings refers to necessary minimum access rights (user < administrator < expert < developer).

- A user has the rights to import operational data and display the results of the calculation for several parameters.
- An administrator has the additional rights to perform plant and program configurations and create report packages.
- An expert has the additional rights to edit operational data, import report packages, and create reports.
- A developer has the additional rights to display and edit the calculation algorithm, change permission group settings, and issue licenses.

DEMO MODE

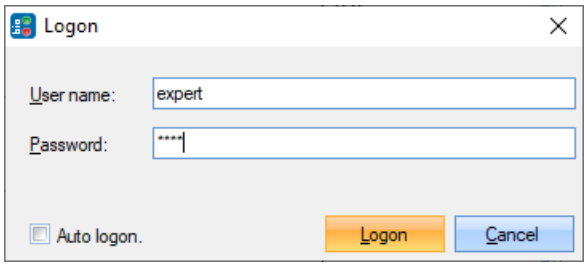
When BIOMA is run in demo mode (that means that no valid license file has been installed), it is NOT possible to create new plant documents, import data, or crate report packages. All changes applied to the sample data will be deleted when the software is closed.

If you want to access the demo data also later when you have installed a valid license, rename a copy of demo.dat (under C:\Program Files (x86)\inka software\BIOMA 2.6.401\Testdata\) to demo.brpz, and import the report package into BIOMA. Note that the file Demodata2021.csv, which can be found in the same folder, contains all the operational data from the demo plant and has been originally used to import the data to the empty demo plant document.

LOGIN (U)

Log in to the BIOMA software.

- Select **File** > **Login**.
- Log in with user name **expert** and password **demo** (if you are in demo mode or you have installed an expert license).
- You are now logged in with expert privileges.

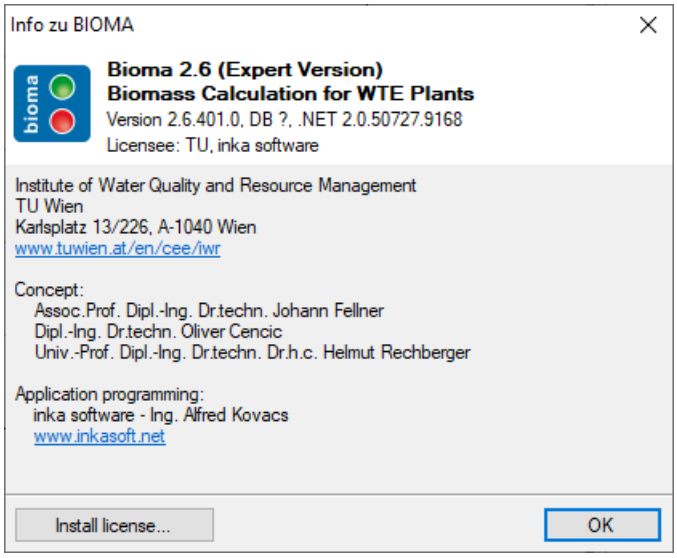


INSTALL LICENSE (A)

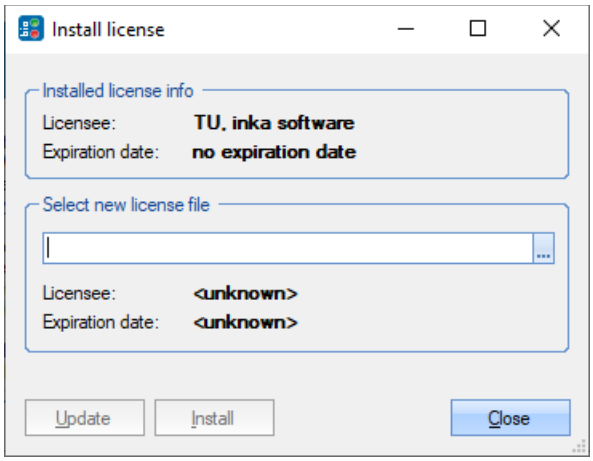
Install a license file. If you do not, BIOMA will run in demo mode where all changes applied to the example data set will not be saved.

- Select **Help** > **About**.

- Click **Install License**.



- Choose the license file (e.g., **company_name.license**) you got when buying BIOMA.



- Click **Update** if the expiration date and the licensee shall be updated. All existing credentials will be kept.
- Click **Install** if a new license shall be installed. The existing license will be overwritten, and all existing credentials (users and passwords) will be lost.
- Confirm the appearing message by clicking **Yes**.
- Restart **BIOMA**.
- **Log in** again (use admin/demo with client licenses and expert/demo with developer licenses).

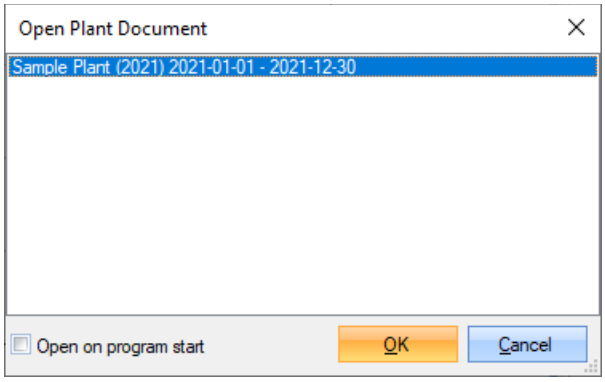
OPEN PLANT DOCUMENT (U)

Open a plant document of your choice.

- Select **File** > **Open Plant Document**.
  - When BIOMA is run in demo mode, the only plant document available is **Sample Plant (2021)**.
  - When BIOMA is run with a valid license for the first time, a new plant document with the name **New plant created at [date time]** is available. Select this entry if you want to design a plant document from scratch.
  - Alternatively, import a report package (cf. Import Report Package (a)).

- If plant documents have already been created with a previous version of BIOMA and the SQL database has been left untouched, all plant documents available in this database should be displayed.

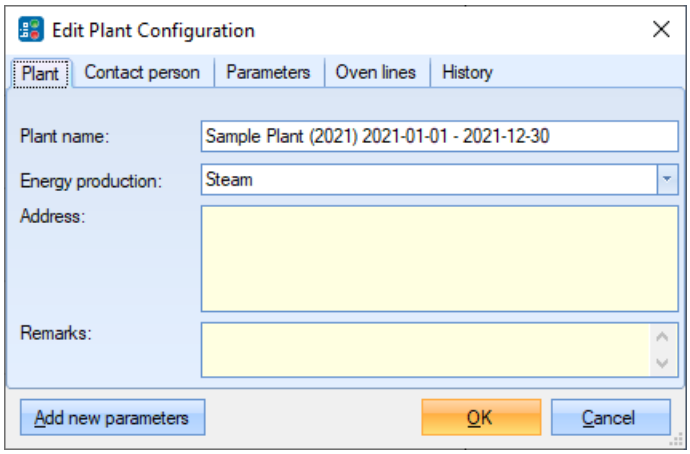
- Select a plant document, tick **Open on program start** and click **OK**.



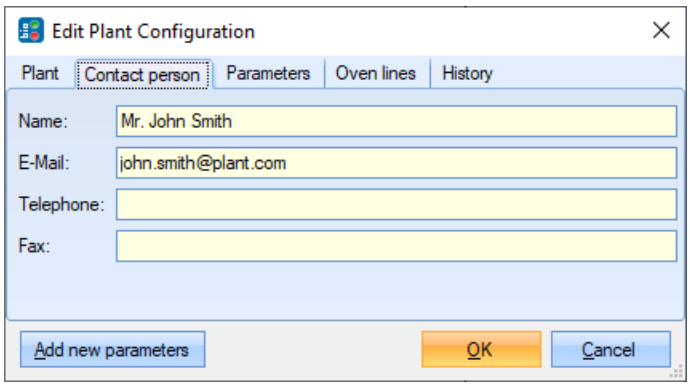
EDIT PLANT CONFIGURATION (A)

Edit general plant information and specific parameters information.

- Select **Edit** > **Edit Plant Configuration**.
- On tab **Plant,** you can enter **Plant name**, the type of **Energy production** (Steam/Hot water), **Address**, and optionally **Remarks**.



- On tab **Contact Person**, you can enter a contact person's name, email, telephone, and fax.



- On tab **Parameters,** edit plant-specific parameters (if necessary). The default settings are taken from **C:\Program Files\inka software\BIOMA 2.6.401\Template\Parameter.xls**. The following settings can be changed.

  Data Source:

  - **Default** values will be the same during online calculation and in the report package.
  - **Manual** and **Manual total** values have to be updated manually when creating a report package. **Manual** values represent relations [e.g., kg/kg], while **Manual total** values represent mass and volume flows over the total reporting period.
  - **Control System** values are directly produced from the control system and will be imported via CSV file.
  - **None** should be chosen if a parameter is not necessary for calculation (e.g., if no sludge is burned, select **none** for mslu).

  Use defaults:

  - If the tick **use defaults** is set, it indicates that during online calculation the default settings (mean value and standard deviation) should be used (if given) when no data is available from the control system.
  - During online calculation, the default values of **Default** and **Manual** values are always used.

  Min and **Max**:

  - Here, the parameters' allowed minimum and maximum values can be stated, which are used for plausibility checks.

  Value and **Uncertainty**:

  - Enter the mean value and the standard uncertainty of a parameter.

  +/- Manual [%]:

  - This standard uncertainty in % will be used during calculation. If it is not given, it will be computed from the given mean value and absolute uncertainty. Note that this is the relative standard uncertainty of the parameters on a daily basis! Because this is a random uncertainty, it will get smaller the larger the considered period is (by the factor 1/sqrt(n), where n is the number of days in the period considered).

    $$u_{rel,n}^2 = u_{rel,daily}^2/n$$

  +/- Systematic [%] (E):

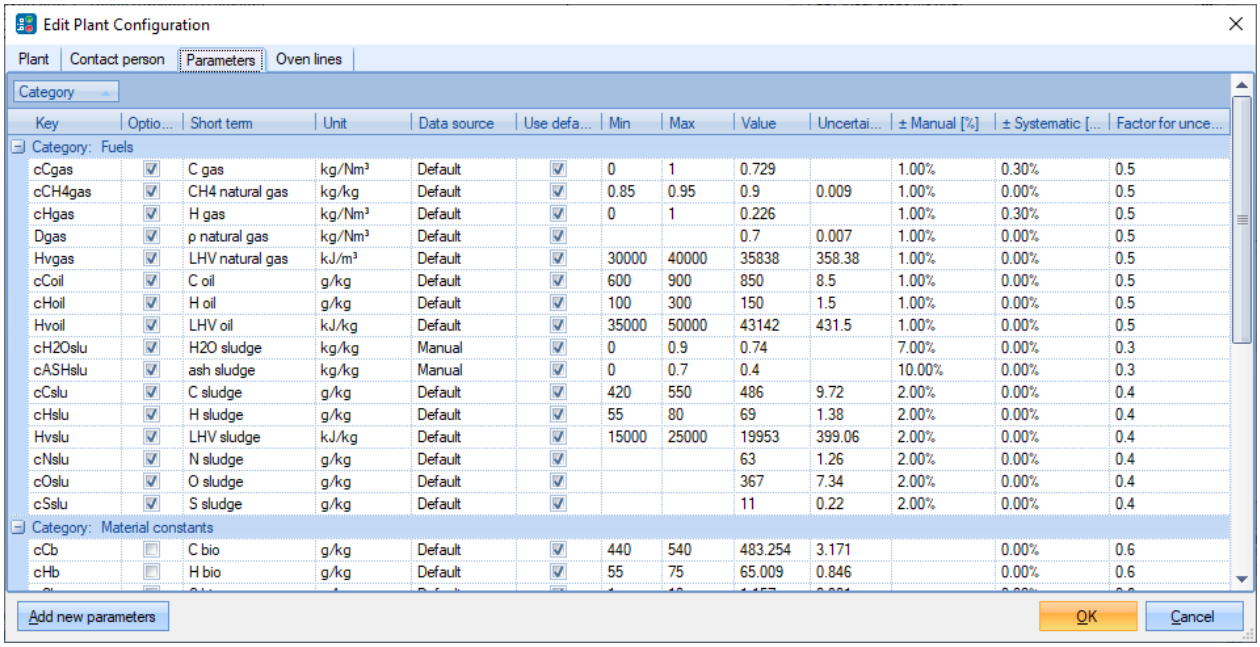
  - If the reduction mentioned above is too fast, a “systematic” part can be introduced, that will not reduce when n is rising:

    $$u_{rel,n}^2 = u_{rel,sys}^2 + (u_{rel,daily}^2 - u_{rel,sys}^2)/n$$

Factor for Uncertainty Calculation (E):

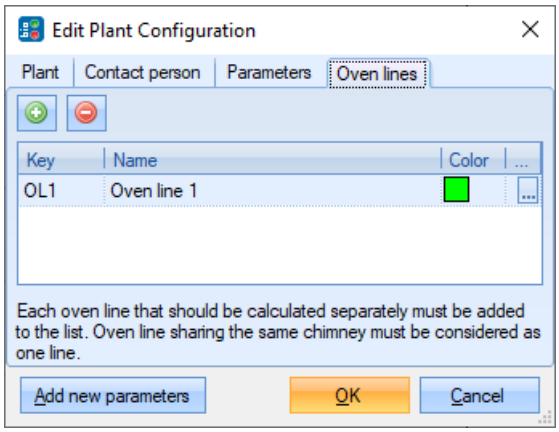
- Additionally, from the remaining random part $u_{rel,daily}^2 - u_{sys}^2$ a certain fraction F can be declared to be also "systematic", and thus not being reduced if n is rising:

$$u_{rel,n}^2 = u_{sys}^2 + (u_{rel,daily}^2 - u_{rel,sys}^2)\, F^2 + \left((u_{rel,daily}^2 - u_{rel,sys}^2) - (u_{rel,daily}^2 - u_{rel,sys}^2)\, F^2\right)/n$$
$$u_{rel,n}^2 = u_{rel,sys}^2 + (u_{rel,daily}^2 - u_{rel,sys}^2)\, (F^2 + (1 - F^2)/n$$

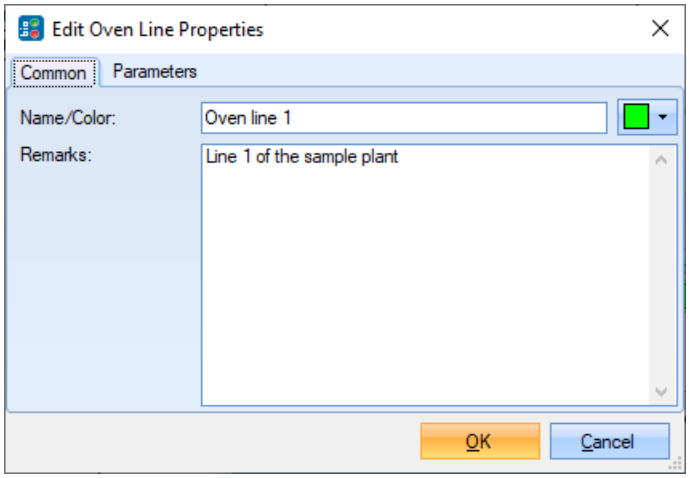


Key	Optio...	Short term	Unit	Data source	Use defa...	Min	Max	Value	Uncertai...	± Manual [%]	± Systematic [...	Factor for unce...
Category: Fuels												
cCgas	☑	C gas	kg/Nm³	Default	☑	0	1	0.729		1.00%	0.30%	0.5
cCH4gas	☑	CH4 natural gas	kg/kg	Default	☑	0.85	0.95	0.9	0.009	1.00%	0.00%	0.5
cHgas	☑	H gas	kg/Nm³	Default	☑	0	1	0.226		1.00%	0.30%	0.5
Dgas	☑	ρ natural gas	kg/Nm³	Default	☑			0.7	0.007	1.00%	0.00%	0.5
Hvgas	☑	LHV natural gas	kJ/m³	Default	☑	30000	40000	35838	358.38	1.00%	0.00%	0.5
cCoil	☑	C oil	g/kg	Default	☑	600	900	850	8.5	1.00%	0.00%	0.5
cHoil	☑	H oil	g/kg	Default	☑	100	300	150	1.5	1.00%	0.00%	0.5
Hvoil	☑	LHV oil	kJ/kg	Default	☑	35000	50000	43142	431.5	1.00%	0.00%	0.5
cH2Oslu	☑	H2O sludge	kg/kg	Manual	☑	0	0.9	0.74		7.00%	0.00%	0.3
cASHslu	☑	ash sludge	kg/kg	Manual	☑	0	0.7	0.4		10.00%	0.00%	0.3
cCslu	☑	C sludge	g/kg	Default	☑	420	550	486	9.72	2.00%	0.00%	0.4
cHslu	☑	H sludge	g/kg	Default	☑	55	80	69	1.38	2.00%	0.00%	0.4
Hvslu	☑	LHV sludge	kJ/kg	Default	☑	15000	25000	19953	399.06	2.00%	0.00%	0.4
cNslu	☑	N sludge	g/kg	Default	☑			63	1.26	2.00%	0.00%	0.4
cOslu	☑	O sludge	g/kg	Default	☑			367	7.34	2.00%	0.00%	0.4
cSslu	☑	S sludge	g/kg	Default	☑			11	0.22	2.00%	0.00%	0.4
Category: Material constants												
cCb	☐	C bio	g/kg	Default	☑	440	540	483.254	3.171		0.00%	0.6
cHb	☐	H bio	g/kg	Default	☑	55	75	65.009	0.846		0.00%	0.6

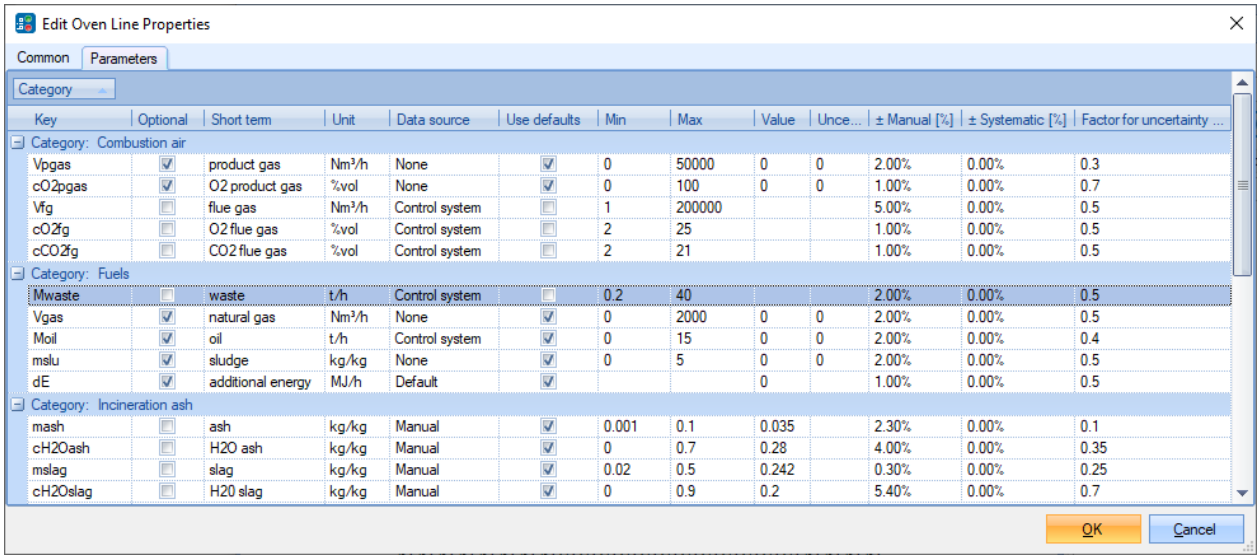
- On tab **Oven Lines**, click **+** to add an oven line.
- **Select** an existing oven line and click ... at the end of the row to edit oven line properties.



- On tab **Common**, edit the **name** and the display **color** of the oven line.



- On tab **Parameters**, edit oven line-specific parameters (if necessary).



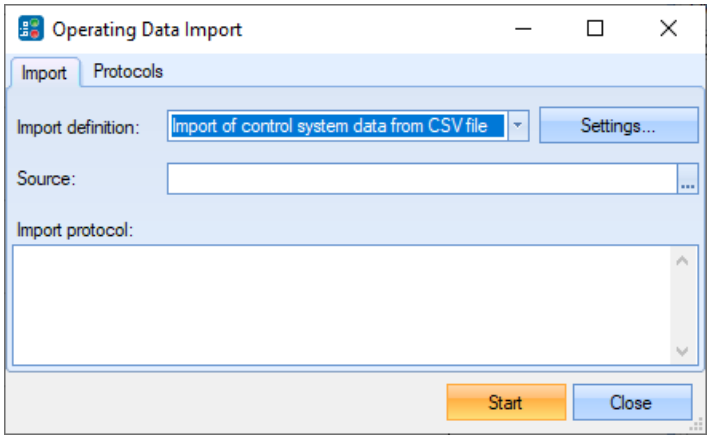
Key	Optional	Short term	Unit	Data source	Use defaults	Min	Max	Value	Unce...	± Manual [%]	± Systematic [%]	Factor for uncertainty ...
Category: Combustion air												
Vpgas	☑	product gas	Nm³/h	None	☑	0	50000	0	0	2.00%	0.00%	0.3
cO2pgas	☑	O2 product gas	%vol	None	☑	0	100	0	0	1.00%	0.00%	0.7
Vfg	☐	flue gas	Nm³/h	Control system	☐	1	200000			5.00%	0.00%	0.5
cO2fg	☐	O2 flue gas	%vol	Control system	☐	2	25			1.00%	0.00%	0.5
cCO2fg	☐	CO2 flue gas	%vol	Control system	☐	2	21			1.00%	0.00%	0.5
Category: Fuels												
Mwaste	☐	waste	t/h	Control system	☐	0.2	40			2.00%	0.00%	0.5
Vgas	☑	natural gas	Nm³/h	None	☑	0	2000	0	0	2.00%	0.00%	0.5
Moil	☑	oil	t/h	Control system	☑	0	15	0	0	2.00%	0.00%	0.4
mslu	☑	sludge	kg/kg	None	☑	0	5	0	0	2.00%	0.00%	0.5
dE	☑	additional energy	MJ/h	Default	☑			0		1.00%	0.00%	0.5
Category: Incineration ash												
mash	☐	ash	kg/kg	Manual	☑	0.001	0.1	0.035		2.30%	0.00%	0.1
cH2Oash	☐	H2O ash	kg/kg	Manual	☑	0	0.7	0.28		4.00%	0.00%	0.35
mslag	☐	slag	kg/kg	Manual	☑	0.02	0.5	0.242		0.30%	0.00%	0.25
cH2Oslag	☐	H2O slag	kg/kg	Manual	☑	0	0.9	0.2		5.40%	0.00%	0.7

IMPORT CONFIGURATION 1 (A)

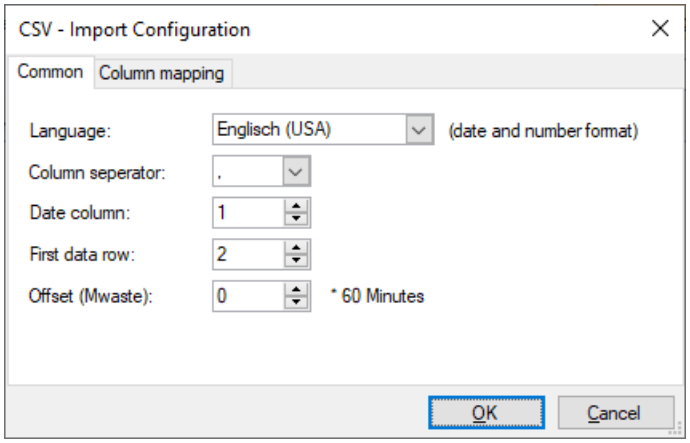
Define the structure of the data in the CSV file to be imported.

- Select **Edit** > **Import Operation Data**.
- On tab **Import,** select **Import of control system data from CSV file**.

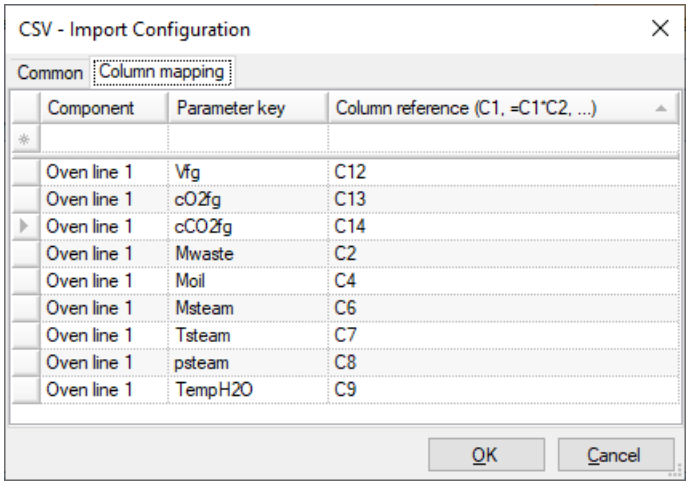
- Click **Settings** to change the CSV import definition settings.



- On tab **Common**, choose the **language**, **column separator**, **position of date column,** and **first data row** of the CSV file.
- Select an **offset for Mwaste**. This is the time from when the waste is taken from the bunker until combustion takes place. The best practice is 2 hours.



- On tab **Column mapping,** you can edit already existing import settings or create new entries. An example setting is displayed in the graph below.
- In the row marked by a *****, you can add a new import parameter by selecting a **component** (oven line), a **parameter key**, and a **column reference**. Note: you have to click the empty field below component or parameter key to display the respective drop-down list.
- Alternatively, you can edit any existing parameter by changing the entries in the respective row.
- Click **OK**.

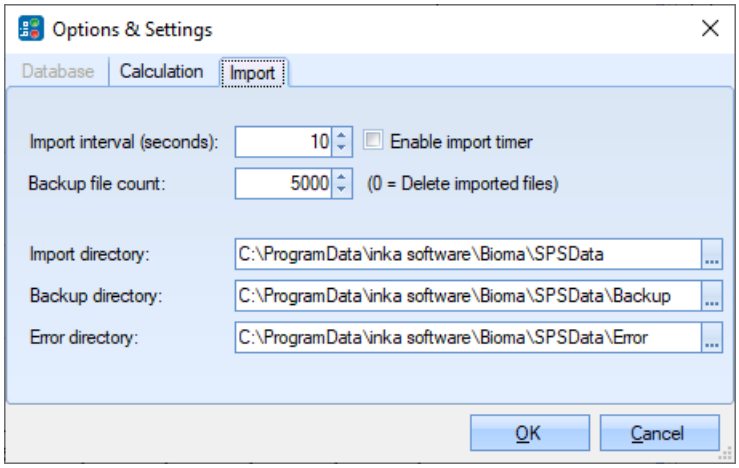


- If you want to import control system data automatically, click **Close** (!).
- If you want to import a CSV file manually, select a source file and click **Start**.

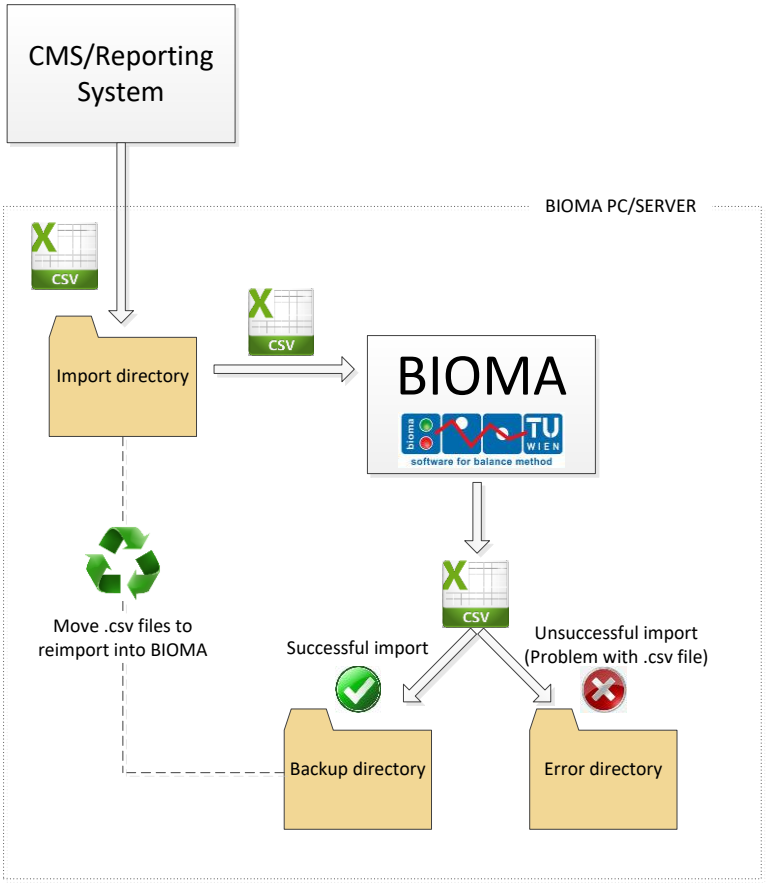
IMPORT CONFIGURATION 2 (A)

Define the (import, backup, error) directories of the CSV files, set the import interval and enable the import timer.

- Select **Extras** > **Options** > tab **Import**.
- Choose **Import Directory**. This is the folder where the CSV data file has to be placed to be automatically imported.
- Choose **Backup Directory**. If the data import was successful, the CSV file will be moved from **Import Directory** to **Backup Directory**).
- Choose **Backup Directory**. If the data import was unsuccessful, the CSV file will be moved from **Import Directory** to **Error Directory**).
- Set Import interval (seconds) and tick **Enable import timer** to activate automatically importing of data. The **Import Directory** will be checked according to the time stated if new data is available.
- Set the number of backup files that should be kept before starting to delete the oldest.



The flow of the .csv file is depicted below.



1) Your CMS/Reporting System generates .csv file containing operation data. The .csv file is placed in a specified folder ('import directory')

2) BIOMA imports data from all CSV files from the 'import directory' into its internal database

3) If the data import is successful, BIOMA moves the .csv file to the 'Backup directory'. If the data import is unsuccessful, the .csv will be moved to the 'Error directory'

4) If you would like to reimport data, simply move files from the 'Backup directory' to the 'Import directory'

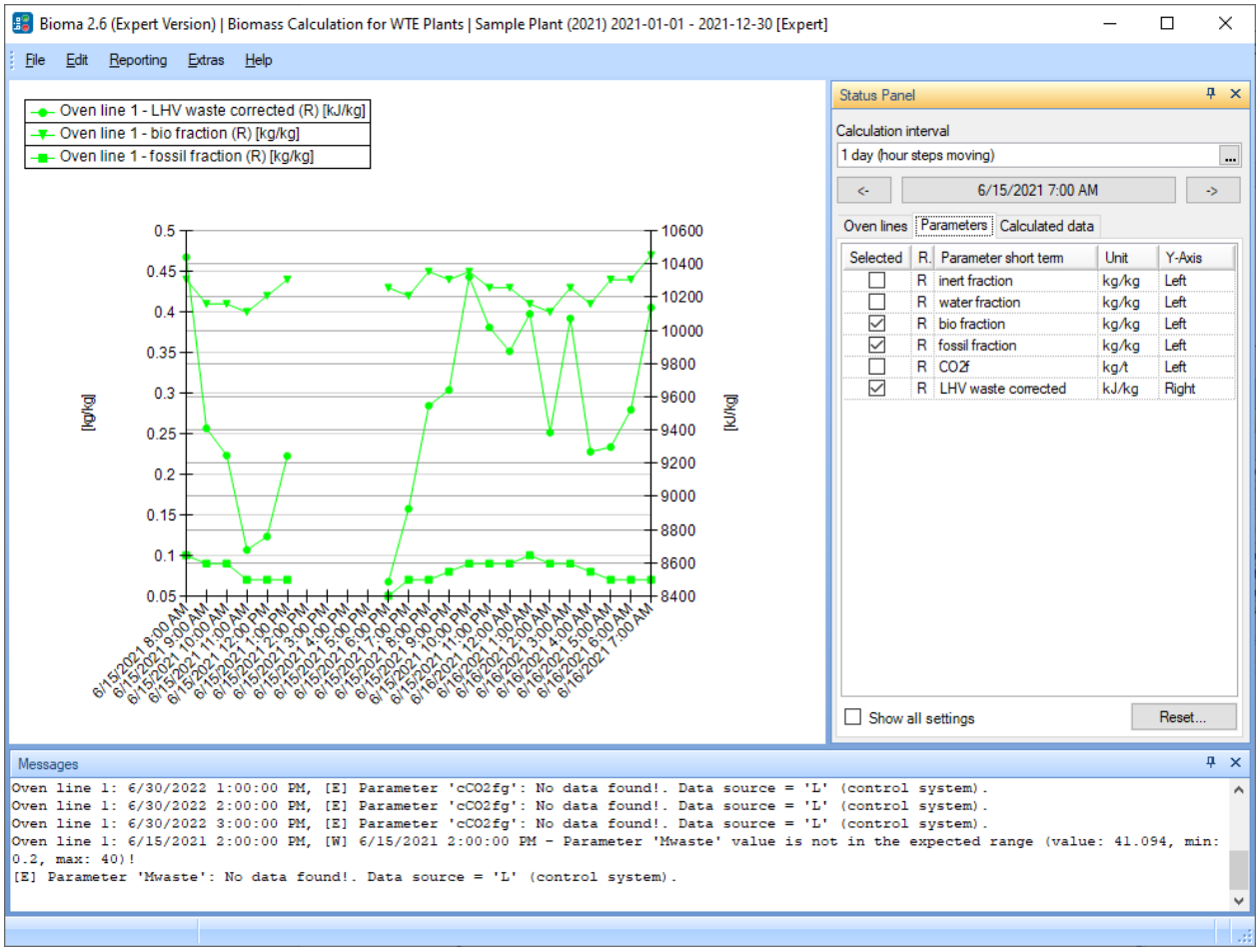
IMPORT DATA (U)

Import data to your plant document.

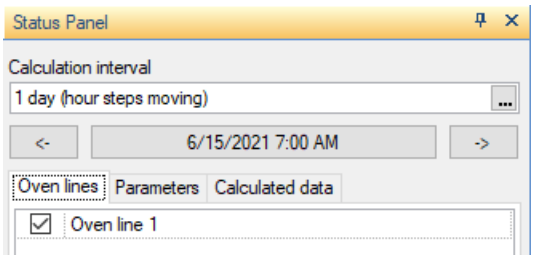
- Enable your control system to automatically produce CSV files with aggregated data for one hour (every full hour!). The time e.g., 01:00 stands for the time interval >0:00 to 1:00.
- Copy these files automatically to the chosen **Import Directory**.
- These files must obey the settings from **Import Configuration 1 (a)**: E.g., *,Mwaste,Vgas,Moil,mslu,Msteam,Tsteam,Psteam,TempH2,Vpgas,cO2pgas,Vfg,cO2fg,cCO2fg 10.06.2022 16:00,20,,0,,100,400,40,125,,,125000,8.5,10.5*
- As soon as the first 4 hours of plausible data are available, a calculation will be performed, and the results will be displayed in the Graphical User Interface (GUI).

USE GRAPHICAL USER INTERFACE (U)

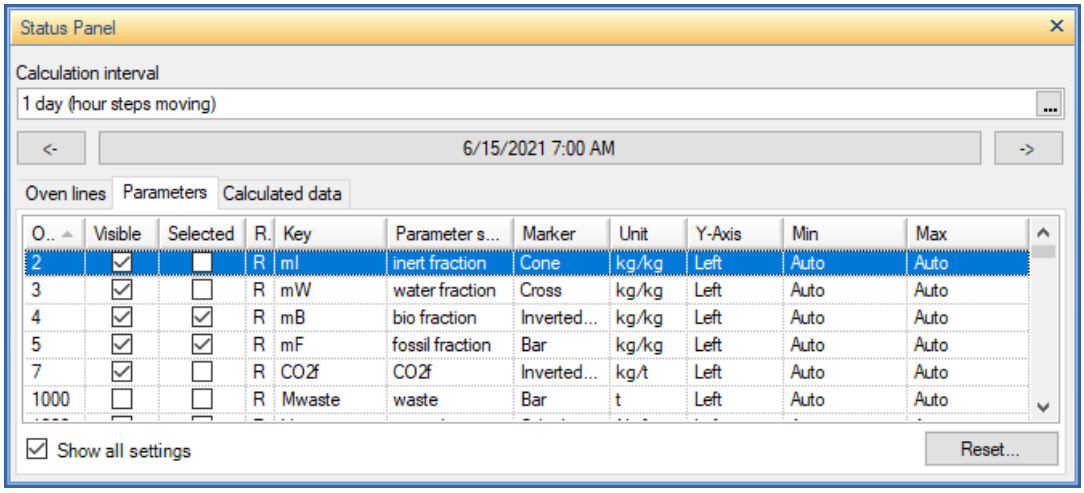
In the graphical user interface of BIOMA, the calculation results of selected parameters can be displayed graphically and by value.



- In the **Status Panel**, on tab **Oven lines**, select the oven lines you want to display in the graph.

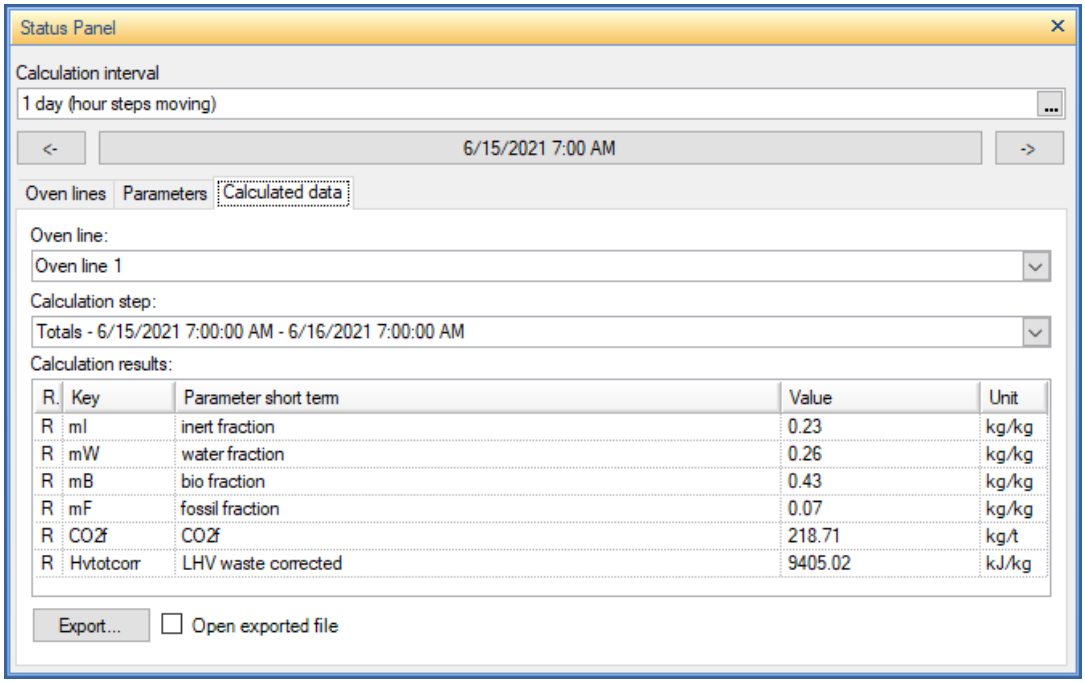


- In the **Status Panel**, on tab **Parameters**, administrators and experts can select the parameters they want to be visible to regular users. These parameters can be selected to be displayed in the graph, and their calculation results can be seen on tab **Calculated data**. (R … reconciled values, I … input values).
    - Select **Show all settings**.
    - Select **Visible** for those parameters that shall be available/visible for regular users.
    - Select **Selected** for those parameters that shall be displayed in the graph. This setting has an effect only if the respective parameters are also visible.
    - You can assign as many parameters as you want to two different y-axes (left and right). The first parameter selected to be displayed determines the unit of the assigned y-axis (left/right). From then on, parameters assigned to the same y-axis can be selected only if they have the same unit as the one of the respective y-axis. The same applies to the second y-axis.
    - You can select the desired **marker** type and the **y-axis** to be used, and edit the **minimum/maximum** values of the respective y-axis.
    - To get a parameter to the top of the list, change its **order number** in the first column.



O..	Visible	Selected	R.	Key	Parameter s...	Marker	Unit	Y-Axis	Min	Max
2	☑	☐	R	mI	inert fraction	Cone	kg/kg	Left	Auto	Auto
3	☑	☐	R	mW	water fraction	Cross	kg/kg	Left	Auto	Auto
4	☑	☑	R	mB	bio fraction	Inverted...	kg/kg	Left	Auto	Auto
5	☑	☑	R	mF	fossil fraction	Bar	kg/kg	Left	Auto	Auto
7	☑	☐	R	CO2f	CO2f	Inverted...	kg/t	Left	Auto	Auto
1000	☐	☐	R	Mwaste	waste	Bar	t	Left	Auto	Auto

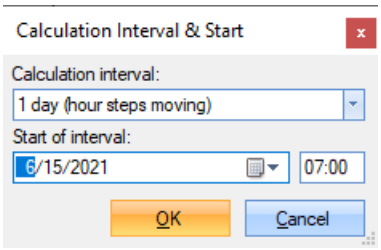
- To show all calculation results of the chosen calculation interval, select tab **Calculated data** in the **Status Panel**. Here, you can select for which line and calculation step you want to display data. Additionally, it is possible to export this information into an XML file by clicking **Export**.



R.	Key	Parameter short term	Value	Unit
R	mI	inert fraction	0.23	kg/kg
R	mW	water fraction	0.26	kg/kg
R	mB	bio fraction	0.43	kg/kg
R	mF	fossil fraction	0.07	kg/kg
R	CO2f	CO2f	218.71	kg/t
R	Hvtotcorr	LHV waste corrected	9405.02	kJ/kg

- If you want to show the results for a different period
  - Click the button ... next to **Calculation interval** (or the date/time button)
  - Select the **calculation interval**:
    - Past 8 hours (hour steps moving) = default setting, no date selection possible
    - 8 hours (hour steps moving)
    - 1 day (hours step moving)
    - 1 week (days steps)
    - 1 month (days steps)
    - 1 year (month steps)

- Select the **starting point** of the calculation interval.



- Click **OK**.
- Alternatively, you can also use the **arrows** next to the date/time button to switch to the previous or calculation interval in steps.

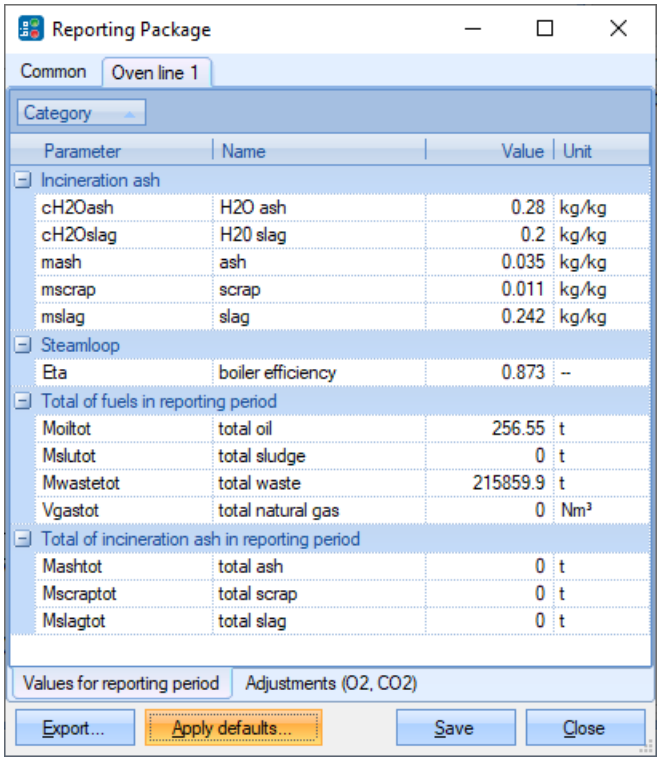
Notes:

- Each data point displayed in a graph with hourly resolution represents the calculation results of the 4-hour-moving-average.
- If any troubles occur during calculation, the related messages will be displayed inside the **Messages** window. To clear this window, **right-click** on it and choose **Clear output**.
- ATTENTION: No calculation uncertainties will be displayed. This feature is only available for experts (cf. Export Online Calculation Results (e)).

EXPORT REPORT PACKAGE (A)

Administrators can export report packages. A report package includes the complete data set for the selected reporting period (including the updated plant parameters, called manual inputs) but no computed results.

- Select **Reporting** > **Export/Edit Report Package**.
- Select the reporting period (e.g., 01.01.2021 – 31.12.2021).
- **Update** plant parameters (tabs Common and Oven lines). This update is needed to correct the met assumptions necessary to perform online calculations.
- If you don't have the total values for Moiltot, Mslutot, Mwastetot and Vgastot, you can click **Apply Defaults** to compute the sum of the data from the database independent of the fact if the respective datasets are plausible or not. Note that Mashtot, Mscaptot and Mslagtot are set to zero because they are not needed for the computation.
- Click **Export**, select a **destination** folder and click **Save**.
- Click **Save** to store the changes.



IMPORT REPORT PACKAGE (A)

If you get support in the form of an edited report package, you have to import it.

- Select **Reporting** > **Import Report Package**.
- Select a report package (extension *.brpz).
- Click **Open**.

The plant document is afterwards available under **File** > **Open Plant Document**.

MENU DESCRIPTION

Here, you find a detailed description of the menu entries.

The letter in the brackets directly after the name of the menu entries refers to necessary minimum access rights (user < administrator < expert < developer).

- A user has only the rights to import operational data and display the results of the calculation for several parameters.
- An administrator has the additional rights to perform plant and program configurations and create report packages.
- An expert has the additional rights to edit operational data, import report packages, and create reports.
- A developer (hardware dongle needed) has the additional rights to display/edit an alternative calculation algorithm, issue licenses, and add/delete/edit user groups.

MENU OVERVIEW (LINKED)

File
- Login (u)
- Logout (u)
- Open Plant Document (u)
- New Plant Document (e)
- Exit (u)

Edit
- Edit Plant Configuration (a)
- Import Operation Data (u)
- Edit Operation Data (e)
- Calculate (u)
- Show Generated Source (d)
- Edit Calculation Source (d)

Reporting
- Export / Edit Report Package (a)
- Import Report Package (a)
- Building Reports (e)
- Export Calculation Results (a/e)
- Export Online Calculation Results (e)
- Reference Systems (e)

Extras
- Options (a)
- Change Log (e)
- Administration (a/e)
  - Export Definition (E)
  - Plant Document Admin (a)
  - Users (a) and Permissions (d)

Help
- About (a)

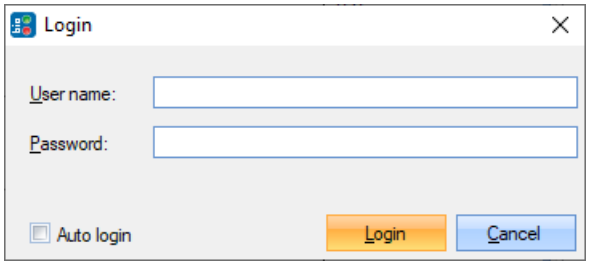
FILE

Here, you can find information on how to log in/log out and how to open/create new plant documents.

LOGIN (U)

You have to log in in order to be able to operate the BIOMA software.

- In the menu, click **File** > **Login**.
- Enter **User Name** and **Password**.
- Directly after installation, the users “wte” (short for waste to energy; = regular user), “admin” or “expert” can be used. The default password for all of the is “demo”.
- It is recommended to change these passwords (cf. Users (a) and Permissions (d)).
- Select **Auto Login** if you want to log in automatically with the entered credentials when BIOMA is started.



LOGOUT (U)

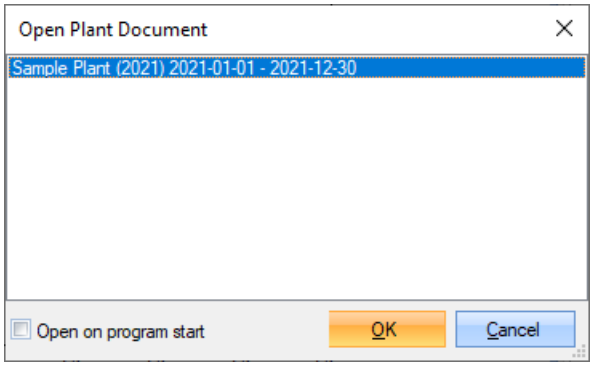
If you are logged in and you want to switch users, you have to log out before being able to log in with different credentials.

- In the menu, click **File** > **Logout** to log off the currently logged-in user.

OPEN PLANT DOCUMENT (U)

Here, you can select the plant document you want to work with.

- In the menu, click **File** > **Open Plant Document**.
- Tick **Open on program start** if you want to open the selected plant document automatically when BIOMA is started.
- Click **OK**.



NEW PLANT DOCUMENT (E)

Here, experts have to opportunity to create new plant documents.

- In the menu, click **File** > **Open Plant Document** to create a new empty plant document, which can be edited afterwards under **Edit** > **Edit Plant Configuration**.

EXIT (U)

Here you can close the BIOMA software.

- In the menu, click **File** > **Exit** to close the software BIOMA.
- Alternatively, you can also click the **x** in the upper-right corner of the BIOMA user interface.

EDIT

Here, you get information on how to edit plant/oven line configurations, import/edit operation data, perform online calculations, and implement own calculation source code.

EDIT PLANT CONFIGURATION (A)

Here, administrators can edit the plant configurations.

- In the menu, click **Edit** > **Edit Plant Configuration**.

BUTTON ADD NEW PARAMETERS (D)

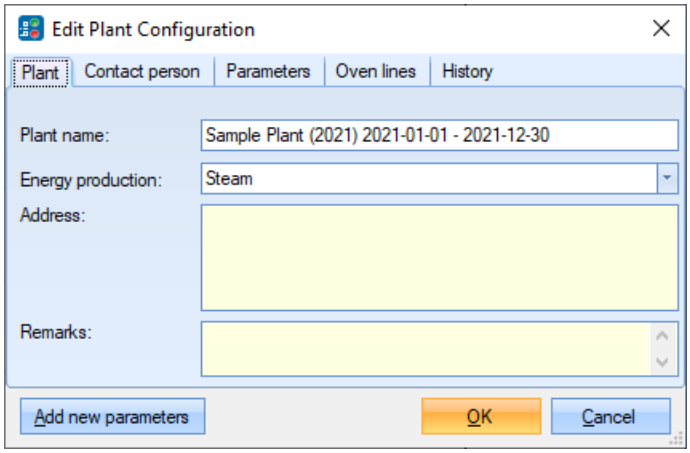
If changes to the parameter.xls have been applied, developers can add these changes to the plant document.

- Click **Add new parameters** to update the database with parameters that have been added to the file **C:\Program Files\inka software\BIOMA 2.6.401\Template\Parameter.xls**.

TAB PLANT

This tab contains general information about the plant.

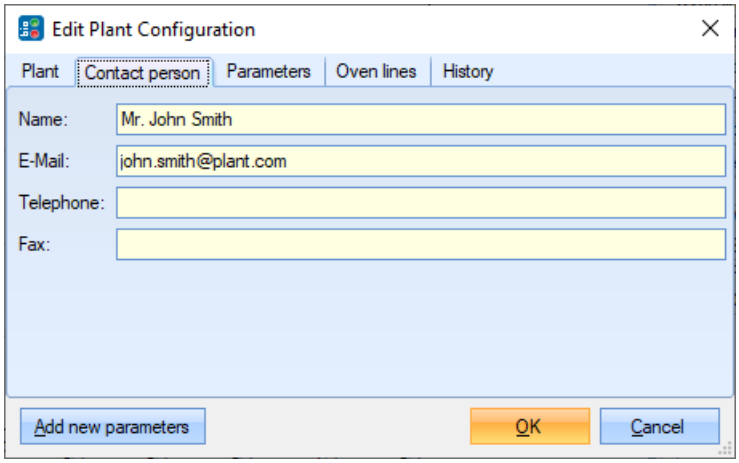
- On tab **Plant**, enter the plant data (**plant name**, the type of **energy produced** (steam/hot water) **address**, and **remarks**).



TAB CONTACT PERSON

This tab contains general information about the contact person.

- On tab **Contact Person**, enter the contact person's data (name, e-mail, telephone, fax).



TAB PARAMETERS

This tab allows to apply changes to the parameters of the plant document.

- On tab **Parameters**, the settings of the plant-specific parameters (concerning fuels and materials) can be edited. The default settings are taken from **C:\Program Files\inka software\BIOMA 2.6.401\Template\Parameter.xls**. The following settings can be changed:

  Data Source:

  - **Default** values will be the same during online calculation and in the report package.
  - **Manual** and **Manual total** values have to be updated manually when creating a report package. **Manual** values represent relations [e.g., kg/kg], while **Manual total** values represent mass and volume flows over the total reporting period.
  - **Control System** values are directly produced from the control system and will be imported via CSV file.
  - **None** should be chosen if a parameter is not necessary for calculation (e.g., if no sludge is burned, select **none** for mslu).

  Use defaults:

  - If the tick **use defaults** is set, it indicates that during online calculation the default settings (mean value and standard deviation) should be used (if given) when no data is available from the control system.
  - During online calculation, the default values of **Default** and **Manual** values are always used.

  Min and **Max**

  - Here, the parameters' allowed minimum and maximum values can be stated, which are used for plausibility checks.

  Value and **Uncertainty**:

  - Enter the mean value and the standard uncertainty of a parameter.

+/- Manual [%]:

- This standard uncertainty in % will be used during calculation. If it is not given, it will be computed from the given mean value and absolute uncertainty. Note that this is the relative standard uncertainty of the parameters on a daily basis! Because this is a random uncertainty, it will get smaller the larger the considered period is (by the factor 1/sqrt(n), where n is the number of days in the period considered).

$$u_{rel,n}^2 = u_{rel,daily}^2/n$$

+/- Systematic [%] (E):

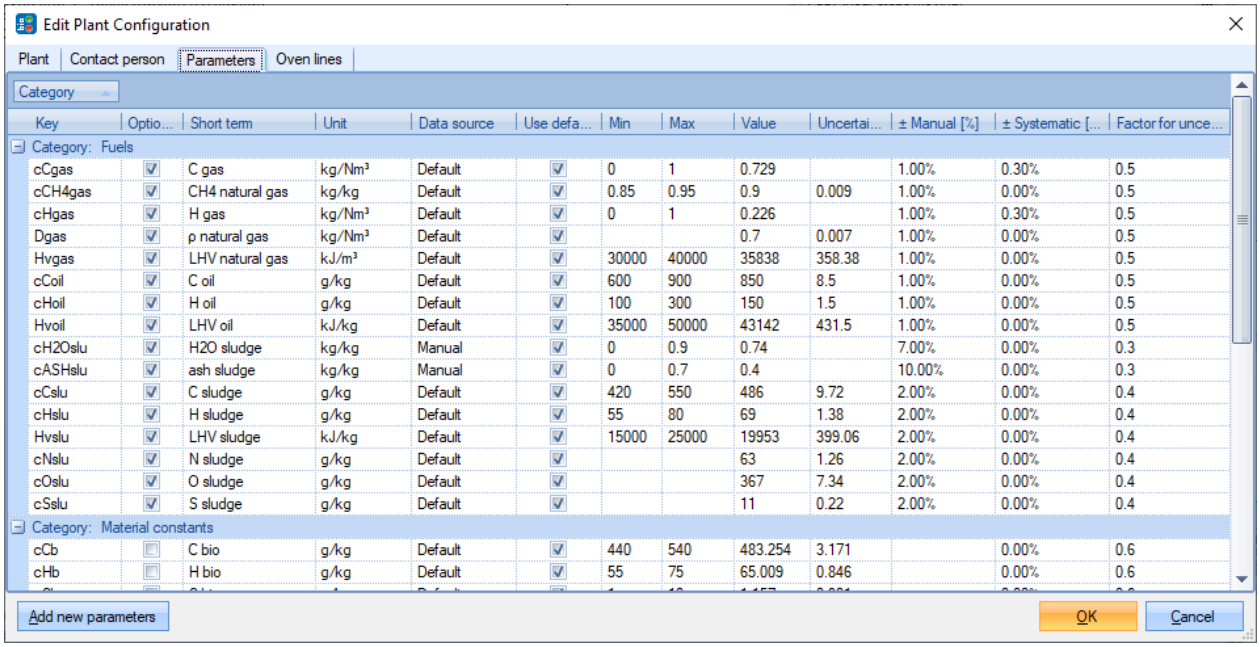
- If the reduction mentioned above is too fast, a "systematic" part can be introduced, that will not reduce when n is rising:

$$u_{rel,n}^2 = u_{rel,sys}^2 + (u_{rel,daily}^2 - u_{rel,sys}^2)/n$$

Factor for Uncertainty Calculation (E):

- Additionally, from the remaining random part $u_{rel,daily}^2 - u_{sys}^2$ a certain fraction F can be declared to be also "systematic", and thus not being reduced if n is rising:

$$u_{rel,n}^2 = u_{sys}^2 + (u_{rel,daily}^2 - u_{rel,sys}^2)\,F^2 + \left((u_{rel,daily}^2 - u_{rel,sys}^2) - (u_{rel,daily}^2 - u_{rel,sys}^2)\,F^2\right)/n$$
$$u_{rel,n}^2 = u_{rel,sys}^2 + (u_{rel,daily}^2 - u_{rel,sys}^2)\,(F^2 + (1 - F^2)/n$$



Key	Optio...	Short term	Unit	Data source	Use defa...	Min	Max	Value	Uncertai...	± Manual [%]	± Systematic [...	Factor for unce...
Category: Fuels												
cCgas	☑	C gas	kg/Nm³	Default	☑	0	1	0.729		1.00%	0.30%	0.5
cCH4gas	☑	CH4 natural gas	kg/kg	Default	☑	0.85	0.95	0.9	0.009	1.00%	0.00%	0.5
cHgas	☑	H gas	kg/Nm³	Default	☑	0	1	0.226		1.00%	0.30%	0.5
Dgas	☑	ρ natural gas	kg/Nm³	Default	☑			0.7	0.007	1.00%	0.00%	0.5
Hvgas	☑	LHV natural gas	kJ/m³	Default	☑	30000	40000	35838	358.38	1.00%	0.00%	0.5
cCoil	☑	C oil	g/kg	Default	☑	600	900	850	8.5	1.00%	0.00%	0.5
cHoil	☑	H oil	g/kg	Default	☑	100	300	150	1.5	1.00%	0.00%	0.5
Hvoil	☑	LHV oil	kJ/kg	Default	☑	35000	50000	43142	431.5	1.00%	0.00%	0.5
cH2Oslu	☑	H2O sludge	kg/kg	Manual	☑	0	0.9	0.74		7.00%	0.00%	0.3
cASHslu	☑	ash sludge	kg/kg	Manual	☑	0	0.7	0.4		10.00%	0.00%	0.3
cCslu	☑	C sludge	g/kg	Default	☑	420	550	486	9.72	2.00%	0.00%	0.4
cHslu	☑	H sludge	g/kg	Default	☑	55	80	69	1.38	2.00%	0.00%	0.4
Hvslu	☑	LHV sludge	kJ/kg	Default	☑	15000	25000	19953	399.06	2.00%	0.00%	0.4
cNslu	☑	N sludge	g/kg	Default	☑			63	1.26	2.00%	0.00%	0.4
cOslu	☑	O sludge	g/kg	Default	☑			367	7.34	2.00%	0.00%	0.4
cSslu	☑	S sludge	g/kg	Default	☑			11	0.22	2.00%	0.00%	0.4
Category: Material constants												
cCb	☐	C bio	g/kg	Default	☑	440	540	483.254	3.171		0.00%	0.6
cHb	☐	H bio	g/kg	Default	☑	55	75	65.009	0.846		0.00%	0.6

If the mouse pointer hovers over the short term of a parameter, a detailed description is displayed as a tooltip.

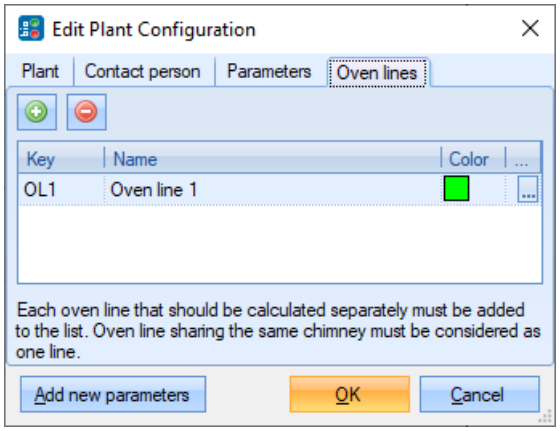
TAB HISTORY (E)

On this tab (visible for experts only), experts can enter information about the history of the plant document.

TAB OVEN LINES

This tab allows to apply changes to the parameters of the specific oven lines.

- On tab **Oven Lines**
  - click **+** to add an oven line.
  - select an existing oven line and click **–** to delete it.



EDIT OVEN LINE PROPERTIES (A)

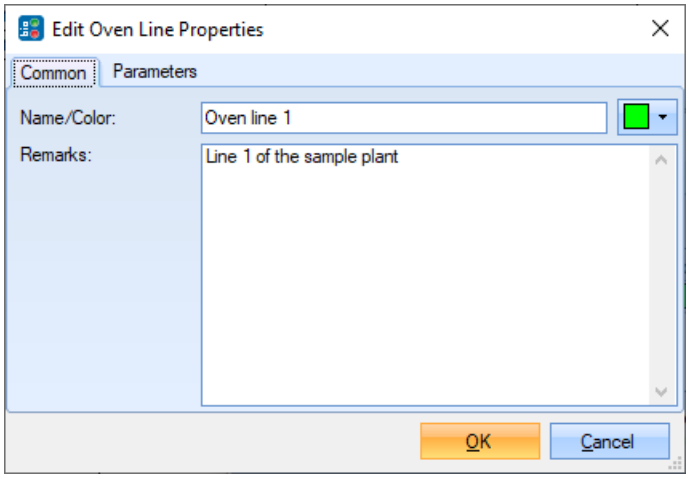
This is a subsection of Edit Plant Configuration.

- In the menu, select **Edit** > **Edit Plant Configuration**.
- On tab **Oven lines**, select an existing oven line and click ... at the end of the row to edit the oven line properties.

TAB COMMON

This tab contains general information about a selected oven line.

- On tab **Common**, enter oven line data (name, color, and remarks).



TAB PARAMETERS

This tab allows to apply changes to the parameters of the oven lines of a plant.

- On tab **Parameters**, the settings for oven line-specific parameters (concerning combustion air, fuels, incineration ash, steam loop, and total values for the reporting period) can be edited. The default settings are taken from **C:\Program Files\inka software\BIOMA 2.6.401\Template\Parameter.xls**. The following settings can be changed:

  Data Source:

  - **Default** values will be the same during online calculation and in the report package.
  - **Manual** and **Manual total** values have to be updated manually when creating a report package. **Manual** values represent relations [e.g., kg/kg], while **Manual total** values represent mass and volume flows over the total reporting period.
  - **Control System** values are directly produced from the control system and will be imported via CSV file.
  - **None** should be chosen if a parameter is not necessary for calculation (e.g., if no sludge is burned, select **none** for mslu).

  Use defaults:

  - If the tick **use defaults** is set, it indicates that during online calculation the default settings (mean value and standard deviation) should be used (if given) when no data is available from the control system.
  - During online calculation, the default values of **Default** and **Manual** values are always used.

  Min and **Max**

  - Here, the parameters' allowed minimum and maximum values can be stated, which are used for plausibility checks.

  Value and **Uncertainty**:

  - Enter the mean value and the standard uncertainty of a parameter.

  +/- Manual [%]:

  - This standard uncertainty in % will be used during calculation. If it is not given, it will be computed from the given mean value and absolute uncertainty. Note that this is the relative standard uncertainty of the parameters on a daily basis! Because this is a random uncertainty, it will get smaller the larger the considered period is (by the factor 1/sqrt(n), where n is the number of days in the period considered).

    $$u_{rel,n}^2 = u_{rel,daily}^2/n$$

  +/- Systematic [%] (E):

  - If the reduction mentioned above is too fast, a “systematic” part can be introduced, that will not reduce when n is rising:

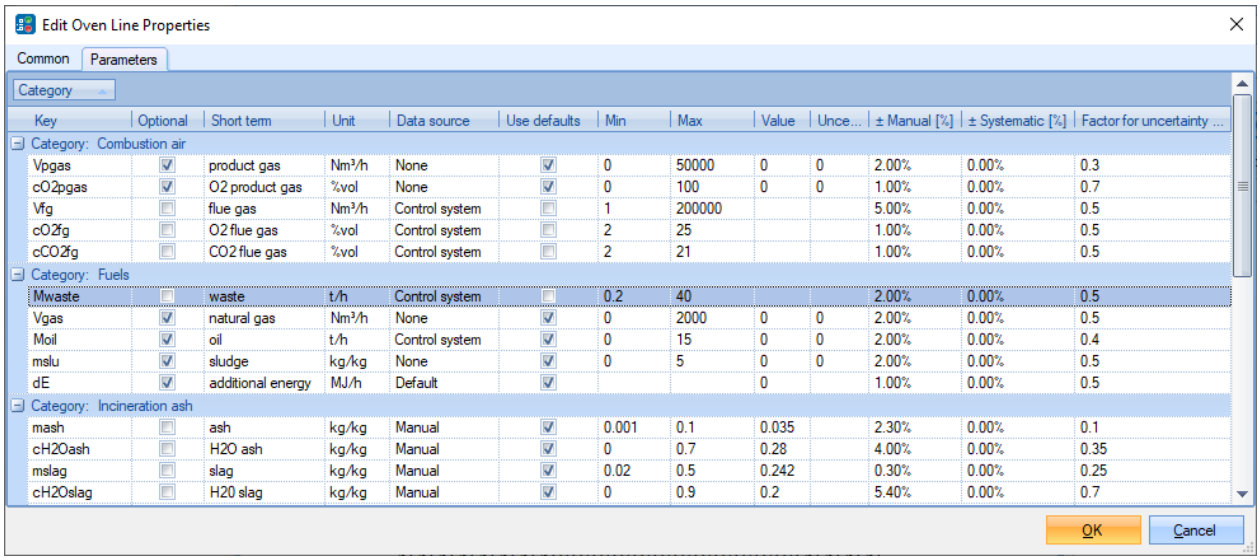
    $$u_{rel,n}^2 = u_{rel,sys}^2 + (u_{rel,daily}^2 - u_{rel,sys}^2)/n$$

Factor for Uncertainty Calculation (E):

- Additionally, from the remaining random part $u_{rel,daily}^2 - u_{sys}^2$ a certain fraction F can be declared to be also "systematic", and thus not being reduced if n is rising:

$$u_{rel,n}^2 = u_{sys}^2 + (u_{rel,daily}^2 - u_{rel,sys}^2)\, F^2 + \left((u_{rel,daily}^2 - u_{rel,sys}^2) - (u_{rel,daily}^2 - u_{rel,sys}^2)\, F^2\right)/n$$
$$u_{rel,n}^2 = u_{rel,sys}^2 + (u_{rel,daily}^2 - u_{rel,sys}^2)\, (F^2 + (1 - F^2)/n$$

If the mouse pointer hovers over a short term of a parameter, a detailed description is displayed as a tooltip.



Key	Optional	Short term	Unit	Data source	Use defaults	Min	Max	Value	Unce...	± Manual [%]	± Systematic [%]	Factor for uncertainty ...
Category: Combustion air												
Vpgas	☑	product gas	Nm³/h	None	☑	0	50000	0	0	2.00%	0.00%	0.3
cO2pgas	☑	O2 product gas	%vol	None	☑	0	100	0	0	1.00%	0.00%	0.7
Vfg	☐	flue gas	Nm³/h	Control system	☐	1	200000			5.00%	0.00%	0.5
cO2fg	☐	O2 flue gas	%vol	Control system	☐	2	25			1.00%	0.00%	0.5
cCO2fg	☐	CO2 flue gas	%vol	Control system	☐	2	21			1.00%	0.00%	0.5
Category: Fuels												
Mwaste	☐	waste	t/h	Control system	☐	0.2	40			2.00%	0.00%	0.5
Vgas	☑	natural gas	Nm³/h	None	☑	0	2000	0	0	2.00%	0.00%	0.5
Moil	☑	oil	t/h	Control system	☑	0	15	0	0	2.00%	0.00%	0.4
mslu	☑	sludge	kg/kg	None	☑	0	5	0	0	2.00%	0.00%	0.5
dE	☑	additional energy	MJ/h	Default	☑			0		1.00%	0.00%	0.5
Category: Incineration ash												
mash	☐	ash	kg/kg	Manual	☑	0.001	0.1	0.035		2.30%	0.00%	0.1
cH2Oash	☐	H2O ash	kg/kg	Manual	☑	0	0.7	0.28		4.00%	0.00%	0.35
mslag	☐	slag	kg/kg	Manual	☑	0.02	0.5	0.242		0.30%	0.00%	0.25
cH2Oslag	☐	H2O slag	kg/kg	Manual	☑	0	0.9	0.2		5.40%	0.00%	0.7

IMPORT OPERATION DATA (U)

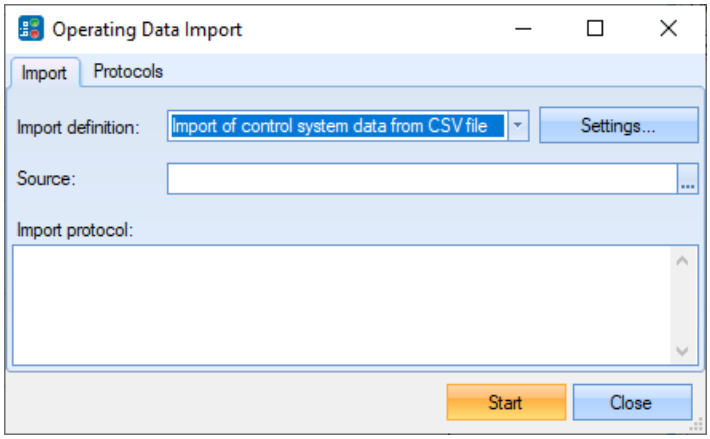
Here, users can import operation data.

- In the menu, select **Edit** > **Import Operation Data**.

TAB IMPORT

On this tab, the import definition and the source of the data to be imported can be selected.

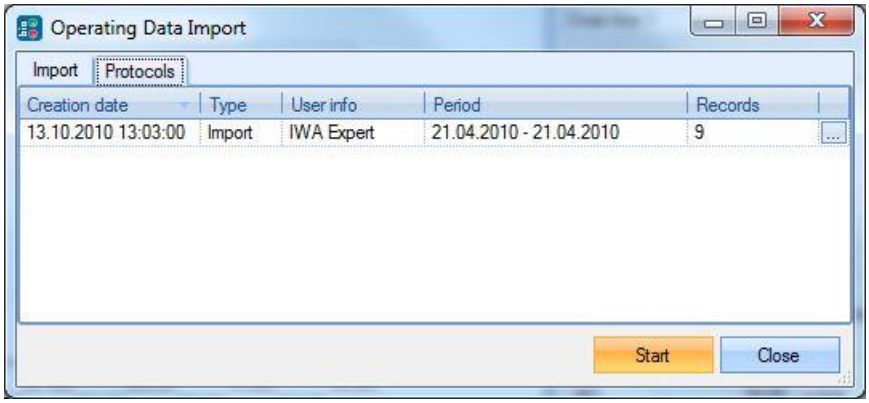
- Select tab **Import** to manually import operational data.
- Select an **import definition**. At the moment, **Import of control system data from CSV file** is available only.
- Click **Settings** to change the CSV import definition settings (admins only)
- Click **…** to select a **Source** file.
- Click **Start**.
- See **Import protocol** if the selected data has been imported successfully.



TAB PROTOCOLS

On this tab, you see the log file of all import and export operations.

- Select tab **Protocols** to display detail about the data import.



CSV IMPORT CONFIGURATION (A)

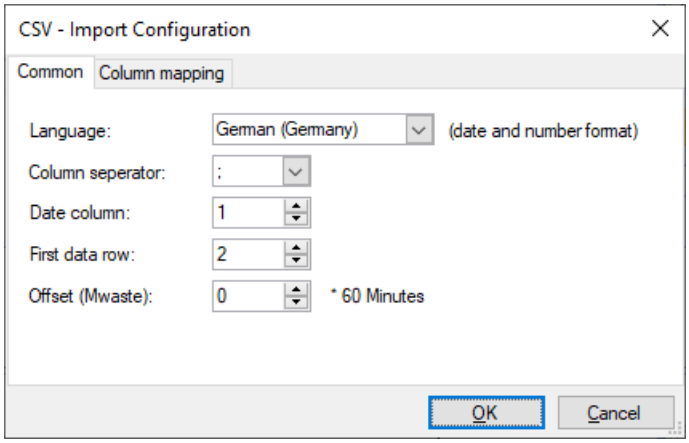
This is a subsection of **Import Operation Data**.

- In the menu, select **Edit** > **Import Operation Data**.
- On tab **Import**, click **Settings** to change the CSV import definition settings.

TAB COMMON

On this tab, you can find common information about the structure of the CSV file.

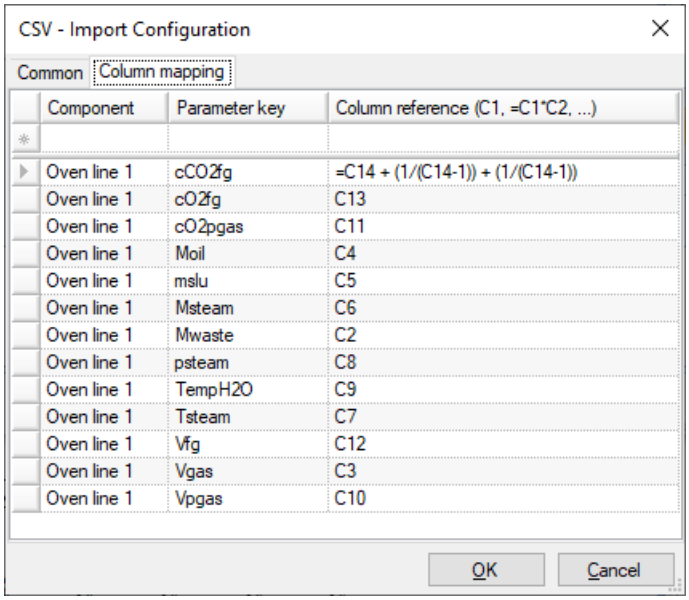
- On tab **Common**, the general settings for importing the data from the CSV file can be edited.
- Select **language**, **column separator**, **date column,** and **first data row**.
- Select an **Offset for Mwaste**. This is the time from when the waste is taken from the bunker until combustion occurs. The best practice is two hours. That means that the measured waste mass for a point in time will be assigned to the remaining data set measured two hours later.



TAB COLUMN MAPPING

On this tab, you define which column of the CSV file represents which parameter.

- On tab **Column Mapping**, the columns of the CSV file are mapped to the respective parameters.
- **Add** a parameter by selecting an oven line, a parameter key, and inserting a column reference in the row marked by a *****.
- **Delete** a parameter by selecting the grey box in front of a parameter row and pressing delete.



Component	Parameter key	Column reference (C1, =C1*C2, ...)
Oven line 1	cCO2fg	=C14 + (1/(C14-1)) + (1/(C14-1))
Oven line 1	cO2fg	C13
Oven line 1	cO2pgas	C11
Oven line 1	Moil	C4
Oven line 1	mslu	C5
Oven line 1	Msteam	C6
Oven line 1	Mwaste	C2
Oven line 1	psteam	C8
Oven line 1	TempH2O	C9
Oven line 1	Tsteam	C7
Oven line 1	Vfg	C12
Oven line 1	Vgas	C3
Oven line 1	Vpgas	C10

Notes:

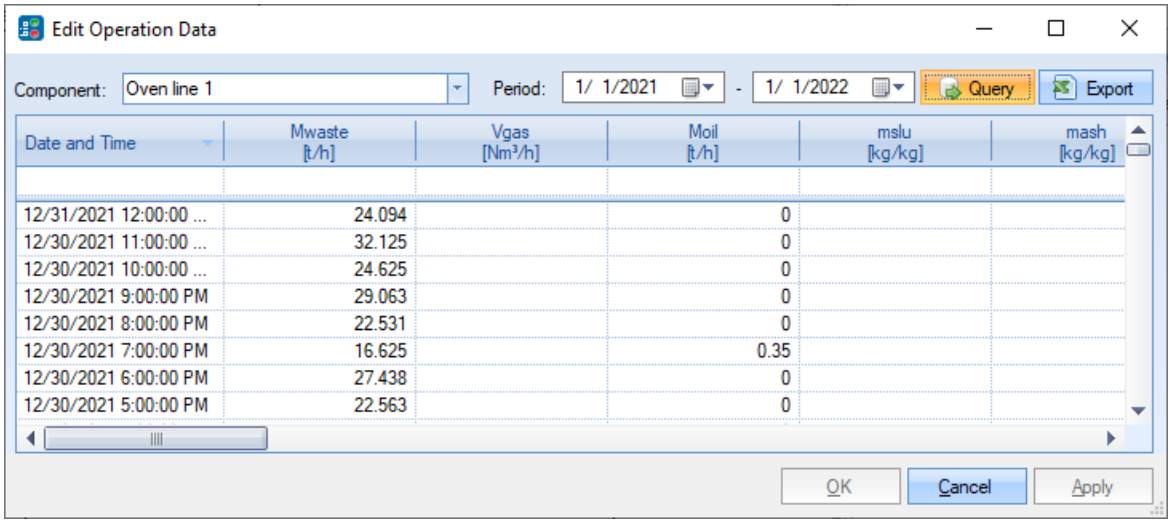
- Columns are addressed with a capital C followed by the column number.
- It is also possible to state equations using these column numbers (see e.g., parameter cCO2fg).

EDIT OPERATION DATA (E)

Here, the imported operation data can be displayed, edited, and exported.

- In the menu, select **Edit** > **Edit Operation Data**.
- Select the desired **Component** (oven line or plant).
- Select the desired **Period**.

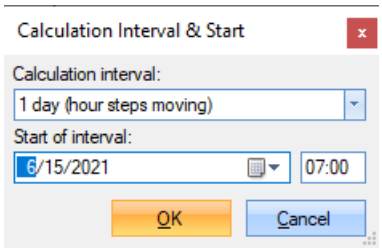
- Click **Query**.
- **Edit** the displayed data.
- If wanted, click **Export** to export the operation data to MS Excel.
- Click **Apply** or **OK**.



CALCULATE (U)

Here, a calculation can be started manually.

- In the menu, select **Edit** > **Calculate**.
- Select the **Calculation interval**.
- Select the date and time of the **Start of the interval**.
- Click **OK**.

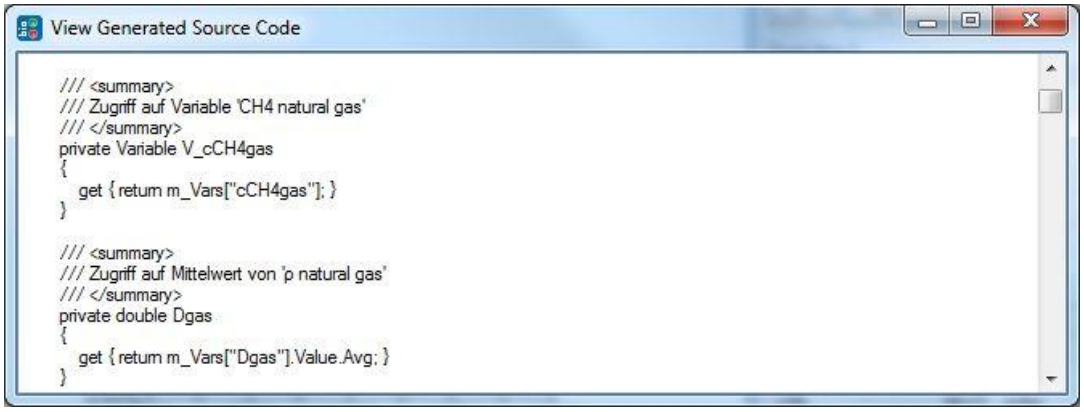


- Alternatively, the calculation can also be started directly in the **Status Panel**.

SHOW GENERATED SOURCE (D)

This menu entry displays the automatically generated source code necessary to access the parameters via names within the calculation source code and the source code entered under Edit Calculation Source (d).

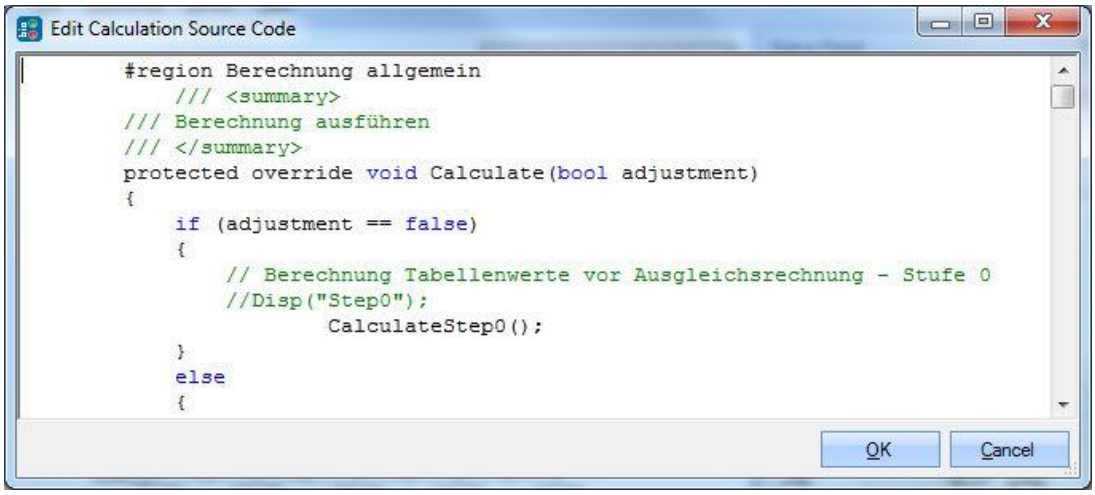
- In the menu, select **Edit** > **Show Generated Source**.



EDIT CALCULATION SOURCE (D)

This menu entry allows to enter/edit an alternative calculation source code directly within BIOMA.

- In the menu, select **Edit** > **Edit Calculation Source**.



REPORTING

Here, you get information on how to export/edit/import report packages, build reports and export calculation results. Additionally, it is possible to recalculate a selected reference system with the selected computation algorithm of the active plant document to compare the results.

EXPORT / EDIT REPORT PACKAGE (A)

To transmit the recorded plant data to authorities for evaluation, administrators can create report packages. A report package includes the complete data set for the selected reporting period (including the updated plant parameters, called manual inputs) but no computed results.

- In the menu, select **Reporting** > **Export / Edit Report Package**.
- Select the reporting period (e.g., 01.01.2021 – 31.12.2021).
- **Update** the plant and oven line parameters (as described below).
- If you don't have the total values for Moiltot, Mslutot, Mwastetot and Vgastot, you can click **Apply Defaults** to compute the sum of the data from the database independent of the fact if the respective

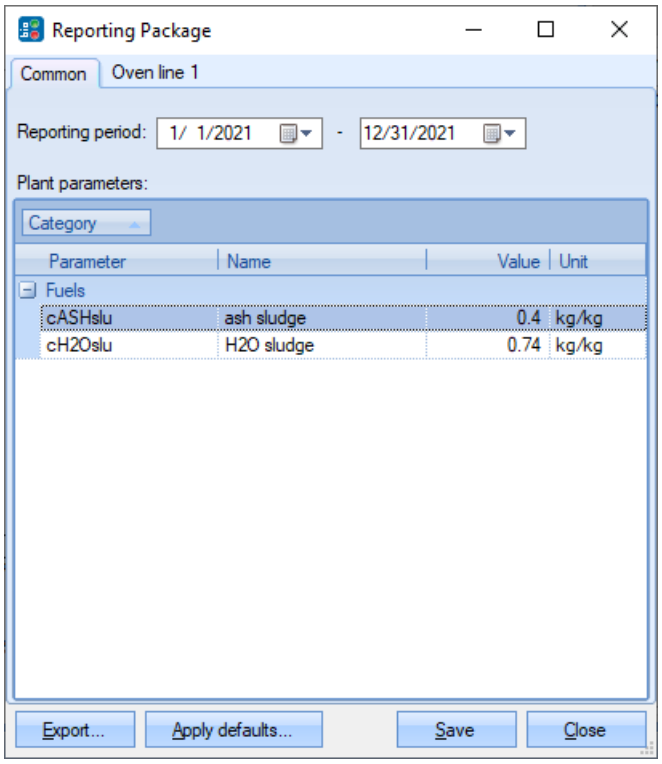
datasets are plausible or not. Note that Mashtot, Mscaptot and Mslagtot are set to zero because they are not needed for the computation.

- Click **Export**, select a destination folder and click **Save**.
- Alternatively, click **Save** to store the changes of updated plant parameters in the internal database only without creating a report package.

TAB COMMON

On this tab, generic settings for the plant parameters used during the online calculation can be updated for the final computation.

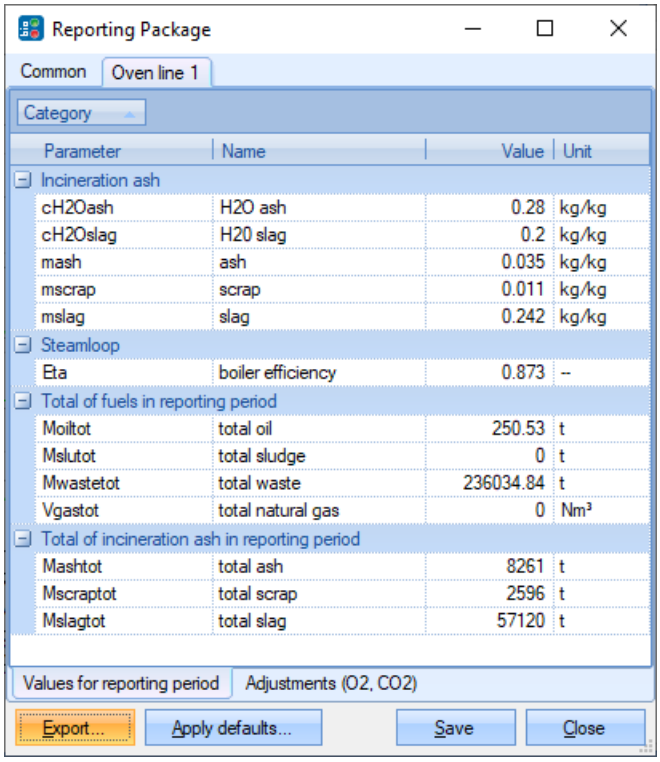
- Select the **reporting period.**
- Update **Plant parameters**.



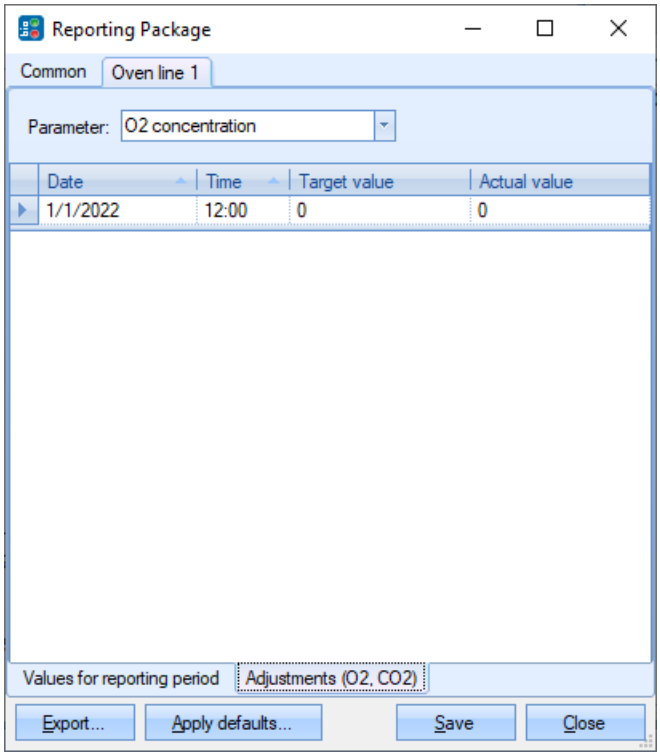
TAB LINE X

On this tab, generic settings for the individual oven lines used during the online calculation can be updated for the final computation.

- On the bottom tab **Values for Reporting period**, update oven line parameters.



- On the bottom tab **Adjustments (O_2, CO_2)**, adjustments for O_2 and CO_2 measurements can be entered. This might be necessary because O_2 and CO_2 calibration of measuring devices are usually performed with calibration gases that have a higher concentration than optimal for the balance method. Because of that, it is recommended to repeat the measurements with calibration gases that contain concentrations in the height of the expected values and enter this information into BIOMA.



IMPORT REPORT PACKAGE (A)

Here, you can import report packages.

- In the menu, select **Reporting** > **Import Report Package**.
- Select a saved report package (extension *.brp) or a compressed report package (extension *.brpz)
- Click **Open**.

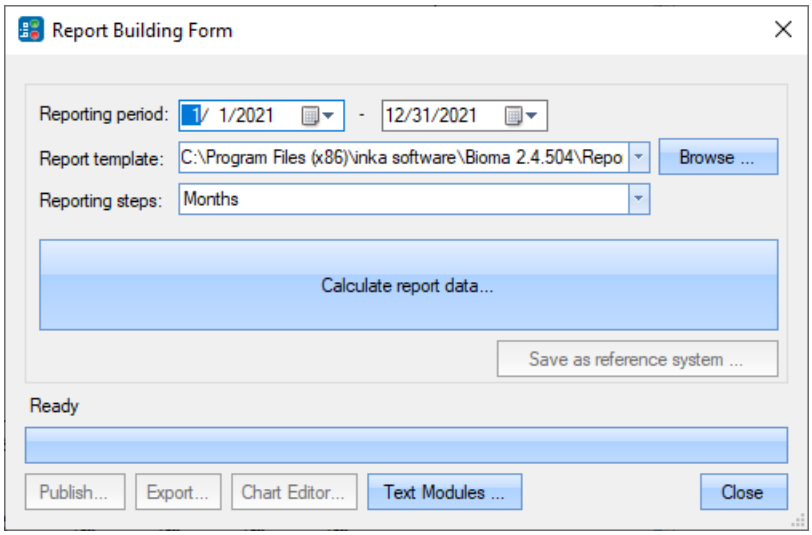
BUILDING REPORTS (E)

Here, you can build a report from the imported data or report package.

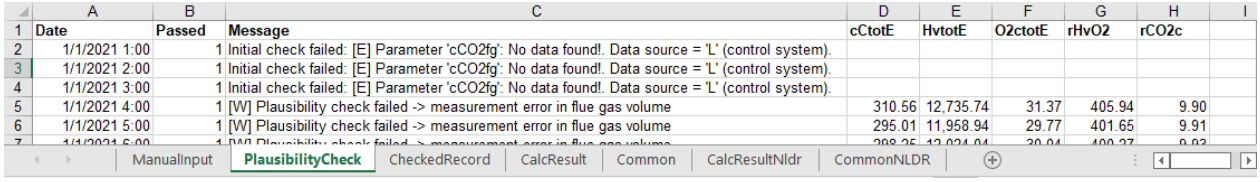
- In the menu, select **Reporting** > **Building Reports**.
- Select the **reporting period**. The beginning and the end of the reporting period can only be chosen within the time frame of the created or imported report package.
- Select an alternative **report template** (BIOMA.xrpt). These templates written in XML are editable.
- Select **reporting steps** (Days, Weeks, Months, Years). This selection should fit the chosen report template. The default setting is **Months**.
- Click **Calculate report data**.

Afterwards

- Click **Chart Editor** to edit existing charts for the report (data binding is written in XML).
- Click **Text Modules** to write a user-defined text that can be implemented in the report template via XML code.



- Click **Publish** to create a pdf report based on the report template.
- Click **Export** to export the results of plausibility checks and the results of the calculation steps to several Excel files (one for each oven line and one for the whole plant).



	A	B	C	D	E	F	G	H
1	Date	Passed	Message	cCtotE	HvtotE	O2ctotE	rHvO2	rCO2c
2	1/1/2021 1:00	1	Initial check failed: [E] Parameter 'cCO2fg': No data found!. Data source = 'L' (control system).					
3	1/1/2021 2:00	1	Initial check failed: [E] Parameter 'cCO2fg': No data found!. Data source = 'L' (control system).					
4	1/1/2021 3:00	1	Initial check failed: [E] Parameter 'cCO2fg': No data found!. Data source = 'L' (control system).					
5	1/1/2021 4:00	1	[W] Plausibility check failed -> measurement error in flue gas volume	310.56	12,735.74	31.37	405.94	9.90
6	1/1/2021 5:00	1	[W] Plausibility check failed -> measurement error in flue gas volume	295.01	11,958.94	29.77	401.65	9.91

ManualInput | PlausibilityCheck | CheckedRecord | CalcResult | Common | CalcResultNldr | CommonNLDR

- Click **Save as a reference system** to save the computational results as a reference system (extension *.brefsys) to be recalculated later with an alternative calculation algorithm (cf. Reference Systems (e)). A reference system is a report package that, additionally, includes the computed results.
- Click **Close** to close the window. You will be asked if you want to store the results of your calculations. If you click **Yes**, you do not have to repeat the calculation when opening the **Report Building Form** again. This is especially useful if you are working on the layout of your report template and only want to view the results of the pdf creation process when clicking **Publish**.

EXPORT CALCULATION RESULTS (A/E)

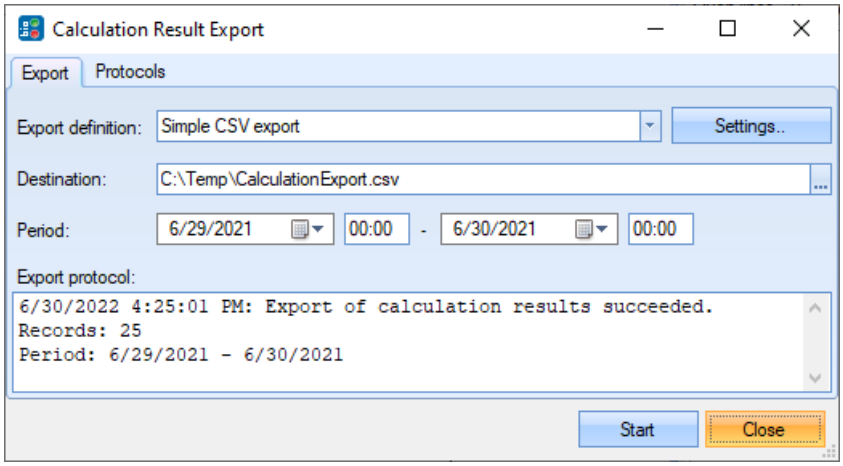
Here, you can export calculation results according to a selected export definition.

- In the menu, select **Reporting** > **Export Calculations Results**.

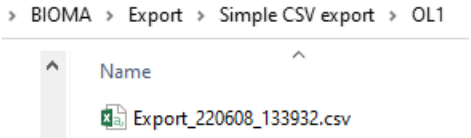
TAB EXPORT

On this tab, you can select an export definition, adjust its setting (experts only), state the destination and the file name of the CSV file to be saved, select the period to be computed, and finally start the export.

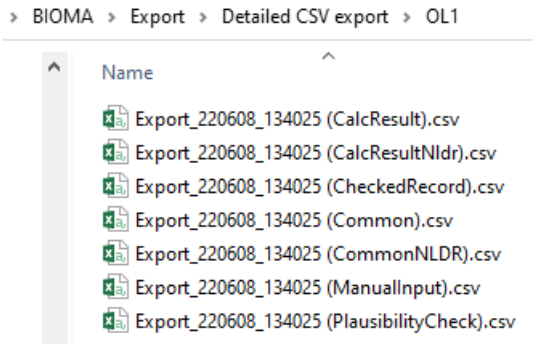
- On tab **Export**, select an existing export definition (which has to be created before by an expert under Export Definition (E)). Per default, administrators have the right to select “Simple CSV export” only. Experts can also select “Detailed CSV export”.
- The **Settings** (also predefined under Export Definition (E)) can be changed by experts only.
- If necessary, restate the **destination** of the CSV file to be saved. The following placeholders can be used in the export file name:
    - ${name} - The name of the export definition
    - ${line} - The oven line key
    - ${sheet - The name of the sheet (detailed export)
    - ${date} - The current date (yyMMdd)
    - ${time} - The current time (HHmmsss)
    - ${yy} - current year (2 digits)
    - ${yyyy} - current year (4 digits)
    - ${MM} - current month (2 digits)
    - ${dd} - current day (2 digits)
    - ${HH} - current hour (2 digits)
    - ${mm} - current minute (2 digits)
    - ${ss} - current second (2 digits)
    - ${fff} - current fraction of second (3 digits)
    - Invalid characters in file name and path will be replaced with underscores ‘_’.
- State the **period** to be considered while exporting the calculation results.
- Click **Start**.
- Check the **export protocol** if the export was successful.



The Simple CSV export will result in one output file:



The Detailed CSV export will result in seven output files:



Notes:

- The **Detailed CSV Export**, which also includes the uncertainties of all parameters, can be performed by experts only.
- The **Simple CSV Export** includes selected parameters only and contains no uncertainties.

Remark: During the computation, no manual input as set under **Export / Edit Report Package (a)** will be considered, Instead the plausible data within the selected period will be aggregated to get a rough estimate.

TAB PROTOCOL

On this tab, you see the log file of all import and export operations.

EXPORT ONLINE CALCULATION RESULTS (E)

Here, experts can export the complete information about online computation (all parameters together with their uncertainties) as an xml file, which can be opened with MS Excel.

- In the menu, select **Reporting** > **Export Online Calculation Results**.

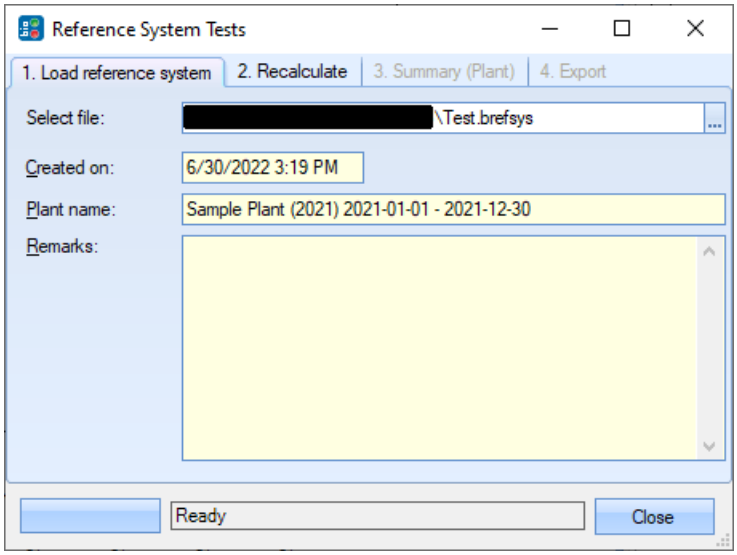
- Select the desired directory and click **OK**.

This point is available only if a computation has already been performed via Control Panel.

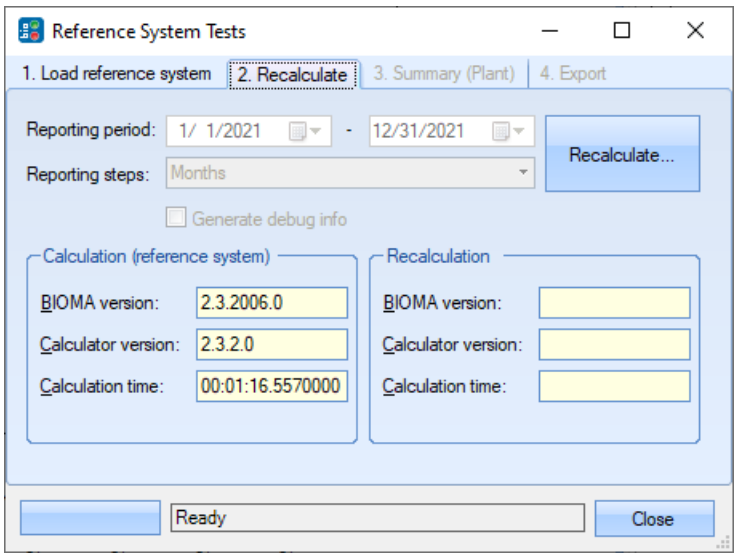
REFERENCE SYSTEMS (E)

Here, experts can recalculate a chosen reference system with an alternative calculation algorithm (cf. Edit Calculation Source (d)) and compare the computational results. The reference system (with extension *.brefsys) must have been created in advance under Building Reports (e).

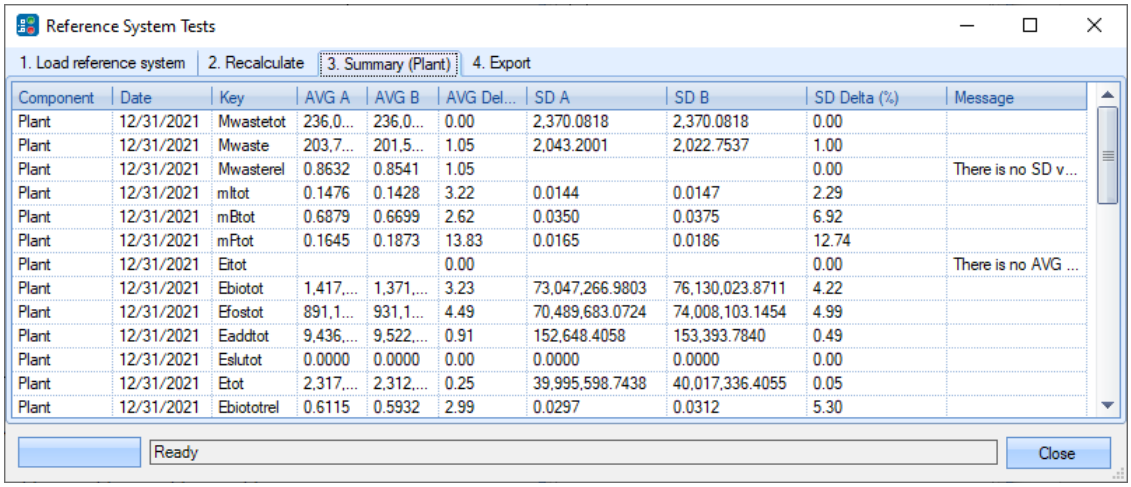
- On tab **Load reference system**, click ... to select the desired reference system.



- On tab **Recalculate**, click **Recalculate** to calculate the loaded reference file with the currently set calculator version.

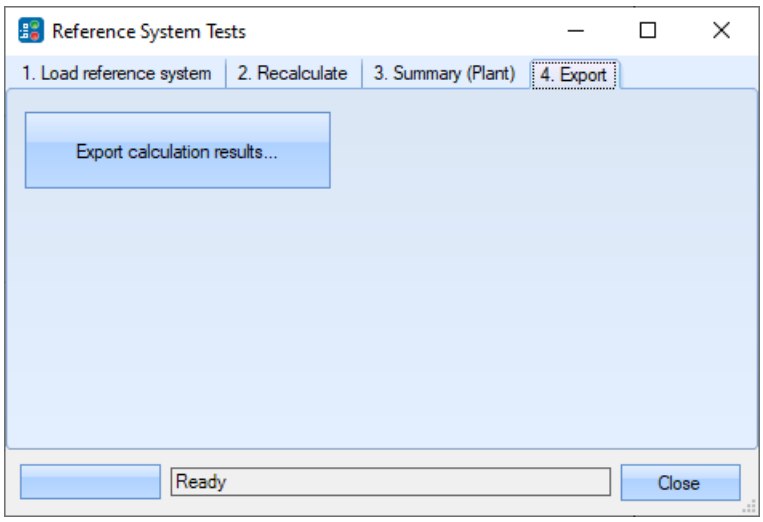


- On tab **Summary**, check the columns **AVG Delta [%]** and **SD Delta [%]** for significant differences.



Component	Date	Key	AVG A	AVG B	AVG Del...	SD A	SD B	SD Delta (%)	Message
Plant	12/31/2021	Mwastetot	236,0...	236,0...	0.00	2,370.0818	2,370.0818	0.00	
Plant	12/31/2021	Mwaste	203,7...	201,5...	1.05	2,043.2001	2,022.7537	1.00	
Plant	12/31/2021	Mwasterel	0.8632	0.8541	1.05			0.00	There is no SD v...
Plant	12/31/2021	mItot	0.1476	0.1428	3.22	0.0144	0.0147	2.29	
Plant	12/31/2021	mBtot	0.6879	0.6699	2.62	0.0350	0.0375	6.92	
Plant	12/31/2021	mPtot	0.1645	0.1873	13.83	0.0165	0.0186	12.74	
Plant	12/31/2021	Eitot			0.00			0.00	There is no AVG ...
Plant	12/31/2021	Ebiotot	1,417,...	1,371,...	3.23	73,047,266.9803	76,130,023.8711	4.22	
Plant	12/31/2021	Efostot	891,1...	931,1...	4.49	70,489,683.0724	74,008,103.1454	4.99	
Plant	12/31/2021	Eaddtot	9,436,...	9,522,...	0.91	152,648.4058	153,393.7840	0.49	
Plant	12/31/2021	Eslutot	0.0000	0.0000	0.00	0.0000	0.0000	0.00	
Plant	12/31/2021	Etot	2,317,...	2,312,...	0.25	39,995,598.7438	40,017,336.4055	0.05	
Plant	12/31/2021	Ebiototrel	0.6115	0.5932	2.99	0.0297	0.0312	5.30	

- Optional: On tab **Export**, click **Export calculation results** to export xml files with the results of both computations.



- Click **Close**.

EXTRAS

OPTIONS (A)

- In the menu, select **Extras** > **Options**.

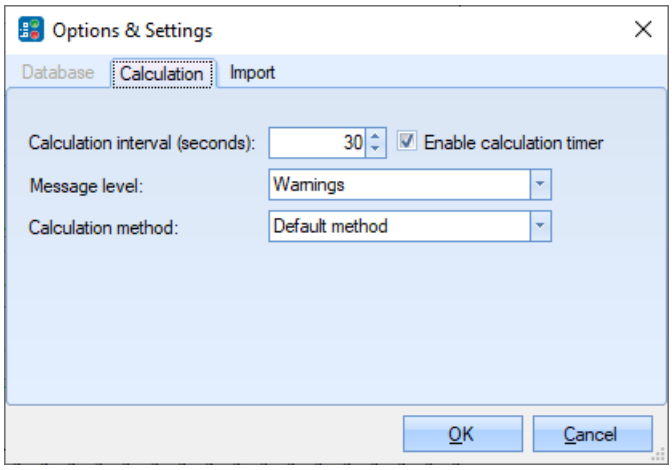
TAB DATABASE

- On tab **Database**, the database connection is established and tested.
- If the standard installation of the database server has been performed, nothing has to be changed. If a different database server should be accessed or e.g., windows authentication shall be used, the setting must be edited here.
- Click **Apply default connection settings** to reset the settings to default.
- Click **Test connection** to check if everything is working correctly.

- Click **OK**.

TAB CALCULATION

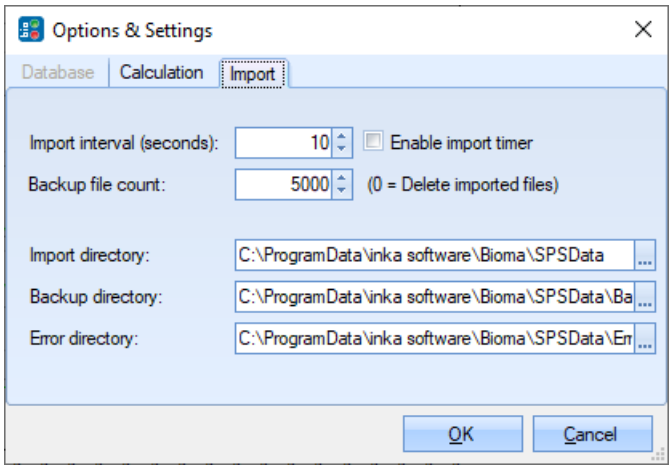
- On tab **Calculation**, the basic settings for the computation can be found.
- If you want to regularly check the operation data for changes (e.g., if new data has been imported) and perform a computation if some are detected, select the **Calculation interval** in seconds and **enable calculation timer**.
- Set **Message level** (none < error < warnings < information < detail).
- Set **Calculation method** (Default method, Source code (necessary for developers only)).



TAB IMPORT

- On tab **Import**, the basic directory settings for importing data can be found.
- Choose **Import Directory**. This is the folder where the CSV data file has to be placed to be automatically imported.
- Choose **Backup Directory**. If the data import was successful, the CSV file will be moved from Import Directory to Backup Directory).
- Choose **Backup Director**". If the data import was unsuccessful, the CSV file will be moved from Import Directory to Error Directory).

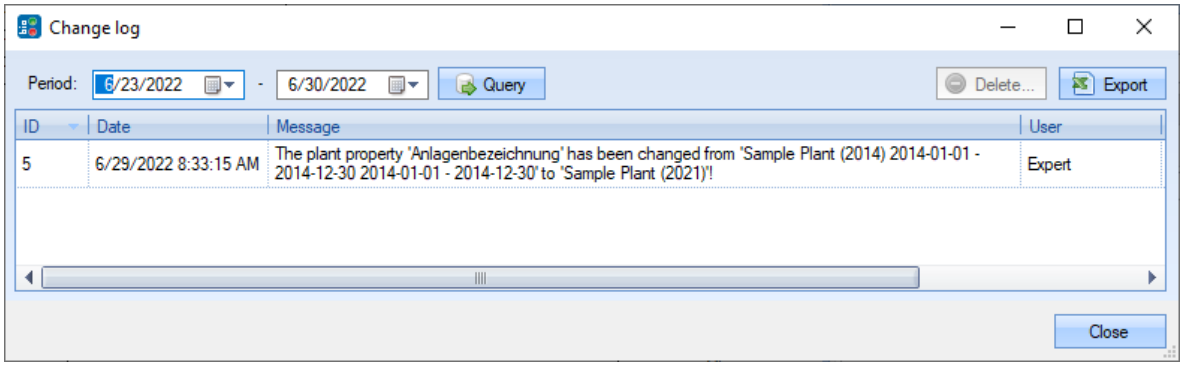
- Set **Import interval (seconds)** and tick **Enable import timer** to activate automatically importing of data. The Import Directory will be checked according to the time stated if new data is available.
- Set **Backup file count** (= the number of backup files that should be kept before starting to delete the oldest).



CHANGE LOG (E)

Here, changes applied to the plant document are logged.

- In the menu, select **Extras** > **Change Log.**



- Select the **period** to be queried and click **Query**.
- Click **Export** to export the information to MS Excel.

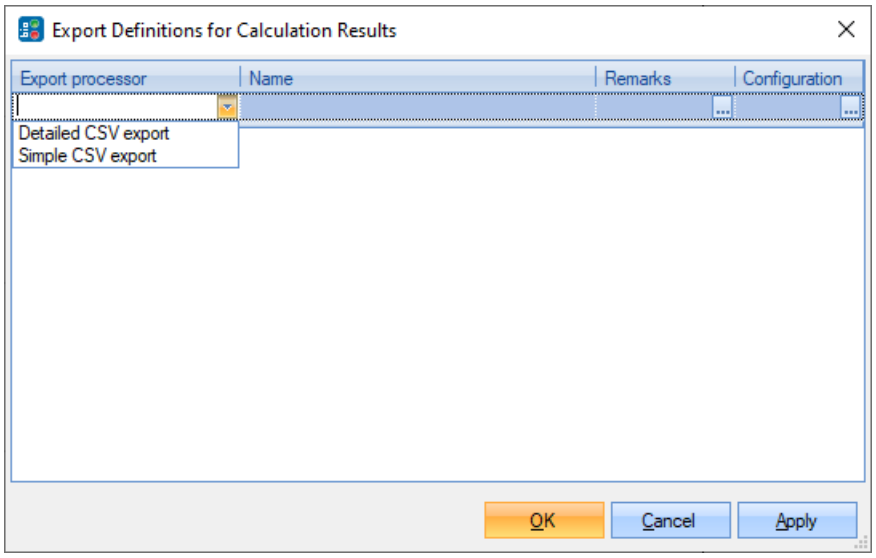
ADMINISTRATION (A/E)

- In the menu, select **Extras** > **Administration**.

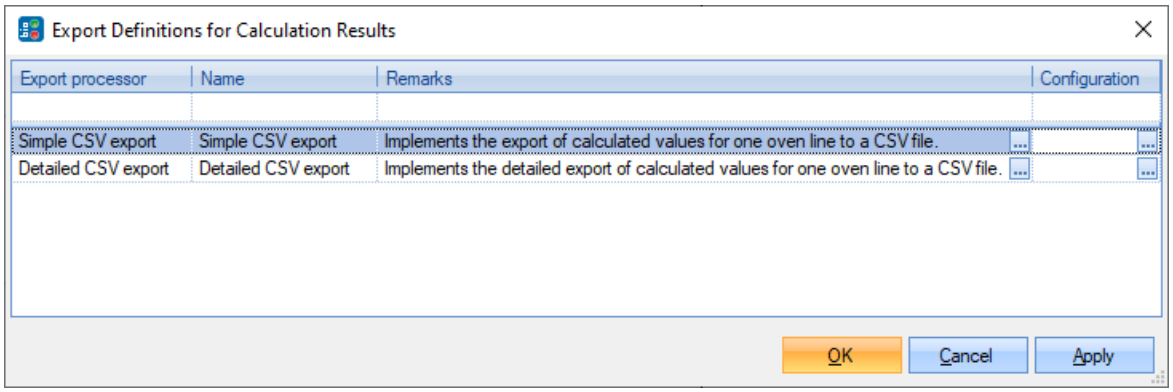
EXPORT DEFINITION (E)

- In the menu, select **Extras** > **Administration** > **Export Definition**.

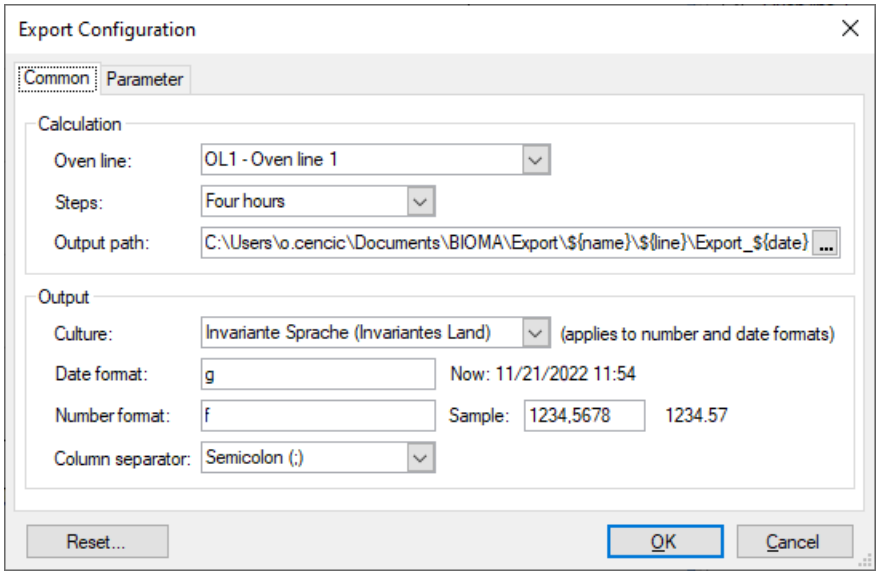
- Click the empty field below **Export processor** and select the desired export processor from the drop-down list (Simple CSV export [=> parameters to be exported can be selected] or Detailed CSV export [=> everything will be exported]).

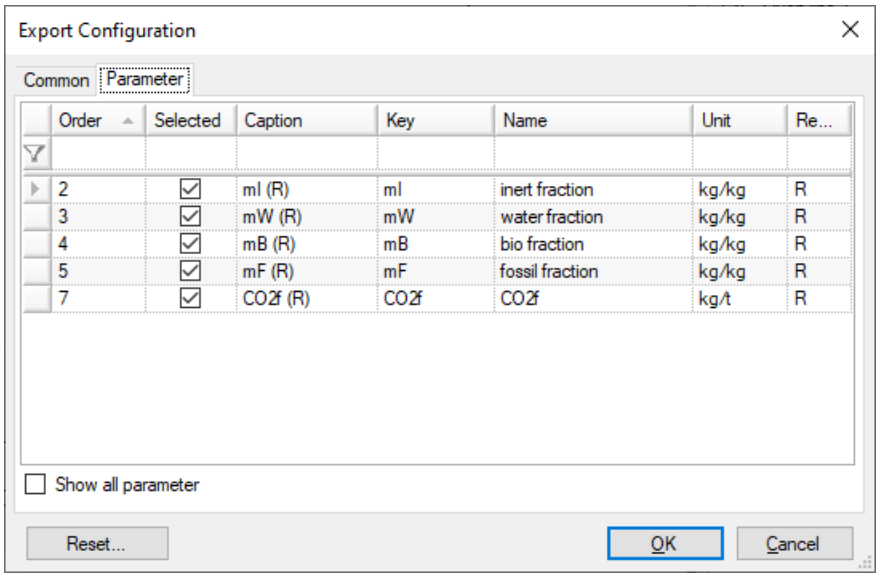


- Click **Apply**.



- State a fitting **name**.
- Click ... next to the Remarks text field to add **remarks**
- Click ... next to the Configuration text field to define the **export configuration** (can be done by experts only).





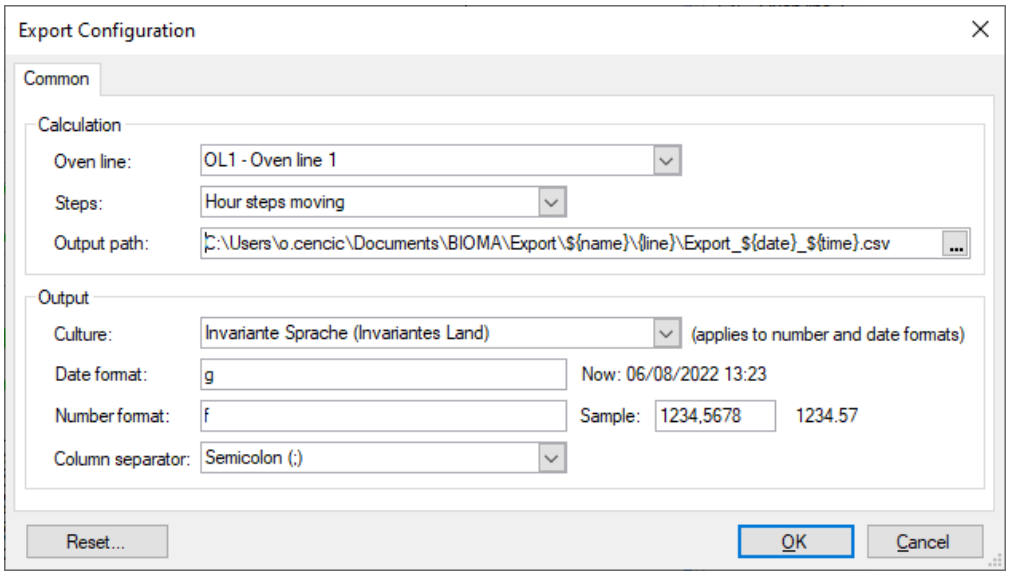
TAB COMMON (E)

On this tab, the common settings of the CSV export can be defined.

- Oven line: Select the oven line to be calculated and exported.
- Steps: Select the calculation steps
- Output path: Enter the default output file name. This name will be used if no name is supplied when executing the export. The file name may contain placeholders that will be replaced when executing the export.
- Culture: The culture determines the date and number formats (e.g., thousands separator, AM, PM)
- Date format: The date format string.
    - Standard DateTime Format Strings: http://msdn.microsoft.com/en-us/library/az4se3k1(v=vs.80).aspx
    - Custom DateTime Format Strings: http://msdn.microsoft.com/en-us/library/8kb3ddd4(v=vs.80).aspx
- Number format: The number format string
    - Standard Numeric Format Strings: http://msdn.microsoft.com/en-US/library/dwhawy9k(v=vs.80).aspx

- Custom Numeric Format Strings: http://msdn.microsoft.com/en-US/library/0c899ak8(v=vs.80).aspx

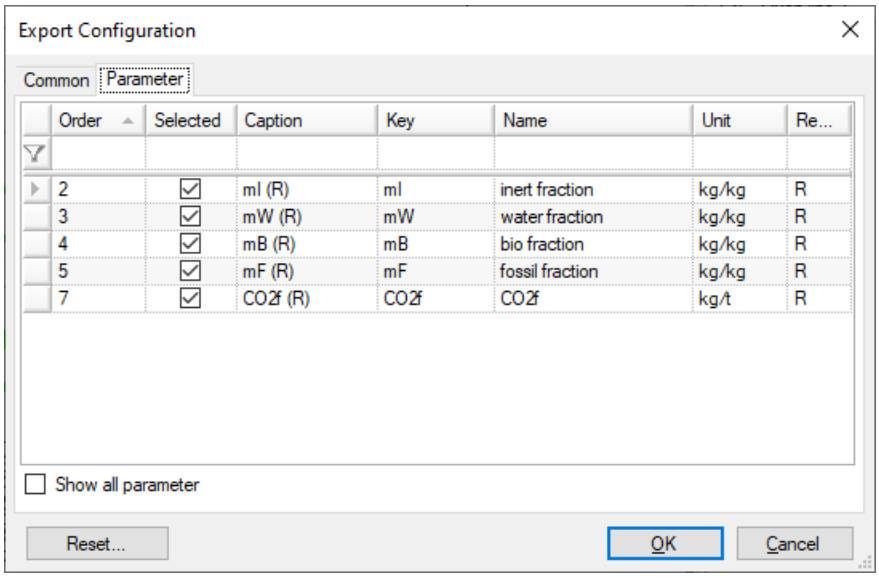
- Column separator: The column separator character.



TAB PARAMETER (E)

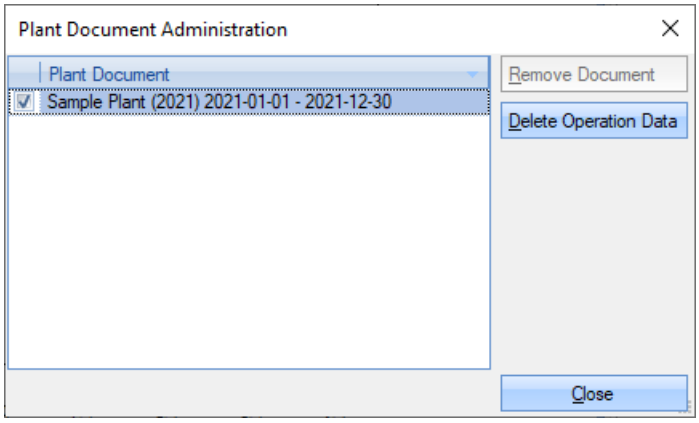
On this tab, the parameters to be considered during the **Simple CSV export** can be selected.

- Select the desired parameters and enter the order of the parameters



PLANT DOCUMENT ADMIN (A)

- In the menu, select **Extras** > **Administration** > **Plant Document Admin**.
- To delete a plant document, tick the document and click **Remove Document**. Note that the active document cannot be deleted.
- To delete only operational data, tick the desired document and click **Delete Operation Data**.



USERS (A) AND PERMISSIONS (D)

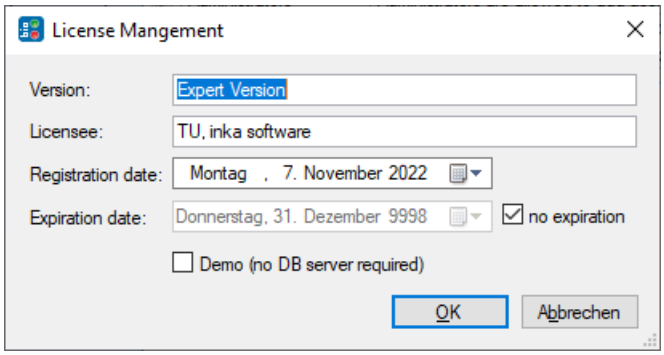
Here, administrators can create/delete users and add them to predefined user groups (with certain connected rights). Additionally, developers can create/edit/delete user groups, assign the respective rights and issue new user licenses.

- In the menu, select **Extras** > **Administration** > **Users and Permissions**.
- Apply the desired **changes** and click **OK**.

ISSUE A LICENSE (D)

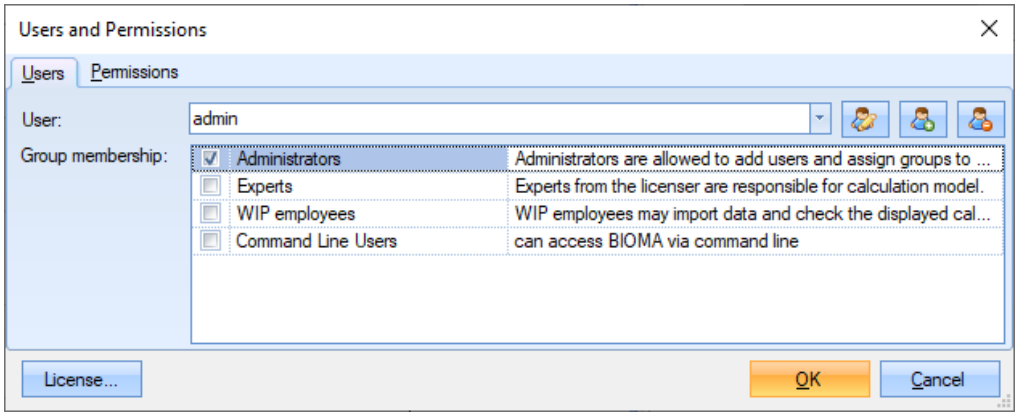
For developers, the easiest way to issue a license is this:

- Install a client (contains the users wte and admin) or an expert license (contains additionally the users expert and BIOMAUtil [= command line user]).
- Apply the desired changes to the license (users, passwords, user group, rights)
- Click **License** (this button is visible for developers only!).
- Enter the name of the **Version** (Client, Expert), the name of the **Licensee**, the **Registration date** (the day from when the license should be valid), and the **Expiration date** (the day from when the license is not valid anymore).
- Additionally, you can state that the license should not expire by activating **no expiration** and that you want the license to be a demo version by activating **demo**.
- Click **OK**.
- Copy the file **C:\ProgramData\inka software\BIOMA\WipClient.sec** and rename it to e.g., **ExpirationDate_NameLicense.license**

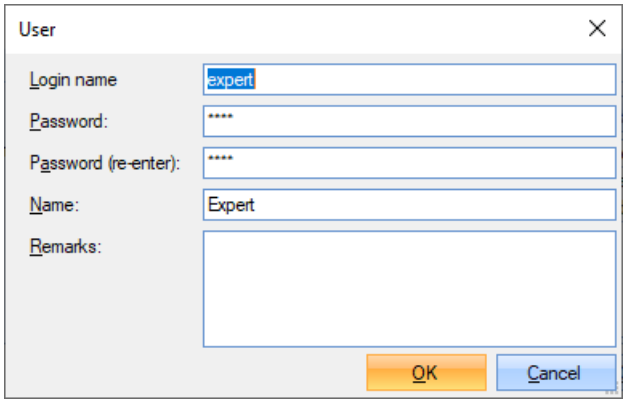


TAB USERS (A)

- On tab **Users**, select one of the available users from the dropdown list to see/edit the group (access rights) it belongs to.



- To edit or create a user,
  - Click the **Edit user** or **Add new user** button.
  - Edit or enter **login name, password, and name** (will be displayed on top of GUI).
  - Click **OK**.

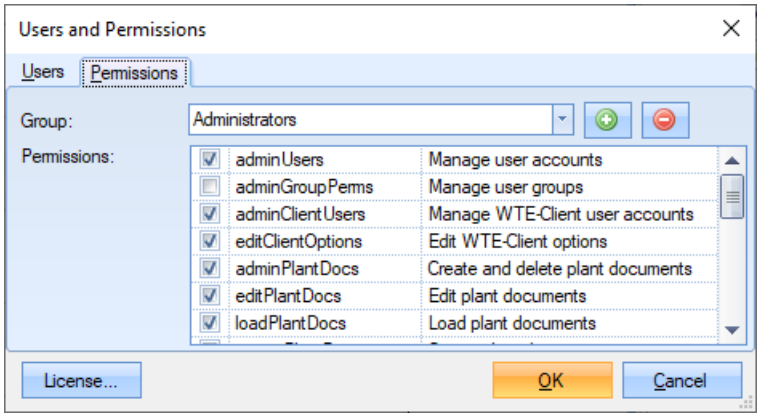


  - Select a **group membership** (experts > administrators > WIP employees [short for Waste Incineration Plant])

- To delete a user,
  - Select the **User** from the dropdown menu and click the **Remove user** button.
  - Click **OK**.

TAB PERMISSIONS (D)

- On tab **Permission**, select the group you want to edit from the drop-down list **Group**.
- Select the desired rights by setting the respective **tick**.



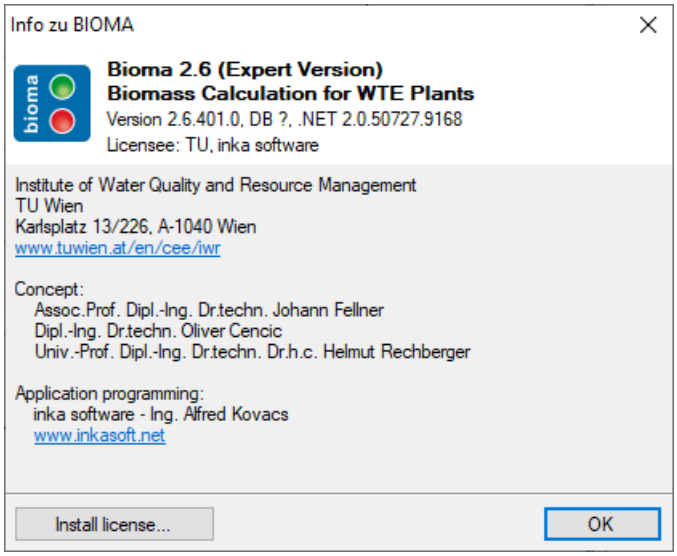
- To create a user group,
  - Click the **Add new group** button (+).
  - Enter the name of the new group and, optionally, some remarks.

- To delete a user group,
  - Select the group from the dropdown list **Group.**
  - Click the **Delete group** button (-)
  - Click **OK**.
  - Attention: No warning will be issued before deletion!

HELP

ABOUT (A)

- In the menu, select **Help** > **About**.
- Click **Install License** to install an acquired license (e.g., XYZ.license).
- Licenses can only be created with developer rights. To get a license, please contact TU Vienna.


Info zu BIOMA
bioma
Bioma 2.6 (Expert Version)
Biomass Calculation for WTE Plants
Version 2.6.401.0, DB ?, .NET 2.0.50727.9168
Licensee: TU, inka software
Institute of Water Quality and Resource Management
TU Wien
Karlsplatz 13/226, A-1040 Wien
www.tuwien.at/en/cee/iwr
Concept:
Assoc.Prof. Dipl.-Ing. Dr.techn. Johann Fellner
Dipl.-Ing. Dr.techn. Oliver Cencic
Univ.-Prof. Dipl.-Ing. Dr.techn. Dr.h.c. Helmut Rechberger
Application programming:
inka software - Ing. Alfred Kovacs
www.inkasoft.net
Install license...
OK

APPENDIX

COMPARISON OF EXPORT FEATURES

In BIOMA, there are multiple features to export data to be processed in other locations. Here is an overview:

Feature 1: **Status Panel** > tab **Calculated data** > button **Export** (cf. Use Graphical User Interface (u))
Access rights: Users
Output: All "visible" parameters (could be input and/or reconciled values)
Uncertainties: No
Period: As selected for computing in the Status Panel
Interval: As selected for computing in the Status Panel
Files: One XML file for each line with tabs results (= reconciled values), inputs (original values)

Feature 2: **Menu** > **Reporting** > **Export Online Calculation Results** (cf. Export Online Calculation Results (e))
Access rights: Experts
Output: Inputs, results, and plausibility checks for all parameters
Uncertainties: Yes
Period: As selected for computing in the Status Panel
Interval: As selected for computing in the Status Panel
Files: One XML file for each line with tabs Manual Input (empty), PlausibilityCheck, CheckedRecords, CalcResult, Common, CalcResultNldr, CommonNldr

Feature 3: **Menu** > **Reporting** > **Building Reports** > **Export** (cf. Building Reports (e))
Access rights: Experts
Output: Inputs, results, and plausibility checks for all parameters
Uncertainties: Yes
Period: Selected reporting period
Interval: Selected reporting steps
Files: One XML file for each line with tabs Manual Input, PlausibilityCheck, CheckedRecords, CalcResult, Common, CalcResultNldr, CommonNldr
One XML file for the total plant with tabs Common, Period

Feature 4: **Menu > Reporting** > **Export Calculation Results** (cf. Export Calculation Results (a/e))
Access rights: "Simple CSV Export": Users
"Detailed CSV Export": Experts
Output: For the oven line as defined in the export definitions =>
"Simple CSV Export": input and/or reconciled value for selected parameters. E.g.,

	A	B	C	D	E	F	G	H
1	Step	From	To	mI (R)	mW (R)	mB (R)	mF (R)	CO2f (R)
2	1	06/22/2014 00:00	06/23/2014 00:00	0.23	0.16	0.50	0.10	305.87
3	2	06/23/2014 00:00	06/24/2014 00:00	0.23	0.27	0.40	0.10	288.53
4	3	06/24/2014 00:00	06/25/2014 00:00	0.23	0.24	0.39	0.14	403.75
5	Total	06/22/2014 00:00	06/25/2014 00:00	0.23	0.23	0.43	0.11	331.02
6								

"Detailed CSV Export": inputs, results, and plausibility checks for all parameters
Uncertainties: "Simple CSV Export": No
"Detailed CSV Export": Yes
Period: Selected period
Interval: As defined in the export definitions
Files: For the oven line as defined in the export definitions =>
"Simple CSV Export": one CSV file with name "CalculationExport.csv"

"Detailed CSV Export": seven CSV files with names ManualInput (empty), PlausibilityCheck, CheckedRecords, CalcResult, Common, CalcResultNldr, CommonNldr

PERMISSION GROUPS

Here is an overview about the permission groups that are included in BIOMA per default:

Flag	Description	WIP employees	Command Line Users	Administrators	Expert
adminUsers	Manage user accounts			X	X
adminGroupPerms	Manage user groups				
adminClientUsers	Manage WTE-clients accounts			X	X
editClientOptions	Edit WTE-Clients options			X	X
adminPlantDocs	Create and delete plant documents			X	X
editPlantDocs	Edit plant documents			X	X
loadPlantDocs	Load plant documents	X	X	X	X
createPlantDocs	Create plant documents			X	X
editSystemParams	Edit system parameter				X
loadTemplate	Load document from template				X
saveTemplate	Save document from template				X
importRecValues	Import operation data	X	X	X	X
importEditConfig	Edit import configuration			X	X
createReports	Perform calculations and create reports				X
createReportPacks	Create report packages			X	X
deleteChangeLog	Delete report packages				
viewChangeLog	View change log entries				X
viewHistoryText	View plant document history				X
editHistoryText	Edit plant document history				X
exportSimple	Simple export of calculated values		X		X
exportDetailed	Detailed export of calculated values				X
exportEditConfig	Edit export configuration				X

COMMAND LINE TOOL

Some basic operations of BIOMA can also be performed without having to start the user interface. Here is a brief description of the command line syntax **biomautil** (mainly for IT experts).

Start the **command line** (press WIN+R > type cmd >hit ENTER) and navigate to the **BIOMA installation folder** (this is normally C:\Program Files (x86)\inka software\BIOMA 2.5.xxx). If you don't know how to do the latter, see e.g. https://riptutorial.com/cmd/example/8646/navigating-in-cmd)

The general structure of all commands is
biomautil /CMD:{Command} [/PlantGuid:{PlantGuid}] [/?|Help]

/? or /Help (it can be used without "/CMD:{command}
For getting help for biomautil, type **biomautil /?**, and then press **ENTER**.

Example:
C:\Program Files (x86)\inka software\BIOMA 2.5.xxx > biomautil /?

The option [/PlantGuid:{PlantGuid}] can be used with all following commands (however, with "/CMD:ListPlants" it doesn't make sense). {PlantGuid} is the plant GUID (Global Unique Identification) of the plant document. If the PlantGuid is not known, it can be retrieved with the command "/CMD:ListPlants". If not supplied, the default plant GUID as for the BIOMA client will be used.

Example:
/PlantGuid:5bd7c003-adbe-4b33-a837-1ac2f5feaeaf (without SPACE!)

/CMD:ListPlants
Queries a list of all plant documents (Plant GUID + Plant name)

/CMD:ListImportDefs
Queries a list of all import definitions.

/CMD:ListExportDefs
Queries a list of all export definitions.

/CMD:CalcExport
Executes an export of calculated values using the specified export definition.

- /ExportDefId:{ID}
  The export definition ID. The command 'ListExportDefs' can be used to query the IDs.
- [/FileName:{ExportFileName}]
  The export file name. If the default destination not specified, of the export definition will be used.
- [/PeriodCount:{n}]
  Count of periods used to calculate the total export period. The default is 1.
- [/Period:{Hours|Days|Weeks|Months}]
  The period used to calculate the total export period. The default is hours.
- [/AddProtocol:{Yes|No}]
  Indicates whether the import protocol will be added to the database. The default is 'No'.

Example:
Export calculation results of the last 14 Days. The export definition specifies the format and the calculation steps. Use double quotes (") to encapsulate file name with blanks.
biomautil /CMD:CalcExport /ExportDefId:1 /FileName:"C:\Temp\my_output_file_name.csv" /PeriodCount:14 /Period:Days

/CMD:Import
Executes the import of operation data from a single file using the specified import definition.

- /FileName:{ImportFileName}
  The import file name.
- [/ImportDefId:{ID}]
  The import definition ID. The command 'ListImportDefs' can be used to query the IDs. If not specified, the default import definition ID will be used.
- [/AutoCommit:{Yes|No}]
  Indicates if the data will be written to the database without confirmation by the user. The default is 'No'
- [/AddProtocol:{Yes|No}]

Indicates whether the import protocol will be added to the database. The default is 'No'.

Example:
Import operation data. Use double quotes (") to encapsulate file name if it contains blanks.
biomautil /CMD:Import /FileName:"C:\Temp\Import file from SPS.csv"

/CMD:BatchImport
Executes a batch import of operation data using the specified import definition. The batch import all files of the import directory and moves them to the backup or error directory after import.

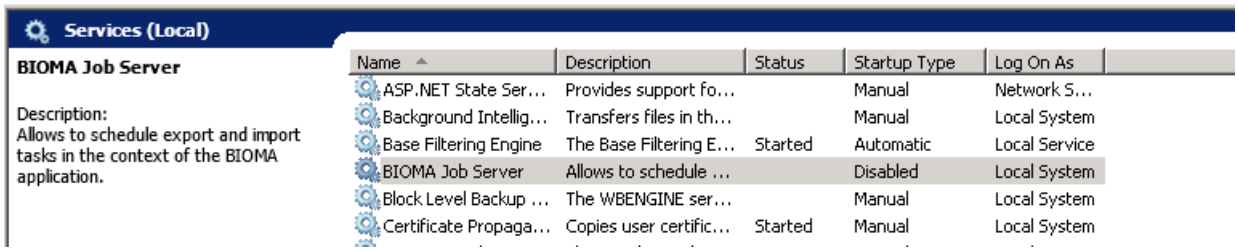
- [/ImportDefId:{ID}]
  The import definition ID. The command 'ListImportDefs' can be used to query the ID. If not specified, the default import definition ID will be used.
- [/ImportDir:{the import directory}]
  The source directory containing the import files. If not specified, the same directory as configured in the BIOMA client will be used.
- [/BackupDir:{the backup directory}]
  Successfully imported files are moved to the backup directory. If not specified, the same directory as configured in the BIOMA client will be used.
- [/ErrorDir:{the error directory}]
  If errors occurring during import the according files will be moved to the error directory. If not specified, the same directory as configured in the BIOMA client will be used.
- [/AddProtocol:{Yes|No}]
  Indicates whether the import protocol will be added to the database. The default is 'No'.

Example:
Batch import without user confirmation using the same settings as the BIOMA client.
biomautil /CMD:BatchImport

BIOMA JOB SERVER

AUTOMATIC IMPORT AND EXPORT WITH THE "BIOMA JOB SERVER"

Beginning with **BIOMA Version 2.3.1001.0**, the „BIOMA Job Server" service will be installed with the setup program. After installation the service is disabled.

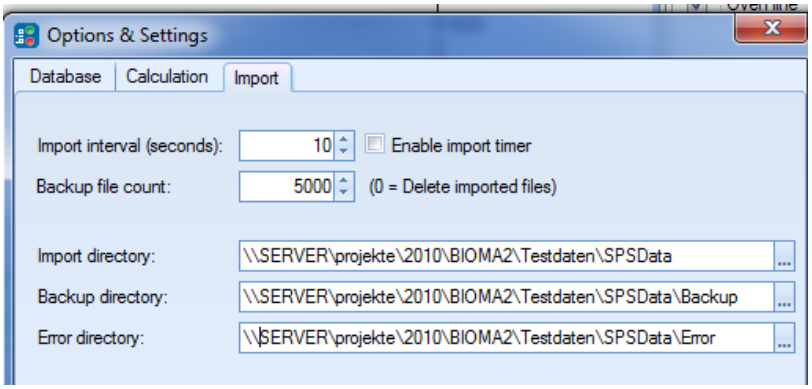


This service allows to schedule BIOMA export and imports tasks. The „BIOMA Job Server" is a slightly modified version of the „Quartz.Net" project.

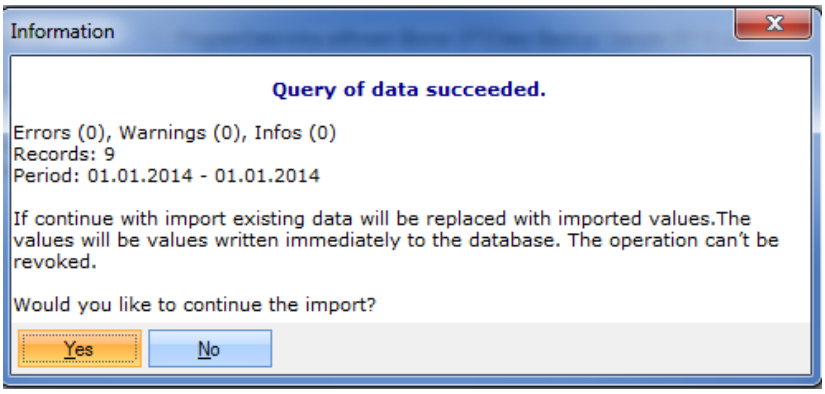
Quartz.NET is an open source project aimed at creating a free-for-commercial use Job Scheduler, with 'enterprise' features. It is licensed under the Apache License, Version 2.0 (the "License"). You may obtain a copy of the License at: http://www.apache.org/licenses/LICENSE-2.0

CONFIGURATION OF SCHEDULED IMPORT

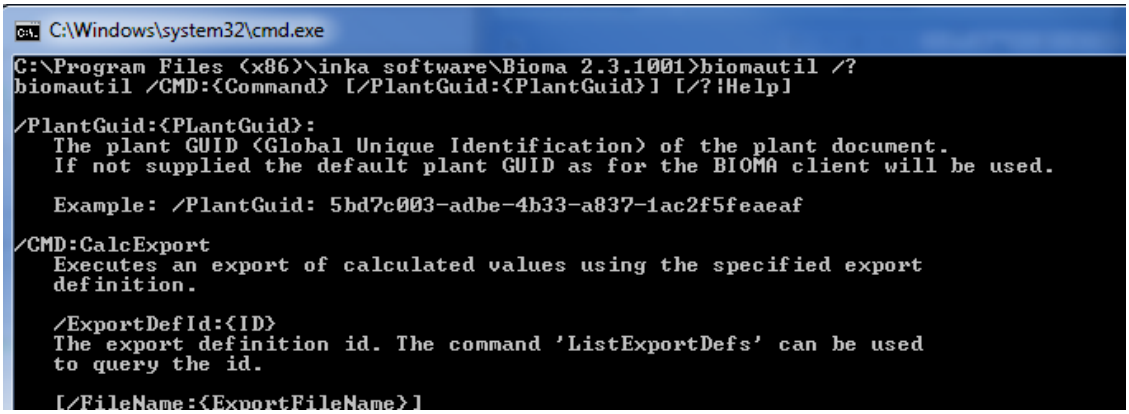
1. Use the BIOMA client application to configure the import/backup/error directories.



2. Call the import at least once from the BIOMA client and check results.



3. The command line utility „biomautil.exe“ is used to perform the import task. This program is located in installation folder of BIOMA. Usually, this is “%ProgramFiles%\inka software\BIOMA X.X.XXXX\”. Execute “biomautil /?” at the command prompt to get more help.



4. Edit the file „Jobs.xml“ in the folder „JobServer“ to modify the default configuration. You need to have administrator privileges to edit the “Jobs.xml” file. Use the “**run as administrator**” context menu to start the editor (e.g. notepad).

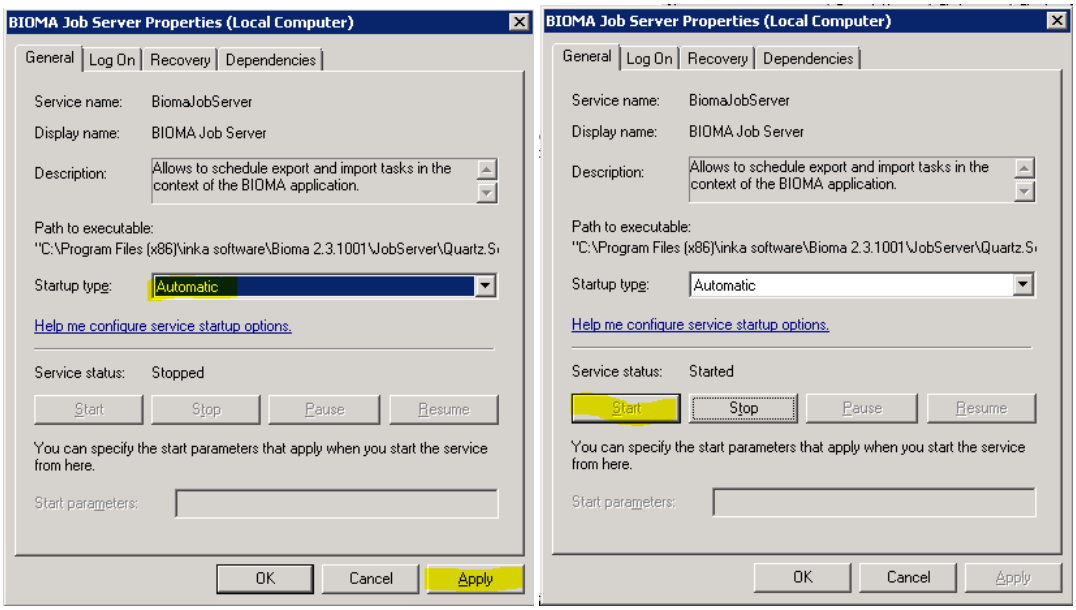
   The default configuration triggers the import every 10 minutes.

   <cron-expression>0 0/10 * * * ?</cron-expression> -->

   A tutorial on how to set the crone-expression of the trigger can be found under

http://www.quartz-scheduler.org/documentation/quartz-2.3.0/tutorials/crontrigger.html

5. Enable and start the „BIOMA Job Server“ service



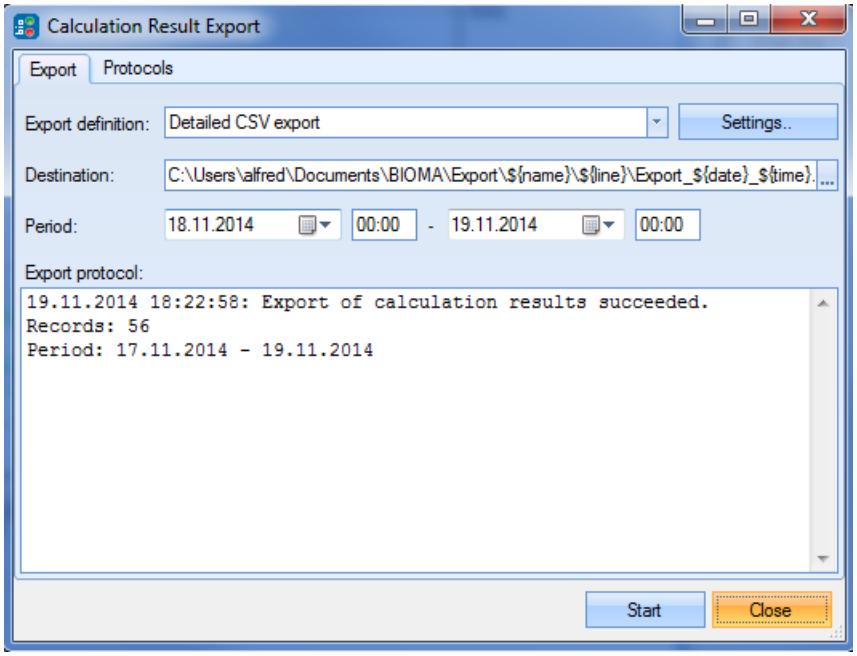
6. View the log file
   The log file is located at „%ProgramData%\ inka software\BIOMA\LogFiles\obServerLog.txt“.
   A maximum number of 10 log each with max 100 KB will be maintained.

   For test purposes you may change the import interval to in „Jobs.xml“ to 1 minute.
   <cron-expression>0 * * * * ?</cron-expression> -->

   Please note, the “BIOMA Job Service” needs to be restarted after changing the configuration.

CONFIGURATION OF SCHEDULED EXPORT OF CALCULATED VALUES

1. Use the BIOMA client to configure and test the export.



2. Test export with the command line utility “biomautil.exe”

   Execute “**biomautil /CMD:ListExportDefs**” to query the export definition ID (ExportDefId).
   Execute “**biomautil /CMD:CalcExport /ExportDefId:1**” to export the data.
   biomautil /CMD:CalcExport /ExportDefId:1 /PeriodCount:1 /Period:Hours

3. Edit “Jobs.xml” to schedule the export command.
   The default configuration triggers the export every day at 2 AM but only in the year 1970. It will not trigger until you remove the year.

   You need to administrator privileges to edit the “Jobs.xml” file. Use the “**run as administrator**” context menu to start the editor (e.g., notepad).

   <value>/CMD:CalcExport /ExportDefId:1 /PriodCount:1 /Period:Hours</value>

   Run every day at 2 AM
   <cron-expression>0 0 2 * * ?</cron-expression>

   Please note that the “BIOMA Job Service” needs to be restarted after changing the configuration.