TECH NOTE :: DSE_Filler

Version: 2022-04-26
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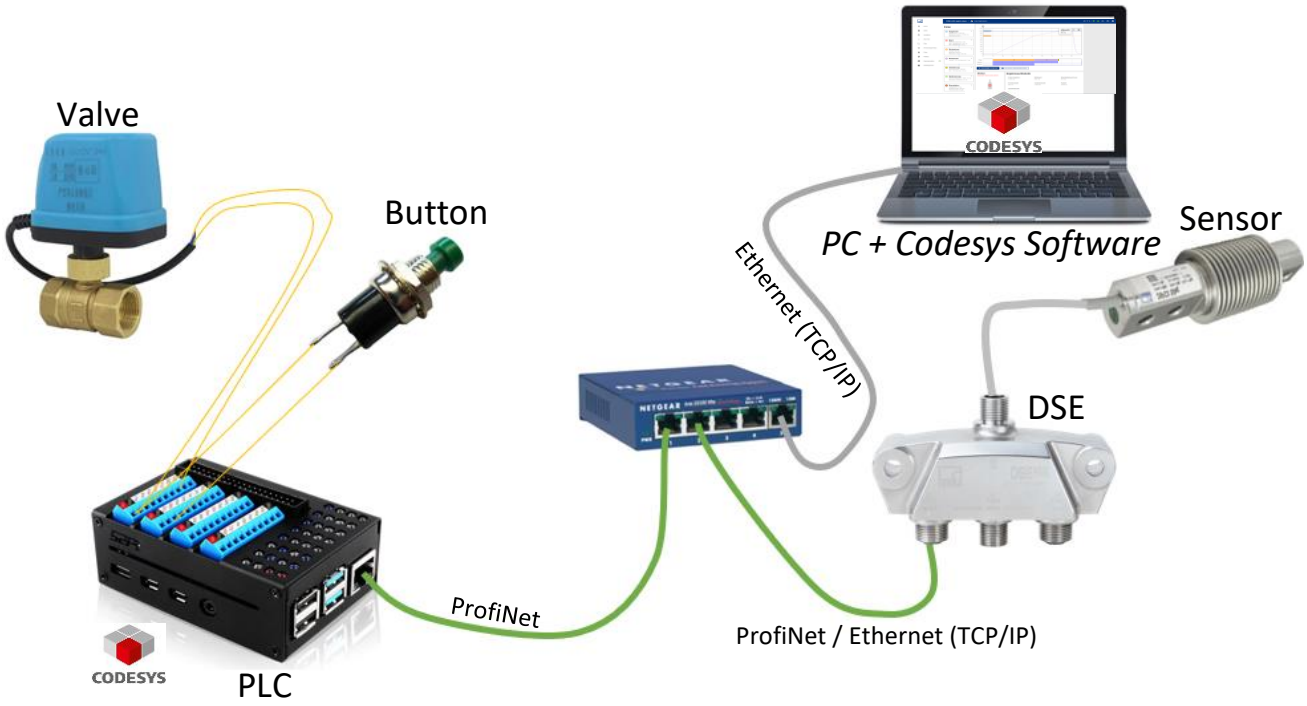
Status: HBM: Public

Brief description

This is a quick start guide for using the filler function of a DSE. This function serves the optimization and monitoring of processes. By means of a user-friendly interface, complicated control technology is available for every user. For initial commissioning, all you need is a computer, sensor and a DSE. This can be extended by a PLC, which takes over the values set in the DSE for fast and accurate control. n this example, a Raspberry PI Model 4B is used with a PROFINET or EtherCAT interface. The functionality of the filler is available in DSE from the FW V2. 0.

Hardware configuration



Sketch of structure

Components required

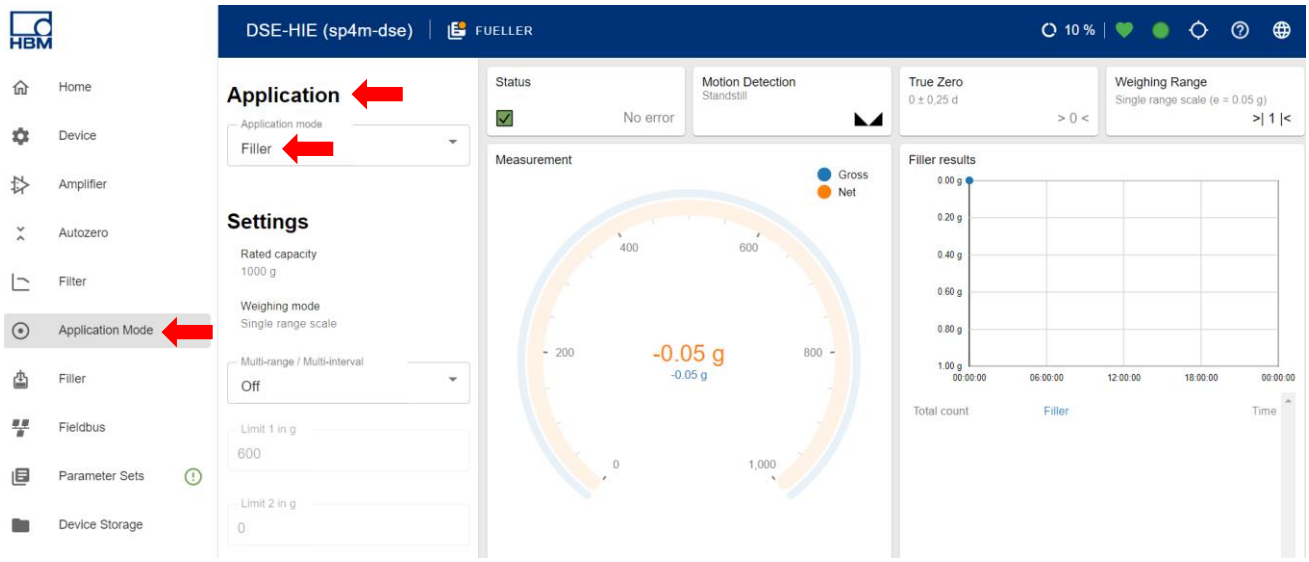
- 1 x DSE system (incl. power supply and Ethernet cable)
- 1 x Ethernet Switch
- 1 x Load cell
- 1 x free software Codesys
- 1 x PLC, R-PI Model 4B (Codesys Controle for Rasperry Pi V 4.4.0.0)

Optional:

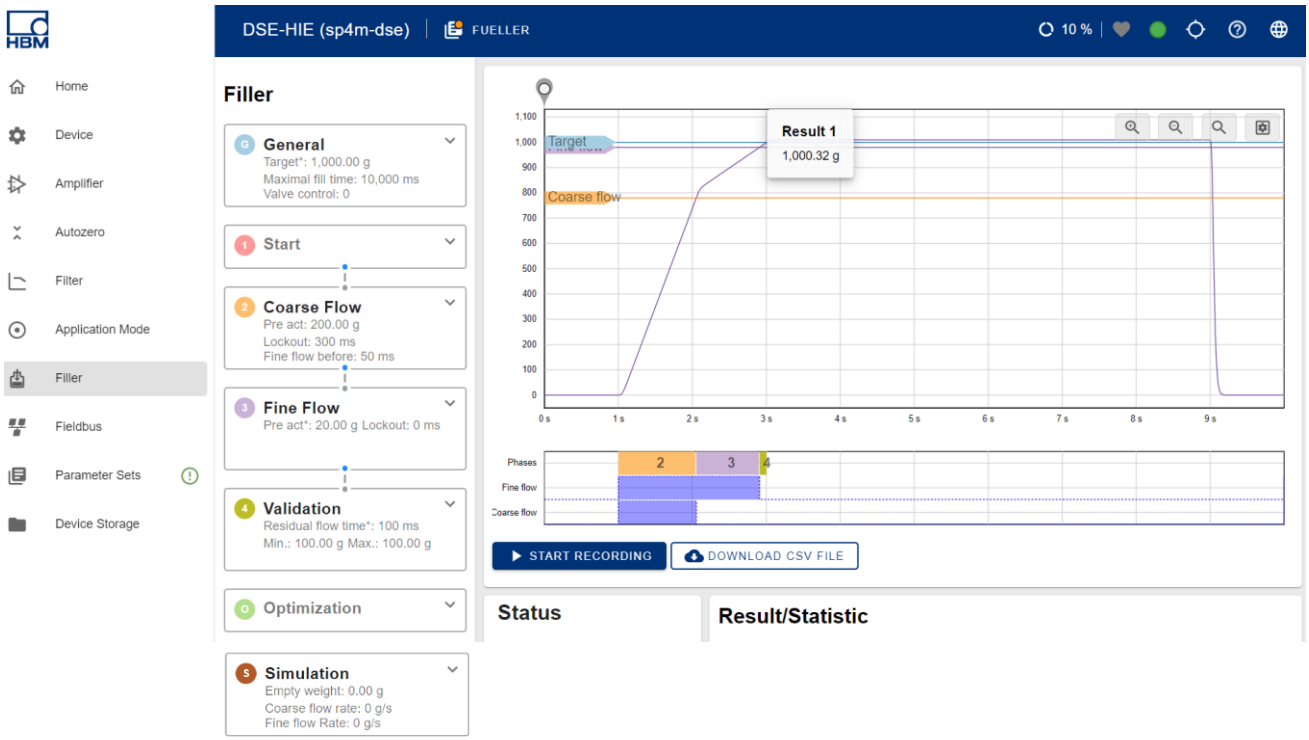
- 3 x Button
- 2 x Valve

Level control web interface

With the help of the DSE, different parameters of a level can be recorded and processed.

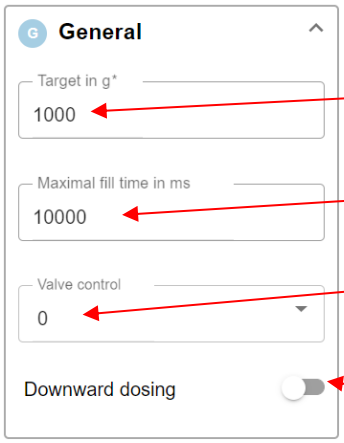


Now switch to the pen. This has various adjustment options in order to capture the different applications of a filling system as well as possible. Many settings are optional, but 3 parameters must be given to the DSE for it to work. Namely **(G) target weight, (3) reserve, (4) post-flow time.**
These and all other settings are discussed in the following chapters.



For all settings, 0 = function inactive.

G General



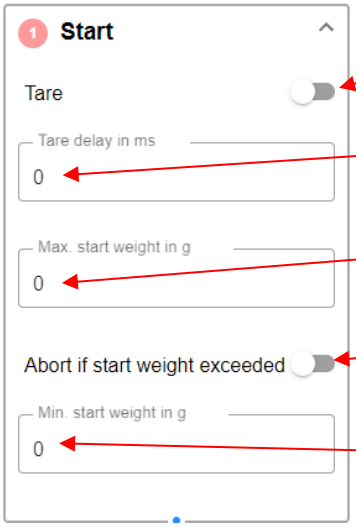
The desired weight to be achieved (is given in grams).

The maximum permissible duration of filling / emptying, otherwise there will be an error message.

Hardware adaptation to the real world, valve adaptation.

Switching possibility, between filling and emptying.

1 Start



Switching option to activate buoyancy before measurement.

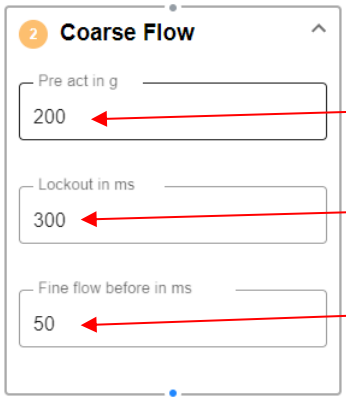
The delay between the start of the measurement and calibration. Also active when balancing is off, for starting weight monitoring.

The maximum permissible take-off weight. If this is exceeded (if switches are used) there will be an error.

Switching possibility to activate the abort function of the starting weight overrun.

The minimum starting weight. If this is done, there will be an error.

2 Coarse Flow

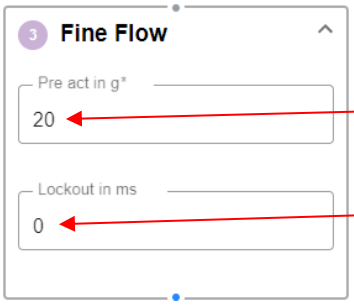


Target weight – fine flow – Coarse Flow = weight at which coarse current stops
In our example, this would be 1000 – 20 – **200** = stop at 780 g.

The time of the coarse current min. is activated.
Target weight monitoring is disabled in this time window.

For a slow start, for foam suppression.

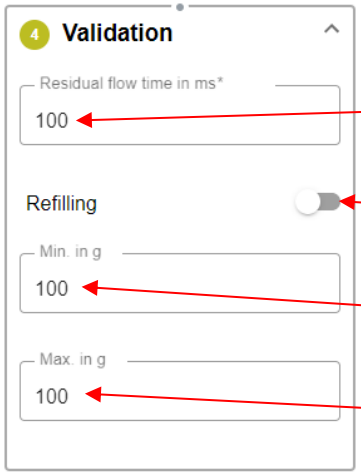
3 Fine Flow



Target weight – reserve = weight at which the fine current stops.
In our example, this would be: 1000 – **20** = Stop at 980 g .

The time of the fine current min. is activated. Target weight monitoring is disabled in this time.

4 Validation



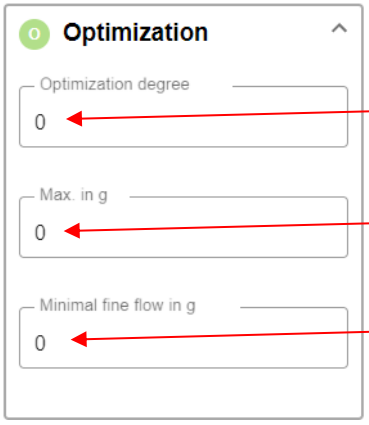
The time that the residual flow still needs before the measured value comes to a standstill.

Activate refilling to limit residual fluid.

Min. Residual flow. Meaning: 1000 – **100** = 900
If this value is lower there is an error.

Min. Residual flow. Meaning: 1000 + 100 = 1100
If this value is exceeded there is an error.

0 Optimization



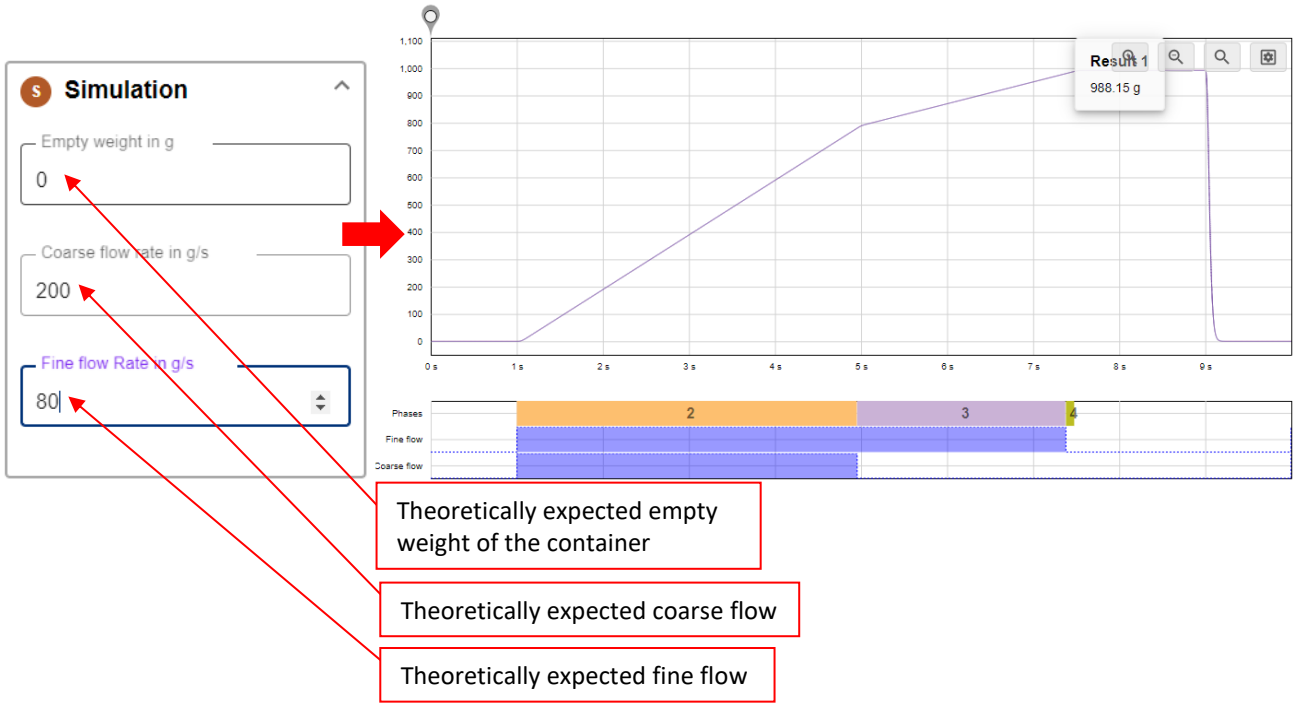
Adjustment possibility for tracking, in 3 speed levels.

Maximum change of the cut-off points by the correction.

The divergence between coarse current and fine current.

S Simulation

The Simulation setting is used for the theoretical testing of the previously entered parameters. These are checked to see if the desired target, in our case 1000g and 10 sec. duration, can be reached.

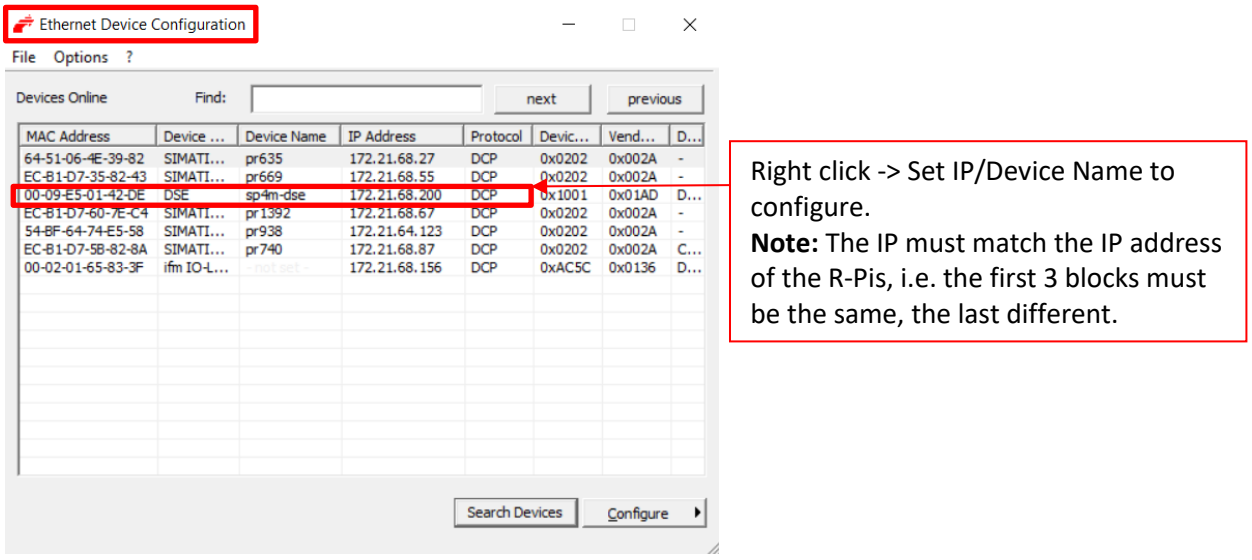


Level control Codesys

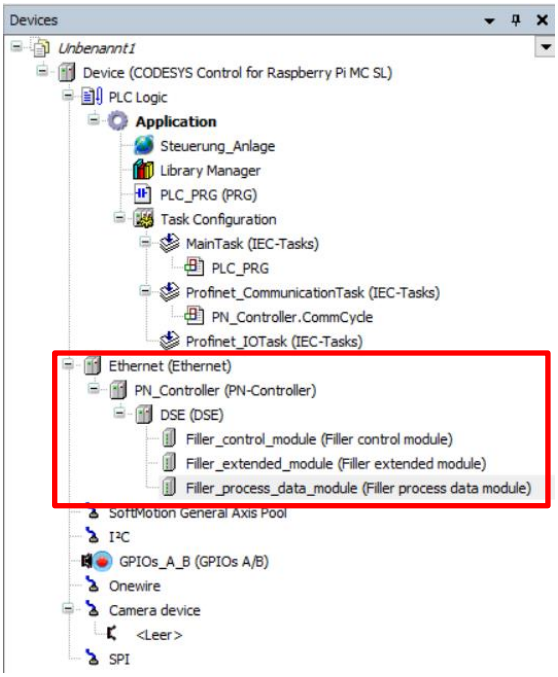
How to prepare Codesys to capture the values of the DSE is explained in the TechNote “TECH-NOTE_DSE_Checkweigher_with_PLC (R-PI) _en” All essential steps are explained there.

Network configurations

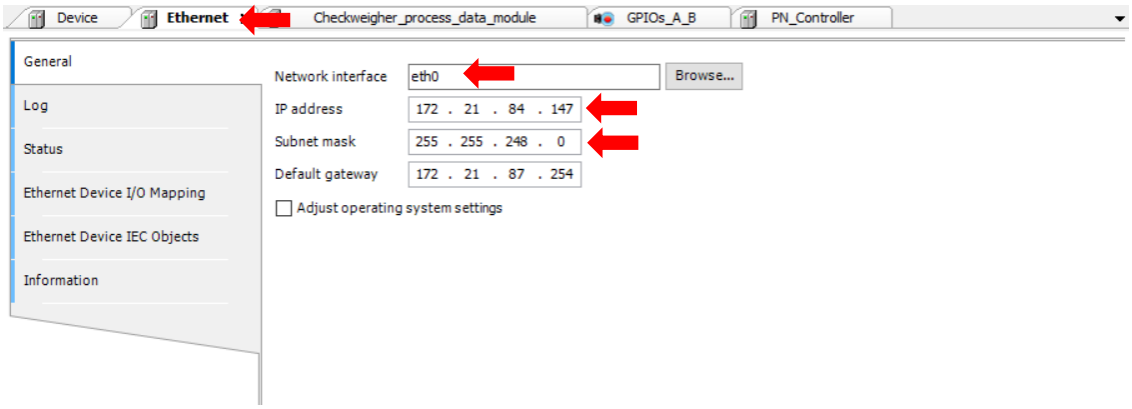
Note: The IP address as well as the device name of the DSE can be configured using "Ethernet Device Setup".



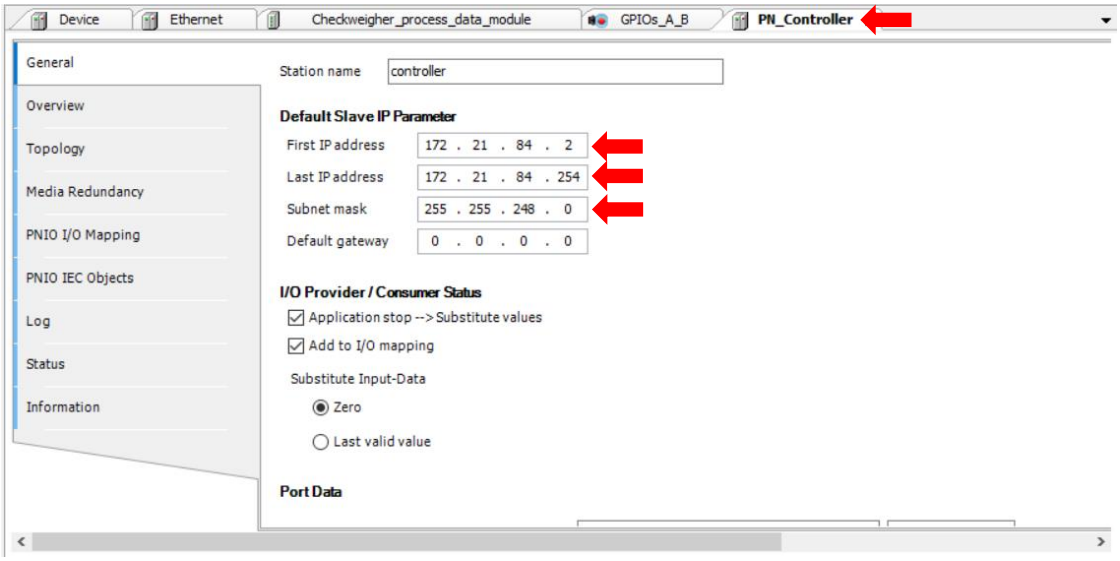
Here you can see the different adapters to connect the DSE with the Codesys Control. These must now be configured for the network.



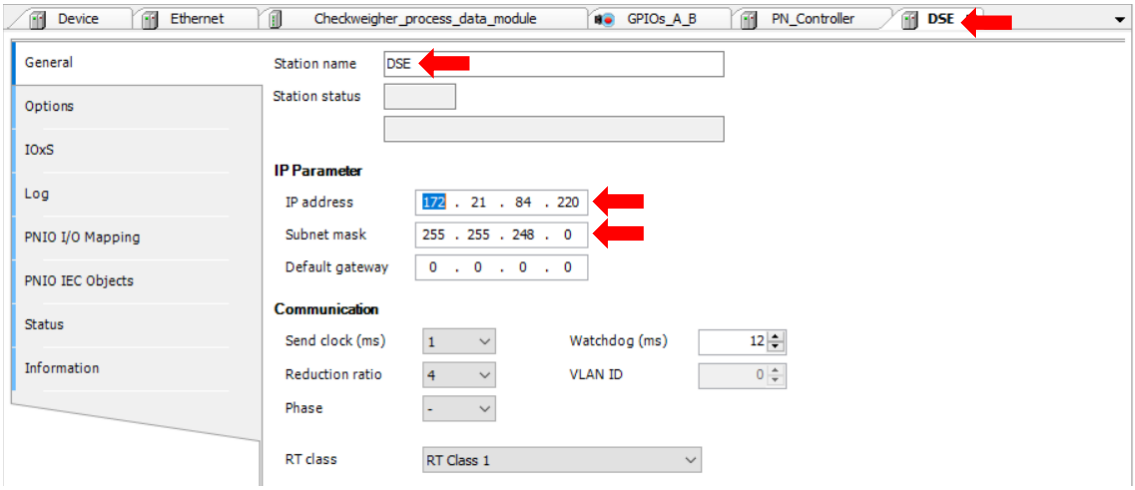
Since the Codesys main programme must communicate with the application on the Raspberry, they must be connected to each other using PROFINET. This is explained below:
First, the network must be adapted by the Ethernet adapter. To do this, click on "Browse..." and select "eth0" so that you are in the network of the network cable.



Now the "PN_controller" must also be adapted. It is important that the first 3 columns are identical to the first 3 columns of "eth0". The subnet mask must also match that of "eth0".

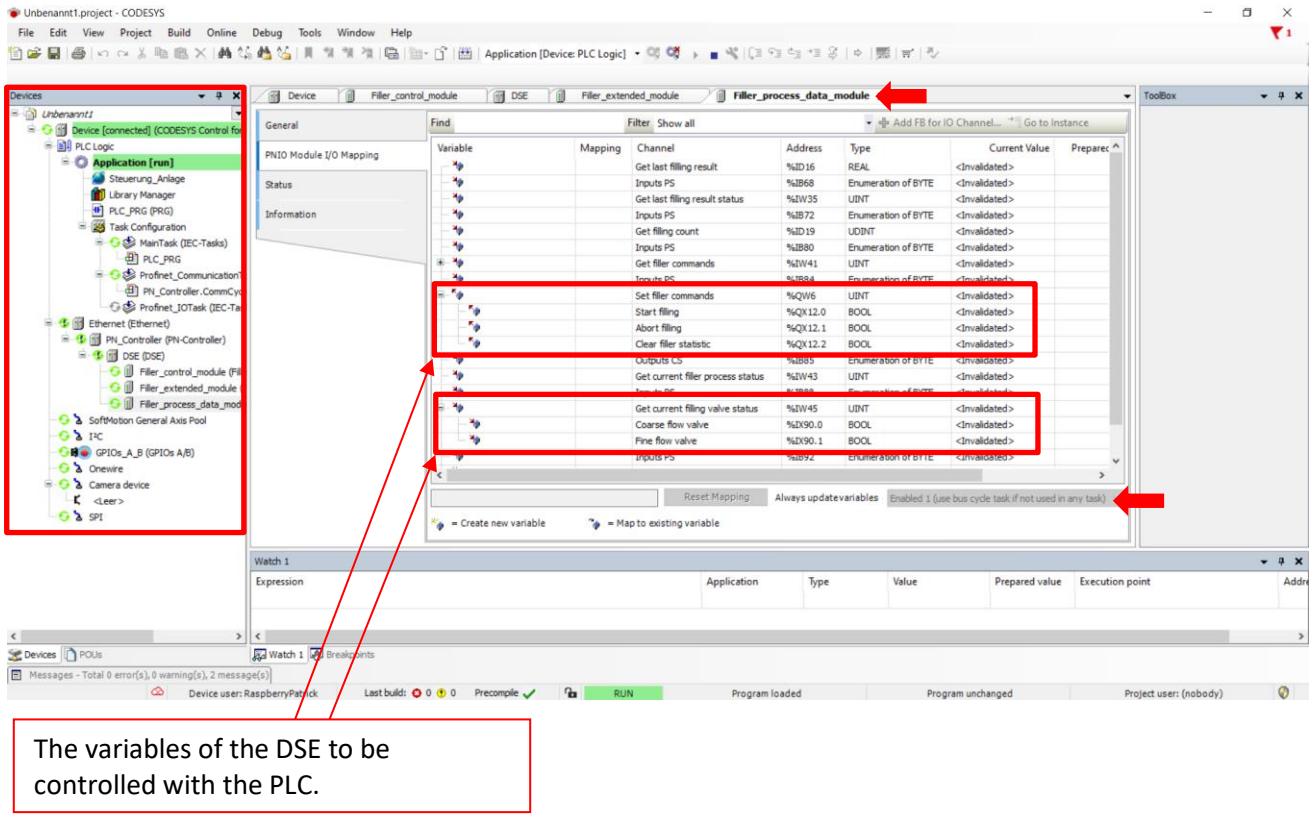


The subnet mask must again match that of "eth0", and the IP address of the DSE must also be entered. The device name must also be entered correctly.



Now the programme only has to be started.

You can see that the programme works when there are green circles next to the inserted devices. See picture:



Example valve control

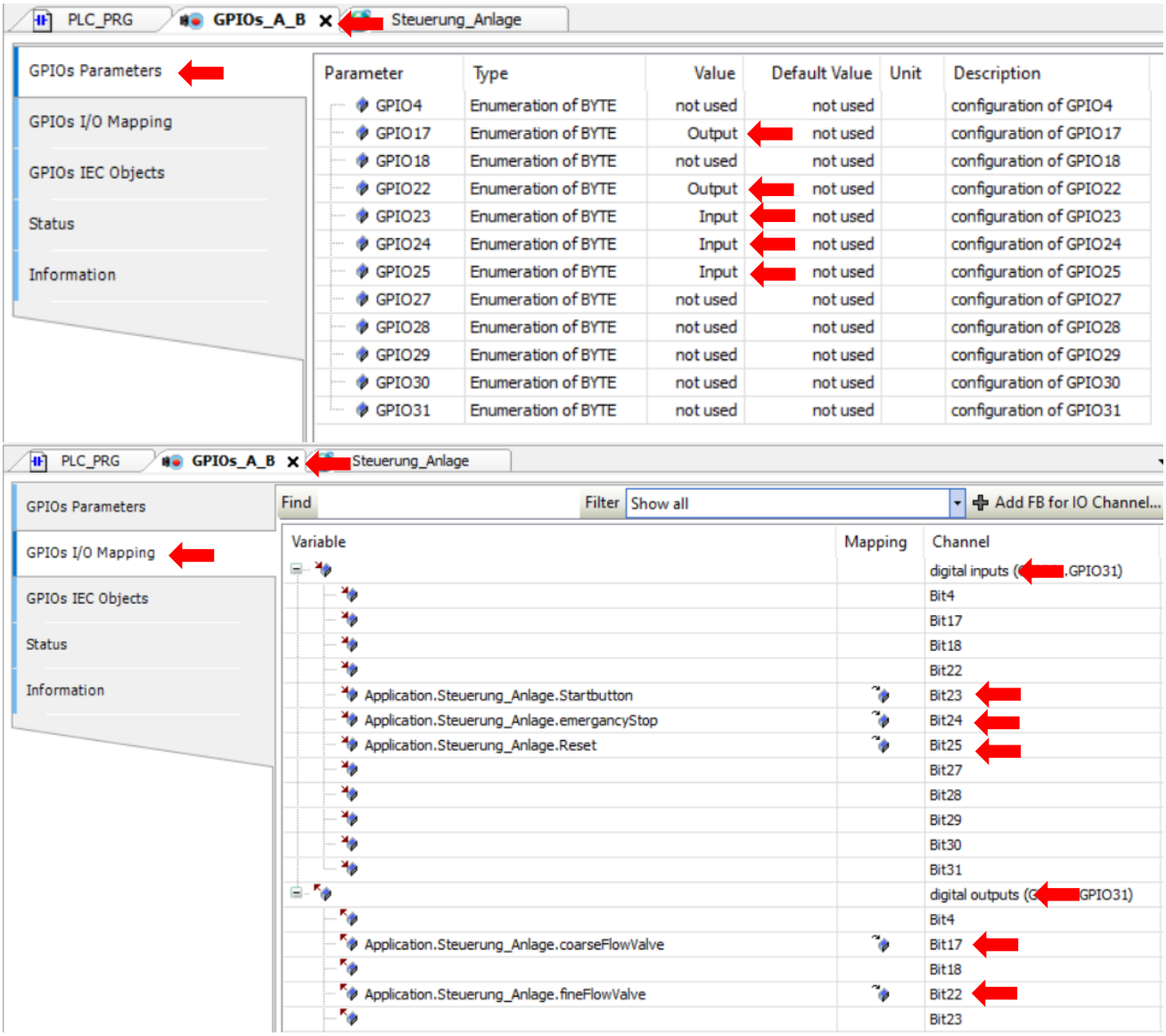
The Codesys control system takes over the parameters entered in the DSE and uses them to control the filling process. Due to the intelligent software of the DSE, only a few steps have to be programmed independently.

First, variables must be created:

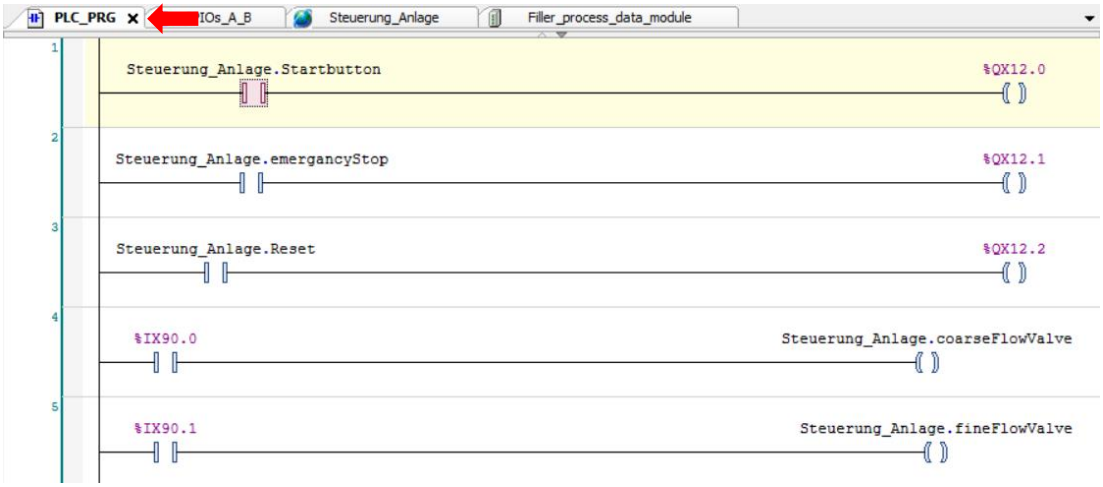
PLC_PRG | GPIOs_A_B | Steuerung_Anlage

```
1  {attribute 'qualified_only'}
2  VAR_GLOBAL
3      //Input
4      Startbutton : BOOL;
5      Reset : BOOL;
6      emergancyStop : BOOL;
7
8      //Output
9      coarseFlowValve : BOOL;
10     fineFlowValve : BOOL;
11
12 END_VAR
```

After that, these variables must be assigned to GPIOs:



For illustration purposes, a simple programme in which all inputs and outputs are used once.
In most cases, forwarding the signals is sufficient, as the DSE internally processes the desired settings that can be set on the web interface.

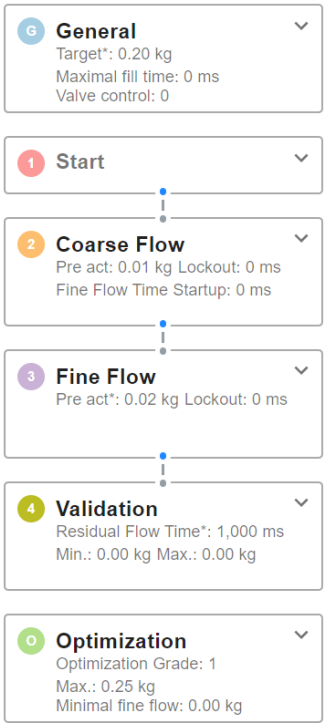


Example Optimization

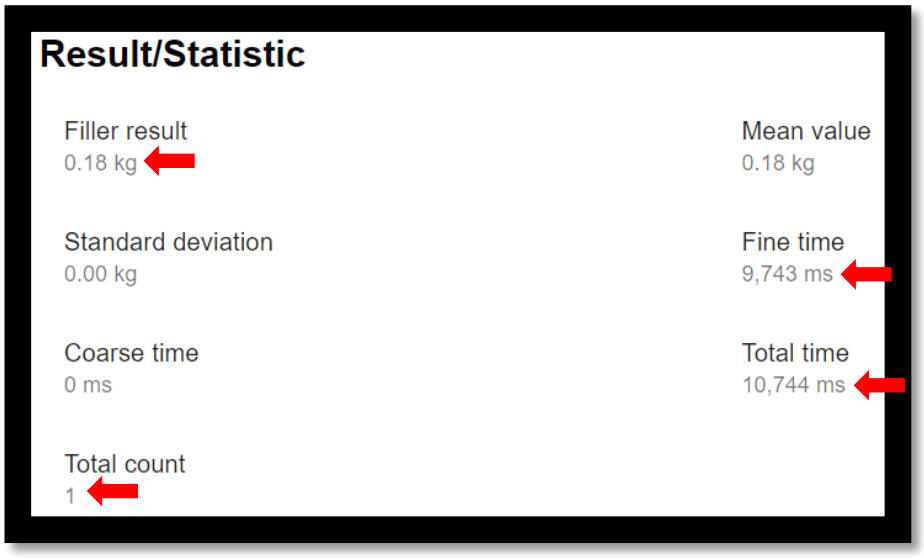
In this concrete example, a filler model was used that only executes Fine Flow. Nevertheless, it is recommended to enter a small value for Course Flow. Otherwise, Course Flow can lead to negative values and thus to strong deviations.

The settings before the first run:

Filler

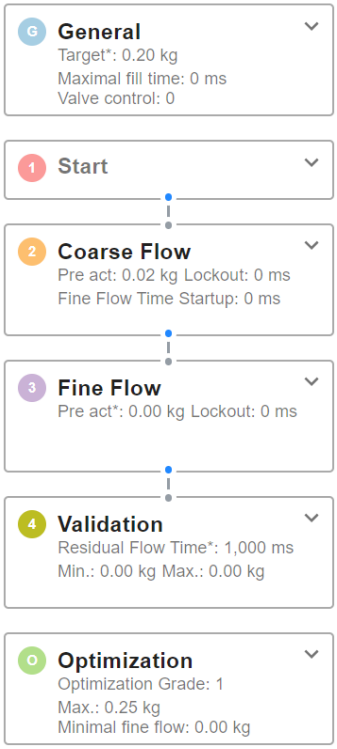


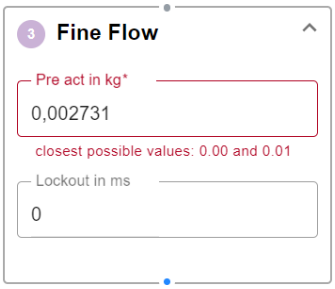
Result first run:



The settings after the first optimisation:

Filler

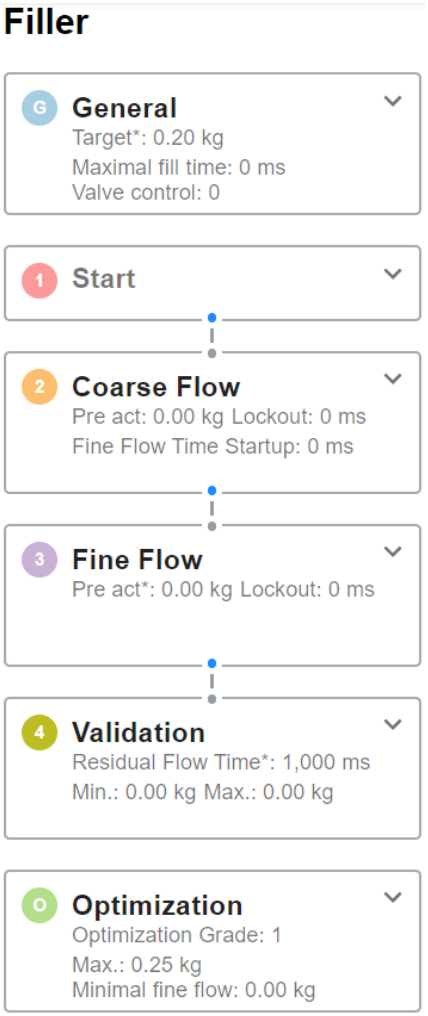


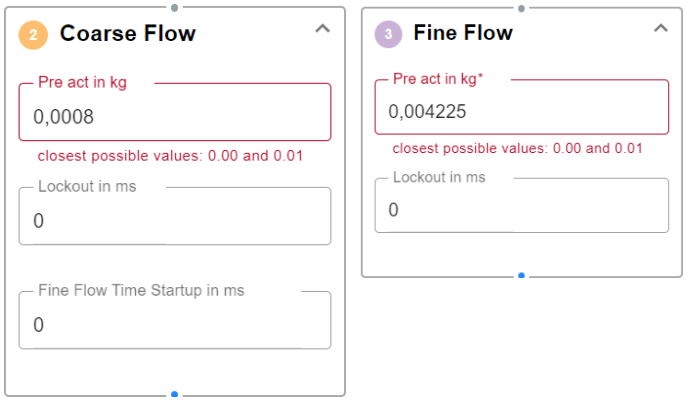


Internally, the DSE calculates with this optimised value, as input it would be inadmissible.

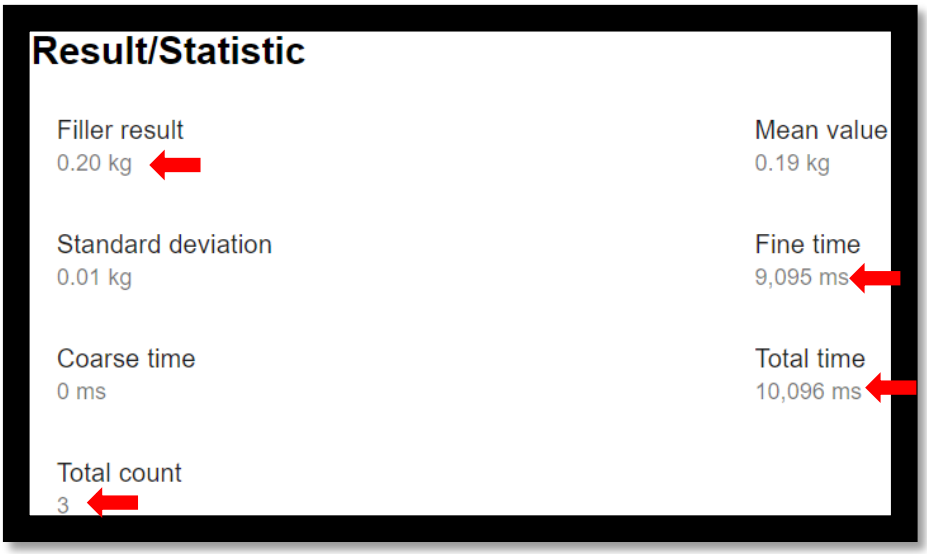
Result second run:

The DSE optimises itself further with each subsequent run. This can also be seen in the results. For speed optimisation in this concrete example, the value for coarse and fine flow becomes smaller and smaller. After the second optimisation:



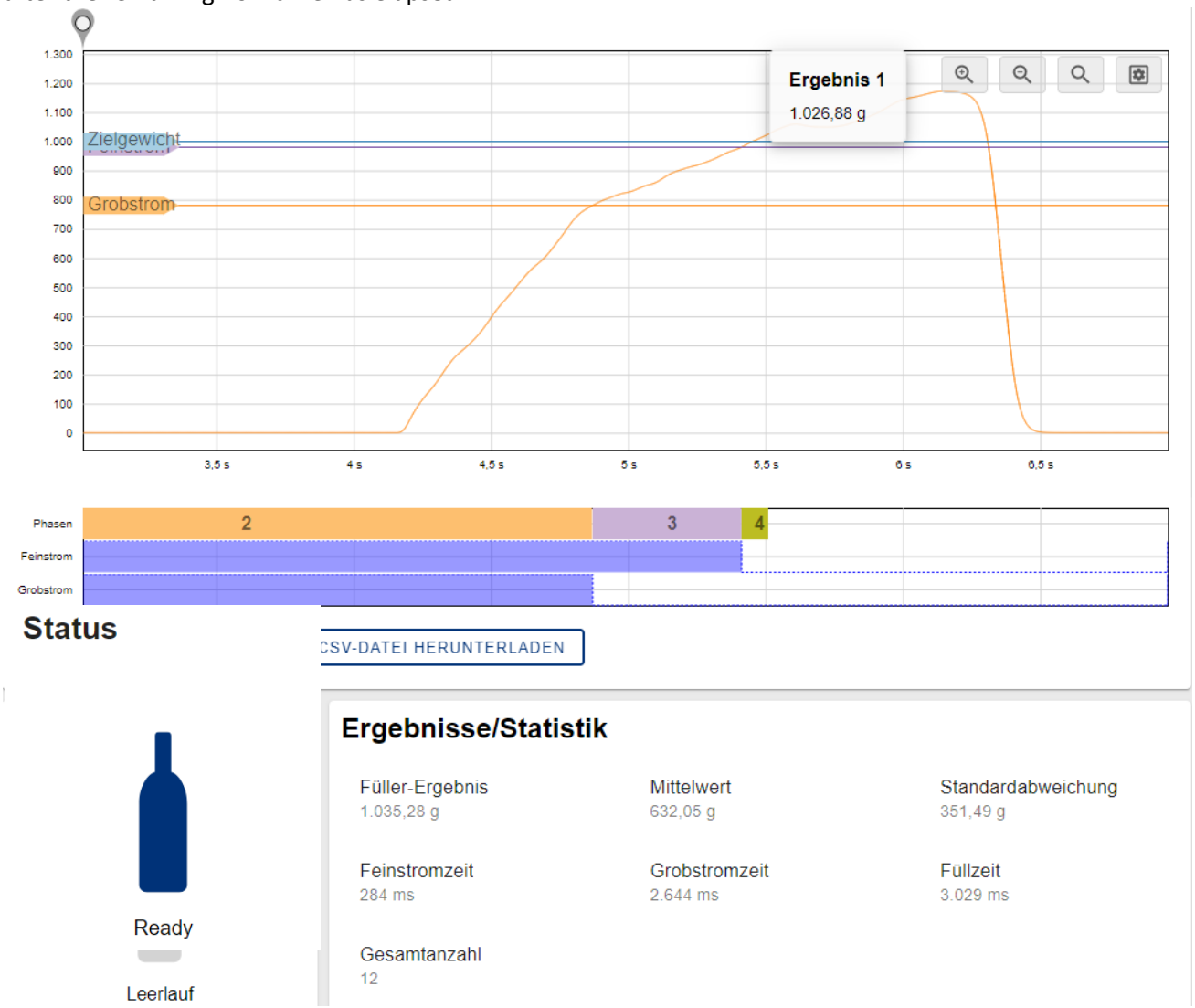


Result third run:



Result

This orange trace is a real measurement. Now you can see if everything is set correctly. In this example, the coarse flow is set well, but the fine flow is still filling beyond the desired 1000g. Result 1 records the weight after the remaining flow time has elapsed.



Legal notice

This example is for illustrative purposes only. It is not subject to any warranties or liability claims.