

CALSUS 01

Secondary calibration solution for the CCS 2



Operating instructions for size calibration

Version 1.2

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1. General informations

Size calibration is carried out using a CCS 2 and a BSS 2. Based on ISO 11171, CALSUS 01, a fluid for secondary calibration, is needed during this process.



Comments:

- The drifting of calibration values over time is rather insignificant.
- If **drastic changes** of calibration values (more than 100%) occur, malfunction is suspected. Especially if **very low values** are determined. In such cases it is to assume that **partial contamination of the sensor** or **contamination of the windows** are the reason.
- Operating instructions and manuals should be read carefully before using any product or device.
- Handling of the solution for calibration should always be very careful. The solution can be used for one calibration.

2. Initial operation

2.1. Configuration of the calibration equipment

Connection of the BSS 2 with the CCS 2 by using the mini measuring hose. Look also in the instruction manual of the CCS 2 and the BSS 2.

3. Determination of the initial contamination level

The purpose of flushing solution is to minimize the initial contamination of the device in order to create a larger difference between the initial contamination and the certified contamination of the calibration fluid.

3.1. Preparation of the flushing solution

- **Agitate** the flushing solution moderately for **app. 3 minutes** in all directions.
- Place it in an **ultrasonic bath** for **app. 30 seconds** and dry it carefully using a laboratory cloth.
- After that **agitate** it again for **app. 3 minutes**.
- **Directly measuring of the flushing solution with the CCS 2/ BSS 2.**



Notice:

Be aware of the fact that this process has to be performed quickly in order to ensure that particles are spread out even within the sample. This is important for accurate and constant measurements.

3.2. Measuring the flushing solution

The purpose of flushing is to attain a contamination level of **16/ 14/ 10 based on ISO 4406.**

- Place a purified sample of the flushing solution in the BSS 2, close the device and **degas the sample**. Make sure that the valve on the BSS 2 is closed!
- Set the pressure at **2.5 bar**.



- Start the programs <e12> on the CCS 2.
- Got to the **offline particle counting** mode.
- Input the sample name: **flushing solution**

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Bottle Sampling
6 channel particle counting

sample name: noname
dilution factor: 1
presentation mode: current single value

K1: > 4µm _(e) []	K2: > 6µm _(e) []
K3: >10µm _(e) []	K4: >14µm _(e) []
K5: >21µm _(e) []	K6: >37µm _(e) []
Code: ISO 4406 []	Code: NAS 1638 []
Code: SAE AS 4059 []	[]

name/dilution: [1]	average [4]
start flushing: [2]	quit [ESC]
start counting: [3]	
save [F1]	print [F2]

- Now open the valve of the BSS 2, flush with [2] (approximate 3 – 4), stop the flushing with [5] and start the count by hitting [3] on the CCS 2.
- **Redo these counts until at least the following contamination level based on ISO 4406 is reached a couple of times: (16/ 14/ 10).**
- Print the values of your last measurement by hitting [F2] in order to calculate new ideal numbers of particles and save the measurement with [F1].
- Shut the valve of the BSS 2 again when finished with the measurements.

IMPORTANT: Make sure that you have enough solution in your sample bottle when starting each measurement. Air could enter the system!

4. Size calibration

The purpose of size calibration is to determine new calibration values by varying threshold values using the program <K11>.

4.1. Change to the program K11

- Close the offline particle count by hitting the [ESC] button. Hit [ESC] and [ENTER] to get into the DOS platform.
- Start the program <K11> using your keyboard



- Choose <calibration values> with the keyboard [↓] and confirm your choice by hitting [ENTER].

- Print the saved values by pressing [F2]
- Switch to the main menu by hitting [ESC]



4.1.1. Entry of the first calibration values

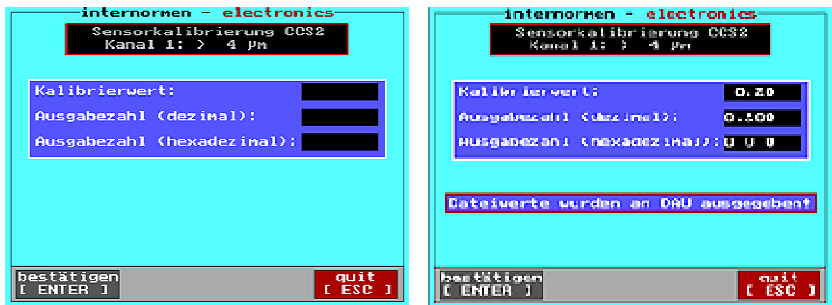
Calibration values which have to be entered in K11:

- > 4 μm : 0.200 V
- > 6 μm : 0.600 V
- > 10 μm : 1.800 V
- > 14 μm : 3.000 V
- > 21 μm : 5.500 V
- > 37 μm : 8.500 V

- Choose the measuring channel using [$\downarrow\uparrow$] and confirm with [ENTER]. (The relevant input box has a red shadow.)



- Input of the calibration value, for example: 4 µm: 0.200
- Confirm with **[ENTER]**.



- With **[ESC]** back to the main menu of K11.
- After entering all channels close this menu.

4.2. Change to the “Offline particle counting” mode

- With **[ESC]** and **[ENTER]** back to the **DOS platform**.
- Start the programs **<d12>** or **<e12>** with your keyboard.
- Confirm the mode “**offline particle counting**” by using **[ENTER]**.

4.2.1. Preparation of the calibration solution

- **Agitate** the calibration solution moderately for **app. 10 minutes** in all directions.
- Place it in an **ultrasonic bath** for **app. 30 seconds** and dry it carefully using a laboratory cloth.
- After that **agitate** it again for **app. 10 minutes**.
- Place the sample of the calibration solution in the BSS 2, close the device and **degas** the sample. Make sure that the valve on the BSS 2 is closed!
- Set the pressure of the device at **2.5 bar**.

4.2.2. First measuring of the calibration solution

- Enter the sample name (**Calib1**) in the “Offline particle counting” mode.
- Open the valve of the BSS 2 and **start flushing** by hitting **[1]**.
- Stop flushing after 6 cycles by hitting **[5]**
- As soon as the flushing process is finished **start the counting** using **[3]** and repeat it three times.
- Press **[4]** after every count in order to **get the average** value for all measurements.
- Print this average value by pressing **[F2]** and saved it with **[F1]**.

4.3. Change to program K11

- Close the “Offline particle counting” by hitting **[ESC]** button. Hit **[ESC]** and **[ENTER]** to get into the **DOS platform** again.
- Start the program <**K11**> using your keyboard.

4.3.1. Entry of the second calibration values

New calibration values which have to be entered:

> 4 μm :	0.300 V
> 6 μm :	0.800 V
> 10 μm :	2.000 V
> 14 μm :	3.500 V
> 21 μm :	6.500 V
> 37 μm :	9.990 V

- Input as in chapter 4.1.1 described.

4.4. Change to the “Offline particle counting” mode

- With [ESC] and [ENTER] back to the DOS platform again.
- Start programs <d12> or <e12> using your keys.
- Confirm the mode “**offline particle counting**” by using [ENTER].

4.4.1. Second measuring of the calibration solution

- Enter the sample name (**Calib2**) in the “Offline particle counting” mode.
- Open the valve of the BSS 2 and **start flushing** by hitting [1].
- Stop flushing after 6 cycles by hitting [5]
- As soon as the flushing process is finished **start the counting** using [3] and repeat it three times.
- Press [4] after every count in order to **get the average** value for all measurements.
- Print this average value by pressing [F2] and saved it with [F1].
- Now close the valve of the BSS 2

Advice: Number your prints! This will keep the right order, which will be helpful when drawing the graph.

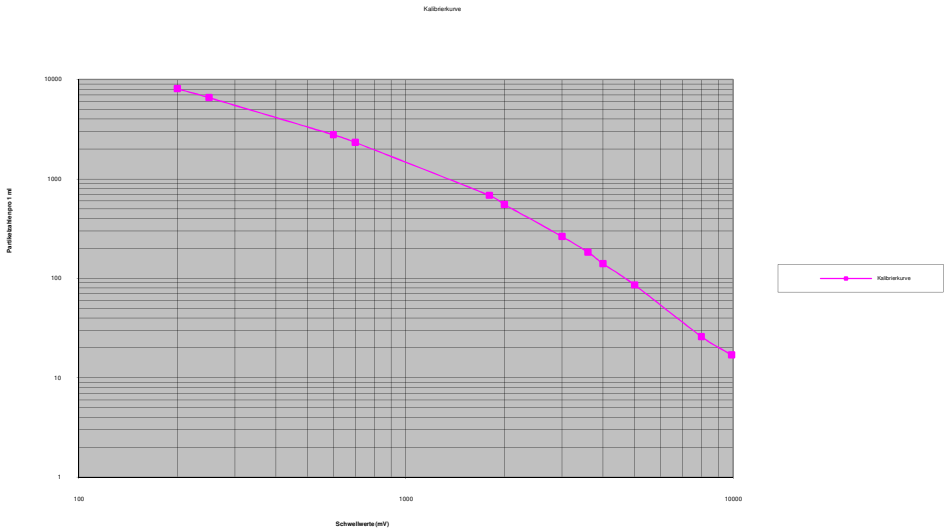
IMPORTANT: Avoid a second flushing after entering the new calibration values by leaving open the valve of the BSS 2. Unfortunately calibration solution is lost during this process, so try to ensure a quick performance.

**NOTICE: Unstable values are an indication for insufficient preparation and/or bad handling of the solution for calibration.
Careful preparation of samples will result in successful calibration!**

5. Graphic evaluation and determination of calibration values

- Print the log-log diagram.
- Plot the threshold values on the X-axis (mV) (Range: 100 mV – 10.000 mV) and plot the number of particles on the Y-axis (for 1 ml) (Range: 1 particle in 1 ml – 10.000 particle in 1 ml).
- Mark calibration values with number of particles from your prints into the diagram.
- Connect the points in your diagram.
- Now take the number of particles for the different measuring channels: > 4 μm , > 6 μm , > 10 μm , > 14 μm , > 21 μm , > 37 μm from the calibration certificate and extract the associate threshold values from the diagram.
- These values are the new calibration values and have to be entered in the CCS 2
- The values can be checked if necessary using the solution for calibration.

Example:



After you are done the calibration please flush the BSS 2 and the CCS 2 with cleaned mineral oil ISO VG 22.