

# CALSUS 01

## Secondary calibration solution for the CCS 2



***Automatic instructions for  
automatic calibration***

**Version 1.3**

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## 1. General

Automatic calibration is carried out using a CCS2 and a BSS2 in combination with the INT-Software CALSOFT 01. 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 a maximum of two separate calibrations.

## **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 BSS2, 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 <sub>(e)</sub> [     ]	K2: > 6µm <sub>(e)</sub> [     ]
K3: > 10µm <sub>(e)</sub> [     ]	K4: > 14µm <sub>(e)</sub> [     ]
K5: > 21µm <sub>(e)</sub> [     ]	K6: > 37µm <sub>(e)</sub> [     ]
Code: ISO 4406 [     ]	Code: NAS 1638 [     ]
Code: SAE AS 4059 [     ]	[     ]

name/dilution: [ 1 ]	average [ 4 ]
start flushing: [ 2 ]	quit
start counting: [ 3 ]	[ ESC ]
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!

### 3.3. Calculating ideal numbers of particles

**The ideal number of particles is a result of the numbers given by the certificate of the solution and of the numbers determined when measuring the initial contamination level.**

The following formula is valid for these measuring channels:  
> 4 µm, > 4,6 µm, > 6 µm, > 6,4 µm, > 10 µm, > 14 µm

$$X_N = (X_Z - X_A) \times 10$$

$X_Z$  – Number of particles given by the certificate of the solution for a certain particle size in one millilitre of the solution.

$X_A$  – Number of particles of the measured initial particulate level (printed) for a certain size in one millilitre.

$X_N$  – New calculated number of particles for a certain particle size in 10 millilitre

Example: Calculating a new ideal number of particles for > 4 µm

$$\begin{aligned} X_Z &= 6475 \text{ particles / 1 ml} \\ X_A &= 358 \text{ particles / 1 ml} \\ X_N &= (6475 - 358) \times 10 \\ &= 61170 \text{ particles / 10 ml} \end{aligned}$$

Channels > 21 µm and > 37 µm:

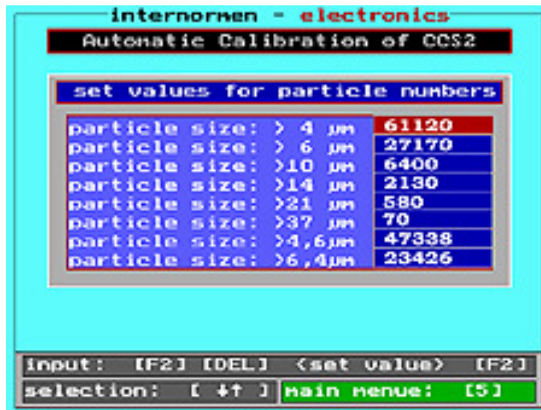
No calculation is necessary for measuring channels > 21 µm, > 37 µm due to statistic reasons. The values given by the certificate of calibration will be accepted as new values and multiplied by 10.

## 4. Calibration

The purpose is to align the actual and the ideal numbers of particles.

### 4.1. Automatic calibration programm AK 11

- Close the offline particle count by hitting [ESC].
- Hit [ESC] again and [ENTER] is get into the DOS platform.
- Start the program <ak11> by using the keyboard.
- Switch to the menu <set value menu> by hitting [5].  
Entry of the calculated ideal numbers of particles.  
(The relevant input box has a red shadow.)
- Activate the input box by hitting [F2], delete the old value with [DEL] and after entering the ideal value confirm by hitting [F2] again.
- After entering all ideal values close this menu by hitting [5].



## 4.2. 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**.

## 4.3. Measuring of the calibration solution

- Now open the valve of the BSS2 and start **flushing** by hitting button **[1]**.
- As soon as it is finished start the calibration by hitting **[2]**.
  - A particle counting is accomplished.
  - The entered ideal values are compared with the counting results.
  - The counting result is colored according to the percentaged difference of the ideal values.

**green:**     $\leq$     **1,5 %**  
**yellow:**    $\leq$     **3 %**  
**red:**         $>$      **3 %**

- Depending on the difference of the ideal values the calibration values are recalculated and displayed.

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**Automatic Calibration of CD52**

counting channel	calibration values:		particle numbers:	
	used	new	set	counted
K1: > 4 $\mu\text{m}$	0.245	0.245	61120	61617
K2: > 6 $\mu\text{m}$	0.812	0.812	27170	26339
K3: >10 $\mu\text{m}$	2.105	2.105	6400	6480
K4: >14 $\mu\text{m}$	4.328	4.328	2130	2124
K5: >21 $\mu\text{m}$	6.220	6.220	580	552
K6: >37 $\mu\text{m}$	9.990	9.990	70	161
K7: >4.6 $\mu\text{m}$	0.382	0.382	47338	46668
K8: >6.4 $\mu\text{m}$	1.140	1.140	23426	23351

set values menu: [5]	graphic: [6]
start flushing: [1]	average: [4]
start calibration: [2]	print: [F1]
loading old values: [3]	cancel: [ESC]

- Redo the calibration until ideal and actual values of the measuring channels: > 4  $\mu\text{m}$ , > 4,6  $\mu\text{m}$ , > 6  $\mu\text{m}$ , > 6,4  $\mu\text{m}$ , > 10  $\mu\text{m}$ , > 14  $\mu\text{m}$  do not differ more than 1.5%.

→ App. three measurements should be enough to adjust the different values.

**Attention:** In the calibration value file the stored calibration values are automatically overwritten with the new calculated calibration values!!

The following functions are available:

- (a) Display the graphics:  
With **[6]** the new calculated calibration curve and the old calibration curve can be displayed.  
Print the graphics with **[F1]**.
  
- (b) Print-out:  
Print your values by hitting **[F1]**.

**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!

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