

Short instruction for the 20-liter apparatus

8.0



REMBE® Research+Technology Center GmbH

Zur Heide 39, D-59929 Brilon, Germany

www.rembe-rtc.de info@rembe-rtc.de

Cesana AG

Baiergasse 56, CH-4126 Bettingen, Switzerland

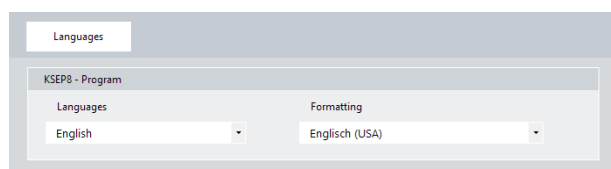
www.cesana-ag.ch info@cesana-ag.ch

Who likes reading operating instructions?

The differences between the previous KSEP systems are significant.

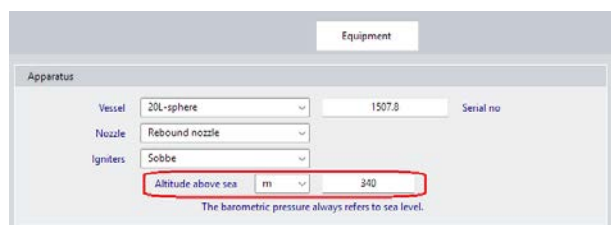
Therefore, there are things you **need to know**.

1. Setup - Software



Languages

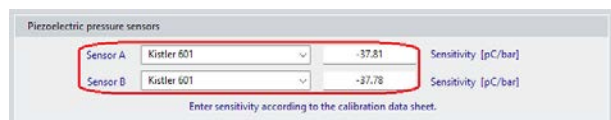
In addition to German and English, many other languages are available for the user interface and test report. If your language is not listed, please contact: info@cesana-ag.ch



Altitude above sea level

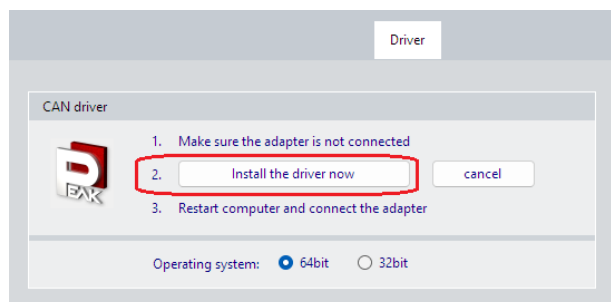
Altitude above sea level of your test site ($\pm 10\text{m}$).

The program's footer displays the current static pressure and the calculated value based on sea level. This value must match the current meteorological data ($\pm 10\text{hPa} = \pm 1\%$).



Pressure sensors

The sensitivity of the pressure transducers can be found in the associated calibration data. (range = 0...5bar or 0...20bar)

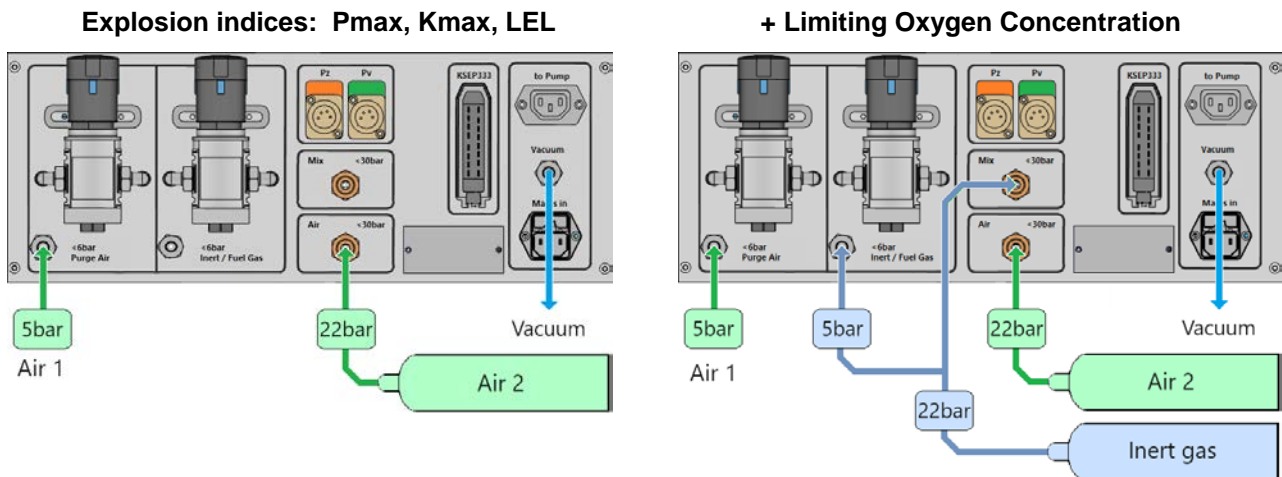


CAN-Driver

You need administrator rights for installation. However, no special rights are required for subsequent use.

Please do not use USB extension cables between the CAN-USB adapter and the PC. This does not comply with the USB standard.

2. Setup - Pneumatics



Air 1 „Purge Air“ (maximum 6 bar,absolute)

This air, usually from the laboratory compressed air network, is used to adjust the gas mixture in the sphere and for cleaning. Adjust to **1 bar** overpressure with the pressure regulator above (display = 1 bar).

Maximum 2 bar overpressure = 3 bar,absolute!

Air 2 „Air“ (22 bar,absolute = 21 bar,relative)

This compressed air is used for the outlet valve and for the dust storage container. The precise storage pressure of 21 bar,absolute is regulated by the system. Therefore, the reduced pressure from the bottle must be slightly higher.



Pressures above **22 bar,absolute** reduce the activation time (td) of the outlet valve. This is not permitted and must be avoided.



Only normal compressor compressed air from bottles may be used. With synthetic compressed air, strongly deviating explosion characteristics are measured.

Inert gas „Mix“ (22 bar,absolute = 21 bar,relative)

This compressed air is used for filling the dust storage container. The precise storage pressure of 21 bar, absolute is regulated by the system. Therefore, the reduced pressure from the bottle must be slightly higher.

Inert gas „Inert / Fuel Gas“ (maximum 6 bar,absolute)

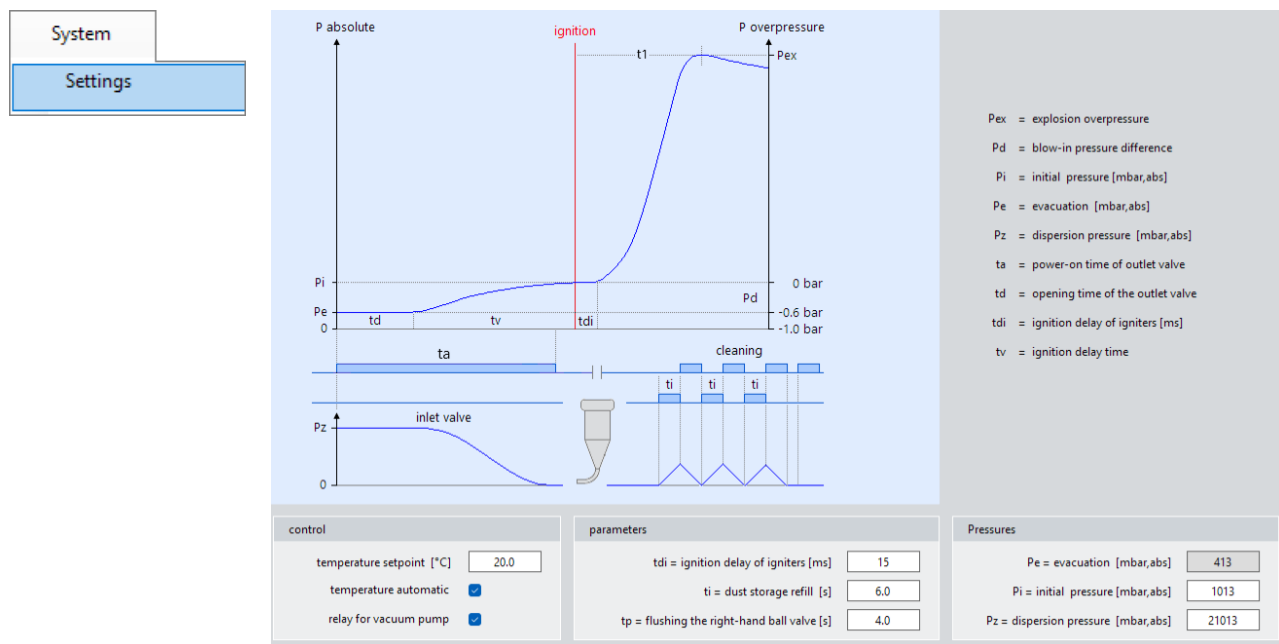
This gas is used to adjust the gas mixture in the sphere. The pressure from the bottle must be further reduced to approx. 5 bar. Then adjust the pressure regulator above it to **1 bar** overpressure (indicator = 1 bar). Maximum 2 bar overpressure = 3 bar, absolute!

Vacuum:

Before the start of each test, the 20-l-apparatus is evacuated in order to obtain normal pressure again (1013 mbar abs.) as the initial pressure for the dust explosion after the subsequent expansion of the dust reservoir air.

Electrical connection of the vacuum pump: This is only switched on automatically when needed.

3. Settings



control temperature automatic: According to ISO/IEC 80079: Initial temperature = **20°C ± 5°C**

Due to the high test frequency, the sphere must be kept at the operating temperature of 20°C by means of water cooling. With an external solenoid valve, the KSE333 can control the jacket temperature of the sphere. This saves a lot of cooling water.

relay for vacuum pump: The vacuum pump is switched on only when required.

parameters tdi = maximum delay: Time delay of the igniters = time difference between the electrical activation of the igniters and the first pressure rise. Adds up to tv and must be controlled. The maximum permissible time delay is defined here. If this is exceeded, an error message is issued..

ti = dust storage refill: Filling time for the dust storage during automatic rinsing.

tp = purge right valve: Flushing time for the right ball valve during cleaning.

pressures According to standards, the following applies: Initial pressure Pi = **1013** mbar. These pressure specifications are calculated automatically as follows and are only to be changed for special test conditions:

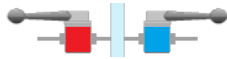
	Pi (Sphere + Dust storage)	Pe (Sphere)	Pz (Dust storage)
Volume x Pressure	20.6L x 1013mbar =	20L x 413mbar +	0.6L x 21'013mbar



If in doubt: restore the recommended factory settings.

4. Preparation

4.1 Static pressure measurement

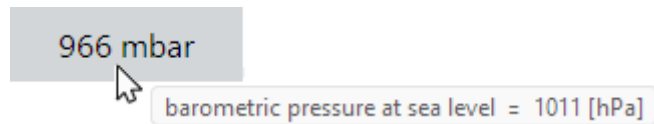


Both ball valves are open. There is ambient pressure in the sphere.

The correct pressure display is easy to check:

The altitude above sea level of your equipment is entered in "Setup". The current static pressure and the calculated value in relation to sea level are displayed in the footer of the program. This value must match the current meteorological data ($\pm 10 \text{ hPa} = \pm 1.0\%$).

Move the mouse pointer onto the display of the static sphere pressure:



4.2 Tightness of the dust storage container

After every major cleaning, the tightness of the dust reservoir and sphere must be checked as follows:



1. Fill the dust reservoir to 20 bar with air. Button „**IN**“.
2. Does the pressure remain constant?
If it drops continuously, the **dust storage is leaking**.
Possible cause: Dirt on the outlet valve.
3. Empty the dust storage with the „**OUT**“ button.
(on-screen or remote-control buttons)

4.3 Tightness of the sphere



1. Evacuate the sphere to 400 mbar. Button „**VAC**“.
(Toggle function: 1 x press = ON, press again = OFF)
2. The pressure remains constant → everything OK
The pressure increases continuously → 3.
(on-screen or remote-control buttons)
3. Close the right-hand ball valve.
4. The pressure now remains constant → **Sphere is leaking**.
5. The pressure increases continuously → **Vacuum filter leaking?**
→ **Connections leaking?**

5. Test check

The explosion characteristics P_{max} and K_{max} are influenced proportionally by the initial pressure P_i .
According to standards: **$P_i = 1013 \text{ mbar} = \text{Normal pressure}$**

5.1 Choice of test procedure:

Test procedure **without dust**
and **without igniters**

procedures	tests
Test check	0
Dust: P_{max} , K_{max}	22
Dust: Lower explosion limit	11
Dust: Limiting oxygen concentration	27

5.2 Automatic preparation:

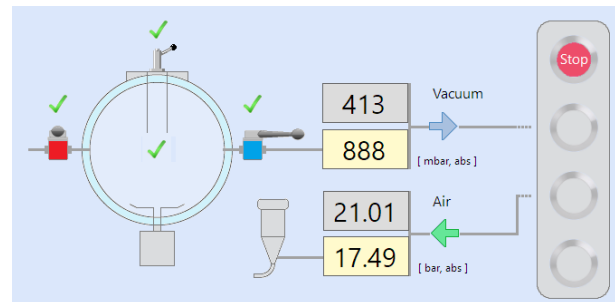
automatic preparation ☒

5.3 Start preparation:

Evacuation of the sphere and filling of the dust container take place in steps. If the set values are not reached after 1 min, the test must be aborted.

→ Sphere leaking?

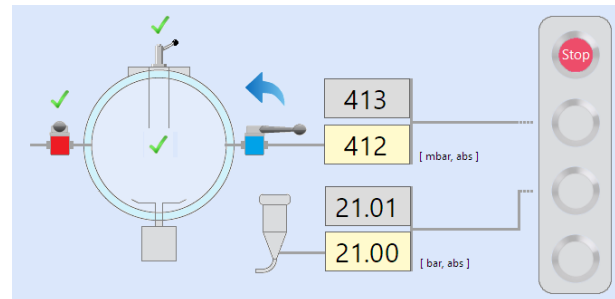
→ Compressed air < 22 bar, absolute?



5.4 Start test:

Close the ball valve and start the test by pressing the OK button on the screen or on the remote control.

Do not wait too long. The pressures may change due to leaks.

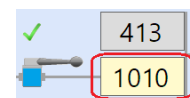
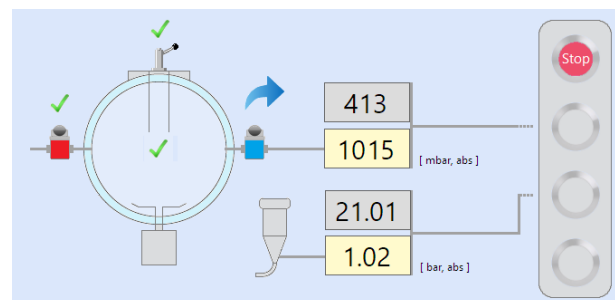


5.5 Check initial pressure P_i :

A theoretical initial pressure is calculated from the measured pressures of the preparation:

check: Initial pressure $P_i = 1013 \text{ mbar}$?

After opening the right-hand ball valve, the effective initial pressure P_i is displayed.



Permissible values for the calculated and effective initial pressure are:

If there are major deviations

leakage is suspected.

$$1013 \text{ mbar} \pm 2\% = 993 \dots 1033 \text{ mbar}$$



If the initial pressure P_i is correct, the calibration chain applies:

Meteodata → Ambient pressure P_v → test check → Dispersion pressure P_z

6. Test procedure

The most complex test procedure is shown here as an example: Limiting Oxygen Concentration (LOC)

6.1 Choice of test procedure:

procedures	tests
Test check	1
Dust: Pmax, Kmax	22
Dust: Lower explosion limit	11
Dust: Limiting oxygen concentration	27

6.2 Settings

O₂ [%] = Oxygen concentration

Inexpensive inert gas cylinders contain a residual oxygen content.

We recommend:

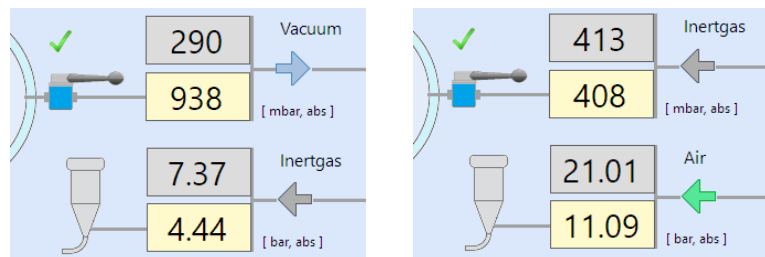
series	[g/m ³]	[g/20 l]	O ₂ [%]	tv [ms]	IE [J]
1	500	10.0	15.0	60	2k

<input checked="" type="checkbox"/> automatic cleaning	inert gas oxygen [%]	1.0	automatic preparation <input checked="" type="checkbox"/>
--	----------------------	-----	---

<input checked="" type="checkbox"/> automatic cleaning	inert gas oxygen [%]	1.0	automatic preparation <input checked="" type="checkbox"/>
--	----------------------	-----	---

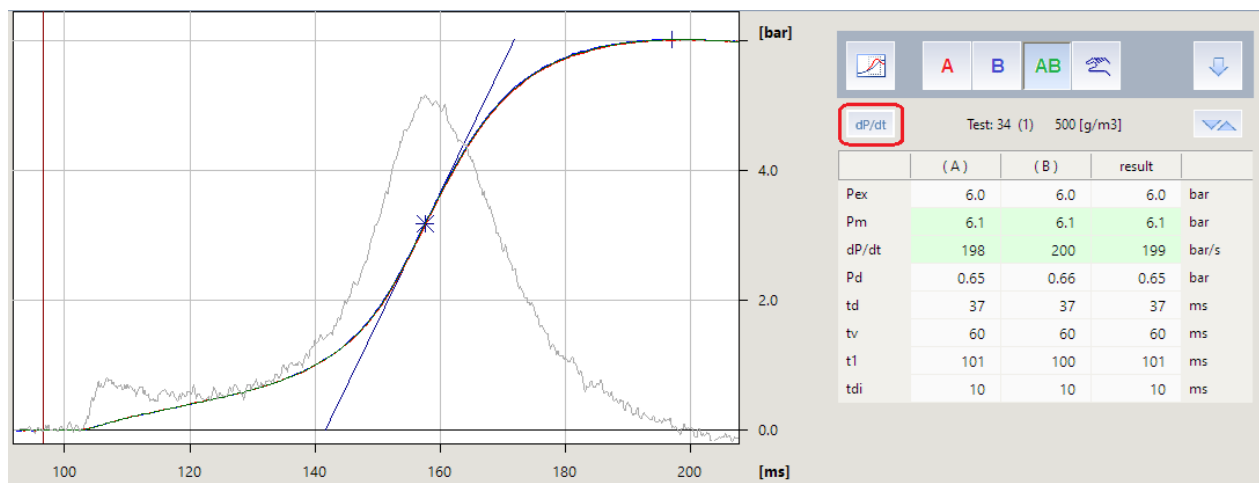
6.3 Preparation

In contrast to previous methods, the same oxygen concentration is created in the sphere and dust storage.



6.4 Testing

Start the test after completing the automatic preparation.



The "dP/dt" button also displays the rate of pressure rise.

6.5 Results of ...

the test

dP/dt	Test: 34 (1) 500 [g/m ³]		
	(A)	(B)	result
P _{ex}	6.0	6.0	6.0 bar
P _m	6.1	6.1	6.1 bar
dP/dt	198	200	199 bar/s
P _d	0.65	0.66	0.65 bar
t _d	37	37	37 ms
t _v	60	60	60 ms
t ₁	101	100	101 ms
t _{di}	10	10	10 ms

the preparation

dP/dt	Test: 34 (1) 500 [g/m ³]		
	setpoint	effective	FS [%]
P _v vacuum [mbar]	296	297	0.1
P _v inert gas [mbar]	413	410	-0.3
P _z air [bar]	21.01	21.07	0.3
P _z inert gas [bar]	6.96	7.02	0.3
P _i calculated* [mbar]	1013	1008*	
oxygen calculated* [vol%]	15.0	15.0*	
inertgas oxygen [vol%]	1.0		
t _a AV power-on [ms]	86		

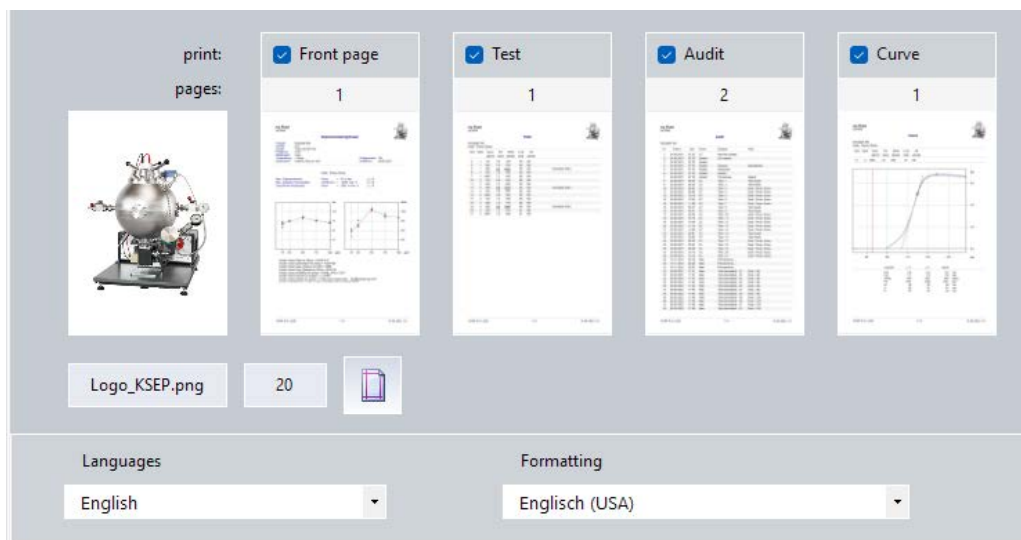
The calculated oxygen concentration (oxygen calculated*) is transferred to the table.

This also applies to the “Hybrid mixture” and “Gas” test methods.

Advantages

- Only one inert gas cylinder is required for all oxygen concentrations.
- The same oxygen concentration is present in the sphere and in the dust storage.
- The absolute pressures measured during preparation are known.
- The calculated oxygen concentration is therefore much more accurate.

7. Report

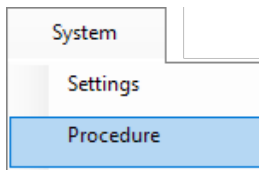


Add your own company logo to the test report. File format = png bitmap

The logo image is automatically reduced to the desired size. It is worth a try.

Regardless of the user's language, the test report can be printed in the customer's language. To do this, select the correct formatting. The date and number format often differ, e.g., the decimal separator can be a period or a comma.

8. Procedures



Grouping the experiments according to test procedures makes it much easier to work with the equipment, as both the test parameters and the graphical representations vary greatly.

of the current KSEP file

for a new KSEP file

2 **Dust: Lower explosion limit**

ignition source: chemical igniters

IE: 2k

tv [ms]: 60

Fuel: Dust

Parameter (XPar)

name:

unit:

maximum:

Criterion: no ignition

Pex [bar]: 0.5

Pm [bar]: 0.2

Inertgas:

Calculate

☐ Pmax

☐ dP/dt

☐ Kmax

☐ t1 min

☒ LEL

☐ LOC

Pm

dP/dt

Conc.

Conc.

Test

mean

maximum

interpolate

linear



The default values comply with CEN regulations. Adjustments to ASTM - LEL/MEC, for example, can be easily made here.

For the **1m3 vessel** with an electro-pneumatic valve, the standard ignition delay time $t_v = 600\text{ms}$ must be adjusted to the valve.

current KSEP-File The test parameters of the currently active file are displayed and can be adjusted. Changes are transferred directly to the file.

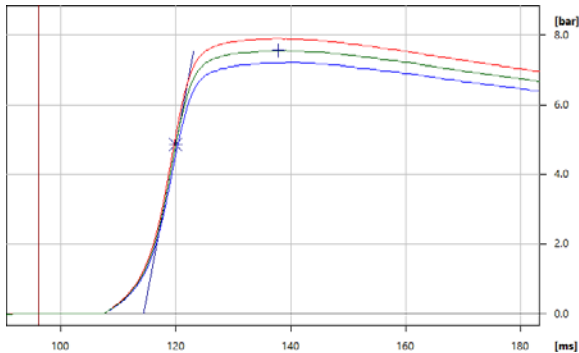
new KSEP-File These are the general test parameters. These parameters are automatically applied to each new test.



Return to the CEN settings.
(only for "new KSEP file")

9. Error in pressure measurement

9.1 Calibration error



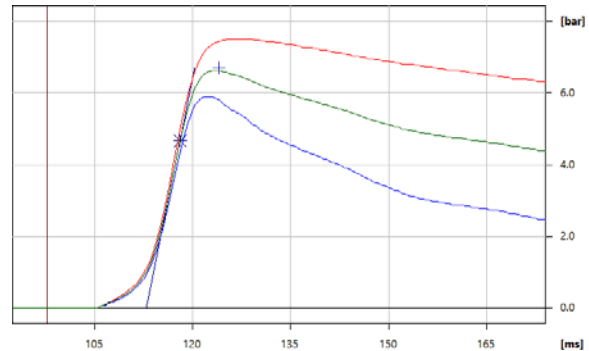
Have the pressure transducers been interchanged by mistake? Do the settings of the calibration data match the calibration sheet?

Piezoelectric pressure sensors

Sensor A	Kistler 601	-37.81	Sensitivity [pC/bar]
Sensor B	Kistler 601	-37.78	Sensitivity [pC/bar]

Enter sensitivity according to the calibration data sheet.

9.2 Error due to drift



Dirty insulators in the plug-in connections of Kistler piezoelectric pressure transducers cause a drift in the charge signal.

Check

IO-Port

Flow rate

Piezoelectric

channel:	A	B	
maximum:	0.06	0.03	bar
current:	0.06	0.02	bar
minimum:	0.00	0.00	bar
drift:	0.06	0.03	bar/min

Limit for drift = 1bar/min = 0.05bar/3s

→ □

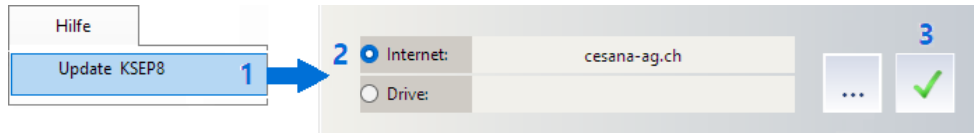
This test program measures the drift. If this is too large, the channel is displayed in red.

Recommendation: rinse the connectors with a cleaning spray (Kistler No. 1001A).

10. Update KSEP8

The “**Update**” menu is only available to users with administrator or service rights.
The update is performed automatically. Existing software settings are retained.

A Your PC is connected to the internet. The update can be carried out immediately:



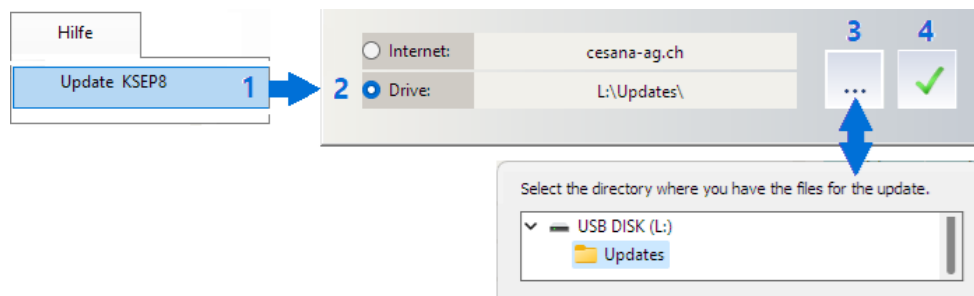
B Your PC is not connected to the internet::

Send an e-mail to: info@cesana-ag.ch

You will receive a link from us for downloading the file(s).

Extract the file “**CAG_Updates.zip**” into a temporary directory or on a USB stick.

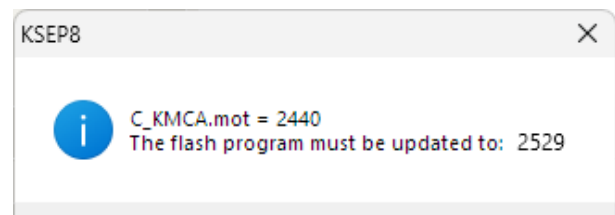
1. Start the update in the MIKE program.
2. Select “**Drive**” as the update source.
3. Search for the “**Updates**” directory.
4. Start the update.



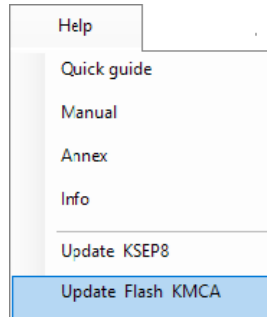
Participants in the annual CaRo calibration ring trial receive a USB stick with the latest software updates. Then enter the directory with the USB stick, e.g. **L:\Updates** in the **Drive** field and start the update.

11. Flash Programming

If the following message appears after an update, the flash program needs to be updated.



Update Flash only visible to administrators.



1. Search for the Flash file **C_KMCA.mot**

Status	PCB-Platine	Dateinamen	Revision
Aktuell	KMC81A	C_KMCA	2440

2. Open the latest flash file

Dateinamen	Datum	Grösse
C_KMCA.mot	19.07.2025	113 KB

3. Compare revision data and program this file if it is newer.

Status	PCB-Platine	Dateinamen	Revision
Aktuell	KMC81A	C_KMCA	2440
neu	KMC81A	C_KMCA	2529

Dateinamen	Zeilen geladen	Zeilen geschrieben	Zeit
C_KMCA.mot	2351	0	00:00

Status	PCB-Platine	Dateinamen	Revision
Aktuell	KMC81A	C_KMCA	2440
neu	KMC81A	C_KMCA	2529

Dateinamen	Zeilen geladen	Zeilen geschrieben	Zeit
C_KMCA.mot	2351	505	00:24



PCB board and file names must be of the same type.

Revision: Year / Calendar week