VERIFICATION MANUAL

MV 5011 EN A

FLEXICOMPT AUTONOME+

A	2016/07/04	Creation	XS	SR
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CONTENTS

1 INTRODUCTION

The calibration may be done with different type of prover.

The most common one is a tank prover (calibrated gauge).
We recommend using a gauge capacity of 2000L.

The calibration procedure consists of making **several similar gravity discharges of a fixed volume** through the FLEXICOMPT AUTOMONE+ (FA+). **The pipe upstream of the FA+ must be a straight pipe of 3'' diameter or more. The length of the upstream pipe must be at least 10 times the diameter of the pipe. No devices which affect the flow rate must mount on the straight pipe.**

The K factor of the FA+ meter may be adjusted by a qualified and authorized operator after a minimum of three partial discharges and of satisfactory repeatability.

Partial discharge: The discharge starts by opening the discharge valve just upstream to the FA+. By closing this valve it ends the discharge. The valve is closed before the upstream line becomes empty.

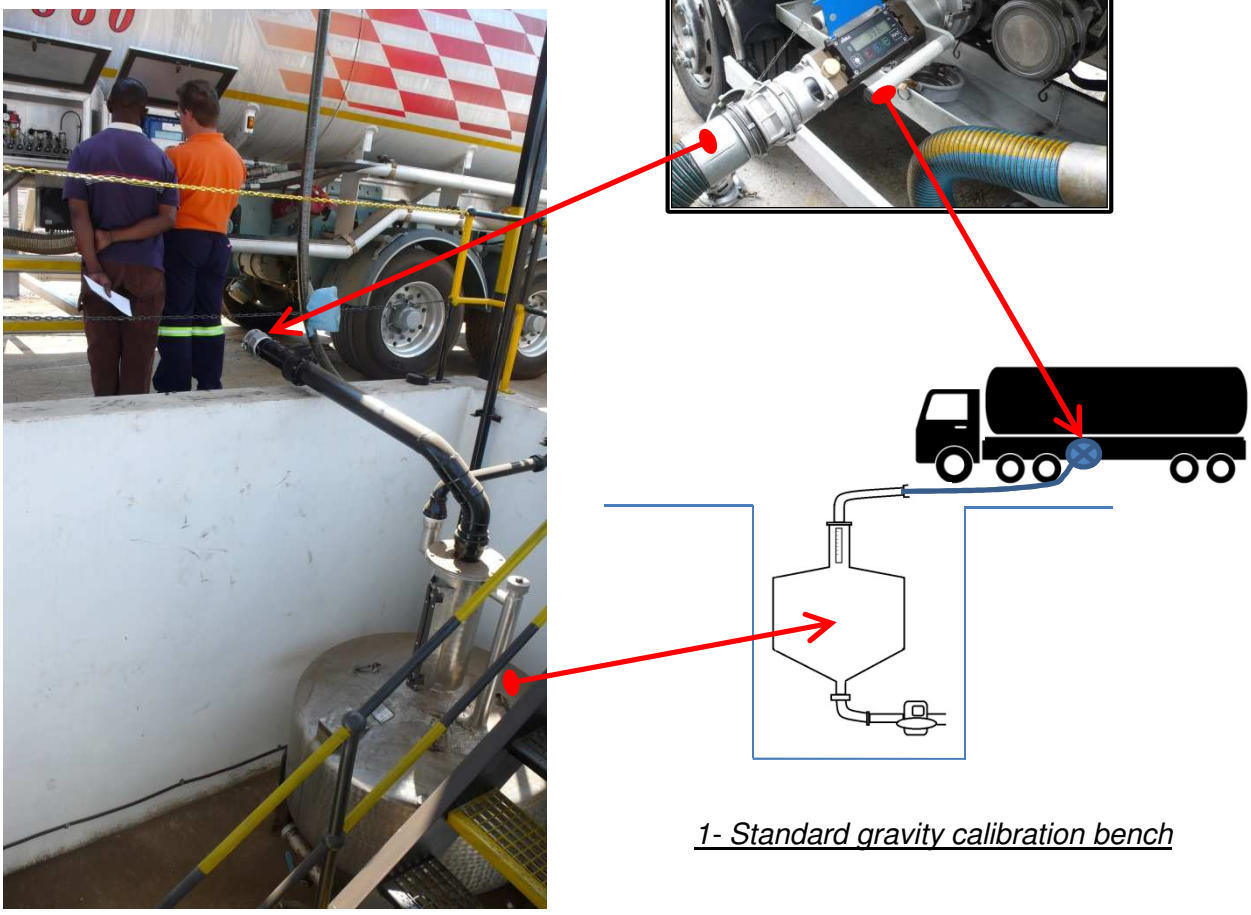
Complete discharge: The discharge starts by opening the discharge valve just upstream to the FA+. The discharge ends when the tank/compartment is empty.

Each discharge must be performed carefully following the same precise instructions.

Calibration bench examples:

The FA+ is connected to a discharge valve of a tank truck which is filled with product to perform partial discharges. For example, fill completely a 3000L tank truck compartment and only discharge 2000L in the tank prover.

The accuracy of the tank prover must be at least +/-0.15% to adjust the FA+.



1- Standard gravity calibration bench

Other calibration installations:

2 - FA+ after the tank prover

In this example, the FA+ is installed at the outlet of the tank prover. This calibration bench only allows complete discharges. In such a case, the FA+ may be adjusted after several complete discharges around +/-3‰.

The size of the tank prover may reduce the error. The bigger the tank prover is, the best is the accuracy.

Remark:

The volume error due to the mix of air at the end of the discharge is very similar for a specific FA+ whatever the volume of the complete discharge. That means that this error is minimized when the discharge volume increase.

Ex: 4L error in 2000L or 20 000L due to the end of measurement is 0.2% or 0.02%.

In this example, the calibration is done thanks to a master meter. The line is always full of product. Only partial discharge must be done. The adjustment of the FA+ may be done close to +/-1‰ depending the accuracy of the master meter used.

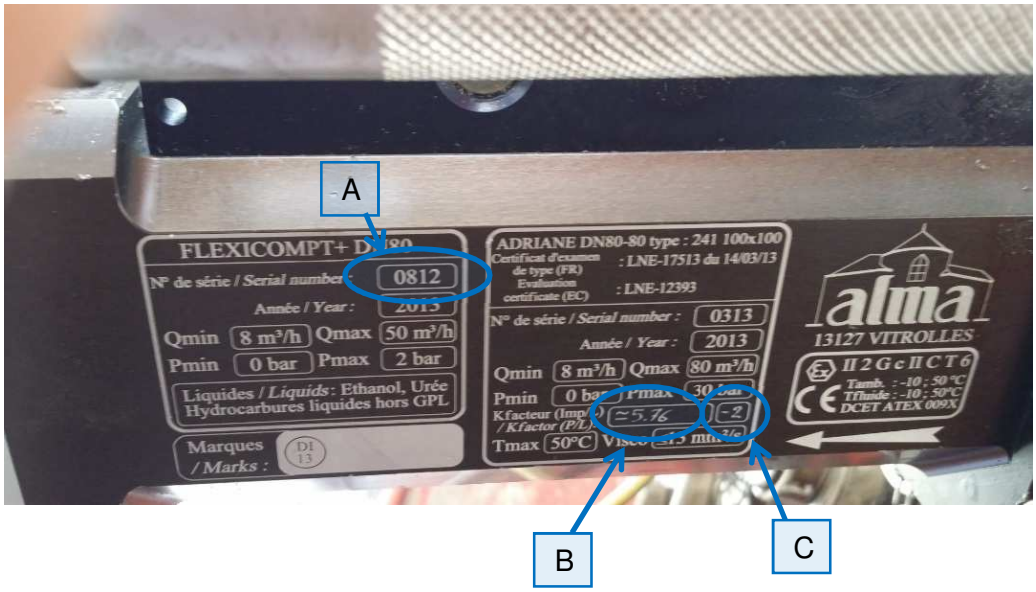
NOTE: the accuracy of the master meter must be at least +/-0.15%.

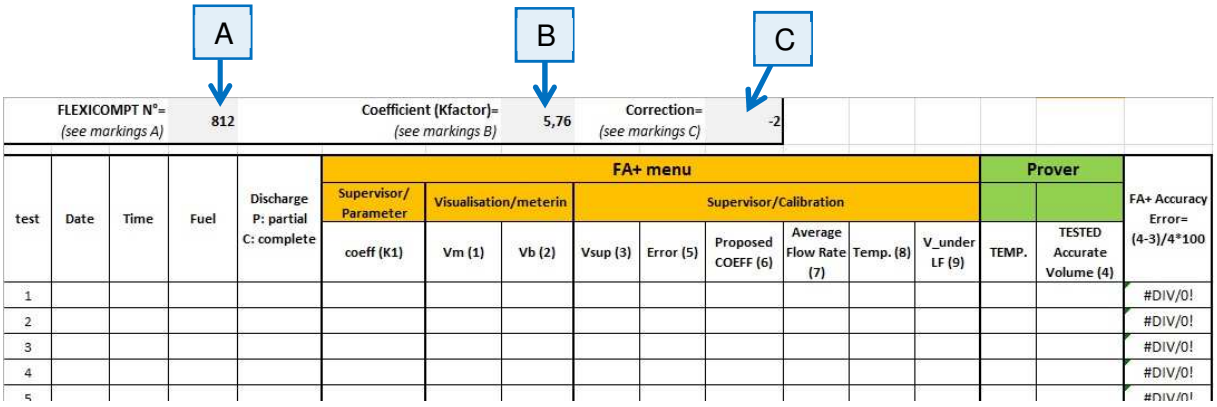
3 - FA+ before a master meter

Please contact ALMA for any help regarding the calibration bench.
Send us pictures of your calibration bench to get the best advice you need.

2 PREPARATION PHASE

2.1.Respect all the security and safety rules.
2.2.Check the visual appearance of the FA+. Make sure there are no visible marks or default.
2.3.Note in the calibration report (ANNEXE 2) the **reference number** A , **the coefficient** (Kfactor) B and the **correction** factor (kV) C of the FA+. (See pictures below)

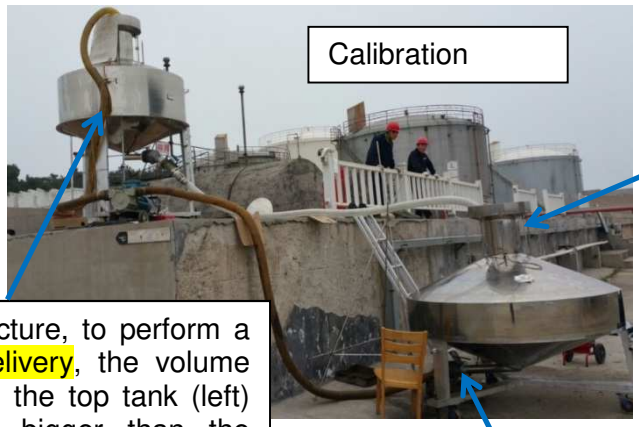


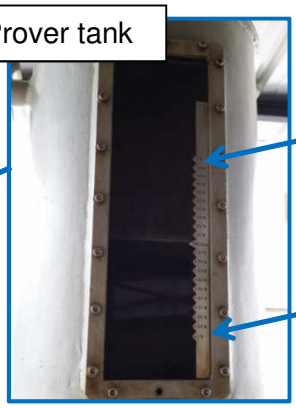


ALMA calibration report (Excel file)

2.4.Check the calibration bench:

- ⇨ Make sure there is no leak
- ⇨ Use the relevant connection fittings to connect the FA+ to the discharge valve and to the flexible pipe.
- ⇨ Make sure the discharge valve can be operated easily
- ⇨ Check the maximum gauge(s) capacity and the range of readable value (min and max)
- ⇨ Make sure the tank prover is empty.





In this picture, to perform a partial delivery, the volume loaded in the top tank (left) must be bigger than the maximum readable value of the prover tank (right).

A sight glass to control if the gauge is empty

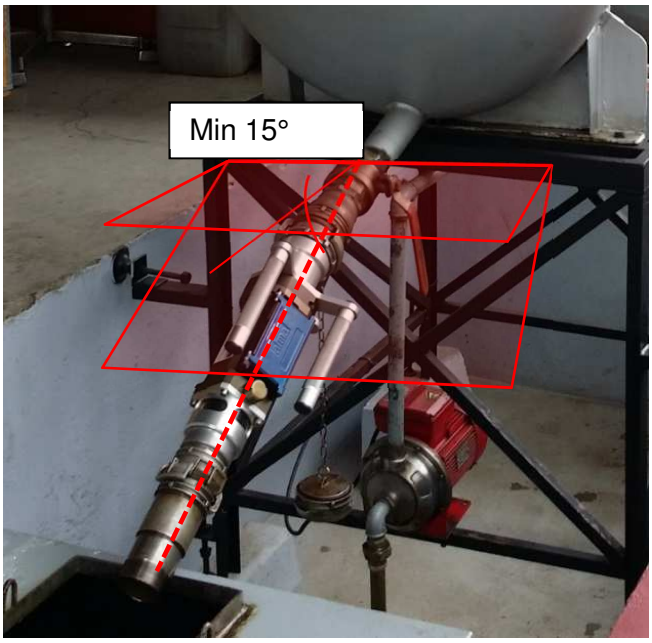
3 BEFORE CALIBRATION TEST

The first discharge test has to be done to stabilize the temperature on the entire calibration bench: pipes, meter, prover tank… **The test result must not be taken into account.**

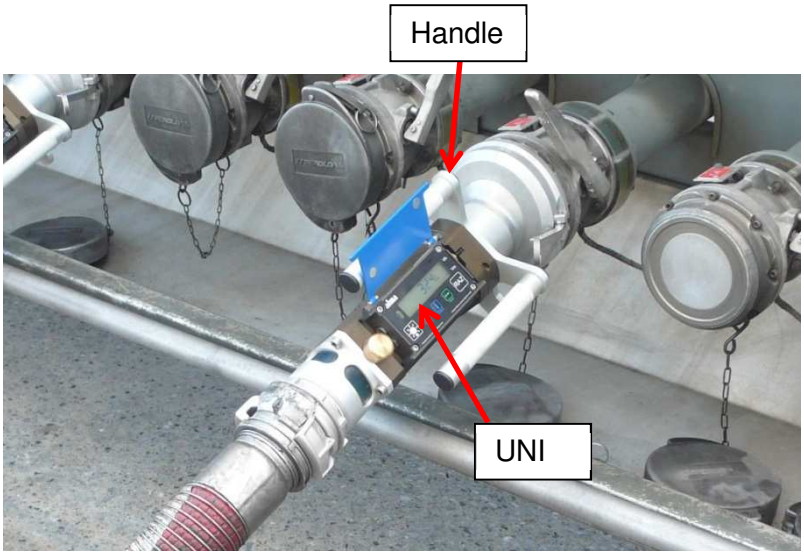
3.1. Install the FA+ on the discharge valve.

3.2. Respect the positioning of the FA+:

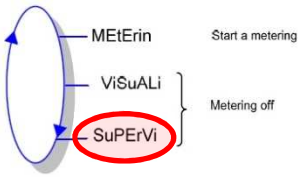
⇨ Slope: minimum 15° from the horizon

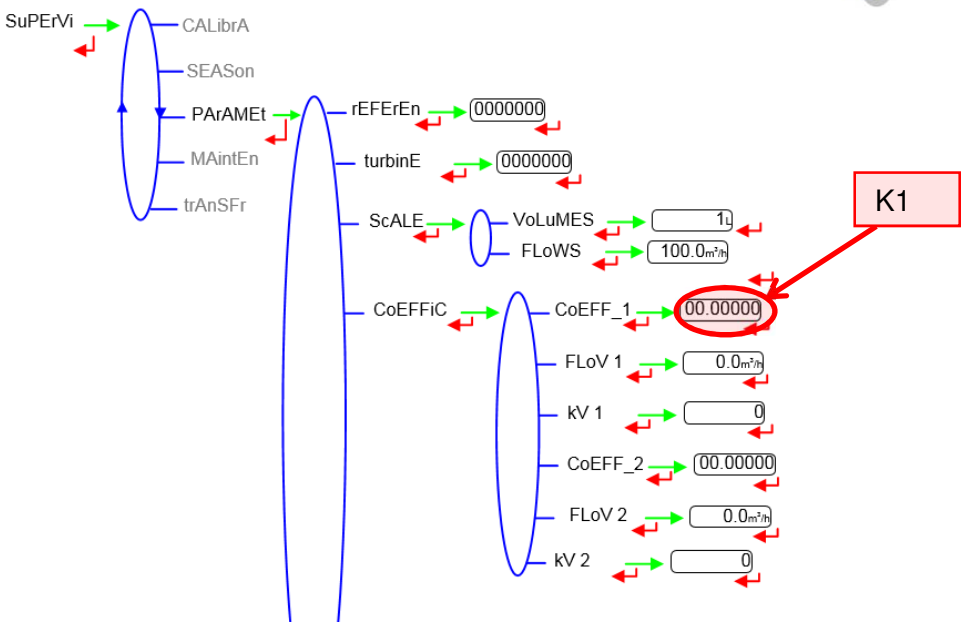


⇨ Rotation: the left handle must be in the highest position, turn the FA+ until this handle is on top. The UNI calculator is rotated by 45°.

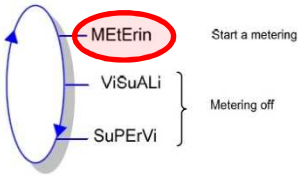


3.3.Check the current coefficient K1 set in the UNI of the FA+ and enter the value in the EXCEL calibration report (See 3.11)
Select the SUPERVISOR menu and choose PARAMETER

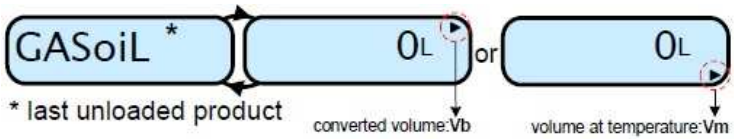




3.4.Press several times (x5) on MODIF until you return to the METERIN menu



3.5.Press RAZ to reset to zero liter. The display must be like this:



3.6.Select the product with SELECT.

3.7.Start the discharge by opening the discharge valve completely.

3.8.Close the discharge valve when the tank prover volume is reached (2000L for example).

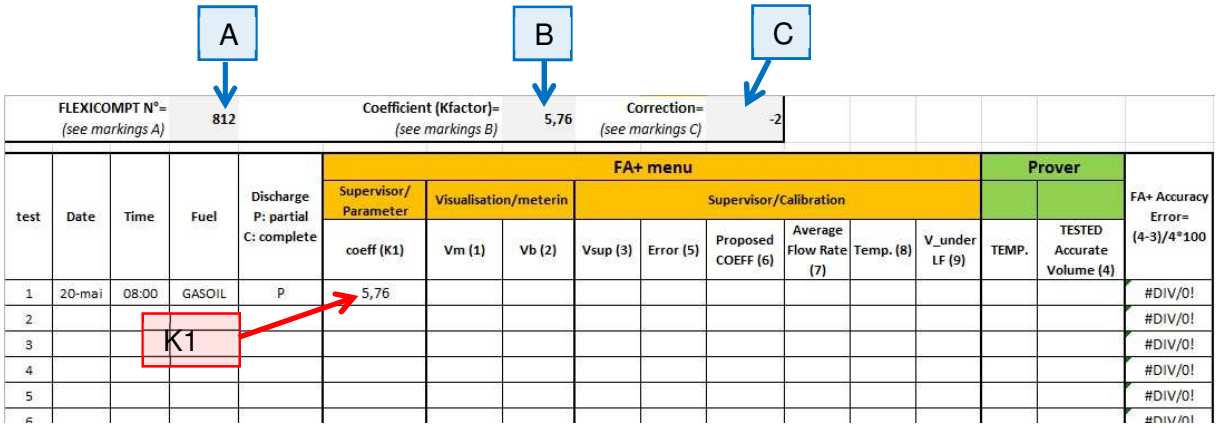
3.9.Wait until the volume displayed by the UNI is flashing and press RAZ to reset to zero the FA+.

3.10.Prepare the calibration bench for a **partial** discharge:

⇨ Empty the tank prover.

⇨ Fill the top tank with its maximum volume capacity.

3.11.Prepare the EXCEL calibration report



4 CALIBRATION TEST

4.1 PARTIAL DISCHARGE

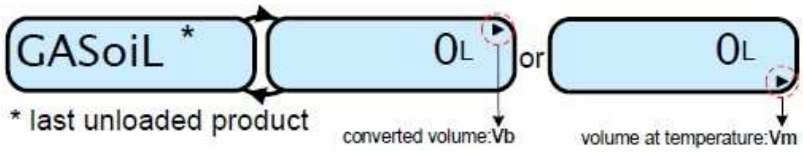
The volume loaded in the top tank must be bigger than the maximum readable visible of the tank prover (See chapter 2.4).

The discharge valve must be opened and closed quickly and always in the same way during all the discharge tests.

The operator must close the discharge valve before the appearance of air (or turbulence) upstream to the FA+. The pipe upstream to the FA+ must be kept full of product.

The FA+ is in the METERIN menu:

4.1.1.Press RAZ to reset to zero liter. The display must be like this:



4.1.2.Select the product.

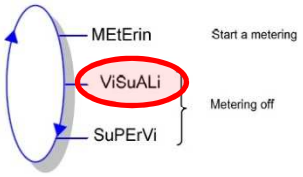
4.1.3.Start the discharge by opening the discharge valve completely.

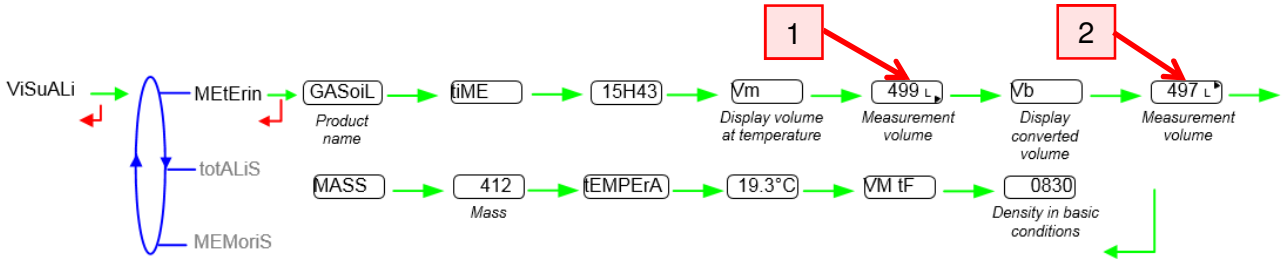
4.1.4.**Before the appearance of air**, stop the discharge by closing the discharge valve

Note: The discharged volume must be enough to be visible within the filling gauge.

4.1.5.Press RAZ to reset to zero the FA+ when the volume displayed by the UNI is flashing (end of measurement). This measurement is recorded in the FA+.

4.1.6.Enter the VISUALISATION menu and choose METERIN to see **Vm** and **Vb** (See §4.3.1 of the MU7033)

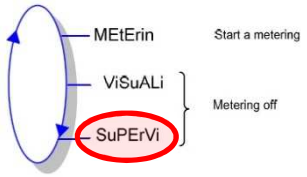


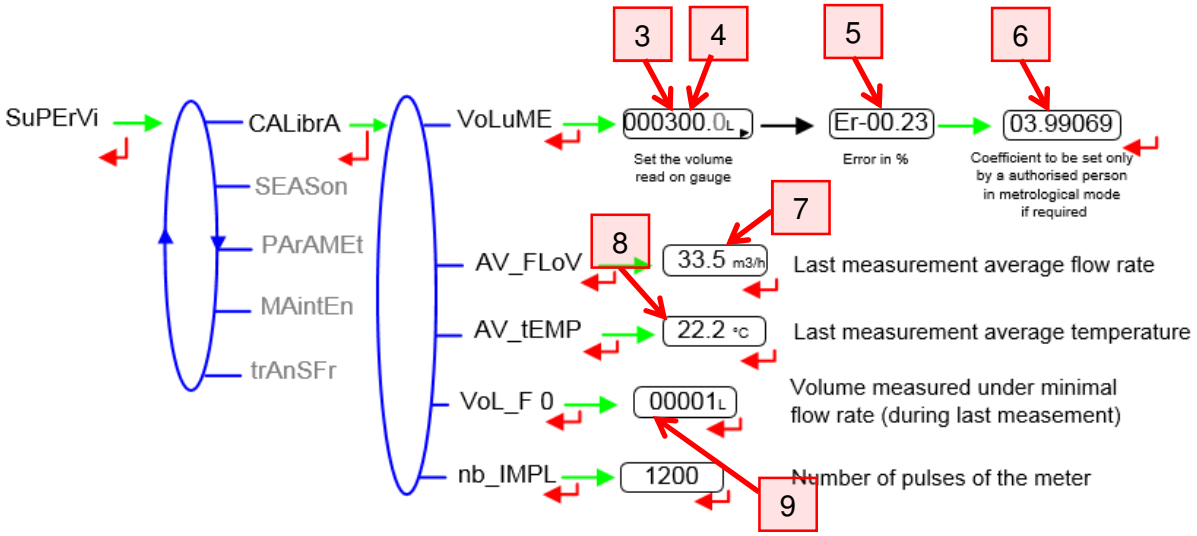


Press VALID: note the value of the gross volume Vm in liter 1 in the EXCEL calibration report.

Press VALID: note the value of the converted volume Vb in liter 2 in the EXCEL calibration report.

4.1.7.Enter the SUPERVISEUR menu and choose CALIBRATION and then VOLUME to see and note all the details of the last measurement (See §4.3.1 of the MU7033)





Press VALID: note the value of **the gross volume in deciliter** 3 in the EXCEL calibration report.

Press VALID: indicate the prover volume 4 and note it in the EXCEL calibration report.

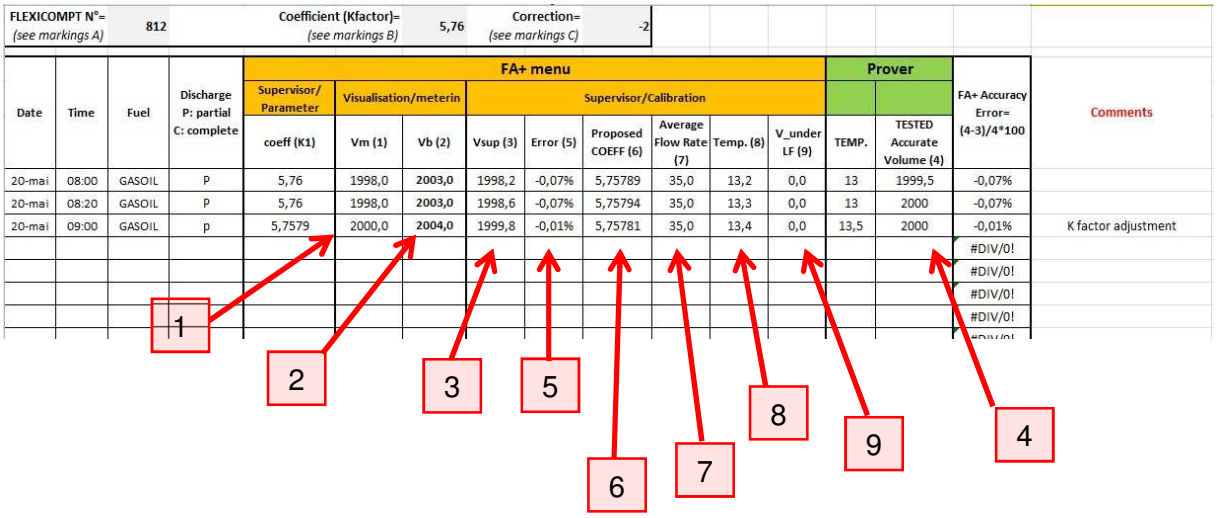
Press VALID: note the value of error in % 5 in the EXCEL calibration report.

Press VALID 2 times: note the proposed coefficient % 6 in the EXCEL calibration report.

Press MODIF and SELECT to select AV_FLOV and Press VALID: note the value of average flow rate 7 in the EXCEL calibration report.

Press MODIF and SELECT to select AV_TEMP and Press VALID: note the value of average temperature 8 in the EXCEL calibration report.

Press MODIF and SELECT to select VOL_F 0 and Press VALID: note the value of volume 9 in the EXCEL calibration report.



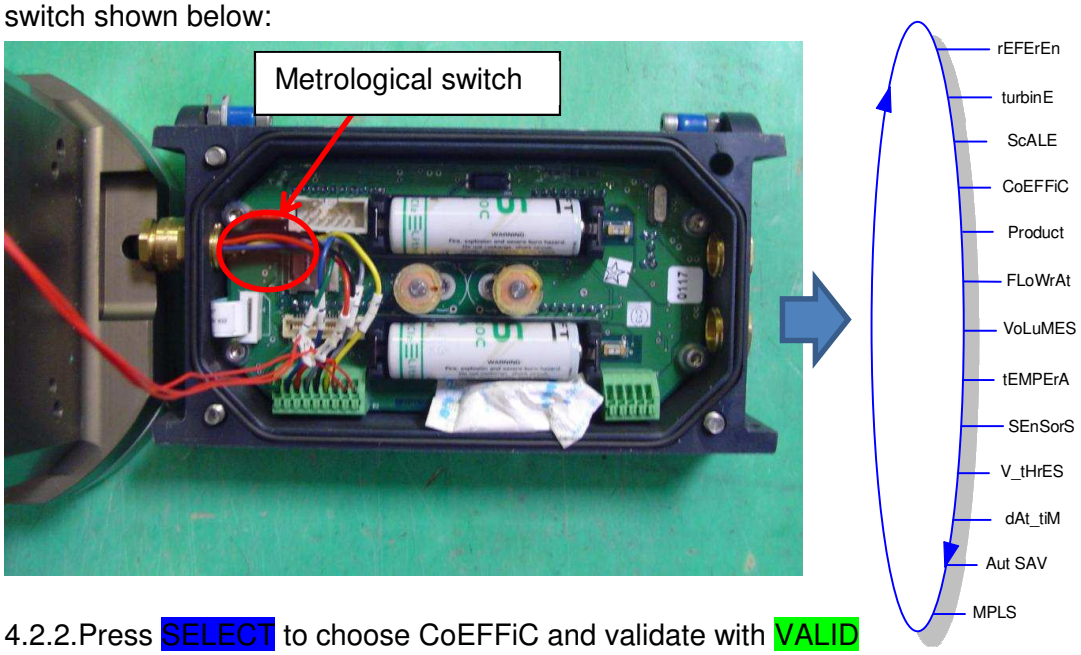
FLEXICOMPT N°= (see markings A)	812			Coefficient (Kfactor)= (see markings B)	5,76		Correction= (see markings C)	-2						
				FA+ menu								Prover		
Date	Time	Fuel	Discharge P: partial C: complete	Supervisor/ Parameter	Visualisation/meterin		Supervisor/Calibration							FA+ Accuracy Error= (4-3)/4*100	Comments
				coeff (K1)	Vm (1)	Vb (2)	Vsup (3)	Error (5)	Proposed COEFF (6)	Average Flow Rate (7)	Temp. (8)	V_under LF (9)	TEMP.	TESTED Accurate Volume (4)	
20-mai	08:00	GASOIL	P	5,76	1998,0	2003,0	1998,2	-0,07%	5,75789	35,0	13,2	0,0	13	1999,5	-0,07%	
20-mai	08:20	GASOIL	P	5,76	1998,0	2003,0	1998,6	-0,07%	5,75794	35,0	13,3	0,0	13	2000	-0,07%	
20-mai	09:00	GASOIL	p	5,7579	2000,0	2004,0	1999,8	-0,01%	5,75781	35,0	13,4	0,0	13,5	2000	-0,01%	K factor adjustment
															#DIV/0!	
															#DIV/0!	
															#DIV/0!	
															#DIV/0!	

4.2 COEFFICIENT ADJUSTEMENT

If necessary the coefficient K1 can be adjusted to meet the accuracy required. Several discharge tests must be performed to confirm the need of a coefficient adjustment.

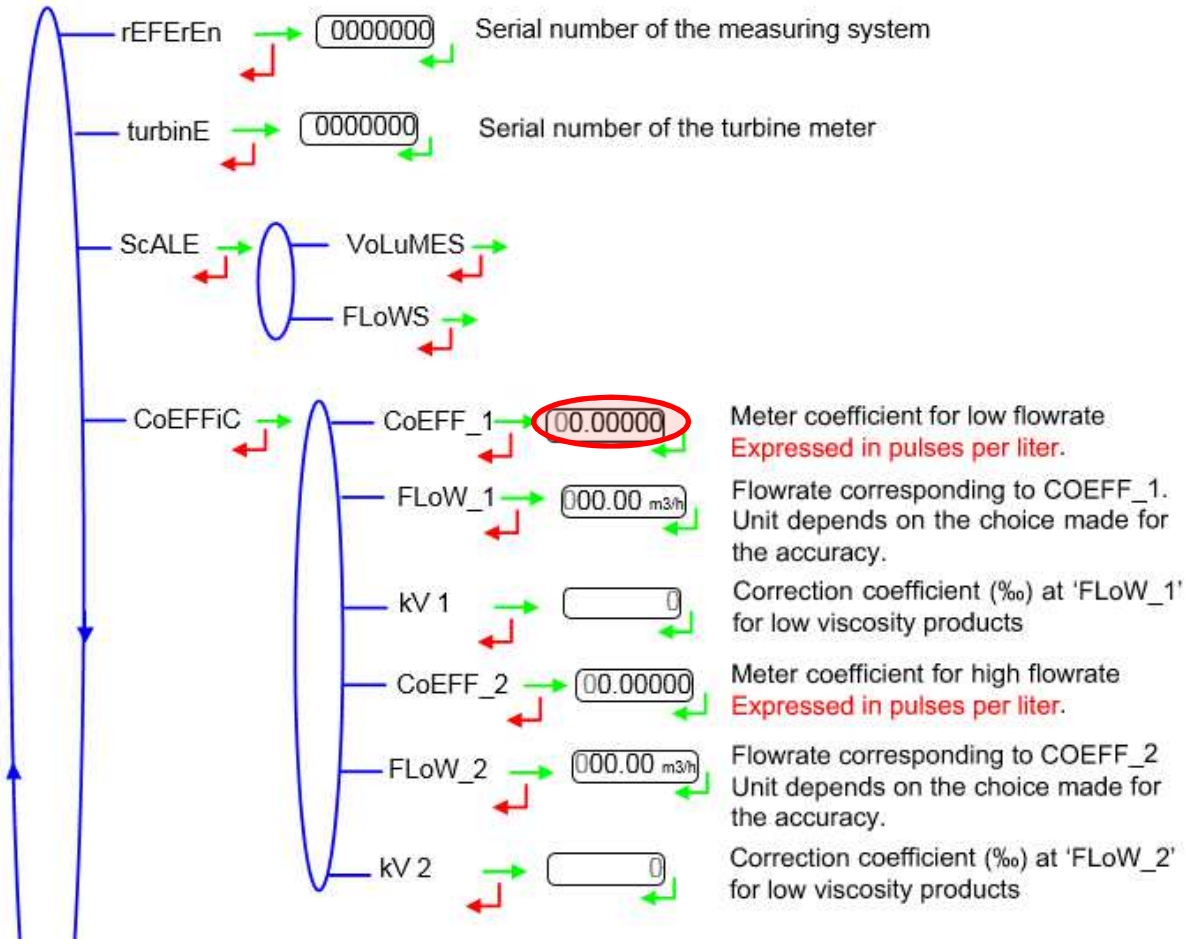
The K factor of the FA+ meter may be adjusted by a qualified and authorized operator only.

4.2.1.Open the indicator (4 screws), then enter the METROLOGICAL mode with the switch shown below:



4.2.2.Press SELECT to choose CoEFFiC and validate with VALID

4.2.3.CoEFF_1 is displayed, validate with VALID



4.2.4. Set the coefficient (K1) previously calculated with MODIF to change a digit and with SELECT to select another digit and validate with VALID

Note:

If the coefficient increases, the volume measured on the next discharge will decrease

If the coefficient decreases, the volume measured on the next discharge will increase

4.2.5. Switch back the metrological red switch to exit the METROLOGICAL menu

4.2.6. Replace the UNI calculator and make sure the O ring is well positioned and no wires are pinched or damaged. The wires must be placed in an empty area (not under the battery cells or under the electrical coil.

4.2.7. Make partial discharge(s) to verify the accuracy (Return to chapter 4.1)

4.3 COMPLETE DISCHARGE

Complete discharge may be done to control the accuracy during a complete discharge. The accuracy and the repeatability may be affected compares to a partial discharge test. It should not be used to modify the coefficient K1. (Unless

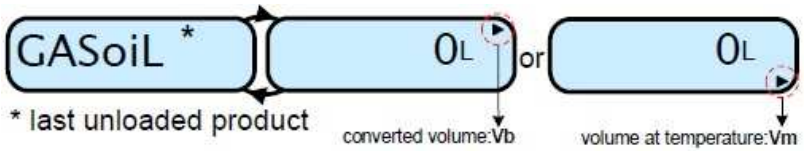
the calibration test allows only complete discharge like example n°2 described in page 3)

This test is done by completely discharge the top gauge in the filling gauge. The volume loaded in the top gauge must be within the readable value of the filling gauge.

Ex: Load 2000L in the top gauge, is the range of the readable value of the filling gauge is from 1990L to 2010L

The FA+ is in the METERIN menu:

4.3.1. Press RAZ to reset to zero liter. The display must be like this:



4.3.2. Select the product.

4.3.3. Start the discharge by opening the discharge valve completely.

4.3.4. Keep the discharge valve open until the measurement ends.

4.3.5. When the measurement ends and the display is flashing with the volume and the fuel name, close the discharge valve.

4.3.6. Press RAZ to reset to zero the FA+. This measurement is recorded in the FA+.

4.3.7. Follow chapter 4.1.6 & 4.1.7 and note that results in the EXCEL calibration report.

Remark:

The volume error due to the mix of air at the end of the discharge is very similar for a specific FA+ whatever the volume of the complete discharge. That means that this error is minimized when the discharge volume increase.

Ex: 4L error in 2000L or 20 000L due to the end of measurement is 0.2% or 0.02%

4.4 TEST WITH GASOLINE

4.4.1 PARTIAL DISCHARGE

This test allows checking the accuracy of the FA+ with gasoline (low viscosity products)

Follow the procedure of the chapter 4.1 **but select a low viscosity product**, e.g. Gasoline, Unleaded (density of the product must be less than 750kg/m3)

4.4.2 CORRECTION FACTOR ADJUSTEMENT

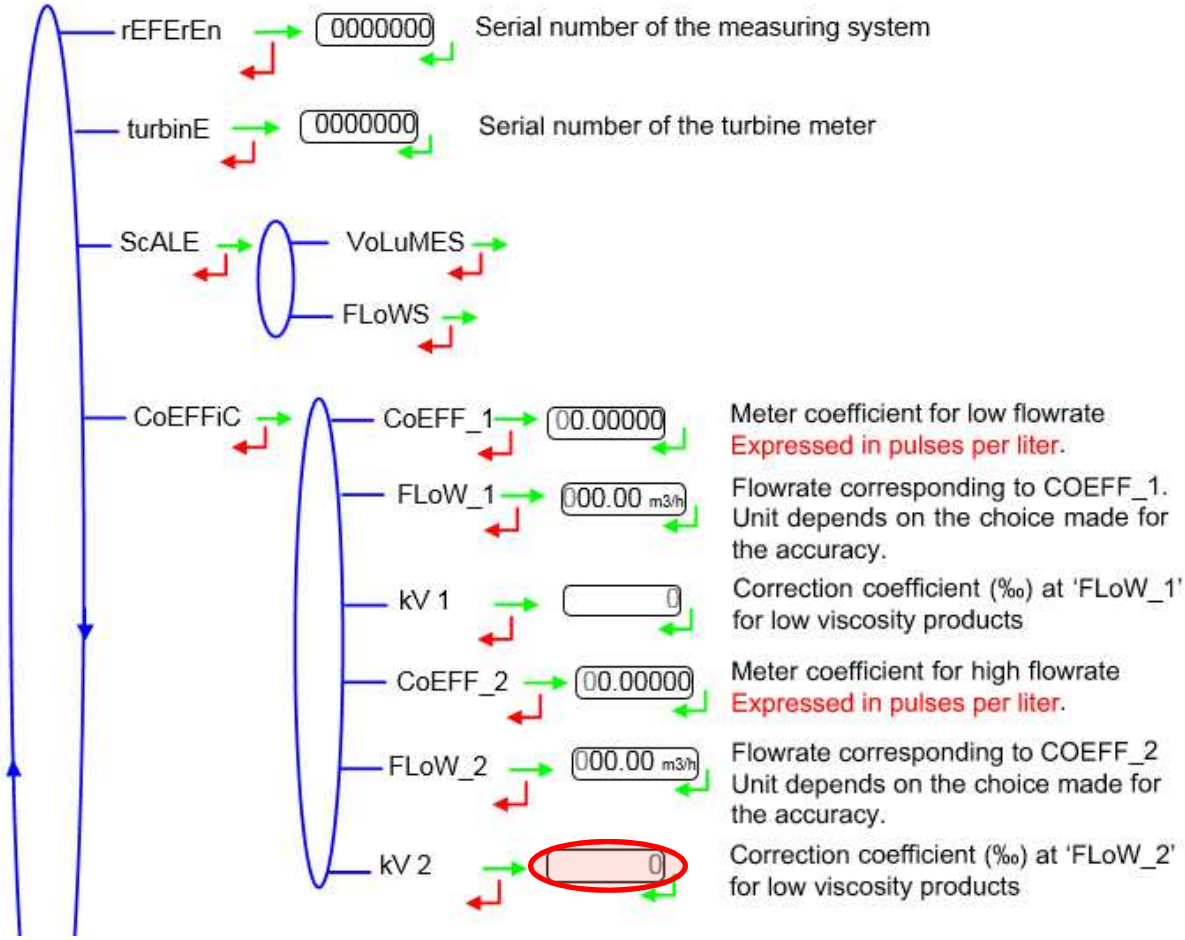
If necessary the **correction factor (kV) can be adjusted** to meet the accuracy required with gasoline.

Don't modify the coefficient K1.

4.4.2.1. Open the indicator (4 screws), then enter the METROLOGICAL mode with the switch (See chapter 4.2.1)

4.4.2.2. Press SELECT to choose CoRRECT or kV and validate with VALID

4.4.2.3 CoEFF_1 is displayed, validate with VALID



4.4.2.4. The correction factor (in ‰) can be adjusted with MODIF to change the digit from -4‰ to 4‰ and with SELECT to select the negative sign before the digit ("-" or blank) and validate with VALID

Note:

If the correction factor increases, the volume measured on the next discharge will decrease, e.g. "1" will increase the volume about 1‰

If the correction factor decreases, the volume measured on the next discharge will increase, e.g. "-3" will decrease the volume about 3‰

4.4.2.5. Switch back the metrological red switch to exit the METROLOGICAL menu

4.4.2.6. Replace the UNI calculator and make sure the O ring is well positioned.

4.4.2.7. Make partial discharge(s) to verify the accuracy. (return to chapter 4.4.1)

ANNEXE 1: Recommended practices for calibration test

The repeatability of the tests performed could be optimized. All action or effect which may affect the measurement must be avoided.

- ⇨ Use clean product. No dirt.
- ⇨ Make sure the filter of the FA+ is clean
- ⇨ Wait between 2 tests that the “foam”, created when the product is pumped back into the top gauge, disappear
- ⇨ Open quickly (1 time only) the discharge valve and close it quickly (1 time only)
- ⇨ Don’t regulate the flow rate during the discharge
- ⇨ Don’t try to reach exactly a specific volume by opening several times the discharge valve or by closing slowly the discharge valve to slow down the flow rate
- ⇨ Try to repeat as close as possible the same discharge procedure:
  - Wait the same time all the times:
    - ❍ Until the foam disappear
    - ❍ Until the filling gauge is consider as empty
    - ❍ Until the top gauge is empty (ONLY FOR COMPLETE DISCHARGE TEST)
  - Discharge the same volume
- ⇨ Don’t take into account the first discharge test or the test after a pause bigger than 2h.
- ⇨ Eliminate all test results which includes a “failure” or “mistake” or “leak” during the discharge

ANNEXE 2: ALMA FLEXICOMPT AUTONOME+ calibration report

Fill the Excel file ‘MV 5011 ANNEXE 2 rev1.xls’