INDEX

A. Becoming acquainted with K200 METER: General

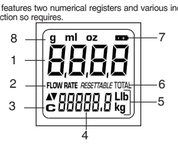
K200 METER is an electronic grease meter based on oval gears measuring system, developed for an easy and exact measurement of the grease
K200 METER is studied in particular to be directly installed on lines of distribution of grease.
An electronic board provided with a microprocessor allows the display management and the calibration of the device.
The oval gear measuring principle adopted offers high precision and low pressure losses together with a compact lightweight design and easy installation.
An electronic card with microprocessor permits control of the display and calibration of the meter.
The user can choose between two different operating modes:
- Normal Mode: Mode with display of Partial and Total dispensed quantities
- Flow Rate Mode: Mode with display of Flow Rate, as well as Partial dispensed quantity.

K200 METER features a non-volatile memory for storing the measuring data of the totals, even in the event of a complete power break for long periods.

The measurement electronics and the LCD display are fitted in the top part of the meter, isolated from the fluid-bath measurement chamber and sealed from the outside by means of a cover

A.1 LCD Display

The "LCD" of K200 METER features two numerical registers and various indications displayed to the user only when the applicable function so requires.



Key:
1 Partial register (4 figures with moving comma: 0.0 ÷ 9999), indicating quantity dispensed from when the RESET button was last pressed;
2. Indication of Flow Rate mode
3 Indication of calibration mode;
4 Totals register (6 figures with moving comma 0.0÷999999), that can indicate two types of Total:
- 4.1 General Total that cannot be reset (TOTAL)
- 4.2 Resettable total

5 Indication of unit of measurement of Totals: kg = kilograms; L=Litres; lb= pounds
6 Indication of type of total, (TOTAL / RESETTABLE TOTAL);
7 Indication of battery charge;
8 Indication of unit of measurement of Partial: g = grams; ml = millilitres; oz = ounces

A.2 User Buttons

K200 METER features two buttons (RESET and CAL). The main functions performed are:

- for the RESET key, resetting the partial register and Resettable Total
- for the CAL key, entering instrument calibration mode and, for some versions, "Flow Rate" activation mode

A.3 How K200 METER Works

K200 METER's metering system is based on a measuring chamber that contains two oval gears that, when rotating, generate electric impulses which are detected and processed by a microprocessor.
The gears are made to turn by the grease flowing through the chamber. The volume of grease that flows through is calculated by the number of gear rotations, given that each rotation corresponds to an identical amount of grease. The magnetic coupling, between the magnets installed on the gears and a magnetic switch outside the measurement chamber, ensures measurement chamber sealing and ensures transmission of the pulses generated by gear rotation to the electronic board microprocessor. By applying an appropriate calibration factor, the microprocessor transforms the impulses into the amount of grease (in weight) that has been dispensed, and displays the result on the LC display.
All K200 METER models are factory set with a calibration factor called FACTORY K FACTOR equal to 1.000.
For best K200 METER performance - adapting this to the intrinsic characteristics of the grease to be measured - the instrument can be "calibrated". Calibration can be restored to factory settings at any time (see "Calibrating").

B. Installing

K200 METER can be installed directly on the tube for grease delivery. The body is provided with two female threads 1/8" (BSP or NPT according to the versions) on which to install the tube for grease.

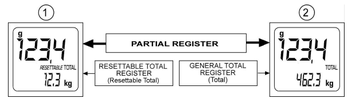
ATTENTION
Always make sure that the thread on the hose and on all attachments applied are compatible with the thread on the chosen K200 METER model. To avoid damaging the grease handle, always fasten every component tightly using the appropriate tools. Make sure the grease is free from impurities; foreign matter in the grease can obstruct the measuring gears.
For the grease handle to function properly, air should be removed from the grease supply line, ensuring a smooth and regular grease flow.

C. Daily use

K200 METER is supplied ready to use.
No commissioning operations are required even after long storage periods.

ATTENTION
- ***K200 METER is designed for professional use and should be operated only by authorised adult personnel.***
- ***Do not use K200 METER in conditions exceeding the limits described in the "SPECIFICATIONS" section or with fluids other than lubricating grease.***
- ***Do not modify or tamper with K200 METER***
- ***Check K200 METER periodically to make sure it is in good conditions***
- ***K200 METER is a high-precision grease meter. Never aim the nozzle toward any part of your body or toward anyone else.***
- ***Use all personal protection equipment prescribed by law***
- ***Discharge the pressure in the supply line before performing maintenance.***

The only operations that need to be done for daily use are Partial and/or Resettable Total register resetting.
Below are the two typical normal operation displays. One display page shows the Partial and Resettable Total registers. The other shows the partial and general total. Switchover from Resettable Total to general Total display is automatic and tied to phases and times that are factory set and cannot be changed by the user.



- The Partial register positioned in the top part of the display indicates the quantity dispensed since the RESET key was last pressed
- The Resettable Total register, positioned in the lower part of the display, indicates the quantity dispensed since the last ResettableTotal resetting. The Resettable Total cannot be reset until the Partial has been reset, while vice versa, the Partial can always be reset without resetting the Resettable Total.
- The General TOTAL register (Total) can never be reset by the user. It continues to rise for the entire operating life of K200 METER.

The register of the two totals (Resettable Total and Total) share the same area and digits of the display. For this reason, the two totals will never be visible at the same time, but will always be displayed alternately.
K200 METER is programmed to show one or the other of the two totals at very precise times:

- The General Total (Total) is shown during K200 METER standby
- The Resettable Total is shown:
- At the end of a Partial reset for a certain time (a few seconds)
- During the entire dispensing stage

For a few seconds after the end of dispensing. Once this short time has expired K200 METER switches to standby and lower register display switches to General Total.

C.1 Dispensing

The user can choose between two different operating modes:
- Normal Mode: Mode with display of Partial and Total dispensed quantities
- Flow Rate Mode: Mode with display of Flow Rate, as well as Partial dispensed quantity.

C.1.1 Dispensing in Normal Mode

This is default mode during which, while the count is made, the Partial and Resettable Total are displayed at the same time.

Should one of the two keys RESET or CAL be accidentally pressed during counting, this will have no effect.

A few seconds after dispensing has ended, on the lower register, the display switches from Resettable Total to General Total: the word RESETTABLE above the word TOTAL disappears, and the Resettable Total is replaced by the General Total.

This situation is called STANDBY and remains stable until the user operates K200 METER again.

C.1.1.1 Partial Reset

The Partial Register can be reset by pressing the RESET key when K200 METER is in Standby, meaning when the display screen shows the word "TOTAL".

After pressing the RESET key, during reset, the display screen first of all shows all the lit-up digits

and then all the digits that are not lit up.

At the end of the process, a display page is first of all shown with the reset Partial and the Resettable Total

and, after a few moments, the Resettable Total is replaced by the NON resettable Total (Total).

C.1.1.2 Resetting the Resettable Total

The Resettable Total resetting operation can only be performed after resetting the Partial register. The Resettable Total can in fact be reset by pressing the RESET key at length while the display screen shows RESETTABLE TOTAL as on the following display page:

Proceed as follows:
1. Wait for the display to show normal standby display page (with Total only displayed),

2. Press the RESET key quickly

3. K200 METER starts to reset the Partial.

4. With the display showing the ResettableTotal, press Reset for at least 1 second

5. The display screen again shows all the segments of the display followed by all the switched-off segments and finally shows the display page where the reset Resettable Total is shown.

C.2. Dispensing with Flow Rate Mode display

It is possible to dispense fluids, displaying at the same time:
- the dispensed partial
- the Flow Rate in [Partial Unit / minute]

as shown on the following display page:
Procedure for entering this mode:
- wait for the meter to go to Standby, meaning the display screen shows Total only
- quickly press the CAL key.
- Start dispensing

The flow rate is updated every 0.7 seconds. Consequently, the display could be relatively unstable at lower flow rates. The higher the flow rate, the more stable the displayed value.
The flow rate is measured with reference to the unit of measurement of the Partial. In the example shown, the flow rate is expressed in ml/min.
To return to "Normal" mode, press the CAL key again.
If one of the two keys RESET or CAL is accidentally pressed during the count, this will have no effect.

Important:
Even though in this mode they are not displayed, both the Reset Total and the General Total (Total) increase. Their value can be checked after dispensing has terminated, returning to "Normal" mode, by quickly pressing CAL.

C.2.1 Partial Reset

To reset the Partial Register, finish dispensing and wait for the meter to show a Flow Rate of 0.0 as indicated in the illustration

then quickly press RESET

Unlike Normal mode, in this case during reset, you do not pass through the stages where the display segments are first lit up and then switched off, but rather the reset partial register is immediately displayed.

D. Calibration

D.1 Definitions

Calibration factor or "K Factor" : this is the multiplication factor applied by the system to the electrical pulses received, to transform these into measured grease units

- Factory K Factor: Factory-set default factor. It is equal to 1,000.

This calibration factor ensures utmost precision in the following operating conditions:

grease	***NLGI grade 2/3***
Temperature:	***20°C***
Flow rate:	**0.1-2.5 Kg/min** **0.1-2.8 L/min** **0.2-5.5 lb/min**

Even after any changes have been made by the user, the factory K factor can be restored by means of a simple procedure.

- User K Factor: Customized calibration factor, meaning modified by calibration.

D.2 Why calibrate?

K200 METER is supplied with a factory calibration that ensures precise measuring in most operating conditions. Nevertheless, when operating close to extreme conditions, such as for instance:

- using grease with viscosity in the extremes of the acceptable range
- in extreme flow rate conditions (close to minimum or maximum acceptable values)

on-the-spot calibration may be required to suit the real conditions in which K200 METER is required to operate.

D3. Calibration procedure:

K200 METER permits making quick and precise electronic calibration by changing the Calibration Factor (K FACTOR).

Two procedures are available for changing the Calibration Factor:
1. **FIELD CALIBRATION**, performed by means of a dispensing operation
2. **DIRECT CALIBRATION,** performed by directly changing the calibration factor

The calibration phases can be entered (by keeping the CAL key pressed for a long time) to :
- Display the currently used calibration factor
- Return to factory calibration (Factory K Factor) after a previous calibration by the user
- Edit current calibration factor.

In calibration mode, the partial and total dispensed quantities indicated on the display screen take on different meanings according to the calibration procedure phase.
In calibration mode, K200 METER cannot be used for normal dispensing operations.
In "Calibration" mode, the totals are not increased.

ATTENTION
K200 METER features a non-volatile memory that keeps the data concerning calibration and total dispensed quantity stored for an indefinite time, even in the case of a long power break; after changing the batteries, calibration need not be repeated.

D.3.1 Displays the current calibration factor and, if required, restores the factory-set factor

By pressing the CAL key while the appliance is in Standby, the display page appears showing the current calibration factor used.

Two cases can occur:

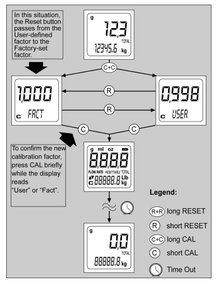
a) If no calibration has ever been performed, or the factory setting has been restored after previous calibrations, the following display page will appear:

The word "Fact" abbreviation for "factory" shows that the factory calibration factor is being used

b) If, on the other hand, calibrations have been made by the user, the display page will appear showing the currently used calibration factor (in our example 0,998) .

The word "user" indicates a calibration factor set by the user is being used.

The flowchart below shows the logical passages from screen to screen



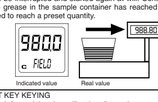
After the restart cycle, K200 METER uses the calibration factor that has just been confirmed

Important:
When the Factory Factor is confirmed, the old User factor is deleted from the memory

D. 3.2 Field Calibration

This procedure calls for the grease to be dispensed into a graduated sample container in real operating conditions (flow rate, viscosity, etc.) requiring maximum precision.

ATTENTION
For correct K200 METER calibration, it is most important to:
- ***Provide yourself with a precision balance with resolution 0.01 gr/ml/oz***
- ***completely eliminate air from the system before calibrating;***
- ***use a precise Sample Container with a capacity of not less than xxx kg, featuring an accurate graduated indicator.***
- ***ensure calibration dispensing is done at a constant flow rate equivalent to that of normal use, until the container is full;***
- ***Do not dispensing more than 999.9 gr/ml/oz in order to keep the resolution of 0.1 gr/ml/oz.***
- ***Carefully follow the procedure indicated below.***

	OPERATION	Display
1	NONE K200 METER in Stand-by	
2	LONG CAL KEY KEYING K200 METER enters calibration mode, and the display shows <<C>> and the current calibration factor instead of the partial . The words "Fact" and "USER" indicate which of the two factors (factory or user) is currently in use. Important: This factor is that which the instrument also uses for field calibration measurement operations	
3	LONG RESET KEY KEYING K200 METER displays "FIELD" and the partial at zero: ready for field calibration.	
4	DISPENSING INTO SAMPLE CONTAINER Without pressing any key, start dispensing into the sample container. Dispensing can be interrupted and started again at will. Continue dispensing until the level of the grease in the sample container has reached the graduated area. There is no need to reach a preset quantity.  Indicated value Real value	
5	SHORT RESET KEY KEYING K200 METER is informed that the calibration dispensing operation is finished. Make sure dispensing is correctly finished before performing this operation. To calibrate K200 METER, the value indicated by the partial totaliser (example 9.800) must be forced to the real value marked on the graduated sample container. To do this follow the instructions in sections 6 and 7.	
6	SHORT RESET KEY KEYING Lets you choose the direction of the arrow in the lower left corner of the display. The up arrow increases the factor shown, and the down arrow reduces it . The operation can be repeated to alternate the direction of the arrow.	

7	SHORT/LONG CAL KEY KEYING The indicated value changes in the direction indicated by the arrow - one unit for every short CAL key keying - continually if the CAL key is kept pressed. The speed increase rises by keeping the key pressed. If the desired value is exceeded, repeat the operations from point (6).  Indicated value Real value	
8	LONG RESET KEY KEYING K200 METER is informed that the calibration procedure is finished. Before doing this, make sure the DISPLAYED factor is the ACTUAL factor (see previous point 7). K200 METER calculates the new USER K FACTOR ; this calculation could require a few seconds, depending on the correction to be made.	
9	NO OPERATION At the end of the calculation, the new USER K FACTOR is shown for a few seconds, after which the restart cycle is repeated to finally achieve standby condition. IMPORTANT: From now on, the indicated factor will become the calibration factor used by K200 METER and will continue to remain such even after a battery change	
10	NO OPERATION K200 METER stores the new calibration factor and is ready for dispensing, applying the newly defined USER K FACTOR.	

D.3.3 Direct modification of *K FACTOR*

This procedure is especially useful to correct a "mean error" obtainable on the basis of several performed dispensing operations. If normal K200 METER operation shows a mean percentage error, this can be corrected by applying to the currently used calibration factor a correction of the same percentage. In this case, the percentage correction of the USER K FACTOR must be calculated by the operator in the following way:

$$\text{New CAL Factor} = \text{Old CAL Factor} * \left(\frac{100 - E\%}{100}\right)$$

Example:

Error percentage found E%	- 0.9 %
CURRENT calibration factor	1.000
New USER K FACTOR	1,000 * [(100 – (- 0,9))/100]= 1,000 * [(100 + 0,9)/100] = 1.009

If K200 METER indicates less than the real dispensed value (negative error) the new calibration factor must be higher than the old one as shown in the example. The opposite applies if K200 METER shows more than the real dispensed value (positive error).

	OPERATION	Display Configuration
1	NONE K200 METER in Stand-by.	
2	LONG CAL KEY KEYING K200 METER enters calibration mode, and the display shows "C" and the current calibration factor instead of the partial . The words "Fact" and "User" indicate which of the two factors (factory or user) is currently being used.	
3	LONG RESET KEY KEYING K200 METER displays "FIELD" and the partial at zero: K200 METER is ready to perform field calibration by dispensing – see previous paragraph.	
4	LONG RESET KEY KEYING We now go on to Direct change of the calibration factor: the word "Direct" appears together with the currently used calibration factor. The lower left corner of the display will show an arrow (up or down) that says how the factor will change (increase or decrease) when the following steps 5 or 6 are performed.	
5	SHORT RESET KEY KEYING Changes the direction of the arrow. The operation can be repeated to alternate the direction of the arrow.	
6	SHORT/LONG CAL KEY KEYING The indicated value changes in the direction indicated by the arrow - one unit for every short CAL key keying - continually if the CAL key is kept pressed. The speed increase rises by keeping the key pressed. If the desired value is exceeded, repeat the operations from point (5).	
7	LONG RESET KEY KEYING K200 METER is informed that the calibration procedure is finished. Before performing this operation, make sure the indicated value is that required.	
8	NO OPERATION At the end of the calculation, the new USER K FACTOR is shown for a few seconds, after which the restart cycle is repeated to finally achieve standby condition. IMPORTANT: From now on, the indicated factor will become the calibration factor used by K200 METER and will continue to remain such even after a battery change	
9	NO OPERATION K200 METER stores the new calibration factor and is ready for dispensing, applying the newly edited USER K FACTOR.	

E. Maintenance

K200 METER has been designed to require a minimum amount of maintenance.
The only maintenance jobs required are:
- Battery change – necessary when the batteries have run down;
- Cleaning the measurement chamber. This may be necessary due to the particular nature of the grease.

ATTENTION
Maintenance should be performed only by authorised personnel who have read and understood this manual. In order to guarantee the product's functionality, always choose original spare parts when replacing damaged components.

E.1. Changing the batteries

K200 METER is complete with 2 x 1.5 V. alkaline batteries ***SIZE N MN9100 LR1*** .
K200 METER features two low-battery alarm levels:
1) When the battery charge falls below the first level on the LCD, the fixed battery symbol appears. In this condition, K200 METER continues to operate correctly, but the fixed icon warns the user that it is time to change the batteries.
2) If K200 METER operation continues without changing the batteries, the second battery alarm level will be reached which will prevent operation. In this condition the battery icon starts to flash and is the only one to remain visible on the LCD.

ATTENTION
Do not discard the old batteries into the environment. Refer to local disposal regulations.

When replacing the batteries, refer to the figure opposite and to the spare parts list, and proceed as follows:
- Press RESET to update all the totals
- Unscrew the battery cap (pos.6)
- Remove the old batteries
- Place the new batteries in the same position as the old ones, making sure the positive pole is positioned as indicated alongside.
- Re-tighten the battery cap, making sure the seal and tapered spring are correctly positioned.
- K200 METER will switch on automatically and normal operation can be resumed.

After changing the batteries and, subsequently, every time there is a power break, K200 METER will start again and use the same calibration factor used when the break occurred. K200 METER does not therefore need calibrating again.

E.2. Cleaning

It is rarely necessary to clean the measuring chamber; cleaning is quick and easy and you don't need to disconnect K200 METER from the supply line.

ATTENTION
Before opening the measuring chamber, make sure the supply line is not pressurized.

To clean the chamber, proceed as follows (with reference to the spare parts list positions):
- Unscrew the four screws that hold the cover (pos.1) and remove the respective washers ;
- Remove the cover and the cover gasket (pos.1-3);
- Take out the oval gears (pos. 2);
- Clean where necessary. For this operation, use a brush or pointed object such as a small screwdriver. Be careful not to damage the body or the gears.
- To reassemble the instrument follow the same steps in reverse order, and refer to the figure above to put the gears back correctly.

ATTENTION
Only one gear is equipped with magnets. The gear with the magnets must be installed as shown in the figure above, with the magnets towards K200 METER's body. The other gear (without magnets) must be installed with its major axis at right angles to the first gear.
Make sure the gears are turning freely before closing the cover.
TIGHTENING TORQUE: 10 Nm

F. Troubleshooting

Problem	Possible Cause	Remedial Action
LCD: no indications	Battery discharged	Check battery and battery contact
Not enough measurement precision	Meter loses calibration	check the calibration factor
	Pump sucks in grease and air	Put the pump in a proper position
	The pump sucks grease and air	Reposition properly the pump
Reduced or zero flow rate	Gears blocked	Clean the measurement chamber
K200 METER does not count, but the flow rate is correct	Incorrect installation of gears after cleaning	Repeat the reassembly procedure
	Possible electronic board problems	Contact your dealer
Indication Err xx yy, after RESET+CAL pressing	Problem of memorization of dates	Deliver/meter a small quantity, wait for 2 seconds, press RESET, press RESET+CAL. Should the same error be displayed, contact your supplier.

M0119ITUK rev1

K200 METER

ITALIANO — **MANUALE DI USO, MANUTENZIONE E CALIBRAZIONE**

ENGLISH — **USE, MAINTENANCE AND CALIBRATION MANUAL**

DICHIARAZIONE DI CONFORMITA'
In accordo con lla direttiva:
89/336/CEE (compatibilità elettromagnetica) e successive modifiche

PIUSI S.p.A. - 46029 Suzzara (Mantova) Italy
dichiara che il seguente modello di contalitri

K200 METER

a cui la presente dichiarazione si riferisce, rispetta la applicabili normative indicate nel seguito:
Normative europee: EN 61000-6-1; EN 61000-6-3; EN 55014-1-2000; EN55014-2-97

Suzzara li 01/01/2004 — il Presidente. Otto Varini

DECLARATION OF CONFORMITY
In conformance with the directives
89/336/CEE (compatibilità elettromagnetica) e successive modifiche

PIUSI S.p.A. - 46029 Suzzara (Mantova) Italy
declares that the followint X-Meter

K200 METER

To witch this declaration refers, conforms to the following applicable regulations:
European Regulations: EN 61000-6-1; EN 61000-6-3; EN 55014-1-2000; EN55014-2-97

Suzzara li 01/01/2004 — the President Otto Varini