

# Flo-Master Pro milk meter

## Product data

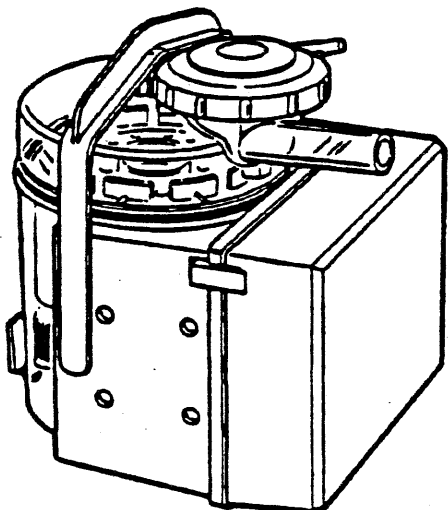
### Description

The Flo-Master Pro milk meter is designed for continuous in-line weighing of the milk. Compared to measuring the volume of the milk, weighing provides high accuracy and is independent of the air contents in the milk.

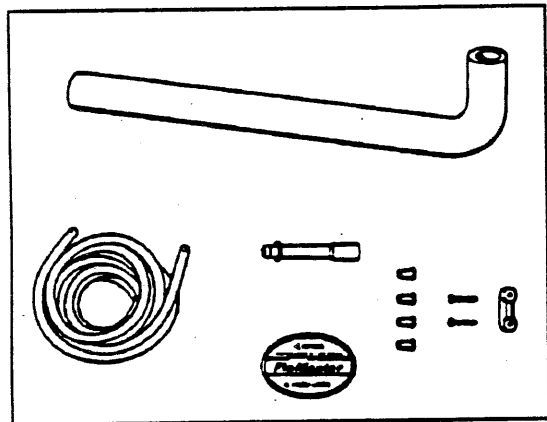
The Flo-Master Pro milk meter is an accurate measuring tool and should be handled carefully.

The Flo-Master Pro milk meter includes a regulator/shutoff in the cover used for retraction of the milk cluster.

Tubes for connection to milk line and vacuum line are included.



**Warning!** Never clean the milk meter with water or steam from a high pressure cleaner.



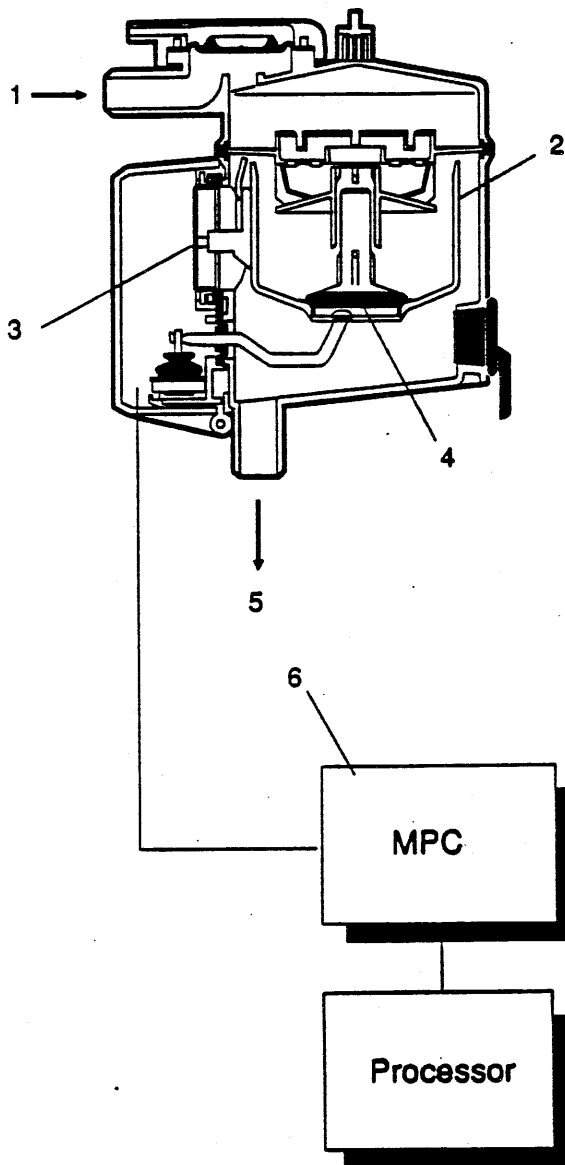
### Technical Data

Measuring range:	0 - 88 kg
Supply voltage:	12 VAC $\pm$ 20%
Current:	470 mA
Inlet:	$\varnothing$ 19/16 mm
Outlet:	$\varnothing$ 25/21 mm
Vacuum hose:	$\varnothing$ 8/5 mm

#### Vacuum requirements:

— During milking	min 42 kPa (12" Hg)
— During cleaning	min 18kPa (5.5" Hg)

## Description



The milk enters the meter from above (1) and is collected in the metering cup (2). The cup is connected to a strain gauge (3) which senses the weight.

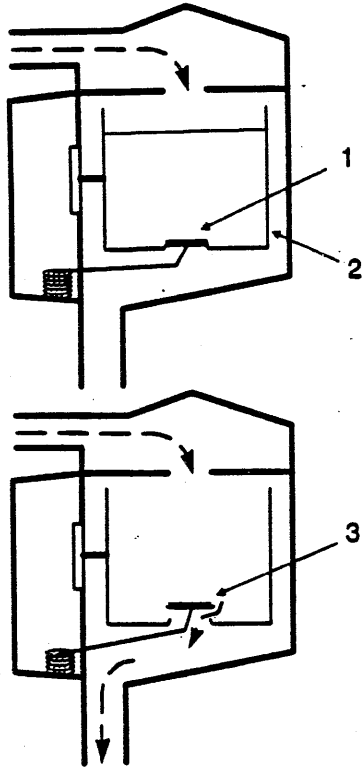
When the cup is filled up to a certain level, the bottom valve opens (4) and the milk is let out. Milk continues to flow in at the top while it is let out at the bottom (5) until the valve closes.

To achieve accurate and reliable measurement, Flo-Master Pro is equipped with advanced electronics (6), (located in the MPC), which process and calculate the information from the strain gauge, control the bottom valve and provide weight information to the stall unit.

The measurement is divided into two phases:

- Filling the metering cup.  
— Bottom valve closed.
- Emptying the metering cup.  
— Bottom valve open.

The actual weighing takes place during the filling phase. In the emptying phase, the weight is calculated by the electronics using the flow rate determined during the filling phase.



## Filling phase

In the filling phase the bottom valve is closed (1).

While the metering cup is being filled (2), the electronics sense the increasing weight up to a thousand times. By dividing the weight of the milk in the cup with the filling time, the average milk flow is calculated.

When the weighed amount of milk in the cup exceeds a certain level, the emptying phase begins.

## Emptying phase

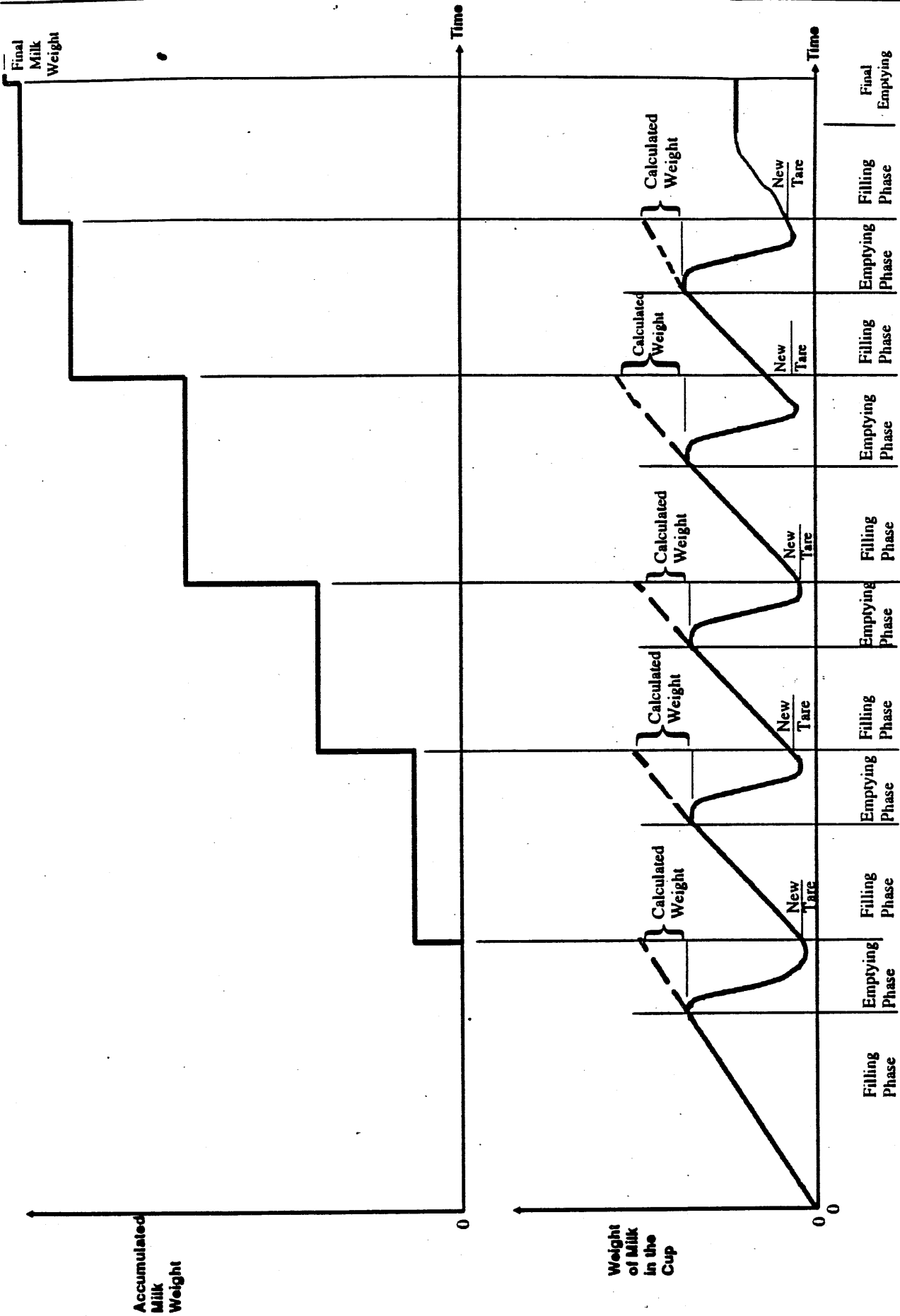
When the emptying phase starts, the bottom valve opens (3) and lets the milk out. The milk continues to flow into, and through, the milk meter during this phase. Depending upon the flow rate of milk into the cup, the valve remains open for 1, 1.5 or 2 seconds. The emptying phase ends when the bottom valve has closed. Then a new tare weight is established for the cup and any milk in it as the filling phase begins.

## Milk weight calculating

The electronics calculate the weight of the milk coming into the cup during the emptying phase by multiplying the total emptying time (1, 1.5 or 2 seconds) by the calculated average milk flow.

The meter electronics is able to tell the difference between milk flow and an air blast. When it senses an air blast the valve is opened and closed to establish a new tare weight without adding any weight to the total.

The diagram on the next page shows how the total milk yield accumulates as the cup is continuously emptied and a new tare weight established.



## Low milk flow

The Flo-Master Pro milk meter performs the function of the flow sensor. The meter continuously senses the milk flow, and when the flow is below a preset limit, adjustable between .4 lbs/min and 1.1 lbs/min (see function 6:3:3:2 in processor), a low-flow message is sent to the MPC.

A low flow indication (flashing flow-light on MPC) appears on the display and a low flow signal is sent to the MPC (just as a flow sensor would) to initiate claw removal.

## Diaphragm Cover

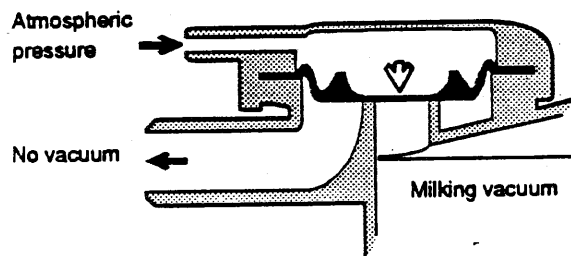
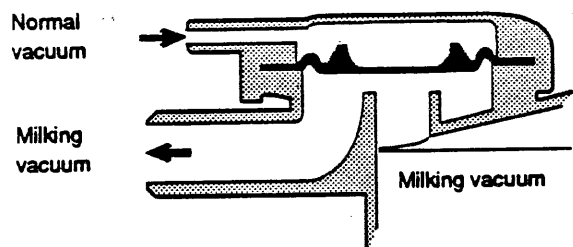
The Flo-Master Pro milk meter is equipped with a diaphragm vacuum shut-off that interacts with an automatic take-off. The meter lid includes a diaphragm that acts on the passage of milking vacuum from the milk line to the claw. The chamber above the diaphragm is connected to control vacuum supplied by an automatic take-off.

The diaphragm can control two vacuum levels:

- Normal vacuum at normal milk flow.
- No vacuum at the automatic claw removal.

### Normal milk flow

During normal milk flow, vacuum is supplied above the diaphragm. Since the milk line has approximately the same vacuum level, the diaphragm is kept in an open position. It is normal for the diaphragm to move slightly with milk flow.



### End of milk flow

When the milk flow has dropped to the low flow limit at the end of the milking, the automatic take-off initiates a positive shut-off. It supplies atmospheric pressure above the diaphragm, and presses the diaphragm down. The diaphragm covers the opening to the milk line and shuts off the vacuum to the claw. The claw releases from the teats and is removed by the take-off.

## Milk meter electronics

The milk meter has four operating modes: standby, milking, cleaning and calibration mode.

### Standby mode

The milk meter waits for a command from the MPC to get into another mode.

### Cleaning mode

The milk meter goes into cleaning mode (from stand-by mode) when the water from the washing system begins to flow through the meter.

The milk meter empties the cup 2 times per minute.

During cleaning, the bottom valve is closed for 25 seconds, then opened for 5 seconds. When the valve is closed, the cleaning liquid flows over the metering cup and cleans the entire milk meter. During the 5 seconds of opening, the liquid flows through the metering cup and cleans the bottom valve and the cup.

### Calibration mode

The calibration mode is accessed from the MPC to check meter accuracy or to recalibrate. A special calibration weight must be used to allow the meter to compare its calculated weight to the actual weight. This can be performed only by an authorized Alfa Laval Agri serviceman.

### Milking mode

The milk meter goes into milking mode when the start milking session button is entered on any MPC.

Before milk flow:

- Empties the cup once per minute, and tares.

During milk flow:

- Sends accumulated weight, flow value, and information about the flow rate above or below the low flow limit to the MPC at each emptying of the cup.

At no flow (after claw removal):

- Empties the cup once per 2 minutes and sends a "No Flow" message to the MPC.

When the exit gate switch is activated to send a confirmed weight to the parlor controller:

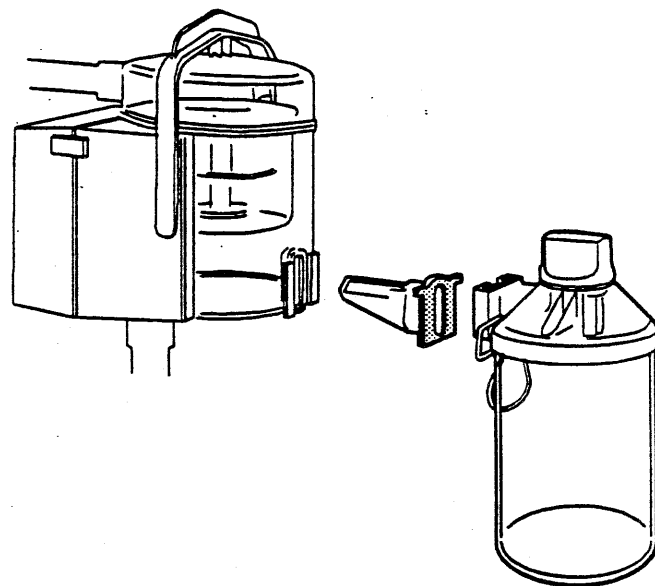
- Empties the cup.
- Sends final milk yield to MPC.

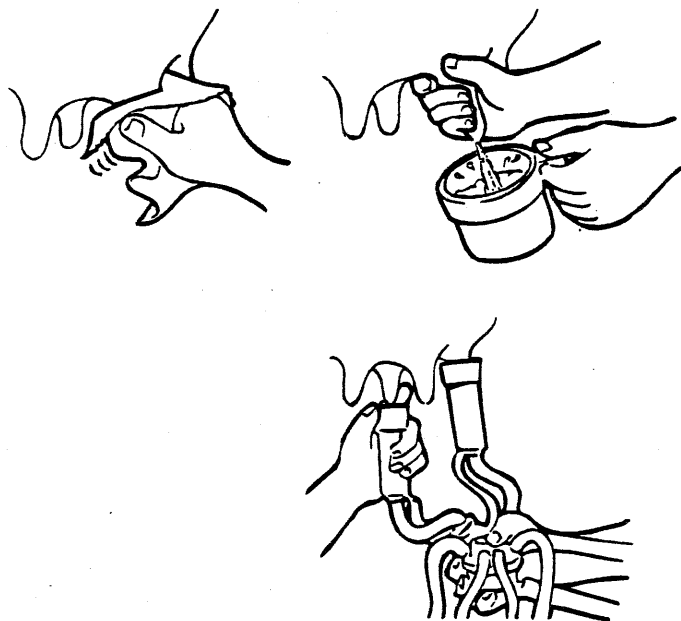
## Butterfat sampling

A butterfat sampler can be attached to the Flo-Master Pro milk meter. The sampler continuously collects a proportional amount of the milk throughout the milking. Since the sample is taken out below the measuring cup, the sample weight is included in the measured yield.

The sampler is designed for quick and easy handling. When milking is finished, close the valve on top of the sampler, unscrew the jar from the lid and remove the jar with the milk sample. Mix the sample by pouring back and forth to another small container two times (two pourings). Pour out the sample, replace the jar, open the valve, and it is ready for a new sample.

The butterfat sampler is **NOT** designed for cleaning in place. *It must be removed and manually cleaned.*





## Milking

Milk the cows following the normal milking procedure:

- Check to see if correct cow number is displayed.
- Check for any status attention, for example dump milk. If so, prepare the milk line for dumping.
- Prepare the cow, wipe off the udder.
- Milk out some milk in a fore milk cup and check the milk.
- Attach the milking unit. The cow number and the milked yield will be alternately displayed on the stall unit during milking.

### Low flow indication

When the milk flow is lower than the preset low flow limit, the milk meter sends a signal to the MPC which can then signal an automatic take-off unit.

The low flow is also indicated on the MPC by the flashing of the flow light on the MPC.

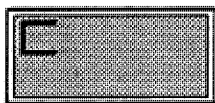
### If milking is interrupted

If the milking unit has been removed, it can be put on again, as long as the exit gate remains closed (and F4 or F5 is not pressed). The milk yield recording continues where it was interrupted.

### Confirmed milk weight

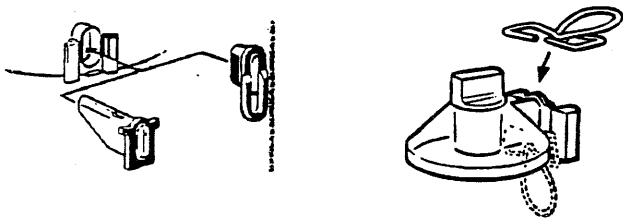
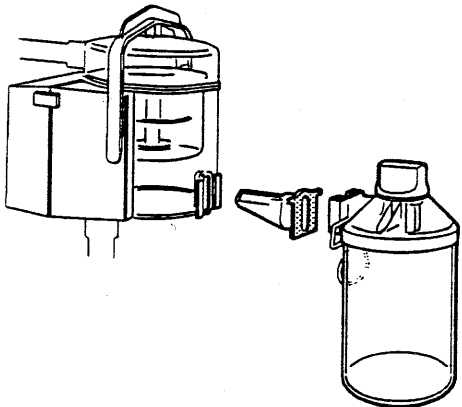
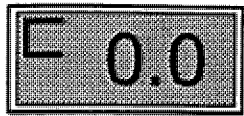
When all cows in a group are milked, open the exit gate and let the cows out.

A "C" in the display indicates that the milk yield values are transferred to the processor after milking of a group. New cows can enter and are identified even if the transfer of confirmed milk is not ready. Their cow numbers are remembered and will show up as soon as the displays are free.



### Defective gate switch

F5↑ confirms that the cows in that group are milked. Can be used if gate switch is defective.



## Single cow

In some cases you might want to know the milked yield of a single cow, without waiting until all cows in the group are finished.

**F4** confirms that the cow in the stall is milked and the confirmed milk weight is displayed. When the exit gate is then opened, that stall display will change to " 0.0".

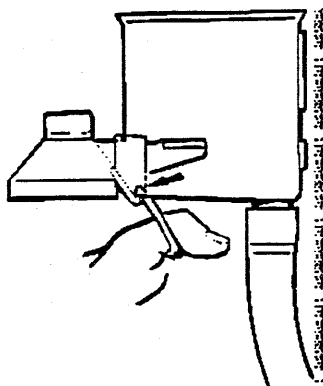
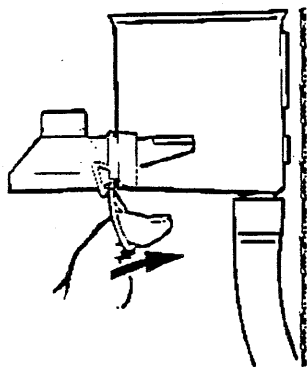
## Butterfat sampling

**NOTE:** *The butterfat sampler is not designed to be cleaned in place. It must be completely disassembled and thoroughly cleaned, manually, with proper washing solution.*

Prior to installing the sampler, be certain that it has been properly cleaned and sanitized.

- Prepare for milk sampling before milking to avoid vacuum drop.
  - Remove the rubber plug (1) from the milk meter.
  - Insert the sampler inlet with seal (2).
  - Holding the spring clip by the ring, place the open rectangular-shaped section over the flange that attaches the sampler lid to the meter housing (3).
  - Pull the ring out and downward, flexing the spring until it is inside the rim of the sampler lid, pointing downward.
  - Slide the sampler flanges over the mating flanges on the meter housing until it stops, aligned with the inlet seal.



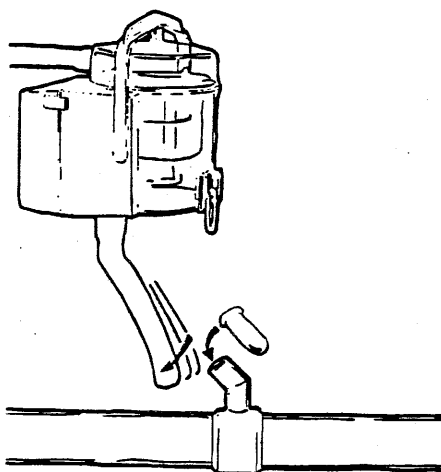


- Pull the spring clip ring down and out from under the rim of the sampler lid until one wire of the clip snaps into the recessed slot on the bottom edge of the meter housing (4 and 5).
- Attach the sampler jar to the lid.
- Open the valve on top of the milk sampler by turning in line with inlet.

- Start milking.
- When the milking is finished, close the valve by turning perpendicular to inlet, and turn the jar to release and dump. Mix the sample by pouring back and forth to another small container two times.

### Dumping of milk/Rinsing of Meter

When milking a cow whose milk must be dumped, it is preferred to bypass the milk meter. Remove the milk hose from the meter inlet and connect to a bucket. If it is necessary to milk through the meter, remove the meter outlet hose at the milk line connection. Connect the tube from the milk meter to a bucket.



**Do not remove the milk tube from the meter outlet except for replacement, to avoid stress which could crack the meter outlet nipple or meter body.**

It is recommended that the meter be rinsed after milking a cow whose milk has to be dumped through the meter. The following steps should be used to do this after the cow has finished milking:

- 1 Use F4 to confirm milk weight for this MPC.
- 2 Enter a dummy cow number (0) at this MPC.
- 3 Run rinse water through meter.
- 4 Press F4 or wait for exit gate switch signal to clear out any weight accumulated for rinse water.

**Note!** *These steps will prevent any weight from rinse water from being added to the cows milk weight.*

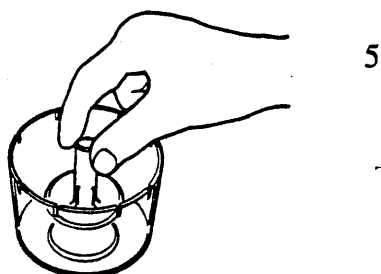
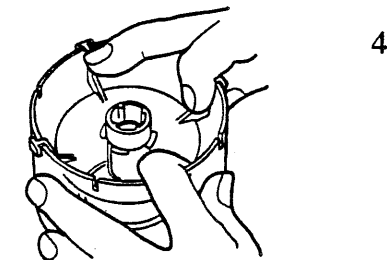
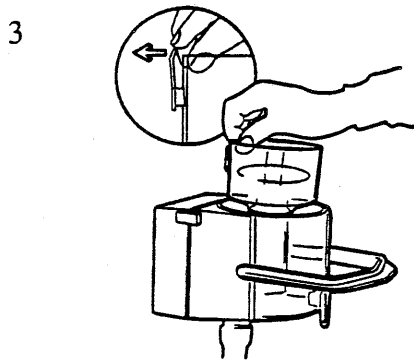
## Milk meter

**CAUTION!**

Care must be taken when removing the metering cup or handling the strain gauge to avoid pushing or pulling on the cup hook of the strain gauge and damaging the gauge.

### Disassembly

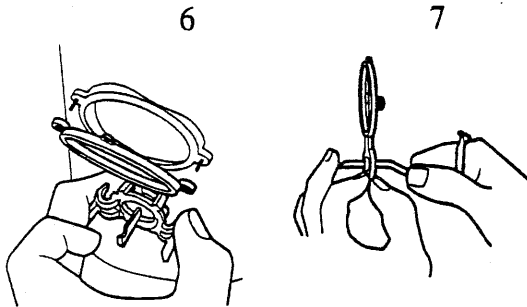
- Fold down the lockstrap (1).
- Lift up the meter cover and the spoiler (2). Turn off the diaphragm cover and remove the diaphragm.



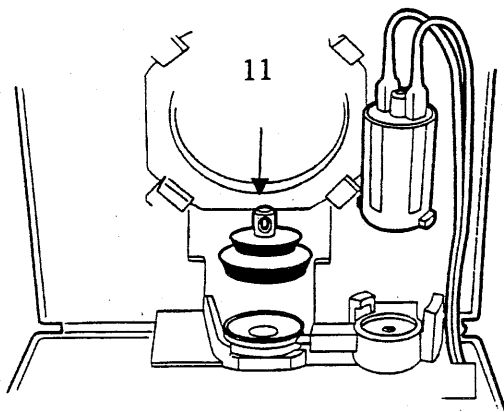
- Press the locking clip (3) of the metering cup toward the strain gauge. Grasp the cup close to its locking clip and lift it straight up. Place the cup on your working area **upside down** to prevent chipping the drip edge around the bottom outlet.
- Check that the drip edge is sharp and unbroken. Damage to the edge may affect accuracy of butter-fat sampling.

- Remove the valve guide from the metering cup by pressing the wings outwards while pulling upwards (4).

- Lift up the valve (5).
- Fold the lockstrap (1) to horizontal position and pull the ends out to release from the mounting bracket .



- Pull the milk meter housing out of the bracket and remove the milk tube.
- Press and pull the two snap locks that hold the valve arm seal on the housing (6).
- Take the gauge seal and valve arm apart (7).
- Remove the plug in the sampling outlet.
- Open the snap locks to the back of the milk meter and fold the lid down.
- Remove the solenoid and check that:
  - The disc (8) is dry and clean. The disc should be installed with nipple side up.
  - The solenoid o-ring (9) is seated properly.
  - The passage (10) between the solenoid valve and the bellows is dry and clean.



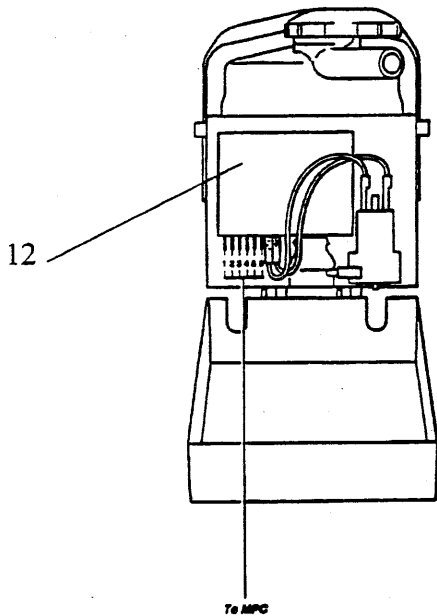
### Strain Gauge Disassembly

- To access the bellows (11) you must first remove the Strain Gauge Assembly (12). To do so rotate the assembly clockwise until it comes free. Handle the Strain Gauge Assembly carefully to avoid pulling the connections loose.

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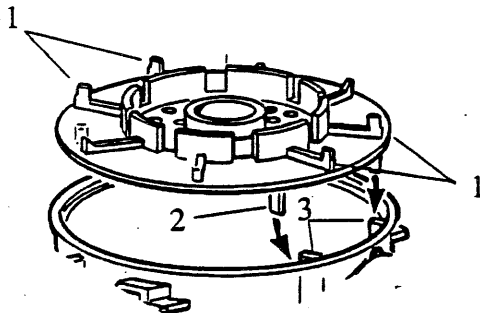
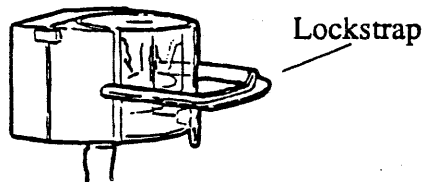
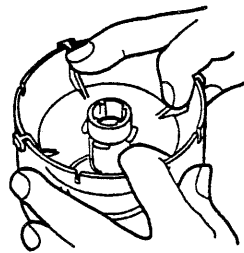
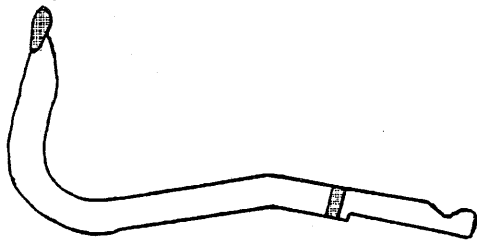
**Contact your local Alfa Laval Agri Serviceman if Strain Gauge Assembly must be replaced.**

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- Pull bellows (11) off the base. Note the spring inside bellows. Pull bellows off the connecting shaft to replace bellows.

## Milk meter



### Assembly

Put the milk meter together in reverse order, using the following guidelines.

#### Valve Arm

- Insert the valve arm into the gauge seal until the enlarged section of the arm seats inside the seal.
- The cupped side of the seal (around the valve arm) fits onto the meter housing.

#### Metering cup

- The wings of the valve guide must be placed in the notches that have knobs.

Make sure not to mix them up with the other notches. The valve guide must be locked to the cup.

Insert two adjacent wings into the notches under the knobs. Insert the other two wings by pressing the wings outward while pushing down.

- When you have assembled the metering cup, pour water into it to a depth of about 3/4" above the seal and check that it does not leak around the valve more than 4 drops per second.

#### Lockstrap

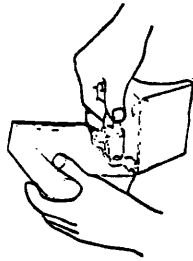
- The lockstrap must be horizontal with the slots in the end knobs downward to allow the knobs to be inserted into the meter bracket. Push the meter housing against the strain gauge seal to allow the lockstrap knobs to snap into place.

#### Spoiler

- Place the spoiler so that the guides on the underside of the spoiler do not interfere with the locking clip of the metering cup. Make sure the guides (2) are NOT between the ribs (3) inside the meter housing. (Line up the two pairs of guides on the top of the spoiler (1) with the lockstrap or with the strain gauge.)

#### Bellows

- Make sure the tapered side of the slot for the valve arm is toward the meter.
- Make sure the spring is in the bellows.

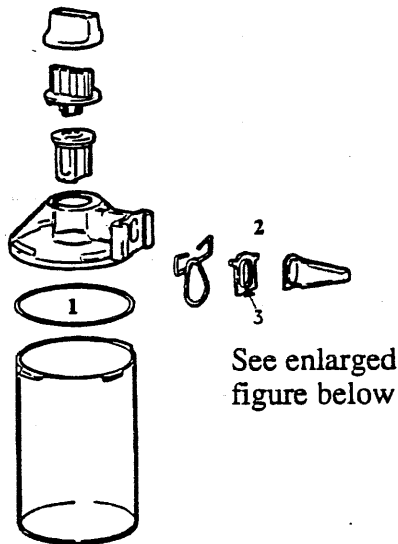


## Strain Gauge Assembly

- Insert assembly into meter housing and there turn counter clockwise until it stops.
- Make sure that all 4 tabs on the assembly are locked in place on the meter housing.

## Replacing solenoid

When replacing the solenoid, make sure it is 12 VDC, (black in color). Make sure the O-ring is installed on the bottom of the solenoid.



## Butterfat sampler

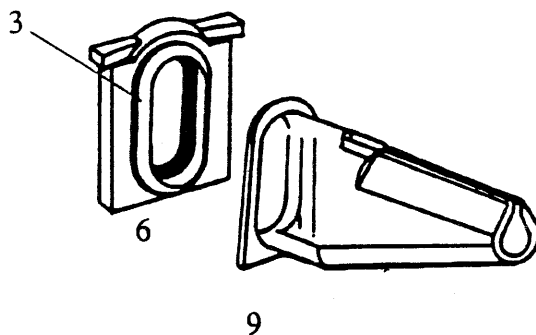
### Disassembly

- Unscrew lid and remove the seal (1).
- Pull up the knob and remove the rubber valve.
- Remove the seal from the sampler inlet.
- Check that the edges of the slot on the upper side of the inlet (2 ) are sharp and unbroken.

### Assembly

Put the sampler together in reverse order, with new rubber parts.

- Assemble the inlet seal onto the inlet with the large tapered rib (3) on the side next to the milk meter housing. The opposite side of the seal has a smaller, rounded rib which contacts the sampler lid when assembled onto the milk meter.



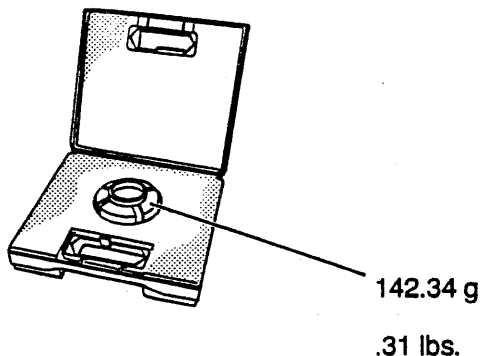
For easiest assembly, insert the square bottom of the inlet flange (a) into the bottom of the seal (b). Then pull the top of seal over the top of the inlet flange until seated in the seal groove.



## Calibration of milk meters

During calibration you check and adjust the milk meter setting so that the displayed value corresponds to actual weight, sensed by the strain gauge of the milk meter.

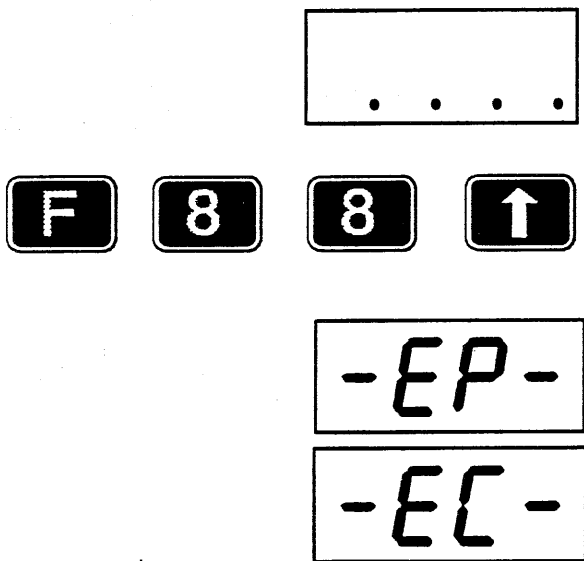
However, if there is a leakage or a fault in the milk meter function, the recorded milk yield may be wrong, even if the calibration is correct. Therefore, periodical checks must be performed in which the weight is checked by the water test.



### Weight

Be careful always to keep the weight in its case. If you scratch it, for example, by putting it down on a rough surface, it will no longer be a precise reference weight.

The value is stamped on the weight.



### Calibration

If the displayed weight is out of limits for any of the milk meters, these must be recalibrated.

The MPC should be in standby mode.

— Enter F88↑ on the MPC. The sign “-EP-” for enter password will appear.

— Enter password 6285↑.

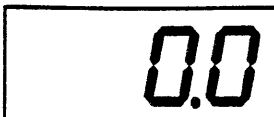
If the password is incorrect, the sign “-EP-” will appear again.

If the password is correct, the MPC shows the sign “-EC-” (enter calibration weight).

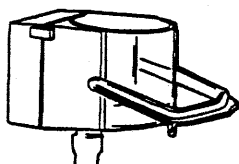
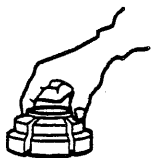
— Enter the value stamped on the calibration weight

#### Example

The weight is stamped with the value 142.34 g (.31 lb.). Round off to 142.3 g (.31 lb.). Enter 1423↑ on the MPC.

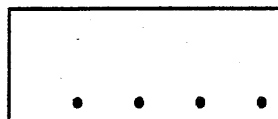


The MPC first displays "—", and then "0.0" for no weight; cup is empty.



— Carefully place the weight in the measuring cup.

The MPC now senses the weight of the calibration weight, compares it with the entered value, and calculates and stores the correct calibration factor for this milk meter.



When this is ready, the MPC displays "-CF-" (calibration finished) for a few seconds and then leaves the function F88.

— Now remove the weight.

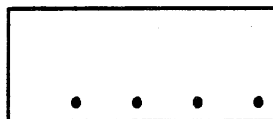
Now the milk meter is calibrated. To check this, you can do the weight check with F89↑, if desired.

Repeat calibration for the other milk meters if necessary.

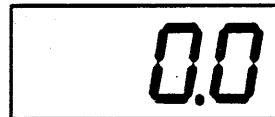
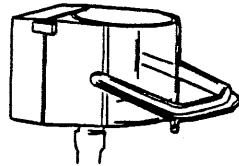
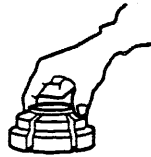
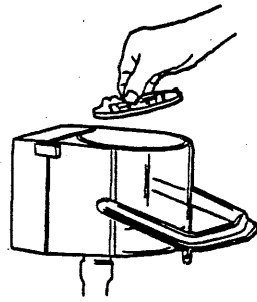
### Check calibration

Check with a gauge weight that the milk meter displays the correct value.

The milk meter should be in stand-by mode.





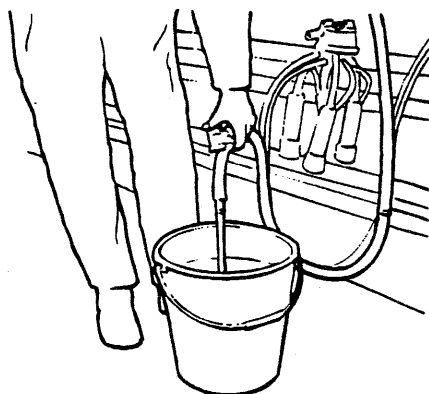


- Remove meter cover and spoiler. Do this on all meters that are to be checked.
- Wait for about 10 minutes (to let the temperature stabilize), or until ambient temperature has been achieved.
- Enter F89↑. This will set the milk meter in check calibration mode.

Then “- - - -” is shown on the display.

- Wait until “0.0” is displayed, and then carefully place the gauge weight in the meter cup.
- Read off the weight. It must be: *the value stamped on the weight  $\pm 0.8$  g (.0018 lb.). If the weight difference is more than  $\pm 0.8$  g (.0018 lb.), a calibration must be done (see section Calibration).*
- Remove the weight.

- The sign “- - - -” will be shown for a short while.
- Wait for “0.0” to be displayed, and put the weight back again.
- Do this at least three times, or until you get good repeatability.
- Leave the function with F↑
- Repeat the procedure on all meters to be checked.



## Water test

Checking the milk meter's recording accuracy with water should be done each time the milk meter has been dismantled, or if you suspect an incorrect yield recording.

Periodical checks should also be carried out according to demands from authorities.

### Equipment needed:

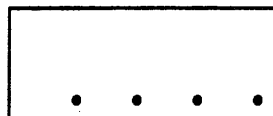
- Test pipe
- Shutoff clip for the milk tube
- Electronic scale with an accuracy of  $\pm 20$  g (.04 lb.)
- Bucket about 20 liters (5.3 gallons)

### Test procedure

The whole test is done locally in the MPC which should be in standby mode.



**Note!** It is important that air is not sucked into the milk meter during or at the end of the test.



The MPC should be in standby mode.

Remove the cluster from the end of the long milk tube and apply a shut-off tube clip on the milk tube. Close the clip.

- Fit the test pipe on the milk tube.
- Start the vacuum pump.
- Fill a bucket with approximately 15 kg (33 lbs.) of water.
- Weigh the bucket and make a note of the weight.
- Make sure that no cleaning mode signal is received from the cleaning unit (shut off the cleaning unit).
- Press F87↑ on the MPC to make the MPC ready for milking with water.
- Put the pipe in the bucket and open the tube clip.
- Press the cluster release key.





**Note!** Too large a flow - outside a normal milking flow - will activate the sweep blocking, and no recording will take place.

- Watch the display. When about 10 kg (22 lbs.) has been sucked up, shut off the water flow with the tube clip.
- Make sure that no water remains in the tube. Lift the tube so that the water flows back to the bucket from one side of the clip and into the milk meter from the other side.



- Press F4↑ to confirm the recorded weight. (It is possible to repeat a water milking with F4↑.)
- Weigh the bucket with the remaining water and subtract this from the original weight. This gives you the real weight of the water that has been measured by the meter.
- Compare the real weight with the weight displayed on the meter.  
**Note!** The value must not differ more than  $\pm 0.2$  kg (.4 lb.)
- Repeat the test again.

If any of the two tests gives a larger difference than 0.2 kg (.4 lb.), check the meter for leaks or other faults, and then repeat the two tests.

If everything seems correct and the milk meter still is out of tolerances, check the calibration. See the section, Calibration.



- Repeat the water test with all milk meters, then press F↑ to leave the milking mode and go to standby.

