

# Basic Functions and Technical Design of LactoCorder®

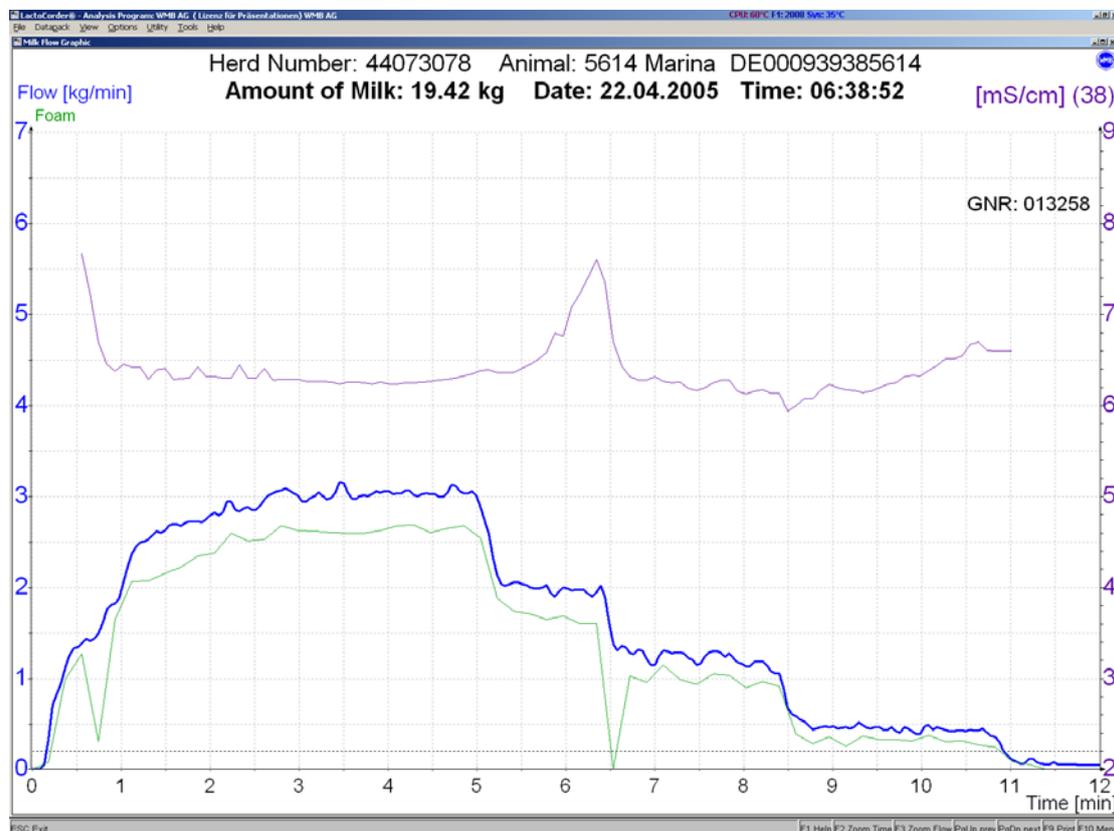
## 1. LactoCorder over 10 Years in Official Milk Recording

For over 10 years many thousand ICAR approved mobile electronic LactoCorders are doing their daily work reliably, precisely and economically in official cow milk recording (protocols A, C and B).

## 2. The Detailed Milk Flow Curves, a Wealth for Additional Services

During every single milk recording LactoCorder registers automatically - and without any hassle or extra work for the recording person (agent or farmer) - high resolution curves of milk flow, electrical conductivity, foam content and milk temperature. From here up to 40 numerical parameters are calculated by the evaluations software "LactoPro". This rich dataset is especially useful for efficient services like consulting, genetics, veterinarian, milk quality, milking machine maintenance etc. – and valuable for the customer.

A detailed milk flow curve is like a fingerprint of the individual animal with a high reproducibility.



## 3. ICAR Approval for Dual Use (Cows and Goats)

Additional approval for goats in 2007 makes the LactoCorder now an ICAR approved cow and goats meter for alternate use. Every LactoCorder, sold since 1997, can be upgraded for dual use without any alterations in the hardware, simply by software changes (software version 07656xx7 and higher). The species can then be chosen on the display. Specific challenges in goats milking: different milk composition, very low flow rates and quantities, much more animals, less room and more milk meters in the parlor, extremely fast operation. Measures taken: Additional fine tuning of measuring system for low flow, electronic identification (RFID) of animals and sample bottles, optical status indication by

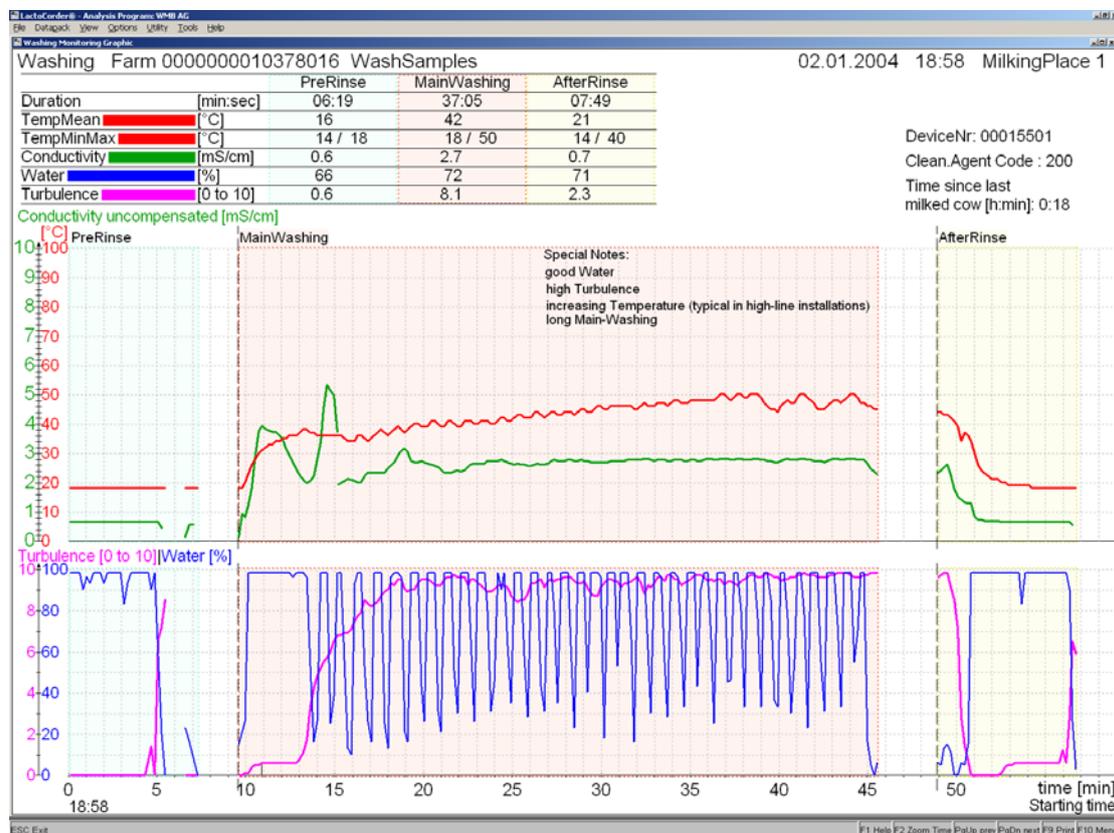
big red signal lamp for optimal coordination, radio control of the LactoCorders by means of a “Commander” fixed on milker's hand.

#### 4. Lowest Vacuum Losses

LactoCorder exhibits lowest flow restrictions (only 36% of the ISO/ICAR standard) thus no disadvantage due to vacuum losses. No danger of adversely biasing the measured milking data just of the best high yielding cows.

#### 5. Wash-Monitoring of Milking Installation

LactoCorder automatically registers washing parameters relevant for the milking installation during its normal cleaning procedure. The “Wash-Monitoring” provides the timing of the different washing phases and - for each phase - temperature, electrical conductivity, turbulence, water distribution and its balance on the different milking places. The results are displayed as diagrams and average values on the PC.



#### 6. Automatic Electronic Cow Identification

Ability for automatic electronic cow identification (official transponder ear tags) by the LactoCorder (Cooperation with Allflex).

#### 7. Live-Monitor in Real Time

By means of “Live-Monitor” the LactoCorder transmits wireless the actual milk flow and conductivity during any normal milking session, so that built up and progression of the milk flow curves can be displayed in real time on a PC or beamed to the wall for instruction, teaching and science.

#### 8. LactoCorder Measuring Principle

The LactoCorder makes use of a novel and patented measuring system: First, the milk which is milked in pulses is largely separated from the carrier air by a centrifugal head,

then calmed down and gently passed on to a flow-measuring chamber. The remaining amount of foamed milk still varies strongly (between 30 and nearly 100%) depending on influencing factors like the milking system, the flow rate, the composition of milk and many more.

A probe for measuring the filling level of the milk is installed in the measure chamber directly in front of the calibrated vertical measuring slot. This probe consists of one transmitting electrode and 60 single electrodes, thus dividing the measuring chamber into 60 equally thick height levels of 1,6 mm each. On each height level the electrical conductivity of the fluid located between the transmitting electrode and the respective layer electrode is measured. This value is put into proportion to the simultaneously measured electrical conductivity of the gas-free milk. This ratio is an exact value for the gas content of the corresponding height level independent from the specific conductivity of the respective milk. The 60 ratio values together form a foam-density profile which is evaluated anew every 0,7 seconds.

The combination of measuring for each height level simultaneously the actual foam density (kg per Liter) as well as the actual volume flow (Liter per minute) through the slot, allows for a precise continuous determination of the total mass flow (kg per minute) even with the extremely fluctuating foam-formation of cow warm milk. In other words, this novel measuring system represents in fact a genuine continuous balance but without any movable weighing elements.

The following measured variables are available, on the basis of this measuring principle, and are recorded continuously during the entire measuring process:

- milk flow (kg/min) as well as milk yield (kg)
- foamed milk content (mass%)
- electrical conductivity of the milk (mS/cm), and in addition
- temperature of the milk (°C)

Each measurement is annotated with the date and time at which the measuring process began using the time-keeping element the LactoCorder is equipped with.

## 9. LactoCorder Sampling

The LactoCorder diverts online during milking and automatically a milk sample directly into a normal analysis bottle with a capacity of around 50 ml. The sample is highly representative as it consists of about 80 representative sub-samples. An integrated RFID reader (or barcode scanner) allows for the sample bottle ID to be recorded as well as be linked to the respective animal in the structure of the measured data in the LactoCorder.

Two values control the intervals and timing of the sampling valve:

- a rough estimation of the expected milk yield of the animal
- the actual milk flow being continuously measured in the LactoCorder ensuring strictly proportional subsamples

Entering the expected yield is necessary to obtain an adequate volume of the sample despite the broad spectrum in milk yield of the animals milked. The sample volume should not be less than 20 ml (ICAR guideline) and not more than 48 ml (to avoid overfilling).

Sampling, using information about the expected yield, is controlled in such a way as to fill 2/3rds of the sample bottle in cases where milking produces exactly the expected yield. A deviation in the milked yield from the expected value leads to a corresponding deviation in the sample volume. Details of the expected yield are entered in whole number increments of the weight unit used (kg. or lbs.). This always relates to the daily milking

volume and it is possible to enter values of between 2 and 99 kg for cows or 0.8 to 9.9 kg. for goats.

The expected yields for the individual animals are normally saved in the LactoCorder by entering the herd data (operational data) before the milking process begins. Entering or correcting the expected yield is also possible directly during milking.

The portion of the expected daily yield for the morning and evening milkings can be set also by the help of the herd data. The selected factor is then valid for all animals in the herd in question. Direct filling of the morning sample and the evening sample into the same bottle is also possible if required.

Example: Expected yield and sampling

	<b>Cow A</b>	<b>Cow B</b>	<b>Cow C</b>
Expected daily yield	16 kg	28 kg	40 kg
Control factor per milking (50 %)	8 kg	14 kg	20 kg
Filling volume of sample bottle corresponding to the control factor	33 ml	33 ml	33 ml
Filling volume as a percentage of the control factor	0.41 %	0.24 %	0.17 %
Filling volume tolerance:			
Lower limit (= - 40 %)	20 ml	20 ml	20 ml
Upper limit (= + 45 %)	48 ml	48 ml	48 ml
Tolerance of milked yield:			
Lower limit: (= expected yield - 40 %)	4.8 kg	8.4 kg	12.0 kg
Upper limit: (= expected yield + 45 %)	11.6 kg	20.3 kg	29.0 kg