MAS-D-TEC®

PORTABLE MASTITIS DETECTOR

Instruction/Service Manual

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57-0009-01B

MAS-D-TEC
DESCRIPTION AND SPECIFICATIONS

MAS-D-TEC is a hand-held milk analyzer for use in the milking parlor to detect mastitis formation in the udders of dairy cows at subclinical levels. About the size of an ordinary flashlight, MAS-D-TEC allows you to easily and accurately check the four individual quarters of a cow in less than thirty seconds. Molded from high-impact material, it is rugged and fully waterproof.

When employed consistently and in accordance with the instructions contained in this manual, MAS-D-TEC is a powerful implement for modern dairy herd management. Early subclinical mastitis detection enables you to maintain higher levels of milk quality and herd productivity and to avoid the expenses and production losses associated with uncontrolled mastitis.

SPECIFICATIONS

SIZE	7.1 cm (2.8 in.) maximum diameter 18.0 cm (7.2 in.) high
WEIGHT	0.3 kg (approximately 0.6 lb)
CONSTRUCTION	High impact polycarbonate
POWER	One 9 Volt alkaline battery type MN1604 or equivalent (Lithium 9 Volt battery may be used for extended battery life)
BATTERY LIFE (Alkaline)	Typically at least 20,000 tests
SAMPLE SIZE	Less than 2 mL (approximately 1/4 teaspoon)
CONDUCTIVITY CELL VOLUME	Less than 1 mL (approximately 1/8 teaspoon)
TIME TO ESTABLISH READING	Less than one second per sample
DISPLAY	LED bar graph 0 to 9 reading
LOW BATTERY INDICATION	Red LED
ACTIVE INDICATION	Green LED

SPECIFICATION OF SAFE USE:
Using this instrument in a manner not specified by Wescor may impair the safety protection designed into the equipment and may lead to injury.

SAFE USE ENVIRONMENT:
This equipment is designed to be safely operated at 5 to 40°C (40 to 105°F), maximum relative humidity 80%.

OPERATING INSTRUCTIONS

Please Note: *When testing milk conductivity, be aware of the following important factors.*

- The reading will start automatically when the sample settles in the instrument and stays on for a minimum of 5 seconds. If the reading is not taken then another sample must be introduced.

- In the presence of fulminant mastitis, milk may have a high somatic cell count or visible abnormalities (such as flakes or clots). These conditions will produce artificially low, perhaps even normal conductivity readings. MAS-D-TEC is designed to indicate ***subclinical mastitis***, before the milk is obviously abnormal.

- Test individual quarters rather than bulk milk samples. Bulk samples are ineffective because mastitic milk is diluted and conductivity readings are likely to be normal.

- For accurate results, cooled or refrigerated milk samples should be heated to 37° C or 98.6° F before testing.

- For best accuracy, use stripping milk (after the cow is milked out). Foremilk can also be tested if you use the first milk out of the teats immediately after washing them.

OPERATING PROCEDURE

1. Hold the instrument vertically with the mouth of the instrument facing up. Prevent the instrument from tilting in any direction.

2. Squirt milk from one of the quarters into the side of the milk entry funnel until milk issues from the drain port. Milk squirted directly into the bottom of the entry funnel causes air bubbles (a frequent cause of questionable readings).

3. The display gives the reading for this quarter for a maximum of 5 seconds. (Once the reading is displayed you can introduce a sample from the next quarter.)

4. Promptly squirt a similar volume of milk from the next quarter into the funnel. This flushes the old sample out and replaces it with the new one.

5. The display gives a reading for a maximum of 5 seconds.

6. Proceed in this manner with the remaining quarters.

INTERPRETING READINGS

The most recent research has shown that maximum accuracy requires using both *absolute threshold* and *differential* readings. The absolute threshold is approximately 7,000 microsiemens at 37° C (a reading of 5 on Mas-D-Tec). This lends high confidence that a reading of 5 or higher is infected.

Use differential analysis (comparing the readings from all quarters) to eliminate any false negative readings. If you see that one quarter is reading 2 units higher than the rest (even if the reading is in the normal range 0 to 4), you should consider that quarter to be infected.

A test giving no reading may be due to an air bubble, or plugged cell. If you doubt the reading, inspect the cell (in the rear lower window) for an obstruction or air bubble.

An incorrect reading is usually caused by an air bubble or a contaminated cell. If MAS-D-TEC is clearly in error, flush the conductivity cell with water. If this fails to correct the problem, it may be necessary to replace the conductivity cell. (Contact Wescor for replacement parts.)

Milk from different breeds of cows differs in conductivity. The MAS-D-TEC calibration is set for Holstein milk. Jersey milk typically reads 2 counts lower than Holstein. A reading of "3" on a Jersey indicates abnormal milk. Abnormal conductivity readings for other breeds have not been established.

CLEANING

After each milking session, flush MAS-D-TEC with water to prevent the buildup of milk residues. Periodically flush MAS-D-TEC with pipeline cleaner or milkstone remover. Clear foreign objects lodged in the line by forcing fluid through the line with an eyedropper or syringe. In case of permanent obstruction, return the instrument to Wescor for repair. If the conductivity cell is cracked or damaged, it must be replaced. The length of the cell is critical to proper calibration.

CAUTION!

Do not clean with high pressure water.

CAUTION!

Changing the length of the tubing in MAS-D-TEC for any reason will alter calibration of the instrument and cause incorrect readings. If the tubing cracks or breaks, the entire tubing must be replaced with tubing available as part of a maintenance kit (RP-144) from Wescor.

UNIT ACTIVE INDICATOR

A green LED indicates that the unit is operational. This LED is visible through the rear lower window. It will flash approximately twice per second with no sample in the device.

LOW BATTERY INDICATION

Whenever battery power is low, the LOW BATTERY light glows as you test samples. The battery should then be replaced.

BATTERY REPLACEMENT

1. With a back and forth rotating motion, gently pull the funnel assembly out of the cylindrical housing while pushing up from the bottom of the detector on the drain.

2. Disconnect the battery and install a new 9 Volt alkaline battery.

   CAUTION!
   Do not connect battery improperly.

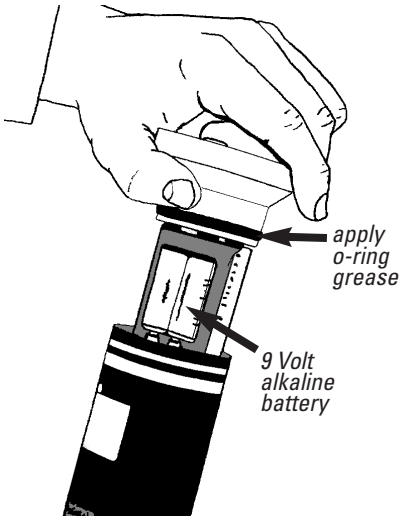
3. Apply a thin coating of O-ring grease (SS-103) to the large O-ring on the funnel assembly. Apply a liberal amount of O-ring grease to the small O-ring on the drain assembly.

4. Make sure the circuit board is completely dry before assembling the funnel.

5. Push the funnel assembly back into the housing and line up the display with the display window on the sleeve.

WARNING!
Do not attempt to charge battery or dispose of in fire. Battery may explode or leak.

NOTE:
Dispose of the used battery according to local regulations.



WHY TEST FOR MASTITIS?

Researchers generally agree that mastitis costs the dairy producer as much as (US) $250 (1995) per cow per year. This is attributed to loss of production (70 percent), treatment (8 percent), discarded milk (8 percent), death and premature culling (14 percent)[1]. There is also agreement that on any given day 40 percent of all cows in a herd will be infected subclinically, with only 1 percent showing clinical signs of infection such as hard or hot spots in the udder or stringy or discolored milk. In addition, recent research shows that infected cows are problem breeders.

With a dairy of 150 cows losing an estimated $37,000 to mastitis every year, it is no wonder there has been so much talk among dairy producers about mastitis. The need for testing is self-evident. Producers who are well informed about herd health and who use good management techniques will ultimately have the “cleanest” herd.

Which Test is Best?

In the past, producers could choose between SOMATIC CELL COUNT (SCC) and the CALIFORNIA MASTITIS TEST (CMT). Somatic cell counts are generally taken once or twice a month with results returned several days later. Some disadvantages of the SCC are as follows:

1. The test loses value because of the time required to receive results.
2. Infected quarters are not identified.
3. Because infected quarters tend to dry up, the overall reading may be lower, even though individual quarter infection may be getting worse.
4. Since SCC is cyclic, single readings are less accurate than multiple readings which are seldom, if ever, taken in actual practice.

The California Mastitis Test, which identifies infection by quarter, provides immediate results, thus overcoming some of the problems associated with SCC. It is sufficiently time-consuming to require a person specifically for that test. An experienced person is usually required to interpret the results because they are quite subjective. This test is also used infrequently, due to the cost of extra personnel.

Conductivity Tests for Subclinical Infections

When using Mas-D-Tec, quarters that read high or that are considered subclinically infected, show increases in undesirable milk components (sodium, chloride, lipase, immunoglobulins, trace minerals and whey components) and **decreases** in the desirable components (lactose, total proteins, casein, solids-not-fat, total solids, fat, calcium, phosphorus, potassium, cheese and heat stability) that dairymen strive for in producing high-quality milk.

MAS-D-TEC is used before teat dipping with minimal additional time required. Results are immediate, in positive, objective, easy-to-read form, with no chemicals or additives used. The speed and ease of use make it ideal for frequent (if not daily) testing, greatly improving the reliability of test results.

[1] Philpot, W. Nelson, Mastitis Management, Clinical Subclinical. Babson Bros. Co., Oak Brook Illinois, 1978.

DEVELOPMENT OF CONDUCTIVITY AS A TEST FOR MASTITIS

Using conductivity to detect subclinical mastitis has been well accepted in the literature. Linzell and Peaker[1] claim that by continuous monitoring and by the study of parallelism, 98 percent of infections can be detected with conductivity. In 1978, Peaker[2] reported a "success rate" in classifying cows using milk conductivity of 100 percent for uninfected cows, 93 percent for cows with highly pathogenic organisms in the mammary glands and 63 percent for those mildly infected; the overall success rate was 82 percent. Fernando, Rindsig and Spahr[3] in 1980 reported 96 percent accuracy in detecting cows with primary pathogens, 47.8 percent accuracy in detecting cows with secondary pathogens and 91.4 percent accuracy in identifying cows with no infection using conductivity. Subsequently they[4] reported 100 percent accuracy in identifying uninfected cows, cows infected with primary pathogens and cows infected with secondary pathogens if strippings were used. Sheldrake, Hoare and McGregor[5] investigated the effect of lactation stage and number of lactations on conductivity and concluded that these effects are small compared to the effects of an infection caused by Staphylococcus aureus. Twomey, Duirs and Haggie[6] of New Zealand established mean conductivity levels for Fresians and Jerseys.

Although conductivity is clearly as good as (if not superior to) any other indirect indication of mastitis[7], the test was previously a laboratory procedure. Conductivity meters, generally speaking, are not designed for the milking parlor environment. Mechanical abuse, humidity, temperature, calibration consistency, sample size and interaction between samples of differing conductivity all require special consideration in an instrument intended for cowside testing.

Researchers have for years recognized the importance of multiple tests for the detection of mastitis. Even a direct microscopic count often fails to detect an infection if used on a single occasion. Bacteria can only be detected when released into the milk by the body cells.

Lack of correlation between SCC, bacteria count and conductivity probably contributed to the general lack of interest shown in conductivity between 1948 and 1968. Recent researchers recognize the cyclic relationship between bacteria count and somatic cell count and are now able to interpret test results more intelligently.

As important as multiple tests are for accuracy, it has not been practical until now to test except on a single occasion. MAS-D-TEC is an idea whose time has come. Thousands of hours of testing by researchers all over the world substantiate the validity of using conductivity for the accurate detection of mastitis. Wescor has taken advantage of modern electronic technology to produce a practical conductivity meter based on a thoroughly researched principle.

REFERENCES

1. J.L. Linzell and M. Peaker: Efficacy of the Measurement of the Electrical Conductivity of Milk for the Detection of Subclinical Mastitis in Cows: Detection of Infected Cows at a Single Visit. Br. Vet. J., 131:447-460, 1975.

2. M. Peaker: The Electrical Conductivity of Milk for the Detection of Subclinical Mastitis in Cows: Comparison of Various Methods of Handling Conductivity Data with the Use of Cell Counts and Bacteriological Examination. Br. Vet. J.,134-308, 1978.

3. R.S. Fernando, R.B. Rindsig, and S.L. Spahr: Electrical Conductivity of Milk Used for Detecting Mastitis. Animal Nutrition and Health, 37-38, October 1980.

4. R.S. Fernando, R.B. Rindsig, and S.L. Spahr: Electrical Conductivity of Milk for Detection of Mastitis. J. of Dairy Sci. 65:659.

5. R.F. Sheldrake, R.J.T. Hoare, and G.D. McGregor: Lactation Stage, Parity and Infection Affecting Somatic Cells, Electrical Conductivity, and Serum Albumin in Milk. J. of Diary Sci. 66:542-547, 1983.

6. A. Twomey, G.F. Duirs, and D. Haggie: Final Report on Conductivity Type Mastitis Detector. AHI Plastic Moulding, Terapa, Hamilton, New Zealand, 1979.

7. B.T. McDaniel, K.L. Anderson, and J.C. Wilk. Evaluation of Simple, Quick and Inexpensive Cowside Tests to Identify Subclinical Mastitis Infections. ANS Report No. 246, 1994.

TIPS FOR MASTITIS CONTROL

Clinical mastitis is usually evident because it is characterized by milk abnormalities and the infected quarter may be hot, swollen, and sensitive. This form of mastitis need not be tested with MAS-D-TEC because it is obvious, and it may clog the test cell and show low readings.

Subclinical mastitis, however, is more subtle. Even before it becomes visible to dairy management, a well-managed herd of 100 cows can lose $25,000 a year due to decreased milk production associated with mammary disease. This necessitates periodic testing of your herd for subclinical mastitis in order to help control it.

1. Test each cow at least twice a month, identifying cows with subclinical mastitis. ***Wescor recommends testing the strippings (after the cow is milked out) from each quarter to give you the most accurate readings. Some experts recommend testing the foremilk, but be sure to obtain the first milk out of the teats immediately after they are washed.*** At each testing, record your results for individual cows in order to see herd trends. More frequency enables more accuracy; a single test may not detect infection due to the cyclic variations in bacteria and conductivity.

2. Quarters with subclinical mastitis (a reading of 5 or higher) should be considered infected. If one quarter is reading 2 units higher than the other quarters, even if it is in the normal range, you should consider that quarter to be infected as well. At this point, milking equipment and techniques should be critically evaluated and corrected if there are any problems. Continue to test cows with MAS-D-TEC. If the readings fail to decrease, contact your veterinarian for a bacteriological and antibiotic sensitivity analysis to help you determine what treatment steps should be taken. Acute clinical mastitis should receive prompt treatment by a veterinarian. Cull selected cows on the basis of persistent high readings, treatment failure and herd value.

3. Antibiotics are too often used as the ultimate answer or treatment without changing milking practices. Both go hand in hand with an effective mastitis control program. A practical approach to control mastitis is to implement a program to prevent new infections and eliminate existing infections. Suggested procedures for such a program are listed below.

    a. Have qualified persons check the complete milking system at regular intervals (i.e., design, vacuum level, pulsation, pump capacity, reserve capacity, reserve air flow, stray voltage, filters, etc.).

    b. Wash teats with a limited amount of warm sanitizing solution and thoroughly dry with single-service rags or towels.

c Gently attach machine within approximately one minute after start of preparation.

d Milk cows rapidly (3 to 5 minutes).

e Shut off vacuum before removing teat cups.

f Do not under-milk or over-milk cows.

g Use an effective teat dip.

h Disinfect teat cup clusters between cows.

i Replace teat cup liners according to manufacturer's suggestions, if not sooner.

j Treat all cows at drying off.

k Treat infected cows with a tested and FDA-approved antibiotic or product designed for subclinical infections.

l Keep housing and walkways clean and dry.

4 Using MAS-D-TEC for early mastitis detection and improving management practices are essential for an effective mastitis control program. Acting on your findings is critical to improving herd health and increasing milk quality and production.

SUPPLIES AND REPLACEMENT PARTS

SUPPLIES

RP-450 Instruction/Service Manual
SS-103 O-Ring Grease (3 gram tube)

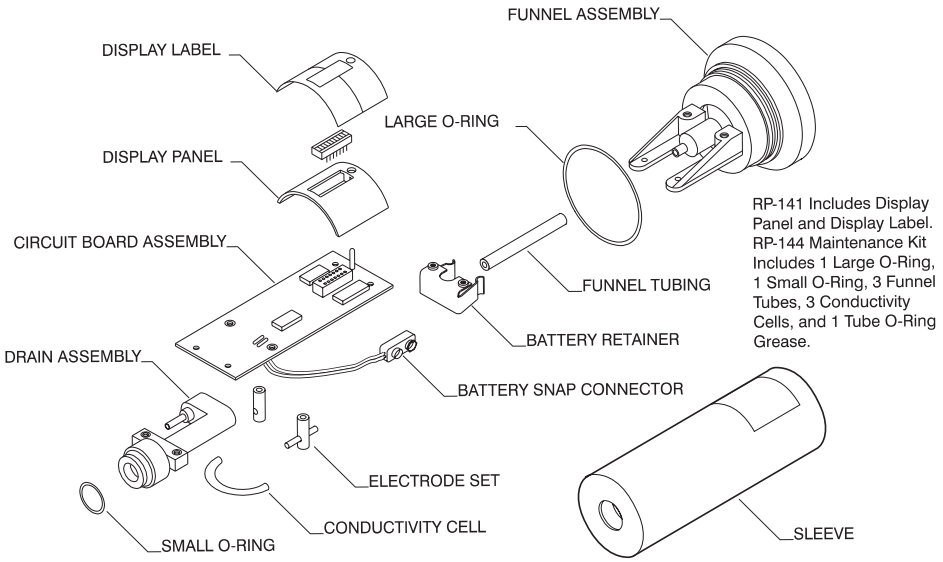
REPLACEMENT PARTS

RP-144 Maintenance Kit (2 O-Rings, 3 Funnel Tubes, 3 Conductivity Cells, and 1 Tube of O-Ring Grease)

For replacement parts and ordering information, contact Wescor:

WESCOR, INC. AN ELITECH GROUP COMPANY
370 West 1700 South
Logan, Utah 84321 USA

TELEPHONE: (435) 752 6011
TOLL FREE: (800) 453 2725
FAX: (435) 752 4127
EMAIL: wescor.service@elitechgroup.com



RP-141 Includes Display Panel and Display Label. RP-144 Maintenance Kit Includes 1 Large O-Ring, 1 Small O-Ring, 3 Funnel Tubes, 3 Conductivity Cells, and 1 Tube O-Ring Grease.