

# INSTRUCTION MANUAL

Milwaukee Wine Lab Photometer



## ■ Mi450 Color & Phenols



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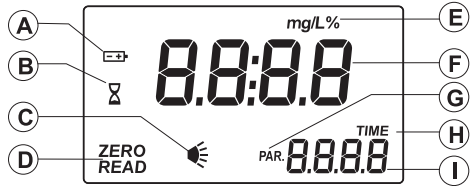
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## FUNCTIONAL DESCRIPTION

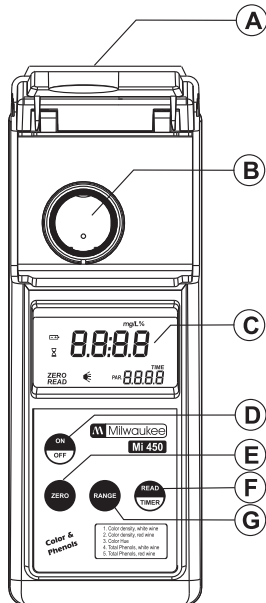
### DISPLAY

- A. BATTERY STATUS ICON
- B. HOURGLASS ICON
- C. LAMP STATUS INDICATOR
- D. MEASURE STATUS
- E. MEASUREMENT UNIT
- F. MAIN DISPLAY
- G. PARAMETER NUMBER INDICATOR
- H. TIMER MODE INDICATOR
- I. SECONDARY DISPLAY



### FRONT PANEL

- A. LID
- B. CUVET HOLDER
- C. LIQUID CRYSTAL DISPLAY (LCD)
- D. ON/OFF KEY, TO TURN THE METER ON AND OFF
- E. ZERO KEY, TO START THE ZERO MEASUREMENT
- F. READ/TIMER KEY, TO START THE SAMPLE MEASUREMENT OR TO ACTIVATE THE COUNTDOWN MODE TIMER
- G. RANGE KEY, TO SELECT THE DESIRED PARAMETER



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## **GENERAL DESCRIPTION**

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Thank you for choosing Milwaukee. This instruction manual will provide you the necessary information for correct use of the meter.

**Mi450** is an auto-diagnostic portable microprocessor meter. It has an advanced optical system based on a special tungsten lamp and a narrow band interference filter that allows most accurate and repeatable readings. All instruments are factory calibrated.

The auto-diagnostic feature of this meter ensures always optimal measurement conditions to perform most precise readings. The light level is automatically adjusted each time a zero-measurement is made, and the temperature of the lamp is controlled to avoid overheating.

### **SIGNIFICANCE OF USE**

#### **Color determination of wine**

Analytical techniques have become a valuable tool of modern wine makers. Especially the definition and the processing techniques to obtain the desired wine color are of key importance. The right decisions taken during maturation of the grapes, processing, aging and blending, all strongly influence the final result of wine color.

The color of wine is always read after removal of suspended matter. There are mainly two color components present, yellow and red but also a blue or green hue may appear. The color hue is the ratio between the yellow color concentrations over the red one, and is an indication about the degree of evolution.

The yellow color in wine comes from the presence of tannins (polymers of flavonoid - procyanidins type, and non-flavonoid phenols) and can be read without dilution. The increase of the yellow-brown color in older wines is due to aging or oxidation.

The red colors of wines are caused by free anthocyanins, copigments of anthocyanins, and polymerized phenolic compounds. The color of these pigments is pH dependent and can be intense dark. It is therefore necessary to dilute the wine sample taking care not to change the original wine pH. Milwaukee recommends using the special wine solvent to minimize possible errors due to dilution.

## Phenol determination of wine

Phenolic compounds are important for several reasons since they (i) affect the color of the wine, (ii) have an astringent taste, (iii) may cause pungent odor, (iv) are a source of oxygen reduction, and (v) are sources of browning substances.

Wine can contain a large variety of phenolic compounds and with traditional analytical techniques it is difficult to distinguish between total phenols and specific phenols. Although some progress has been made with HPLC, the most common analyses for total phenols remain the reaction of phenolic substances with the Folin-Ciocalteu reagent. Other methods like the direct spectrophotometric determinations are less accurate, because of difference in specific molar absorptivity, and color present of non phenolic substances.

The reaction between phenols and the Folin-Ciocalteu reagent involves oxidation of the phenolic groups (R-OH) with a mixture of phosphotungstic acid ( $H_3PW_{12}O_{40}$ ) and phosphomolybdic acid ( $H_3PMo_{12}O_{40}$ ) to the quinoid form (R=O). The concomitant reduction of the Folin-Ciocalteu reagent causes a blue color in the sample that is proportional to the total phenolic content that, in turn, is expressed as g/L of Gallic Acid Equivalents (GAE).

Another common method to express the phenol content is to report the Folin Index (FI) or Total Phenol Index. Simply multiply the read value in g/L of GAE times 25, to find the Folin Index value.

This meter is supplied with:

- Two sample cuvetts and caps
- Reagents for 5 tests (Mi550A-0, Mi550B-0, Mi550C-0, Mi550S1-0)
- One 200  $\mu$ L automatic pipette with Instruction Sheet
- One 2000  $\mu$ L automatic pipette with Instruction Sheet
- Two plastic tips for 200  $\mu$ L automatic pipette
- Two plastic tips for 2000  $\mu$ L automatic pipette
- One 5 mL syringe with tip
- One 1 mL plastic pipette
- One 3 mL plastic pipette
- Four 1.5V AA batteries
- Tissue for wiping cuvetts
- Instruction Manual
- Instrument Quality Certificate

## SPECIFICATIONS

Range	0.000 to 1.000	for Color Density, white wine
	0.00 to 15.00	for Color Density, red wine
	0.00 to 9.99	for Color Hue
	0.000 to 0.750 g/L	for Total Phenols, white wine
	0.00 to 5.00 g/L	for Total Phenols, red wine
Resolution	0.001	for Color Density, white wine
	0.01	for Color Density, red wine
	0.01	for Color Hue
	0.001	for Total Phenols, white wine
	0.01	for Total Phenols, red wine
Precision	±0.010 @ 0.200	for Color Density, white wine
	±0.20 @ 5.00	for Color Density, red wine
	±0.03 @ 0.75	for Color Hue
	±0.015 @ 0.350 g/L	for Total Phenols, white wine
	±0.10 @ 2.00 g/L	for Total Phenols, red wine
Light Source	Tungsten lamp	
Light Detector	Silicon Photocell with narrow band interference filter @:	
	420 nm	for Color Density, white wine
	420 and 520 nm	for Color Density, red wine
	420 and 520 nm	for Color Hue
	610 nm	for Total Phenols, white wine
	610 nm	for Total Phenols, red wine
Methods	Direct reading in the case of Color Density and Color Hue The reaction between Phenols and the reagents causes a blue tint in the sample for Total Phenols	
Environment	0 to 50 °C (32 to 122 °F) ; max 95% RH non-condensing	
Battery Type	4 x 1,5 volt AA batteries	
Auto-Shut off	After 15' of non-use in <i>measurement mode</i> .	
Dimensions	225 x 85 x 80 mm (8.7 x 3.3 x 3.1")	
Weight	500 g (17,6 oz.).	

This instrument is in compliance with CE Directives.

**Required Reagents for Color Density, white wine**

No reagents required.

**Required Reagents for Color Density, red wine**

<u>Code</u>	<u>Description</u>	<u>Quantity/test</u>
Mi550S1-0	Wine Solvent-1	8 mL

**Required Reagents for Color Hue**

<u>Code</u>	<u>Description</u>	<u>Quantity/test</u>
Mi550S1-0	Wine Solvent-1	8 mL

**Required Reagents for Total Phenols, white wine**

<u>Code</u>	<u>Description</u>	<u>Quantity/test</u>
Mi550A-0	Phenol Reagent A	5 mL
Mi550B-0	Phenol Reagent B	6 drops
Mi550C-0	Phenol Reagent C	4.5 mL

**Required Reagents for Total Phenols, red wine**

<u>Code</u>	<u>Description</u>	<u>Quantity/test</u>
Mi550S1-0	Wine Solvent-1	8 mL
Mi550A-0	Phenol Reagent A	5 mL
Mi550B-0	Phenol Reagent B	6 drops
Mi550C-0	Phenol Reagent C	4.5 mL

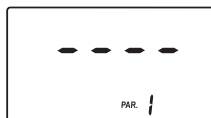
## GUIDE TO DISPLAY CODES



This prompt appears for a few seconds each time the instrument is turned ON.



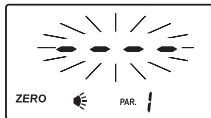
This prompt indicates the battery capacity value.



Indicates that the instrument is in a ready state and waiting for the next command (Timer or Zero).



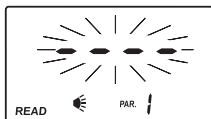
After Timer is pressed, a blinking hourglass icon appears and the display shows a 60 minutes countdown. At the end of the countdown an acoustic signal alerts the user that the timer is finished.



Indicates that the meter is performing a zero measurement. The light intensity is automatically re-adjusted (auto-calibration features) if necessary.



The instrument is zeroed and a measurement can be made.

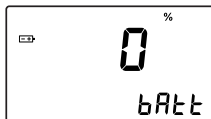


Indicates that the meter is making a measurement.



Batteries voltage is getting low and the batteries need to be replaced.






Indicates that the batteries are dead and must be replaced. After this message appears, the instrument is switched off. Change the batteries and restart the meter.

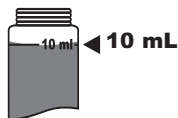
## GENERAL TIPS FOR AN ACCURATE MEASUREMENT

The instructions listed below should be carefully followed during testing to ensure best accuracy.

- For a correct filling of the cuvet: the liquid in the cuvet forms a convexity on the top; the bottom of this convexity must be at the same level of the 10 mL mark.
- For dosing the wine sample, we recommend to use the supplied Milwaukee automatic pipettes **Mi0026** (200  $\mu\text{L}$ ) and **Mi0022** (2000  $\mu\text{L}$ ).

For a correct use of the Milwaukee automatic pipette, please follow the related Instruction Sheet.

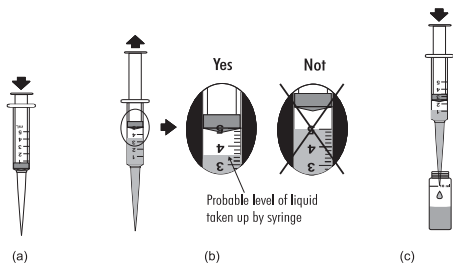
- In order to avoid reagent leaking and to obtain more accurate measurements, it is recommended to close the cuvet first with the supplied HDPE plastic stopper  and then with the black cap.
- Whenever the cuvet is placed into the measurement cell, it must be dry outside, and completely free of fingerprints, oil or dirt. Wipe it thoroughly with **Mi0004** (tissue for wiping cuvet, see chapter ACCESSORIES) or a lint-free cloth prior to insertion.



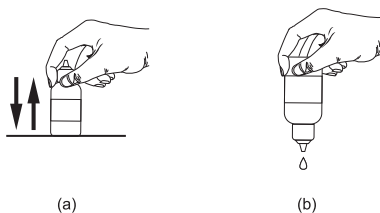
Milwaukee  
automatic pipette



- In order to measure exactly 5 mL of reagent with the 5 mL syringe:
  - push the plunger completely into the syringe and insert the tip into the reagent bottle.
  - pull the plunger up until the lower edge of the seal is exactly on the 5 mL mark.
  - take out the syringe and clean the outside of the syringe tip. Be sure that no drops are hanging on the tip of the syringe, if so eliminate them. Then, keeping the syringe in vertical position above the cuvet, push the plunger completely down into the syringe. Now the exact amount of 5 mL has been added to the cuvet.



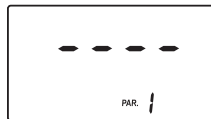
- Proper use of the dropper:
  - to get good reproducible results, tap the dropper on the table for several times and wipe the outside of the dropper tip with a cloth.
  - always keep the dropper bottle in a vertical position while dosing the reagent.



- Do not let the reacted sample stand too long after reaction, or accuracy will be lost.
- After the reading it is important to discard immediately the sample, otherwise the glass might become permanently stained.
- All the reaction times reported in this manual are referred to 20°C (68°F). As a general rule of thumb, they should be doubled at 10°C (50°F) and halved at 30°C (86°F).

## MEASUREMENT PROCEDURES

- Turn the instrument on by pressing **ON/OFF**.
- When the LCD displays “---”, it is ready. The secondary LCD indicates which parameter is selected (“1” or “2” or... “5”). The display code that appears is the one of the last selected parameter.



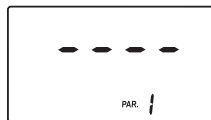
- Press the **RANGE** key to select the desired parameter.
- After the desired parameter code appears on the display, perform a measurement procedure following the instructions reported in corresponding parameter section (see table below).



Code	Parameter
1	Color Density, white wine
2	Color Density, red wine
3	Color Hue
4	Total Phenols, white wine
5	Total Phenols, red wine

### COLOR DENSITY, WHITE WINE

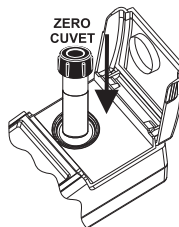
- Press **RANGE** to select the parameter code “1” for Color Density - white wine (see above).



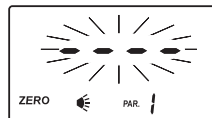
- Fill an empty cuvet with Deionized Water and replace the cap.



- Insert the zero cuvet into the holder and close the lid.



- Press **ZERO** and “----” will blink on the display.



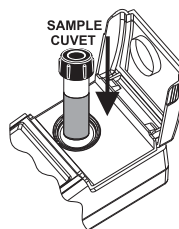
- After a few seconds the display will show “-0.0-”. The meter is now zeroed and ready for measurement.



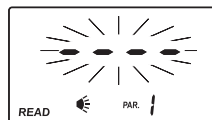
- Remove the cuvet from the instrument.
- Use the plastic pipette to fill a cuvet with white wine and replace the cap.



- Insert the sample into the holder and close the lid.



- Press **READ/TIMER** and “----” will blink during measurement.

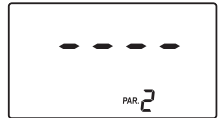


- The instrument directly displays the color density on the Liquid Crystal Display.

**Interferences:** Suspended matter should be removed by centrifugation or prior filtration. Use an adequate filter material that does not absorb color.

## COLOR DENSITY, RED WINE

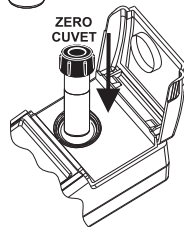
- Press **RANGE** to select the parameter code "2" for Color Density - red wine (see page 11).



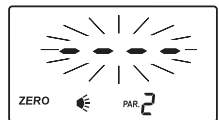
- Fill an empty cuvet with Deionized Water and replace the cap.



- Insert the zero cuvet into the holder and close the lid.



- Press **ZERO** and "----" will blink on the display.

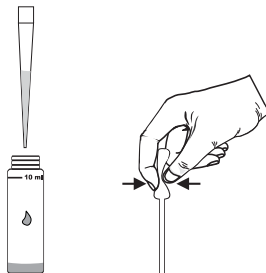


- After a few seconds the display will show "-0.0-". The meter is now zeroed and ready for measurement.

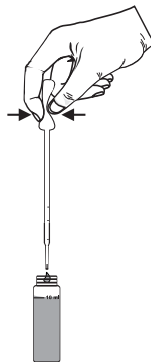


- Remove the cuvet from the instrument.

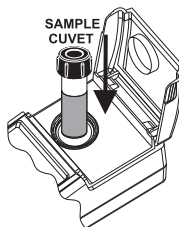
- Use the 2000  $\mu\text{L}$  automatic pipette to add exactly 2 mL of red wine sample to an empty cuvet. For a correct use of the automatic pipette please follow the related Instruction Sheet.



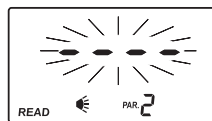
- Use the 1 mL plastic dropper pipette to fill the cuvet up to the 10 mL mark with Wine Solvent 1 (Mi550S1-0) and replace the cap.



- Insert the sample into the holder and close the lid.



- Press **READ/TIMER** and "----" will blink during measurement.

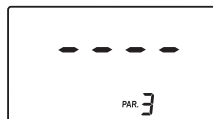


- The instrument directly displays the color density on the Liquid Crystal Display.

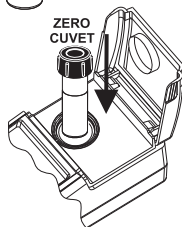
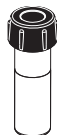
**Interferences:** Suspended matter should be removed by centrifugation or prior filtration. Use an adequate filter material that does not absorb color.

## COLOR HUE

- Press **RANGE** to select the parameter code "3" for Color Density - red wine (see page 11).

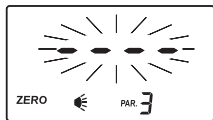


- Fill an empty cuvet with Deionized Water and replace the cap.



- Insert the zero cuvet into the holder and close the lid.

- Press **ZERO** and "----" will blink on the display.

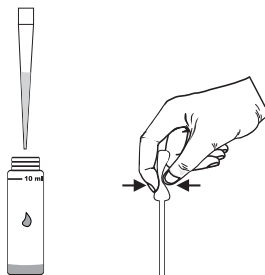


- After a few seconds the display will show "-0.0-". The meter is now zeroed and ready for measurement.



- Remove the cuvet from the instrument.

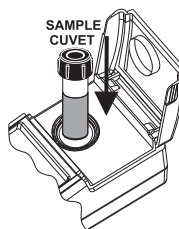
- Use the 2000  $\mu\text{L}$  automatic pipette to add exactly 2 mL of wine sample to an empty cuvet. For a correct use of the automatic pipette please follow the related Instruction Sheet.



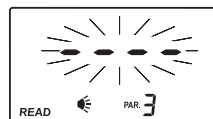
- Use the 1 mL plastic dropper pipette to fill the cuvet up to the 10 mL mark with Wine Solvent 1 (Mi550S1-0) and replace the cap.



- Insert the sample into the holder and close the lid.



- Press **READ/TIMER** and "----" will blink during measurement.



- The instrument directly displays the color density on the Liquid Crystal Display.

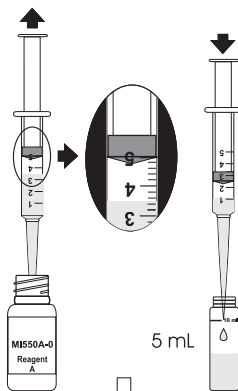
**Interferences:** Suspended matter should be removed by centrifugation or prior filtration. Use an adequate filter material that does not absorb color.



**TOTAL PHENOLS, WHITE WINE****Sample preparation**

- Use the 5 mL syringe to add exactly 5 mL of **Mi550A-0** reagent to an empty cuvet.

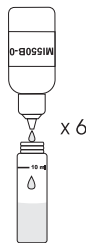
**Note:** in order to measure exactly 5 mL of reagent with the syringe, follow the instructions on page 10.



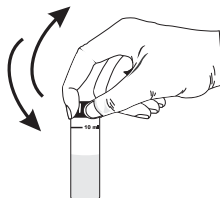
- Use the 200  $\mu$ L automatic pipette to add exactly 0,2 mL of white wine sample to an empty cuvet. For a correct use of the automatic pipette please follow the related Instruction Sheet.



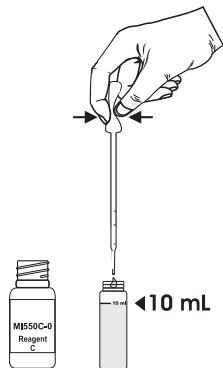
- Add 6 drops of **Mi550B-0** reagent to the cuvet.



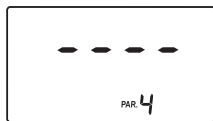
- Replace the cap and shake gently to mix.



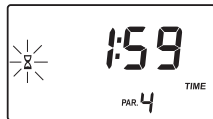
- Wait for 1 minute and then use the 3 mL pipette to add **Mi550C-0** reagent, to bring the volume up to the 10 mL mark.



- Turn the meter ON and press **RANGE** to select the parameter code "4" for Total Phenols - white wine (see page 11).



- To obtain the reacted sample hold down **READ/TIMER** for several seconds. The instrument will show the countdown. Alternatively, wait for 2 hours. The instrument gives an acoustic signal to alert the user that the countdown is finished.

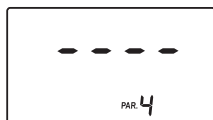


or

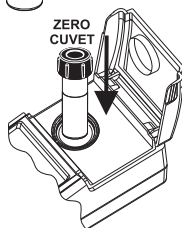


## Measurement

- Press **RANGE** to select the parameter code "4" for Total Phenols - white wine (see page 11).

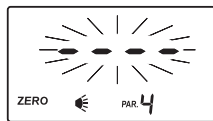


- Fill an empty cuvet with Deionized Water and replace the cap.



- Insert the zero cuvet into the holder and close the lid.

- Press **ZERO** and "----" will blink on the display.

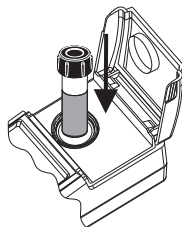


- After a few seconds the display will show "-0.0-". The meter is now zeroed and ready for measurement.

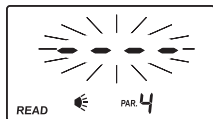


- Remove the cuvet from the instrument.

- Insert the reacted sample into the holder and close the lid.



- Press **READ/TIMER** and the display will show "----" during measurement.
- The instrument directly displays concentration in g/L of GAE (gallic acid equivalent) on the Liquid Crystal Display.

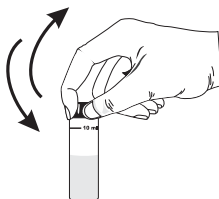


**Note:** If the phenols concentration is 0,750 g/L or higher, please repeat the test following the instruction for red wine (see below).

## TOTAL PHENOLS, RED WINE

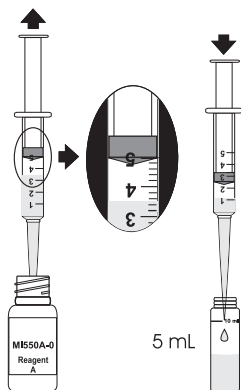
### Sample preparation

- Use the 2000  $\mu\text{L}$  automatic pipette to add exactly 2 mL of deionized water sample to an empty cuvet. For a correct use of the automatic pipette please follow the related Instruction Sheet.
- Then use the 200  $\mu\text{L}$  automatic pipette to add exactly 0,2 mL of red wine.
- Replace the cap and shake gently to mix. This is the diluted red wine sample.



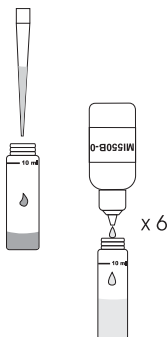
- Take another empty cuvet and use the 5 mL syringe to add exactly 5 mL of **Mi550A-0** reagent.

**Note:** in order to measure exactly 5 mL of reagent with the syringe, follow the instructions on page 10.

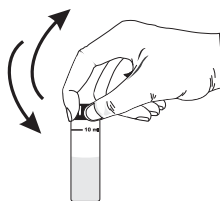


- Use the 200  $\mu\text{L}$  automatic pipette with a clean pipette tip to add exactly 0,2 mL of **diluted red wine sample**.

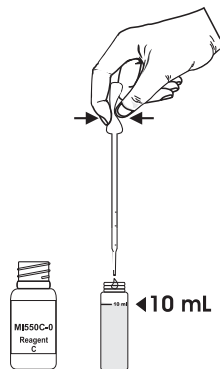
- Add 6 drops of **Mi550B-0** reagent to the cuvet.



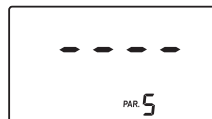
- Replace the cap and shake gently to mix.



- Wait for 1 minute and then use the 3 mL pipette to add **Mi550C-0** reagent, to bring the volume up to the 10 mL mark.



- Turn the meter ON and press **RANGE** to select the parameter code "5" for Total Phenols - red wine (see page 11).



- To obtain the reacted sample hold down **READ/TIMER** for several seconds. The instrument will show the countdown. Alternatively, wait for 2 hours. The instrument gives an acoustic signal to alert the user that the countdown is finished.

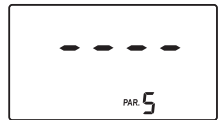


or

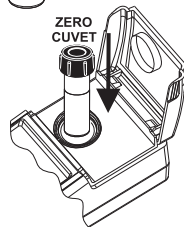
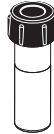


## Measurement

- Press **RANGE** to select the parameter code "5" for Total Phenols - red wine (see page 11).

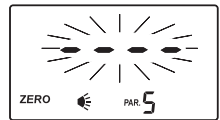


- Fill an empty cuvet with Deionized Water and replace the cap.



- Insert the zero cuvet into the holder and close the lid.

- Press **ZERO** and "----" will blink on the display.

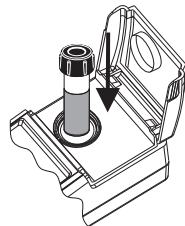


- After a few seconds the display will show "-0.0-". The meter is now zeroed and ready for measurement.

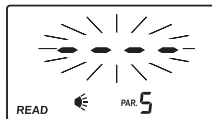


- Remove the cuvet from the instrument.

- Insert the reacted sample into the holder and close the lid.



- Press **READ/TIMER** and the display will show "----" during measurement.
- The instrument directly displays concentration in g/L of GAE (gallic acid equivalent) on the Liquid Crystal Display.



**Note:** If the phenol concentration is higher than 5 g/L, then pre-dilute the wine sample in the following way: use the automatic pipette to add 2 mL of deionized water and 2 mL of wine sample. Then follow the normal sample preparation procedure, using this pre-diluted sample as red wine sample. In this case the final value must be multiplied by 2.

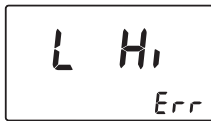


## ERROR MESSAGES

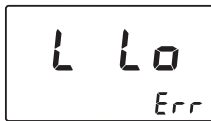


The meter has lost its configuration. Contact your dealer or the nearest Milwaukee Instruments Customer Service Center.

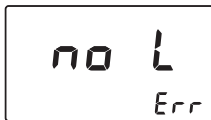
### on zero reading:



“Light high”: there is too much light to perform a measurement. Please check the preparation of the zero cuvet.

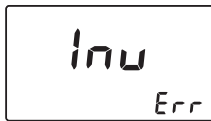


“Light low”: there is not enough light to perform a measurement. Please dilute the sample five times (see “General tips for an accurate measurement”, page 8).



“No Light”: the instrument cannot adjust the light level. Please check that the sample does not contain any debris.

### on sample reading:



“Inverted”: the sample and the zero cuvet are inverted.



The sample absorbs less light than the zero reference. Check the procedure and make sure you use the same cuvet for reference (zero) and measurement.



A flashing value of the maximum concentration indicates an over range condition. The concentration of the sample is beyond the programmed range: dilute the sample and measure again.

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## **BATTERY REPLACEMENT**

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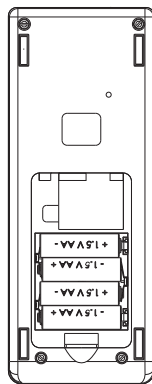
Battery replacement must only take place in a non-hazardous area.

The blinking “” will appear when the batteries power gets low.

When batteries are completely discharged, “0% bAtt” will appear and after two seconds the instrument is switched off.

Remove the battery cover from the bottom of the instrument and change the old batteries with 4 fresh 1.5V batteries, paying attention to the correct polarity.

Replace the cover.



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## **ACCESSORIES**

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### **Reagent sets**

Mi450KIT      Color & Phenols reagents set for wine (20 tests)

### **OTHER ACCESSORIES**

- Mi0006      1.5V AA batteries (4 pcs)
- Mi0004      Tissue for wiping cuvetts (4 pcs)
- Mi0011      10 mL glass cuvetts (2 pcs)
- Mi0014      Caps for cuvetts (2 pcs)
- Mi0026      200  $\mu$ L automatic pipette
- Mi0027      Plastic tips for 200  $\mu$ L automatic pipette (25 pcs)
- Mi0022      2000  $\mu$ L automatic pipette
- Mi0023      Plastic tips for 2000  $\mu$ L automatic pipette (25 pcs)

For your Safety don't use or store the instrument in hazardous environments. To avoid damages or burns, do not perform any measurement in microwave ovens.

### **WARRANTY**

This instrument is warranted against defects in materials and manufacturing for a period of 2 years from the date of purchase. Electrodes are warranted for 6 months.

If during this period the repair or replacement of parts is required, where the damage is not due to negligence or erroneous operation by the user, please return the instrument, electrode and probe to either distributor or our office and the repair will be effected free of charge.

Damage due to accidents, misuse, tampering or lack of prescribed maintenance is not covered by the warranty.

**Milwaukee/Martini instruments reserves the right to make improvements in design, construction and appearance of its products without advance notice.**

# THANK YOU FOR CHOOSING



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