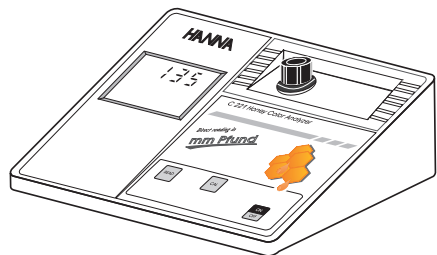


Instruction Manual

C 221 Honey Color Analyzer



HANNA
instruments
www.hannainst.com

CE
This Instrument is in
Compliance with the CE Directives

Dear Customer,

Thank you for choosing a Hanna product. This manual will provide you with the necessary information for the correct use of the instrument. Please read it carefully before using the analyzer. If you need additional technical information, do not hesitate to e-mail us at tech@hannainst.com or call 1-800-426-6287.

This instrument is in compliance with **CE** directives.

Warranty

C 221 is warranted for two years against defects in workmanship and materials when used for its intended purpose and maintained according to the instructions.

This warranty is limited to repair or replacement free of charge.

Damages due to accident, misuse, tampering or lack of prescribed maintenance are not covered.

If service is required, contact your dealer. If under warranty, report the model number, date of purchase, serial number and the nature of the failure. If the repair is not covered by the warranty, you will be notified of the charges incurred.

If the instrument is to be returned to Hanna Instruments, first obtain a Returned Goods Authorization Number from the Customer Service department and then send it with shipment costs prepaid. When shipping any instrument, make sure it is properly packaged for complete protection.

To validate your warranty, fill out and return the enclosed warranty card within 14 days from the date of purchase.

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Hanna Instruments reserves the right to modify the design, construction and appearance of its products without advance notice.

Preliminary Examination

Please examine this product carefully. Make sure that the instrument is not damaged. If any damage occurred during shipment, please notify your Dealer.

Each C 221 Honey Color Analyzer is supplied complete with:

- Five Sample Cuvets
- One Light Shield Cap
- One support for cuvetts
- Instruction Manual
- 12 VDC Transformer (HI 710005 or HI 710006)
- 30 mL Glycerol (1 bottle)
- Two 9V Batteries

Note: save all packing material until you are sure that the instrument works correctly. Any defective item must be returned in its original packing.

General Description

The C 221 portable microprocessor analyzer measures the percent light transmittance of honey compared to analytical reagent grade glycerol. The transmittance value allows identification of the honey Pfund grade. The instrument directly displays the measurement result expressed in mm Pfund.

Measurements are made using matched square optical cuvetts having a 10 mm light path.

Display codes aid the user in routine operations.

The meters have an auto-shut off feature that will turn the instrument off after 10 minutes of non-use.

Significance and Use

Honey color varies naturally in a wide range of tonalities, ranging from light yellow to amber, dark amber and black in extreme cases; sometimes green or red hues may also occur. Color of untreated honey depends on botanical origin: for this reason color is very important for definition and commercial classification of monofloral honeys. Honey darkens with ageing, and other changes in color may result from beekeeper's interventions and from the different ways of conservation (e.g.: use of old honeycombs, contact with metals, high temperatures, exposition to light, etc.).

The primary characteristic for commercial honey classification is color. Color classes are expressed in millimeters (mm) Pfund grades, compared to an analytical grade Glycerol Standard Reference.

Table 1 reports the USDA classification for honey samples and the related mm Pfund values.

Table 2 shows the color of different monofloral honeys: data are obtained from a statistical set of honey samples. The table reports for each type of honey: average value of color, standard deviation, and the minimum and maximum values measured.

Specifications

SPECIFICATIONS

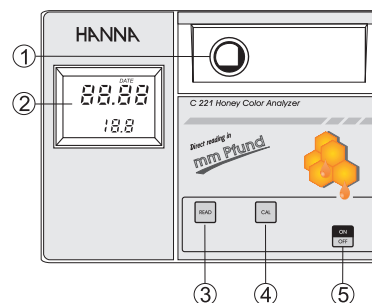
Range	0 to 150 mm Pfund
Resolution	1 mm Pfund
Precision	±2 mm Pfund @ 80 mm Pfund
Typical EMC Dev.	1 mm Pfund
Light Source	Tungsten lamp with narrow band interference filters @ 420 nm and 525 nm.
Method	Direct Measurement
Light Detector	Silicon Photocell
Environment	0 to 50°C (32 to 122°F); max 90% RH non-condensing
Power supply	2 x 9V batteries / 12 to 20 VDC through voltage adapter
Auto-Shut off	After 10' of non-use
Dimensions	230 x 165 x 70 mm (9.0 x 6.5 x 2.8")
Weight	640 g (22.6 oz.)

REQUIRED STANDARD

Description	Quantity/test
Glycerol	4 mL

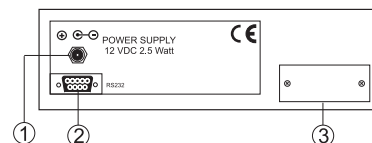
FRONT PANEL

- 1) Cuvet Holder
- 2) Dual Level Liquid Crystal Display (LCD)
- 3) READ key, to perform measurement
- 4) CAL key, to calibrate the meter prior to measurement
- 5) ON/OFF key, to turn the meter on and off

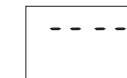


REAR PANEL

- 1) Power Supply 12 VDC 2.5 Watt
- 2) RS 232 Socket
- 3) Batteries Compartment



Guide to Display Codes



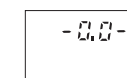
This indicates that the meter is in a ready state and zeroing can be performed.



Sampling in progress. This flashing prompt appears each time the meter is performing a measurement.



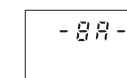
The microprocessor is adjusting the light level, indicated by a scrolling "SIP".



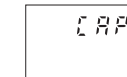
This indicates that the meter has been calibrated and measurement can be performed.



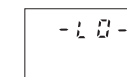
The blinking "LOBAT" indicates that the battery voltage is getting low and the batteries need to be replaced.



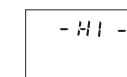
This indicates that the batteries are dead and must be replaced.



Light over range. The cuvet is not inserted correctly and an excess ambient light is reaching the detector. If the cap is properly installed, then contact your dealer or the nearest Hanna Customer Service Center.



The lamp is not working properly. Contact your dealer or the nearest Hanna Customer Service Center.



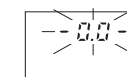
The lamp is not working properly. Contact your dealer or the nearest Hanna Customer Service Center.



This indicates that the meter has lost its configuration. Contact your dealer or the nearest Hanna Customer Service Center.

ERROR MESSAGES

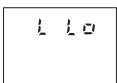
a) on zero reading:



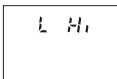
This indicates that the zeroing procedure failed due to a low signal-to-noise ratio. In this case press CAL again.



The instrument cannot adjust the light level. Please check that the sample does not contain any debris.

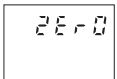


There is not enough light to perform a measurement. Please check the preparation of the Glycerol cuvet.

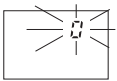


There is too much light to perform a measurement. Please check the preparation of the Glycerol cuvet.

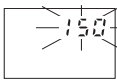
b) on sample reading:



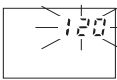
Calibration was not performed. Follow the instruction described in the measurement procedure for calibrating the meter.



Under range. A blinking "0" indicates that the sample absorbs less light than the Glycerol Reference. Check the procedure and recalibrate the instrument.

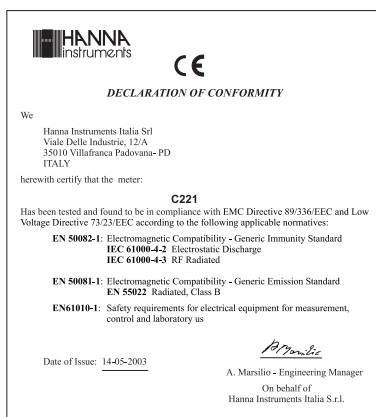


1) A flashing value of "150" (maximum measurable value) indicates an over range condition. The color intensity of the sample is beyond the programmed range.



2) A flashing value lower than the maximum measurable value (e.g. 120) indicates a low signal-to-noise ratio condition. In this case accuracy of the result is not guaranteed. Repeat the reading procedure.

CE Declaration of Conformity



Recommendations for Users

Before using these products, make sure that they are entirely suitable for your specific application and for the environment in which they are used.

Operation of these instruments may cause unacceptable interferences to other electronic equipments, this requiring the operator to take all necessary steps to correct interferences.

Any variation introduced by the user to the supplied equipment may degrade the instruments' EMC performance.

To avoid damages or burns, do not put the instrument in microwave oven. For yours and the instrument safety do not use or store the instrument in hazardous environments.

Tips for an Accurate Measurement

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

- Use matched square cuvetts, having 4 clear faces and a 10 mm path length.
- 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 **HI 731318** or a lint-free cloth prior to insertion.
- It is important that the sample does not contain any debris. This would corrupt the readings.
- Samples should be completely free of air bubbles. If bubbles are present, tap the cuvet on the table to remove them.

Operational Guide

POWER CONNECTION

Plug the 12VDC adapter (**HI 710005** - 110VDC, or **HI 710006** - 220VDC) into the DC socket. Plug the adapter into the outlet.

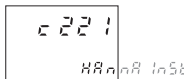
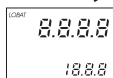
Alternatively, remove the battery cover on the back of the meter; attach two fresh 9V batteries and replace the cover.

Note: Insure the main line is surge protected.

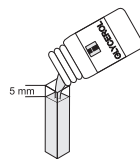
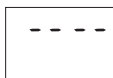
Note: Always turn the meter off before unplugging it to insure no data is lost.

MEASUREMENT PROCEDURE

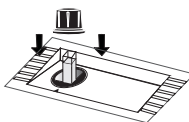
- Turn the meter on by pressing ON/OFF.
- The meter will first perform an LCD self diagnostic test by displaying a full set of figures.
- Then it will show a scrolling "C221 Hanna Inst" message.



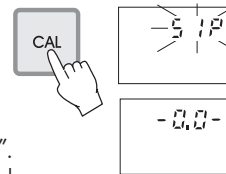
- When the LCD displays "----", the meter is ready.
- To perform calibration, fill one cuvet with about 4 mL of Glycerol, up to 5 mm (0.2") below the rim. This is the Glycerol Standard Reference.



- Place the Glycerol cuvet into the holder. Then put the light shield cap on.



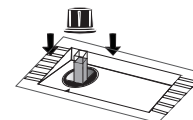
- Press CAL and "SIP" will blink on the display.



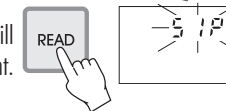
- After a few seconds the display will show "-0.0-". The meter is now calibrated and ready for measurement.
- Remove the Glycerol cuvet.
- Add to a second clean cuvet about 4 mL of honey, up to 5 mm (0.2") below the rim. This is the sample.



- Place the sample cuvet into the holder. Then put the light shield cap on.



- Press READ and "SIP" will blink during measurement.



- The instrument directly displays the honey color intensity value expresses in mm Pfund, as compared to Analytical grade Glycerol (fixed at zero Pfund).

INTERFERENCES

Interference may be caused by air bubbles or turbidity in the sample. Scratched or dirty cuvetts will also affect readings. Always check clearness of cuvetts prior to use.

BATTERY REPLACEMENT

Battery replacement must only take place in a non-hazardous area using two 9V alkaline batteries. Remove the battery cover on the back of the meter, attach two fresh 9V batteries and replace the cover while paying attention to the correct polarity.

Accessories

ANALYSIS KIT

C219 Kit

Kit for Honey Color analysis, including 82 cuvetts, 30 mL of Glycerol and two 5 mL syringe (75 tests average)

OTHER ACCESSORIES

C215-00300

5 mL graduated syringe

HI 710005

110VAC to 12VDC voltage adapter

HI 710006

220VAC to 12VDC voltage adapter

HI 721310

9V battery (10 pcs)

HI 731318

Tissue for wiping cuvetts (4 pcs)

HI 731335

Caps for cuvetts (4 pcs)

Table 1

USDA Color Standards Designations	Color Range Pfund Scales (mm)
Water White	≤ 8 or less
Extra White	> 8 - ≤ 17
White	> 17 - ≤ 34
Extra Light Amber	> 34 - ≤ 50
Light Amber	> 50 - ≤ 85
Amber	> 85 - ≤ 114
Dark Amber	> 114

Table 2

Honey Type common name	Latin name	AVERAGE (mm Pfund)	SD (mm Pfund)	Min. value (mm Pfund)	Max. Value (mm Pfund)
Acacia tree	Robinia pseudacacia	15	6	11	27
Chestnut tree	Castanea sativa	92	19	62	119
Citrus spp.	Citrus spp.	14	5	11	35
Dandelion	Taraxacum officinalis	54	11	41	71
Eucalyptus	Eucalyptus spp.	58	11	41	71
Fir honeydew		98	8	83	110
Fir tree honeydew		99	16	83	130
French honeysuckle	Hedysarum coronarium	18	6	11	35
Heather	Erica arborea	96	10	83	119
Lime tree	Tilia spp.	43	17	11	71
Rhododendron	Rhododendron spp.	13	5	11	27
Strawberry tree	Arbutus unedo	70	10	55	83
Sunflower	Helianthus annuus	61	6	51	71
Thyme	Thymus spp.	52	16	27	83