Operator Quick Guide

ORBISPHERE 3625



HACH ULTRA™

EXCELLENCE IN PROCESS ANALYTICS

Revision F - 04/04/2008

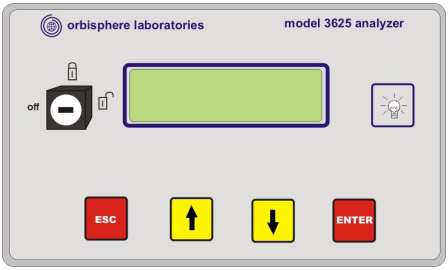
Operating Information

About this Guide

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Instrument Controls

Delivered with the 29976 package piercer, is the 3625 indicating instrument. The front panel of the instrument has several displays and controls.



The **Key Switch** should be turned to the horizontal unlocked position to start the instrument in measurement mode. The function keys are only active if the key switch is in the unlocked position. Use the vertical locked position to avoid accidental modifications.

The **Display** has a two-line liquid crystal display (LCD), having 16 characters per line.

A **Light Button**, when pressed, provides illumination to the LCD for three minutes.

Four **Function Keys** provide simple operator control over the instrument functions:

- **ESC** back one step.
- ⇧ or ⇩ move through the loop of available data (selection blinks).
- **ENTER** confirm selection.

Main Menu

The main menu is reached by pressing **ESC** as many times as needed:

- **MEASURE**: Measurement
- **OPTIONS**: Set up the instrument
- **CALIBRATE**: Calibration procedures



Entering Values

When entering numbers, several digits are displayed. The caret symbol ^ represents the cursor. After entering the last digit, the new value is saved.



- ⇧ ⇩ increase or decrease the number value
- **ENTER** move cursor one digit to right
- **ESC** move cursor one digit to left
- **ENTER** confirm last value entered
- ⇧ ⇩ move decimal point (when applicable)
- **ENTER** confirm and exit

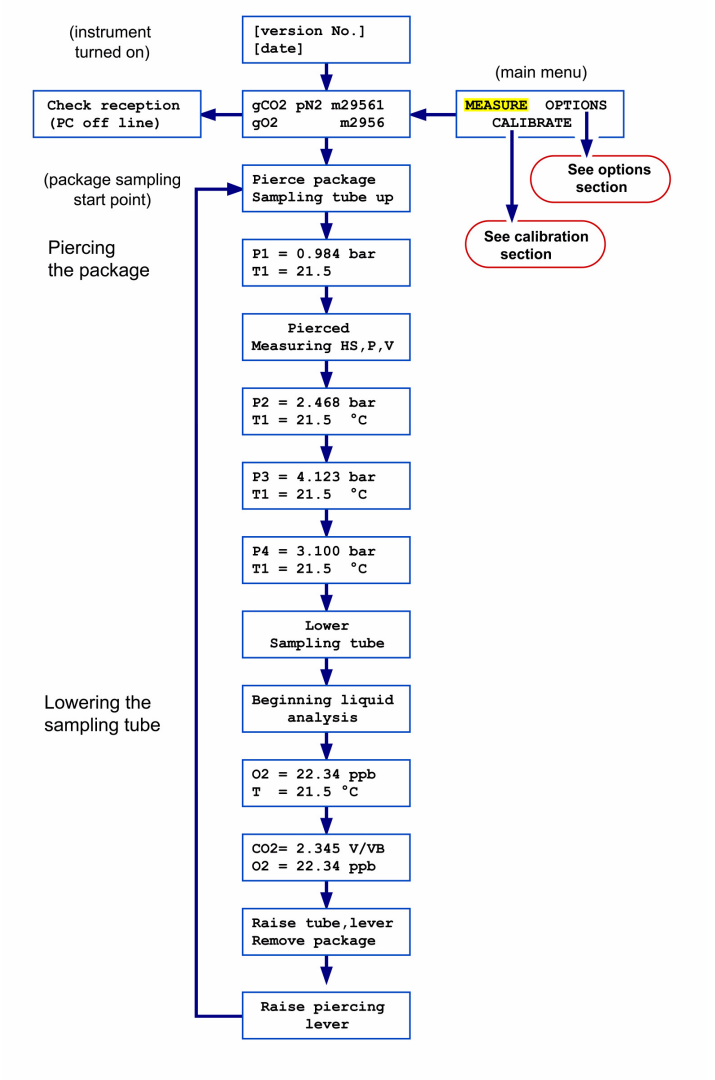
OrbiPack PC Software

The Beverage Package Analyzer system works with the OrbiPack software. Ensure that:

- An RS232 cable is connected from your PC to the instrument
- The PC is turned on
- The software is running

Measurement Menu

The flow chart below gives an overview of the **MEASURE** menu and sequence.



Measurement Process

Start the Instrument

The key switch on the instrument must remain in the vertical position to perform measurements.

A configuration screen is displayed for a few seconds, and then the message prompts you to start the measurement sequence.

This message remains on for a few seconds, and then the display shows the atmospheric pressure (**P1**) and temperature (**T1**) in the analyzer manifold. The pressure and temperature screen alternates with the preceding message until you either pierce a package (or press **ESC** to return to the main menu).

Package Pressure Equalization

In order to perform an accurate analysis, partial pressure in the package must be balanced between the gas phase (headspace) and the liquid phase (beverage). The packages to be tested must be gently agitated in a longitudinal direction for at least three minutes, using a reciprocating shaker.

Prepare for Piercing

First, make sure the piercing knife used is correct for the application (metal or plastic).

Check that the sampling tube is fully retracted inside the piercing knife, and that the rubber seal is in good condition and extends slightly below the piercing knife tip.

To clamp a package into position, tilt the piercing lever backward, install a package on the mat, and bring the lever to the vertical position. The package must be vertical on the base mat, and centered in the upper positioning plate. During the analysis, the package must remain firmly clamped; if not check the positioning device height adjustment.

Following instructions given by the system, pierce the package where the surface is smooth and flat, to get a good seal.

Pierce the Package

When prompted, pull the piercing lever down all the way in a uninterrupted move.

During analysis, any pressure leak past the rubber seal will alter results. Do not release the piercing lever until it is all the way down.

Headspace analysis is automatically triggered. When complete, the display will prompt you to lower the sampling tube.

Holding the piercing lever:

- Lower the sampling tube until all the way. The product sampling and analysis is then automatically triggered.
- Adjust the flow meter to 150 ml/min.

Visually check that the liquid in the tubing and flow chambers is not foaming. Increase the forcing gas pressure if necessary.

When analysis sequences are over, the display will ask you to remove package.

- Raise the sampling tube to its upper position, holding it only by the handle bar
- Lift the piercing lever all the way (past the 2 step device, if applicable)
- Remove the empty package

The instrument should display the **Pierce package** message, saying that the equipment is now ready for a new package sampling.

Daily Cleaning (user maintenance)

Every 8 hours of use or when a measurement session is over, whichever comes first, the sampling circuit must be flushed to remove any product deposit in the sampling lines and chambers.

Perform a measurement routine, using a package filled with clean water and some non aggressive liquid detergent (do not use caustic soda). Use either:

- 0.5% bleach (sodium hypo chlorite) at room temperature
- 5% Contrad (dilute caustic detergent) at 40° C

The measuring instrument waits for the evidence of piercing to continue, so press **ENTER** to bypass this step. Repeat this operation with two packages filled with water low in dissolved oxygen.

Let the system purge run for 5 minutes to purge liquid out and dry the system.

ACCESS

The software is password driven, so be sure you have a valid username and password. Depending on your access level, some of the following options may not be available to you.

PROCESS BAR

To hide or display the process bar, select it from the **View** menu. The process bar is displayed at the bottom left of the application window. It shows five boxes indicating the sequences of the current analysis. They correspond to the display messages on the measuring instrument.

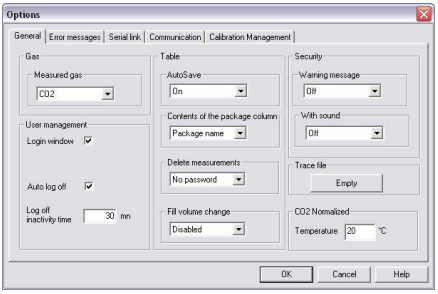


When one analysis step is completed, the corresponding box turns green. However, if a problem is found, the box turns red. Click the **Help** button for further details.

SOTWARE OPTIONS

You may set several options before performing a measurement. Select **Options** from the **Tools** menu and click the desired tab.

General



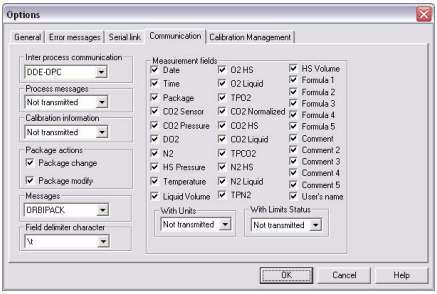
This option allows you to set several parameters, such as the gas being measured, and whether to capture the data after each measurement.

Error Messages

You can enable or disable warning messages for errors that may occur during package analysis. If one or more box is checked, and the corresponding error occurs, a pop up window displays the error and asks if you want to save the data anyway.

Inter Process Communication

The software allows for communication with other control and management systems such as SCADA and LIMS, etc. The communication option is used to define the necessary parameters.

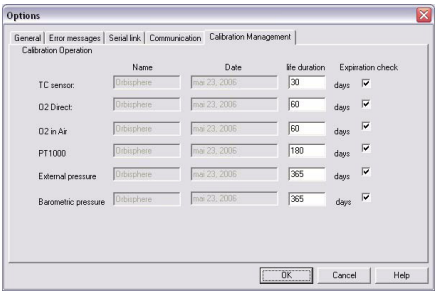


Note :

If using this option, you must have the appropriate communications software installed on your PC.

Calibration Management

Each time a calibration is successfully completed, the measuring instrument sends a message to the OrbiPack software that is saved together with the current date and operator's name.



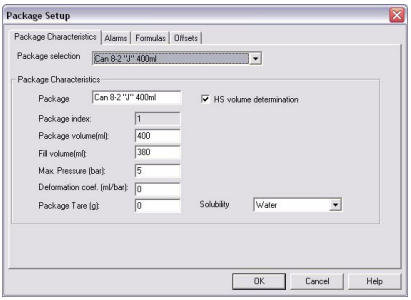
A calibration deadline date can be set, by checking the **Expiry check** box.

PACKAGE SET-UP

Supervisor level is required to access **Package set-up** in the **Package** menu.

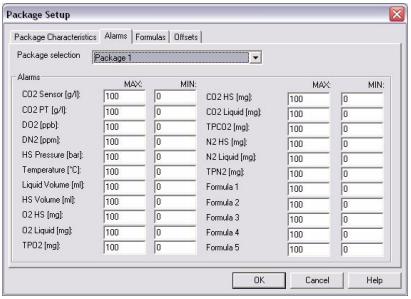
Package Characteristics

Enter the data corresponding to the package to be tested. Up to 500 different package specifications can be saved.



Alarms

Various thresholds can be entered to trigger alarms. The values exceeding these limits will appear in red in the data file.



Formula

Five formula lines are available to compute different equations of solubility. This allows you to create and compute a specific new parameter, or a different CO_2 solubility equation. The columns corresponding to the new formulae are displayed in the data table.

Offsets

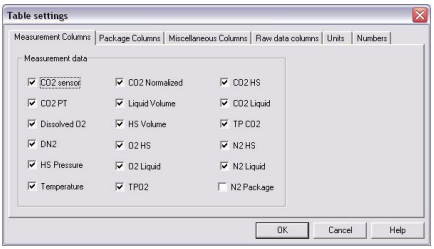
The offset is a multiplication factor applied to the measured data (e.g. an offset factor set at 1.01 will increase the value by 1%).

DATA TABLE SETTING

The options selected here defines the data elements listed in the data table (i.e. the file of measurement data).

Measurement Columns

This requires supervisor level access and can be made during or after the measurement sequence.



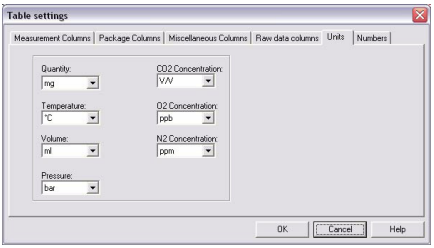
Several columns can be displayed for analysis purposes, regarding data, units, or resolution (decimal position).

Raw Data Columns

This is useful for diagnostic and troubleshooting operations. This concerns data received from the instrument before any computations are applied.

Units

Select the units to be used and displayed in the table columns.



Setting Instrument Options

The instrument is equipped with customized features for specific applications. Select **OPTIONS** from the main menu, and then use the ⇧ ⇩ keys until your choice is flashing. Press **ENTER** to select it.

MEMBRANES

The selection of a membrane is a compromise between the frequency of sensor services (calibration, maintenance) and the sensor sensitivity. It is also dependent on plant conditions (frequency of analysis, O_2 level being measured, etc.).

The default membrane for the O_2 sensor is model 2956A. It allows measurements within the ppb range. If sensor measure drifts, or sensor service frequency is high (less than once a month), then membrane model 2952A is recommended.

SERIAL OUTPUT

The serial RS-232 interface provides communication with an external computer or printer.

Print - Provides a formatted list of results as text to a PC or printer.

PC Com - Communication link between the Orbi-Pack software and the measuring instrument. The instrument sends the results data, and the PC sends the package setup data.

Diagnostic - Provides a formatted data list. There are two diagnostic data formats, depending on whether the instrument is in measure or calibrate mode.

Upload - A test function that generates a text file of the measuring instrument memory.

CONTINUOUS PURGE

This is a test function. When enabled, the system continuously purges the thermal conductivity sensor, and displays the sensor voltages for a 100% purge gas.

SAMPLING SYSTEM PURGE

This command opens the purge gas to the beverage sampling system. This is used to flush and dry the system during daily maintenance. This can also be used to rapidly bring the O_2 sensor inside the working range.

NITROGEN TC SENSOR CORRECTIONS

Humidity Factor Correction

Moisture may affect the N_2 sensor readings. Use this option to set the humidity correction factor of the N_2 sensor.

Oxygen Factor Correction

O_2 in the measured gas may affect the N_2 sensor readings. Use this option to set the oxygen correction factor of the N_2 sensor.

Temperature Correction

Significant changes in the sample temperature influences the N_2 sensor reading. Use this option to reduce this influence.

CHECK ROUTINE

This routine provides displays of the forcing gas pressure, and allows you to check valve operation on the system.

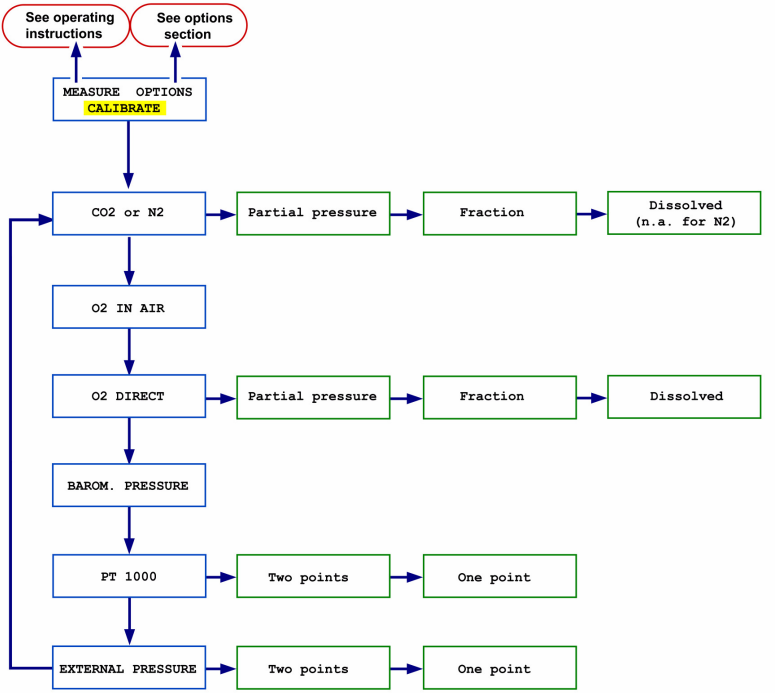
- **Pressure** - Forcing gas pressure check.
- **ABC check** - Automatic test routine for manifold electro valves.
- **D check** - Automatic test routine for pneumatic valves.
- **Valve** - This manual valve test function allows you to individually open and close each electro valve.
- **Tube** - A test function for the positioning switch on the sampling tube.

OXYGEN STABILITY

This option is used to monitor the O_2 sensor. When the O_2 stability criteria are not met, the data on the PC screen will be displayed on a red background.

Calibration

The flow chart below gives an overview of the calibration menu and sequences.



The following table shows the recommended sensor calibration interval for an average of 500 package analyses per week. This proposed schedule should be modified accordingly for varying operating conditions.

Sensor Calibration	Interval
PT 1000 temperature sensor	1 year
Barometric (internal) pressure sensor (located inside instrument)	6 months
Package (external) pressure sensor (located inside manifold)	3 months
Electrochemical O_2 sensor with membrane 2952A	4-6 weeks
Electrochemical O_2 sensor with membrane 2956A (special)	2-4 weeks
Thermal conductivity sensor	3 months

Note :

The gas sensor should be calibrated after each membrane change. Wait a minimum of 30 minutes before performing the calibration.

Calibration (cont)

PT-1000 TEMPERATURE SENSOR

This process requires the use of the 0°C simulator (model 32116), supplied with your Beverage Package Analyzer, and which plugs into the PT1000 socket on the instrument's back panel.

Prepare a package of water at room temperature, and measure the temperature of water with a certified thermometer and note this temperature.

Unplug the PT-1000 cable from the instrument back panel, and select the **PT-100**, **TWO POINT** calibration routine. Plug the simulator in the PT-1000 socket, and when prompted for low point temperature, enter 0°C. Select **RESISTOR** calibration and when the low point voltage is displayed, press **ENTER**.

Remove the simulator, and connect the PT 1000 cable. When prompted for high point temperature, enter the previously noted water temperature. Select **LIQUID** calibration, lower the sampling tube into the water package, and press **ENTER**. Wait until the voltage is stable, and press **ENTER** to validate and calibrate.

BAROMETRIC PRESSURE SENSOR

Measure the barometric pressure using a certified barometer in the location where the measuring instrument is used. The reference barometric pressure must be within ± 5 mbar.

If value is OK, press **ESC**. Otherwise enter the barometric pressure in mbar and press **ENTER**.

PACKAGE PRESSURE SENSOR

For the external pressure sensor, connect a certified pressure gauge to the forcing gas inlet line. Adjust the forcing gas pressure to 4 bar (gauge pressure).

It is recommended to use the **TWO POINT** calibration procedure, which requires that you work at two different pressures.

EC SENSOR (O_2)

Two methods of calibrations are available:

- **In air calibration**: Expose sensor to 100% humid air (**recommended**)
- **Direct calibration**: Expose sensor to a known source of O_2 (requires an optional flow chamber)

To calibrate in air, remove the O_2 sensor (still connected) from piercer, and wipe dry the sensor protection grille. Put one drop of tap water in the sensor storage cap. Install the cap sensor slightly loose to avoid compressing the air inside.

Select **O2 IN AIR** from the calibration menu and wait 5 minutes until the values displayed are stable. Press **ENTER** to save the new calibration.

TC SENSOR (CO_2/N_2)

Four calibration methods are available:

- **Partial pressure**: Using a known composition of CO_2 (or N_2) at ~5 bar (**recommended**)
- **Fraction**: Using a known composition (preferably pure) of CO_2 (or N_2) at atmospheric pressure
- **Calibration kit**: Requires optional HUA calibration kit. Using a known concentration of dissolved CO_2
- **Reference package**: Using a package with a known gas concentration content as a reference

For the partial pressure method, use the Orbisphere 32001.xxx calibration flow chamber. The sensor is exposed to a known composition of CO_2 (or N_2) between 3 and 5 bar absolute pressure (ideally close to the partial pressure being measured), measured with an external certified pressure gauge having a precision of ± 5 mbar.

Disconnect the external temperature sensor cable and remove the sensor from the piercer. If the sensor head is wet, rinse the tip with water, and dry with a tissue. Make sure that the grille in the front of the sensor is clean and dry.

Insert the sensor into the calibration flow chamber and connect a source of calibration gas to the flow chamber inlet. Close the flow chamber outlet valve to build up the requested pressure in the system.

Select **PARTIAL PRESSURE** from the calibration menu and enter the absolute pressure of the calibration gas. After 3 stable calibration cycles, the calibration should be complete.

Measurement Troubleshooting

The following table lists possible measurement errors.

Symptom	Probable Cause	Corrective Action	Sensor
Instrument does not start. No display or backlight.	No power. Incorrect voltage.	Check connections. Check instrument voltage label on the instrument rear panel.	
	Blown fuse.	Unplug the instrument and replace the fuse.	
Downward drift during measurement.	Purge gas pressure too low.	Adjust pressure at regulator to get over 3 bubbles per second from sensor exit tube (immerged in water).	CO_2
	Sample flow stopped.	Correct and start a new test.	CO_2
Low reading.	Leak in purge gas.	Check line for leaks with soapy water.	CO_2
	Sample flow too low.	Adjust sample flow according to procedure.	O_2
High reading.	Incorrect calibration in gas (wet membrane & protection grille ?)	Re calibrate the sensor according to procedure.	O_2/CO_2
High/low readings.	Calibration values entered did not match sample used.	Check that the entered numerical data and units fit the gas concentration or pressure.	O_2/CO_2
Unstable reading during calibration.	Calibration gas flow restricted, generating pressure pulse.	Make sure calibration gas flows freely; unscrew sensor collar ¼ turn to create a leak, thus increasing gas flow during calibration.	CO_2
Calibration impossible	Improperly mounted protection cap or membrane.	Sensor needs servicing.	O_2/CO_2
	Leaking purge gas solenoid valve in TC sensor.	Check purge gas sequence. If purge gas solenoid leaks during measurement phase (more than 1 bubble in 15 seconds), the sensor needs servicing.	CO_2
Erratic readings.	Water condensation into the thermal conductivity element.	In Options menu, turn on Continuous Purge mode overnight to dry the sensor cell. Water condensation may seriously damage the TC sensor cell.	CO_2
Forcing gas pressure P3 ≈ P4 during measurement cycle.	Product in manifold electro valves.	Perform cleaning and testing of the manifold valves.	

Instrument Error Messages

The following table lists possible instrument error messages.

Message	Reason	Action
Prg	Purge gas failure	Restore purge gas to specifications Perform the Continuous Purge test
	Damaged sensing element	Return sensor to Orbisphere
Chk	Purge voltage drifting	Check purge gas Perform the Continuous Purge test
Lmt	Ramp limit violated	Reduce gas permeation Perform the Continuous Purge test
Too low	Forcing gas pressure is insufficient to lift the liquid to the sensors	Check forcing gas pressure Verify that the forcing gas pressure is set at 500 mbar higher than the package pressure (P2)
Too high	Forcing gas pressure exceeds the limit set in the OrbiPack 4.00 software for this package type	Check forcing gas pressure, and check OrbiPack 4.00 software max press. set limit. Verify that the forcing gas pressure is set at 500 mbar higher than the package pressure (P2)
Check Reception	The PC communication has failed	Check PC cable connection Verify correct PC link and setup
Change the Filter	The gas filter in manifold may be clogged	Replace the gas filter
Calibration out of Bounds	Wrong membrane installed	Correct accordingly
	Perforated or torn membrane	
	Two membranes instead of one (or the opposite)	

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