

Gastro+™ Gastrolyzer®

USER MANUAL



CE
2797

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Helping to detect gastrointestinal disorders, one breath at a time.

Important Information/Reminders

WARNING: Please read the manual before use.

WARNING: Never use alcohol or cleaning agents containing alcohol or other organic solvents as these vapours will damage the electrochemical sensor inside.

WARNING: Under no circumstances should the instrument be immersed or splashed with liquid.

WARNING: Breath tests must only be carried out with Bedfont® accessories. Failure to do so may cause incorrect readings.

WARNING: The mouthpieces are single patient use only and can be used for a maximum of 3 tests. Further re-use could cause incorrect readings and could increase the risk of cross infection. The mouthpiece should be disposed of after use, in accordance with local waste disposal guidance.

WARNING: Patients should hold their breath for the duration of time indicated by the monitor during a breath test. Failure to do so may cause incorrect readings.

WARNING: To ensure a breath sample is taken at the correct flow rate, the monitor must be held upright at all times during a breath test.

WARNING: Do not block the exhaust ports on the device at any time. Blocking the exhaust ports may cause erroneous readings.

WARNING: Ensure the batteries are full or the device is connected to the computer via the USB port. If the device loses power during the automatic testing mode, only saved results will remain on the device and the protocol timings will be lost.

WARNING: Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of the Gastro⁺™ Gastrolyzer®, including cables specified by the manufacturer. Otherwise, degradation of the performance of this equipment could result. This equipment should be moved if necessary to avoid interference.

WARNING: When selecting an accessory for the Gastro⁺™ Gastrolyzer® monitor, please be advised that an accessory not recommended by Bedfont® may result in loss of performance and may compromise the safety of the device.

CAUTION: Ensure the monitor is used within the stated operating temperature and humidity ranges. Operating temperature is 15-35°C (59°-95°F). Operating humidity is 15-90% non-condensing.

CAUTION: Portable and mobile RF communications equipment can affect the Gastro⁺™ Gastrolyzer® monitors.

CAUTION: Please do not attempt to modify the equipment in any way or use accessories not specified by the manufacturer. Any attempt to do so, will invalidate the warranty and may cause product failure or damage to your Gastro⁺™ Gastrolyzer® monitor. The product warranty does not cover product failure or damage resulting from use with non-approved accessories.

NOTE: See Bedfont’s infection control and maintenance guidelines for further information on infection control.

NOTE: Bedfont® will make available on request service training to appropriately qualified personnel.

NOTE: Please refer to References section of this manual as appropriate for indicated citations.

Contents

Important Information/Reminders.....	1
Definitions.....	4
Introduction.....	4
Intended Use.....	4
Contraindications.....	5
Compliance.....	5
Instrument Layout.....	5
User Interface.....	6
Taking a breath test.....	6
Taking a face mask test.....	10
Conducting multi-patient breath tests.....	12
Patient Profiles.....	16
Protocol pre-set timings.....	17
Edit protocol timings.....	18
Edit protocol names.....	19
Protocol pre-set thresholds.....	21
Edit protocol pre-set positive thresholds.....	22
Reviewing history.....	23
Changing date and time.....	24
Technical Specification.....	26
Glossary of Symbols and Safety Information.....	26
Environment.....	29
Display symbols.....	30
Maintenance.....	32
Calibration.....	33
Troubleshooting.....	36
GastroCHART™ software – connecting to the PC.....	37
Returns procedure.....	37
Spares.....	38
Warranty.....	39
References.....	39
Responsible Manufacturer and Contacts.....	40

Definitions

WARNING: indicates a potentially hazardous situation, which, if not avoided, may result in minor or moderate injury.

CAUTION: indicates a potentially hazardous situation, which, if not avoided, may result in damage to the device.

NOTE: used to call attention to notable information that should be followed during use.

Introduction

H₂ is generated in the intestinal lumen by bacterial action on carbohydrates in the small or large intestine. Once the resultant H₂ is diffused into the bloodstream it is transported to the alveoli and then can be detected in expiratory air. Levitt¹ demonstrated the correlation between intestinal lumen H₂ production and H₂ excretion in expiratory air. Accurate measurement of H₂ in parts per million (ppm) in expiratory air reveals intolerance and/or malabsorption of carbohydrates; or bacterial overgrowth.

Intended Use

The Gastro⁺™ Gastrolyzer[®] is a hand-held monitor used to measure Hydrogen (H₂) levels in expired breath samples as an aid to screening and diagnosis of gastrointestinal sugar and nutrient malabsorption.

The monitor has the ability to analyze multiple breath samples provided by children and adults. Samples are obtained through a single-use disposable SteriBreath™ Eco mouthpiece or a disposable face mask, using the D-piece™ sampling system which enables end-expired breath to be analyzed.

The Gastro⁺™ can be used by to aid in the screening and diagnosis of the following disorders:

- Carbohydrate Breakdown Deficiency
- Carbohydrate Malabsorption
- Lactose Intolerance
- Bacterial Overgrowth
- Determination of time of passage through gut

The Gastro⁺™ Gastrolyzer[®] diagnostic measurements obtained are intended to be reviewed by an appropriately qualified healthcare professional and interpreted in conjunction with relevant medical factors applicable to the sample provider, as an aid in assessment of appropriate treatment or an aid to diagnosis of a condition. Specific diagnosis is not possible directly or instantly with this device; further specific testing and symptom analysis would need to be carried out by a healthcare professional to diagnose a patient's condition.

Contraindications

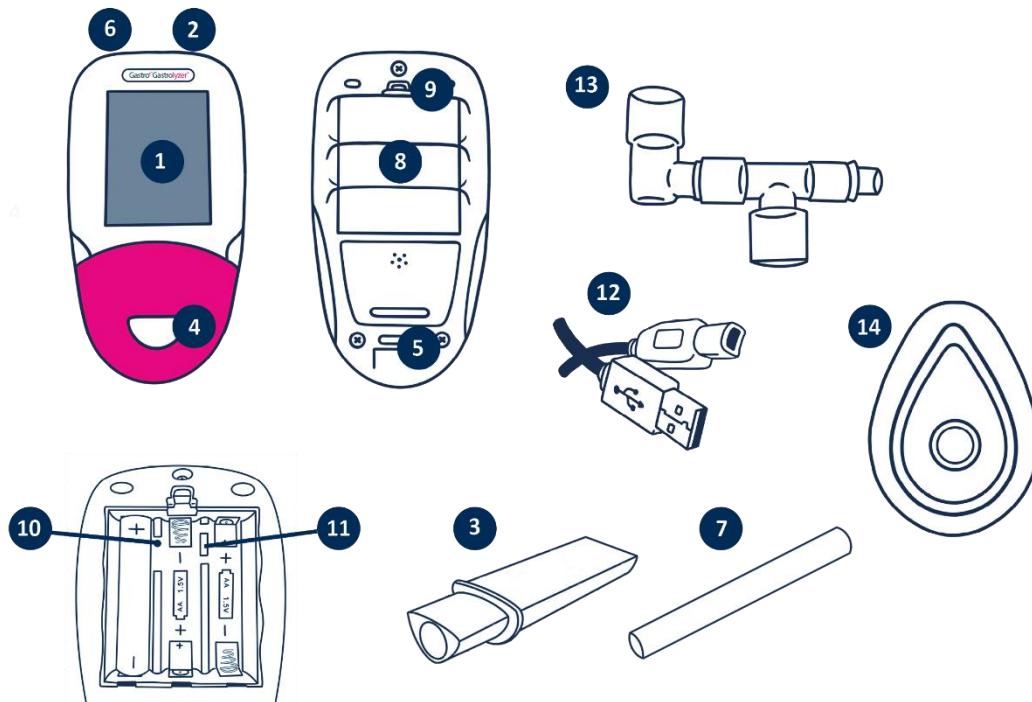
There are no known contraindications.

Compliance

Please refer to the following sections of this manual for more information on the compliance of the Gastro⁺™ Gastrolyzer[®] monitor

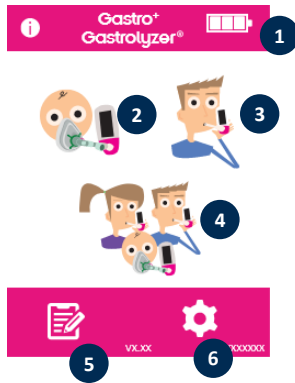
- Glossary of Symbols and Safety Information
- Environment

Instrument Layout



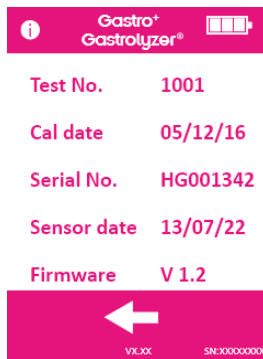
- | | |
|---|-------------------------------|
| 1. Display | 8. Battery compartment |
| 2. Power button | 9. Battery compartment clip |
| 3. Breath sampling D-piece™/OneBreath™ | 10. Reset button |
| 4. D-piece™ aperture | 11. Programming switch |
| 5. Exhaust port for breath sample | 12. USB cable (1.0m) |
| 6. USB connector (for use with GastroCHART™ software) | 13. Face Mask Sampling System |
| 7. Single-use SteriBreath™ Eco mouthpiece | 14. Face Masks |

User Interface



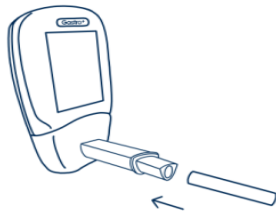
Home Screen

1. Battery status
2. Face mask breath test
3. Normal breath test
4. Multi-patient air test
5. Patient profiles
6. Settings



The information screen displays information about the monitor and sensor.

Taking a breath test

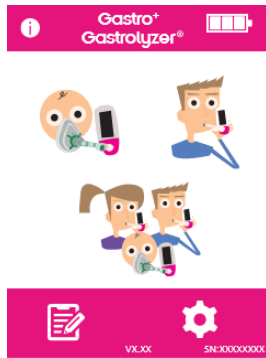


D-piece™ and SteriBreath™ Eco



OneBreath™

Attach a breath sampling D-piece™ and SteriBreath™ Eco mouthpiece, or attach a OneBreath™ mouthpiece.

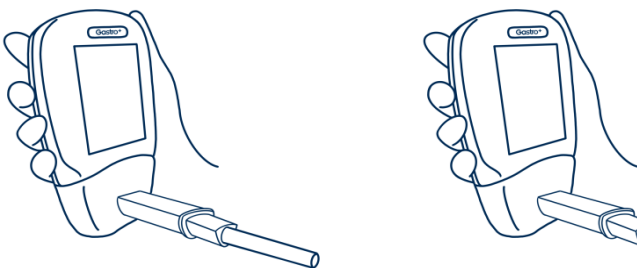


Turn on the monitor by pressing the power button once.

Press the breath test icon on screen.



If the timer is shown, the sensor is stabilising.



Inhale and hold breath for the pre-set 15 second countdown as shown on screen. If unable to hold breath for full 15 seconds, the timer can be adjusted in the settings.



Press the home button at any time to cancel the breath test.



A beep will sound during the last three seconds of the countdown.



Blow slowly into mouthpiece, aiming to empty lungs completely.





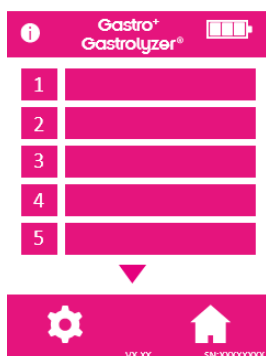
The ppm will rise and hold onscreen.



When the test is finished, the breath test, home and save icons will appear at the bottom of the screen.

To repeat breath test, press the breath test icon and repeat steps.

To return to the home screen, press the home icon.

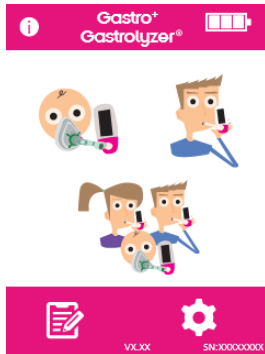


To save the reading, press the save icon and select the relevant patient profile.

Remove the D-piece™ or OneBreath™ between tests to purge sensor with fresh air.

To switch off, press and hold the power button for 3 seconds, unit will also power off after 45 minutes of inactivity to save power.

Taking a face mask test



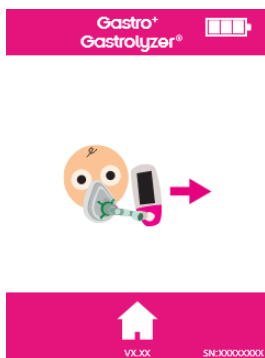
Attach a D-piece™ or OneBreath™ then a new face mask sampling system and appropriately sized face mask.

Turn on the monitor by pressing the power button once.

Press the face mask breath test option.



If the timer is shown, the sensor is stabilising.



Inhale and exhale into the face mask, the device will take the reading in real-time.



The ppm levels will rise and hold at the peak level, when this has stopped rising for a period of 5 consecutive seconds the test result can be recorded and the test stopped.



When the test is finished, the face mask breath test, home and save icons will appear at the bottom of the screen.

To repeat breath test, press the face mask breath test icon and repeat steps.

To return to the home screen, press the home icon.

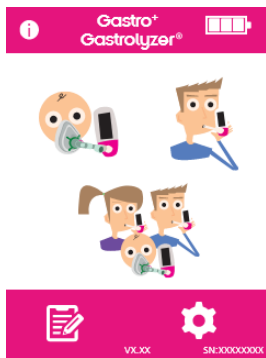
Remove the D-Piece™ or OneBreath™ and face mask sampling system between tests to purge sensor with fresh air.

To switch off, press and hold the power button for 3 seconds, unit will also power off after 45 minutes of inactivity to save power.

Conducting multi-patient breath tests

WARNING: Ensure the batteries are full or the device is connected to the computer via the USB port. If the device loses power during the automatic testing mode, only saved results will remain on the device and the protocol timings will be lost.

The Gastro⁺™ Gastrolyzer® allows automatic testing for up to 10 patients in one session to be set up, which can be very time-saving in a busy clinic. This can be done by following these steps:



Press the multi-patient icon on the main screen; this will go to the patient database screen, where patients can be selected that have been previously added. To add patients follows instructions in 'adding a patient profile' section of this manual.



Up to 10 patients can be selected for testing simply by pressing their name slot. Selected patients will change from pink to green when selected, to deselect them press the name slot again and it will return to pink.

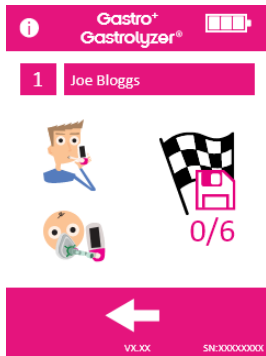
Once the desired patients have been selected, press the right arrow at the bottom of the screen to progress to the protocol screen.



Select the protocol for each patient; their name will be shown at the top of the screen.

Select the protocol by pressing the protocol name, for example 'lactose', when selected the protocol will change to green. To edit the protocol timings please see 'edit testing Protocols' section of this manual.

Press the right arrow at the bottom of the screen to progress to the next patient.



When the final protocol has been selected and when selecting a patient during testing, three options will appear for the first patient. Their name will be shown at the top of the screen.

To perform a breath test (please note: if this is the base sample no substrate/sugar should be given to patient before this point) press and follow steps 4-8 of the 'taking a breath test' section of this manual.

To perform a face mask test (please note: if this is the base sample no substrate/sugar should be given to patient before this point) press and follow steps 3-6 of the 'taking a face mask test' section of this manual.



If the test is unsuccessful in any way, take the test again by pressing the back arrow on the result screen, this will overwrite the previous result.

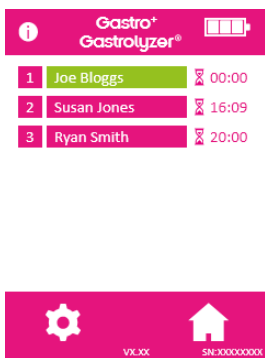


To save this reading to the patient profile, press the save icon.

This is the base sample; once the result has been saved, a prompt will appear to give the patient the relevant substrate/sugar.

Once the patient has done this, press the right arrow to continue with the next patient, this will also start the next breath test timer for the previous patient.

The device will prompt the next patient, tested in the same way.



When the final patient has provided a sample and taken the substrate/sugar, a screen will show all the patients in the testing session with countdown timings for each patient until their next test.

When the timer for a patient reaches zero, an alarm will sound indicating the next test is ready to be taken and the patient name will turn green.

Take the next reading for that patient by pressing their name and following above instructions.

Once each patient has finished their testing protocol, their name slot will turn green and the readings will be saved in the profile.



The amount of tests performed and how many are left for any given patient can be viewed by selecting the profile in the session screen.

If the results are satisfactory before the protocol session has finished, the session can be ended early by selecting the profile in the session screen and pressing the number of tests icon.

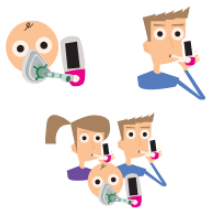


Confirm the action by pressing the same icon on the next screen.



- 1 Susan Jones ✓
- 2 Ryan Smith ✓
- 3 Joe Bloggs ✓

Once the complete patient session has finished, all name slots will show as green.



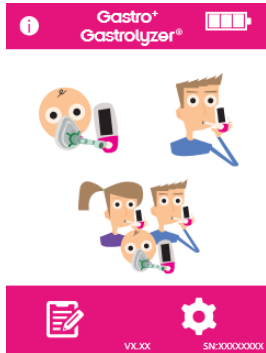
Return to the home screen in order to view results by pressing the profile icon.



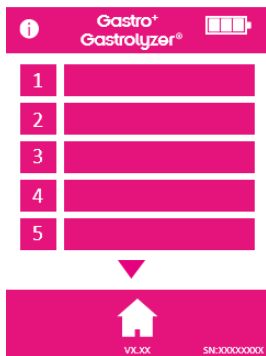
Results can be downloaded to GastroCHART™ for future reference or printing. Follow instructions in 'GastroCHART™ software' section of this manual.

Patient Profiles

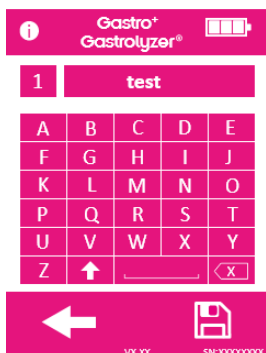
The Gastro+™ Gastrolyzer® allows up to 10 patient profiles to be set-up on the device in order to record readings to a specific patient profile and then downloaded later using GastroCHART™. This can be done by following the steps below:



Press the patient profile icon on the home screen.

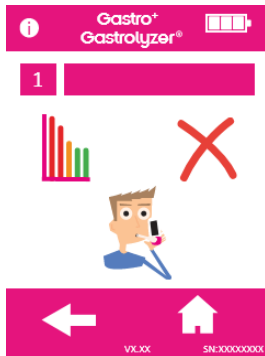


Press a patient profile to go to the edit screen.



Press the patient profile slot again to enter the name for the patient using the keyboard provided.

Once name or ID has been edited, press the save icon.



The patient profile has now been successfully set-up. More patient profiles can be set-up by pressing the back arrow and repeating steps.

Return to the home screen by pressing the home icon.

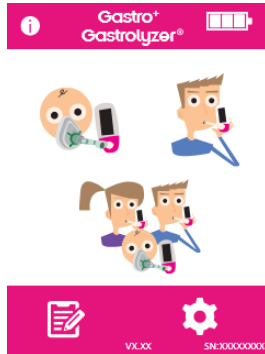
Protocol pre-set timings

The Gastro⁺ Gastrolyzer[®] is pre-set with testing protocols that follow time intervals recommended by clinical research.

Test	Recommended Dosage	Test frequency (minutes)	Samples
Lactose ³	25g of Lactose in 250ml of water	0, 15, 30, 60, 90, 120	6
Lactulose ²	10g of Lactulose in 200ml of water	0, 20, 40, 60, 80, 100, 120, 140, 160, 180	10
Fructose ³	25g of Fructose in 250ml of water	0, 15, 30, 60, 90, 120	6
Sorbitol ³	12.5g of Sorbitol in 250ml of water	0, 15, 30, 60, 90, 120	6
Xylitol ³	25g of Xylitol in 250ml of water	0, 15, 30, 60, 90, 120	6
Glucose ³	50g of glucose in 250ml of water	0, 15, 30, 45, 60	5

NOTE: Please refer to References section of this manual as appropriate for indicated citations.

Edit protocol timings



The testing protocols timings can be edited with different timings. Press the settings icon on the home screen.



Press the protocol icon.



Select the protocol to be changed; this will change to green when selected. Press the right arrow to continue.

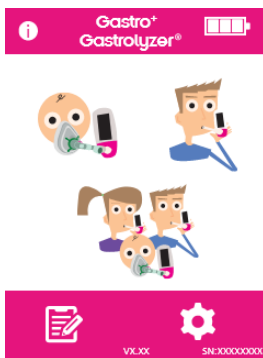


Select up to 10 time intervals by pressing the interval slot and increasing/decreasing the up or down arrows.

The base sample cannot be changed and will show as 'base', active intervals will show in green.

Once the protocol has been edited, press the save icon to save. Return to the settings screen.

Edit protocol names



The testing protocols names can be edited. Press the settings icon on the home screen.



Press the protocol icon.



Select the protocol to be changed; this will change to green when selected. Press the right arrow to continue.



Press the protocol name at the top of the screen.



Enter the new or preferred protocol name using the keyboard provided.

Press the save icon to save.

Protocol pre-set thresholds

Below is an interpretation table for general guidance on interpreting the H₂ values as an aid in assessment of appropriate treatment or an aid to diagnosis of conditions. Other factors through qualified judgement need to be taken in account by looking at the patient history, on-going symptoms and symptoms during testing. H₂ readings can be interpreted as positive or negative using the following pre-set thresholds (this is the increase in reading compared to the base sample):

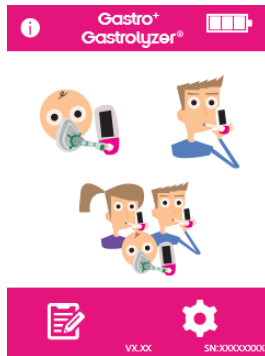
Test	Positive interpretation
Lactose ^{2,3}	H ₂ ≥20ppm CH ₄ ≥12ppm compared to base sample
Lactulose ⁴	H ₂ & CH ₄ >20ppm compared to base sample within 90 minutes of lactulose ingestion
Lactulose ² SIBO*	a) Early increase of at least 20ppm for the sum of the two gases b) Increase >20ppm corresponding to the appearance of lactulose in the colon
Lactulose ² IITT**	Fast ≥20ppm peak is detected at 60 minutes Normal ≥20ppm peak is detected at 80 minutes Slow ≥20ppm peak is detected 100 minutes or later
Fructose ²	H ₂ ≥20ppm CH ₄ ≥12ppm compared to base sample
Sorbitol ³	H ₂ ≥20ppm compared to base sample
Xylitol ³	H ₂ ≥20ppm compared to base sample
Glucose ³	H ₂ ≥10ppm CH ₄ ≥10ppm compared with base sample

*SIBO = Small Intestinal Bacterial Overgrowth

**IITT = Impaired Intestinal Transit Time

NOTE: Please refer to References section of this manual as appropriate for indicated citations.

Edit protocol pre-set positive thresholds



The testing protocols names can be edited. Press the settings icon on the home screen.



Press the protocol icon.



Select the protocol to be changed; this will change to green when selected. Press the right arrow to continue.



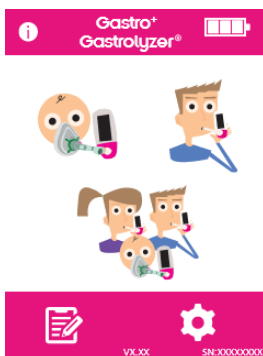
Press the graph and ppm icon.



Press the up or down arrow to increase or decrease the threshold.

Press the save icon to save.

Reviewing history

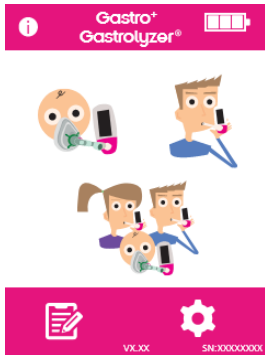


The Gastro⁺ Gastrolyzer[®] will record every reading taken in its history up to 150 readings. To access this, press the settings icon.



Press the history icon.

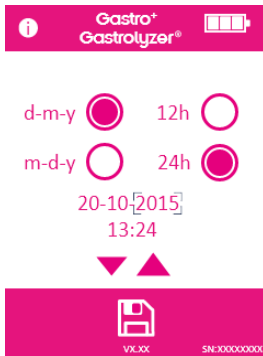
Changing date and time



To change the date and time on the Gastro+™ Gastrolyzer®, press the settings icon.



Press the date & time icon.



Select either d-m-y or m-d-y for the date format and 12h or 24h for the time format.

Dates and times are then adjusted by selecting the number and pressing the up or down arrows to increase and decrease.

Save the settings by pressing the save icon.








Technical Specification





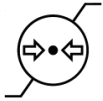







Concentration range	0-500ppm
Display	Full colour touchscreen
Detection principle	Electrochemical Sensor
Repeatability	<5%
Accuracy	≤±3ppm/10% - whichever is greater*
Power	3 x AA (LR6 or equivalent) – up to 1000 minutes 1 x CR2032 Lithium coin cell
T₉₀ response time	<40 seconds
Operating temperature	15-35°C (59°- 95°F)
Storage/transport temperature	0-50°C (32°- 122°F)
Operating/transport/storage pressure	Atmospheric ±10%
Operating humidity	15-90% non-condensing
Storage/transport humidity	0-95%
Expected sensor operating life	2 years
Sensor sensitivity	1ppm
Sensor drift	<2% per month
Dimensions	Approx. 37 x 77 x 140 mm
Weight	Approx. 215g (including batteries)
Materials	Case: polycarbonate/ABS blend SteriTouch® anti-microbial additive D-piece™: polypropylene SteriBreath™ Eco: paper OneBreath™ Mouthpiece: polypropylene Face Mask Sampling System: polypropylene, Styrene-butadieneplastic & silicone Face Masks: polyvinyl chloride and polyethylene
CO cross interference	<4%

*Readings of >200ppm at temperature between 26-35°C (78-95°F) can decrease accuracy to 15%.

Glossary of Symbols and Safety Information

Glossary of Symbols			
Title of Symbol	Symbol	Explanatory Text	Symbol & Standard References
Degree of protection against electric shock	N/A	Type BF applied part	N/A
Type of protection against electric shock	N/A	Internally powered equipment	N/A
Degree of safety application in the presence of a flammable anaesthetic mixture	N/A	Equipment not suitable for use in the presence of flammable mixtures	N/A


with air, oxygen or nitrous oxide			
Degree of protection against ingress of liquid	IPX0 not protected against water ingress	Degree of Ingress Protection Provided by Enclosure	IEC 60601-1, Table D.3, Symbol 2 IEC 60529
Direct Current		To indicate on the rating plate that the equipment is suitable for direct current only; to identify relevant terminals.	IEC 60601-1, Table D.1, Symbol 4 ISO 7000/IEC 60417-5031
Consult instructions for use		Indicates the need for the user to consult the instructions for use	ISO 15223 – 1, Clause 5.4.3 ISO 7000 – 1641 IEC 60601-1, Table D.1, Symbol 11
Serial Number		Indicates the manufacturers serial number so that a specific medical device can be identified	ISO 15223 – 1, Clause 5.1.7 ISO 7000 – 2498
Non-ionizing electromagnetic radiation		To indicate generally elevated, potentially hazardous, levels of non-ionizing radiation, or to indicate equipment or systems e.g. in the medical electrical area that include RF transmitters or that intentionally apply RF electromagnetic energy for diagnosis or treatment	IEC 60601-1-2 Clause 5.1.1 IEC 60417 - 5140
Keep dry		Indicates a medical device that needs to be protected from moisture	ISO 15223 – 1, Clause 5.3.4 ISO 7000 – 0626
WEEE (Waste Electrical and Electronic Equipment)		DO NOT THROW IN GENERAL RUBBISH DISPOSAL/TRASH! – Waste Electronic Equipment	EN 50419 Directive 2012/19/EU, Annex IX
Date of Manufacture		Indicates the date when the medical device was manufactured	ISO 15223 – 1, Clause 5.1.3 ISO 7000 – 2497 FDA 21 CFR 801

Manufacturer		Indicates the medical device manufacturer (*Note – Date of manufacture, name and address of manufacturer can be combined in one symbol	ISO 15223 – 1. Clause 5.1.1 ISO 7000 – 3082
Type BF Applied Part (Whole Device)		To identify a type BF applied part complying with IEC 60601-1 (Degree of protection against electric shock)	IEC 60417-5333 IEC 60601-1, Table D.1, Symbol 20
Temperature limit		Indicates the temperature limits to which the medical device can be safely exposed	ISO 15223 – 1. Clause 5.3.7 ISO 7000 – 0632
Humidity limitation		Indicates the range of humidity to which the medical device can be safely exposed	ISO 15223 – 1. Clause 5.3.8 ISO 7000 – 2620
Atmospheric pressure limitation		Indicates the range of atmospheric pressure to which the medical device can be safely exposed	ISO 15223 – 1. Clause 5.3.9 ISO 7000 – 2621
Authorised representative in the European Community		Indicates the authorised representative in the European Community	ISO 15223 – 1. Clause 5.1.2
Unique device identification		Indicates a carrier that contains unique device identifier information	ISO 15223 – 1. Clause 5.7.10
Indicator of Medical Device		Indicates the item is a medical device	ISO 15223 – 1. Clause 5.7.7
Catalogue number		Indicates the manufacturer's catalogue number so that the medical device can be identified	ISO 15223 – 1. Clause 5.1.6 ISO 7000-2493
CE mark		Manufacturer's declaration of compliance to all relevant European Medical Device Regulations	European Directive 93/42/EEC
Bedfont® logo		Manufacturers logo	N/A
General symbol for recovery/recyclable		To indicate that the marked item or its material is part of a recovery or recycling process.	ISO 7000-1135

Environment









The Gastro[™] Gastrolyzer[®] product complies with the Medical Device Directive 93/42/EEC as amended by 2007/47/EC and the Medical Device Electromagnetic Compatibility standard IEC/EN 60601-1-2.





















WARNING: Portable RF communications equipment (including peripherals such as antenna cables and external antennas) should be used no closer than 30 cm (12 inches) to any part of the Gastro[™] Gastrolyzer[®], including cables specified by the manufacturer. Otherwise, degradation of the performance of this equipment could result. This equipment should be moved if necessary to avoid interference.











Guidance and manufacturer's declaration: Electromagnetic Immunity (IEC 60601-1-2)			
The Gastro[™] Gastrolyzer[®] is intended for the use in the electromagnetic environment specified below. The customer or the user of the Gastro[™] Gastrolyzer[®] should assure that it is used in such an environment.			
Test	IEC 60601 Test level	Compliance level	Electromagnetic environment – guidance
Radiated Emissions: FCC part 15 Subpart B Class A & EN55011:2016 + A1:2017 Class A	30MHz to 1GHz	Met or exceeded	Portable and mobile RF communications equipment should be used no closer to any part of the Gastro [™] Gastrolyzer [®] including cables, than the recommended separation distance calculated from the equation appropriate to the frequency of the transmitter.
Conducted Emissions: FCC part 15 Subpart B Class A & EN55011:2016 + A1:2017 Class A	150KHz to 30 MHz	Met or exceeded	
Radiated Immunity : IEC 61000-4-3:2006 + A1 2007 + A2:2010 & EN61000-4-3:2006 + A1:2008 + A2:2010	3V/m (1kHz 80%) 80MHz – 2.7GHz Spot Frequencies: 385MHz 27 V/m PM 18 Hz 450MHz 28 V/m FM 1 kHz sine 710MHz 9 V/m PM 217 Hz 745MHz 9 V/m PM 217 Hz 780MHz 9 V/m PM 217 Hz 810MHz 28 V/m PM 18 Hz 870MHz 28 V/m PM 18 Hz 930MHz 28 V/m PM 18 Hz 1720MHz 28 V/m PM 217 Hz 1845MHz 28 V/m PM 217 Hz 1970MHz 28 V/m PM 217 Hz 2450MHz 28 V/m PM 217 Hz 5240MHz 9 V/m PM 217 Hz 5500MHz 9 V/m PM 217 Hz 5785MHz 9 V/m PM 217 Hz	Met or exceeded	Interference may occur in the vicinity of equipment marked with the following symbol: 
Conducted Immunity: IEC 61000-4-6:2015 & EN61000-4-6:2014	6V rms ISM and amateur radio bands	Met or exceeded	

Voltage Dips and Interrupts: IEC 61000-4-11:2005 & EN61000-4-11:2004	240VAC 500mS (50/60Hz) 70% @ 0° 240VAC 20mS (50/60Hz) 100% @ 0° 240VAC 10mS (50/60Hz) 100% 240VAC 5S (50/60Hz) 100% 100VAC 500mS (50/60Hz) 70% @ 0° 100VAC 20mS (50/60Hz) 100% @ 0° 100VAC 10mS (50/60Hz) 100% @ 0°, 45°, 90°, 135°, 180°, 225°, 270°, 315° 100VAC 5S (50/60Hz) 100%	Met or exceeded	
Power Frequency Magnetic Field: IEC 61000-4-8:2012 & EN61000-4-8:2010	30 A/m (50Hz and 60Hz)	Met or exceeded	
Fast Transient Burst: IEC 61000-4-4:2016 & EN61000-4-4:2012	± 2kV	Met or exceeded	
Surges: IEC 61000-4-5:2008 & EN61000-4-5:2006	± 0.5, 1.0 kV L-L ± 0.5, 1.0, 2.0 kV L-E 20s	Met or exceeded	
ESD: IEC 61000-4-2:2012 & EN61000-4-2:2009	+/- 8kV contact +/- 2, 4, 8,15kV air	Met or exceeded	

Display symbols

Description	Gastro ⁺ ™ Gastrolyzer®
Battery condition: full	
Battery condition: low	
Battery condition: empty	
Breath test	
Face mask test	
Automatic patient breath test	
Inhale	
Hold breath	

Edit countdown (breath hold) timer	
Countdown (breath hold)	
Exhale	
ppm reading	
Save	
Settings	
Home	
Patient profiles	
Patient profile slot	
Patient results chart	
Delete patient record	
Time until next breath sample	
Finish and save	
Change D-piece™	
Next step	
Previous step	
Sensor change due	
Sensor change overdue	
Calibration due date	
Calibrate device	

Attach flow meter to gas canister	
Attach calibration adaptor to D-piece™	
Attach D-piece™ to monitor and turn on gas flow	
System processing	
Calibration successful	
Calibration failed	
Retry calibration	
3 month calibration reminder	
Device reading history	
Edit date/time	
Firmware version	V2.23
Serial number	SN: HG000001

Maintenance

Routine maintenance

1. Mouthpieces should be replaced after every use.
2. Hands should be washed regularly in accordance with infection control practice.
3. Please do not attempt to modify the equipment in any way or use accessories not specified by the manufacturer. Any attempt to do so will invalidate the warranty and may compromise the safety of the device.
4. Bedfont® will make available upon request service training to appropriately qualified persons.
5. Holding the reset button down for 30 seconds will perform complete device reset, **this will clear any saved data and revert all settings to the factory defaults.** After performing a reset the device will need to have the date/time set and be calibrated before it can be used.
6. Replace batteries when indicated by the empty symbol.
7. Bedfont® recommend removal of the batteries when the device is not used for prolonged periods of time to prevent leakage.

8. Replace breath sampling D-piece™ every 30 days or if visibly soiled or contaminated. The Gastro⁺™ Gastrolyzer® products will give a reminder during start-up when the D-piece™ should be replaced, see 'change D-piece™' symbol.
9. The sensor should be replaced every 2 years, 60 days prior to the sensor change 'countdown to sensor change' symbol will be shown with the date on which the sensor should be changed. This can be ignored by pressing the home icon until the date at which the sensor should be changed arrives, at this point the 'change sensor' symbol will be shown. Change sensor if trained to by an approved Bedfont® engineer or send to Bedfont® or the local representative.

Cleaning

Bedfont® recommends wiping the instrument and D-piece™ external surfaces with a product specifically developed for this purpose. An EPA registered alcohol free disinfectant should be used, such as Sani-Cloth AF3 Germicidal Disposable Wipe. Cleaning should be performed following the instructions for use specified by the manufacturer of the EPA registered disinfectant. The device or consumables cannot be sterilized. It is recommended that wipes are used once and for one surface only. The Gastro⁺™ Gastrolyzer® device should be cleaned for initial use and after each patient use.

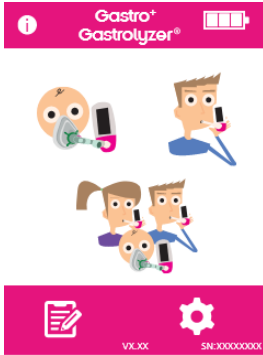
WARNING: Never use alcohol or cleaning agents containing alcohol or other organic solvents as these vapours will damage the electrochemical sensor inside.

WARNING: Under no circumstances should the instrument be immersed or splashed with liquid.

Calibration

The Gastro⁺™ Gastrolyzer® is calibrated at 21°C ±4°C (17°C-24°C) or 70°F ±39°F (63°F-75°F) before leaving Bedfont®. Please ensure the atmospheric temperature is between 17-24 °C (63°F to 75°F) before calibrating. If it is too cold to calibrate (<17°C or 63°F), a blue thermometer will be shown on-screen. Move the Gastro⁺™ Gastrolyzer® to a warmer area and try again later. If it is too hot to calibrate (>25°C or 77°F), a red thermometer will be shown on-screen. Move the Gastro⁺™ Gastrolyzer® to a cooler area and try again later.

The Gastro⁺™ Gastrolyzer® should be calibrated every 3 months and will give a reminder during start-up when calibration is due. The calibration gas required is 100ppm hydrogen in air.



Turn on the monitor by pressing the power button once.
Press the settings icon.



Press the cylinder icon once to proceed.



The monitor must be zeroed, this will happen automatically.
Do not connect the gas at this stage.



Ensure the fine control valve is in the off position.



Screw the fine control valve and flow indicator assembly to the gas can. This is best done by screwing the gas can into the valve.

Once this has been successfully carried out, the first step of the calibration process will be shown onscreen.



Allow the gas to flow at 0.5 litres per minute.



Allow the gas to flow through the instrument for the duration of the test, again monitoring the rate of flow.



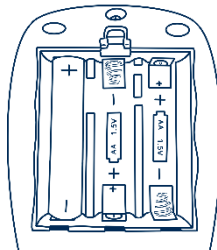
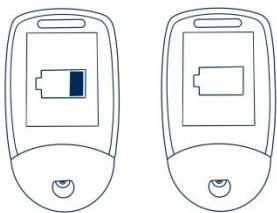
A successful calibration will be indicated by the tick icon, press the home icon to return to the home screen.



A failed calibration will be indicated by the red cross icon, press the rotating arrow icon to attempt calibration again – if the problem persists see ‘troubleshooting’ or call the local supplier of Bedfont® products.

Return to the home screen by pressing the home icon.

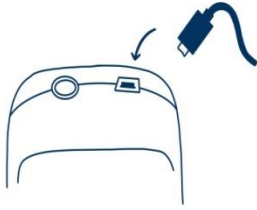
Troubleshooting



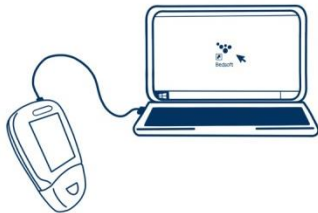
The unit fails to turn on

If the unit fails to turn on properly, check if the low or empty battery symbols are shown or replace the batteries. Ensure that the batteries are inserted the correct way around, matching the symbols moulded into the plastic.

GastroCHART™ software – connecting to the PC



Place one end of the connection lead into the USB socket on the top of the Gastro+™ Gastrolyzer® product.



Connect the other end to the USB port on the PC.

Before starting the software, ensure that the Gastro+™ Gastrolyzer® is connected to the PC and switched on. Double click the GastroCHART™ icon on the PC to start the programme. Refer to the supplied documentation for how to operate GastroCHART™. GastroCHART™ is available to download for FREE at <https://www.gastrolyzer.com>.

Returns procedure

If the Gastro+™ Gastrolyzer® requires servicing, please contact the local Bedfont® Customer Service Department, distributor or supplier before returning any goods.

1. The customer repairs department will need to be supplied with the monitor serial number and description of the fault. Once this information has been received, a returns/ ticket number will be issued. Please state the returns/ticket number on the outside of the box when returning the monitor, and ensure that a telephone number, fax number, and full return address are clearly stated.
2. The product must also be decontaminated before it is returned according to the local regulations. Bedfont® can provide a decontamination certificate to complete, which also needs to be attached to the outside of the box. Failure to do so will result in the product being subject to Bedfont® decontamination procedure and will delay the service/repair and may incur costs.

3. Bedfont® advises that a courier service is used when returning monitors. This enables goods to be insured for loss or damage in transit. When the goods are received, an email stating so will be sent.
4. If the device has been returned for repair it will then be examined and an 'engineer's report' and quotation for the repair will be sent, which will also include an authorisation form. Complete the authorisation form, and ensure that an 'official purchase order number' is included. Please contact the customer repairs department if an 'official purchase order number' cannot be provided.
5. If the monitor is still in warranty and the fault is covered by warranty, see 'warranty' section of this manual, Bedfont® will repair it and return it with an 'engineer's report', free of charge.
6. If the repair is not carried out, a handling fee will be charged. Ensure that a completed authorisation form with an 'official purchase order number' is returned.
7. The equipment will be returned as soon as Bedfont® has received all relevant paperwork. A carriage fee will be charged if the monitor is no longer in warranty.

Spares

SteriBreath™ mouthpiece	SteriBreath™ mouthpieces are both cost effective and compact. They are individually sealed for optimum infection control.
SteriBreath™ Eco mouthpiece	SteriBreath™ Eco mouthpieces are entirely made from paper and therefore are 100% recyclable and 100% biodegradable, including its packaging. Even better, all materials are from sustainable sources.
D-piece™	The D-piece™ is used to attach a SteriBreath™ Eco mouthpiece to the monitor. The D-piece™ incorporates a one-way valve and an infection control filter, which are proven to remove and trap >97% of viruses ⁵ and >99% of bacteria ⁵ . The D-piece™ should be changed every four weeks or more often if visibly soiled. An automatic reminder will appear on the screen every 28 days.
OneBreath™ mouthpiece	The OneBreath™ mouthpiece is a single-use bacterial filter mouthpiece and can be attached directly to the monitor to take a breath sample. The OneBreath™ incorporates a one-way valve and an infection control filter, which are proven to remove and trap >97% of viruses ⁵ and >99% of bacteria ⁵ .

Face mask sampling system	This sampling system is single patent use and allows the patient to breathe normally through a face mask in order to produce a breath sample. Also available in adult, adolescent and infant sizes.
Calibration gas	The Gastro ⁺ ™ requires calibration quarterly using 100ppm H ₂ gas, provided as a kit or replacement cylinder.

Warranty

Bedfont[®] Scientific Limited warrants the Gastro⁺™ Gastrolyzer[®] product and H₂ sensor (excluding batteries) to be free of defects in materials and workmanship for a period of 2 years from the date of shipment. Bedfont's sole obligation under this warranty is limited to repairing or replacing, at its choice, any item covered under this warranty when such an item is returned, intact and prepaid, to Bedfont[®] or the local representative.

This warranty is automatically invalidated if the products are repaired; altered, void labels removed or otherwise tampered with by unauthorised personnel, or have been subject to misuse, neglect or accident.



Never dispose of any electronic instrument or batteries in domestic waste. At the end of the product's life, contact Bedfont[®] or its distributor for disposal instructions.

References

1. Levitt, M.D. (1969): Production and excretion of hydrogen gas in man. New Engl. J.Med. 281:122-127
2. Biolab Medical Unit; Nutritional and Environmental Medicine; London England. Breath Hydrogen and Methane February 2012. Available at <http://www.biolab.co.uk/docs/bhydro.pdf>
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4. Pimental M. et al Methane Production during Lactulose Breath Test is Associated with Gastrointestinal Disease Presentation. Digestive Diseases and Sciences. Vol. 48 No. 1 2003
5. Public Health England (PHE). Report No. 17/001.

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