

User manual

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Portable analyzer GA-S1 for O₂ and CO₂

Version 2015-5



INDEX

1. INTRODUCTION.....	3
1.1 ABOUT THIS MANUAL.....	3
1.2 EXPLANATION OF THE SYMBOLS.....	3
1.3 RANGES OF MEASUREMENT.....	3
1.4 CONTACT.....	4
2. GUARANTEE.....	4
3. HANDLING.....	4
4. ANALYZER START UP.....	5
4.1 CHECKING THE ANALYZER.....	6
5. CONTROL PROCEDURE.....	7
6. CALIBRATION.....	9
6.1 CALIBRATING THE O ₂ SENSOR WITH ZERO % - GAS (NITROGEN).....	9
6.2 CALIBRATING THE CO ₂ SENSOR WITH REFERENCE GAS.....	10
6.3 CALIBRATION OF FRESH AIR.....	10
7. SAVE AND RELOAD DEFAULT SETTINGS.....	12
7.1 SAVE DEFAULT SETTINGS.....	12
7.2 RESET TO DEFAULT SETTINGS.....	12
7.3 RESET TO FACTORY SETTINGS.....	13
8. BATTERY.....	14
8.1 GENERAL.....	14
8.2 USER MANUAL BATTERY.....	14
9. DISPLAY OPERATING TIME.....	17
10. TECHNICAL SPECIFICATIONS.....	18

OVERVIEW IMAGES

Image 1: Calibrating gas connection with the included hose.....	7
Image 2: Connection of calibrating gas with a testing bottle.....	8

OVERVIEW TABLES

Table 1: Automatic charger.....	18
Table 2: Spare parts.....	18

1. Introduction

This user manual applies to the following company group:

- Schele Electronic UG & Co KG

1.1 About this manual

This manual contains instructions about how to work with the portable analyzer of Schele Electronic in order to lead to safe and efficient operations.

Please read the entire manual carefully before starting up the portable analyzer.

The portable analyzer is meant to measure oxygen (O₂) and/or carbon dioxide (CO₂) in cold stores for fruits and vegetables. The O₂ sensor type used is not suitable for cold stores where the CO₂ is removed through chalk. This O₂ sensor is particularly suitable for stores treated with an active carbon scrubber.

Attention!

Hydrocarbons can influence the measurement of the oxygen sensor. These hydrocarbons are not removed by chalk.

1.2 Explanation of the symbols



In this user manual, this symbol stands for all instructions and regulations related to your safety and the safety of any third party.



You find this symbol at important instructions and information for trouble-free operations and a correct usage of the portable analyzer.

1.3 Ranges of measurement

0-25% O₂ and 0-10% CO₂

or

0-25% O₂ and 0-30% CO₂

The range of measurement is dependent on the type of analyzer you purchased.

1.4 Contact

For questions and remarks you can contact:

Schele Electronic UG & Co KG
Antoine Schele
Zum Brachsen 3/2
88662 Überlingen
Germany

Tel: +49 (0)7551 7211
Fax: +49 (0)7551 9499994
E-Mail: info@schele-electronic.de

2. Guarantee

When using the portable analyzer appropriately as described in this user manual the guarantee period is 12 months.

3. Handling

ON: Switch on (Push 2 seconds)
OFF: Switch off

Function keys:

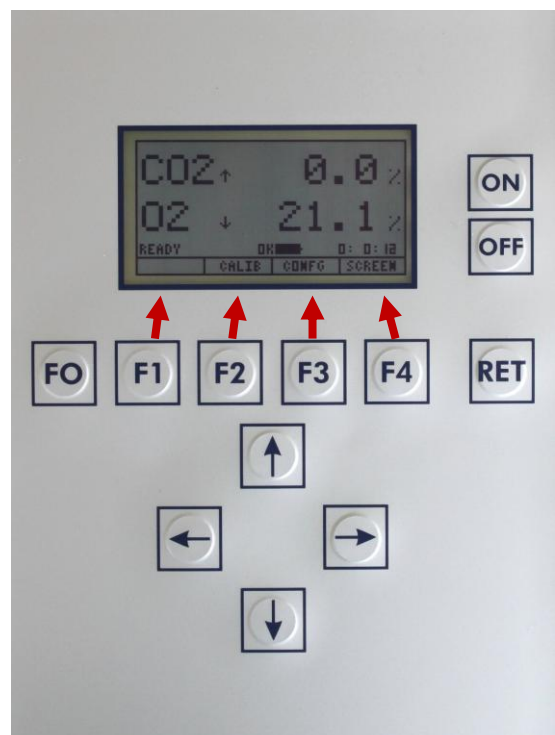
F0: Changing company name at startup
F1: Empty
F2: Start calibration
F3: Configuration (*is not described*)
F4: Operation time

- The function of the keys F1-F4 are dependent on the chosen screen
- The current functions are displayed at the screen bottom

RET: Confirmation settings

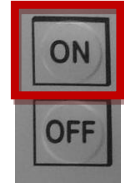
Arrow keys:

←↑→↓ Scrolling or adjusting a setting

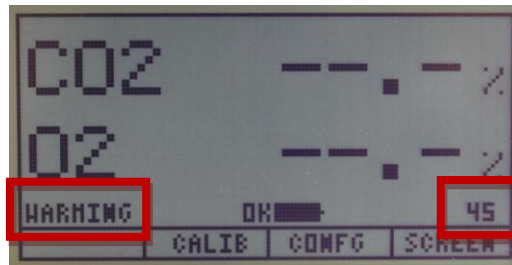


4. Analyzer start up

The portable analyzer is switched on at the “ON” button (Push for 2 seconds).
At the same time an air pump is switched on. This pump is responsible for the suction of the gas sample.



For a reliable measurement, please observe the minimum warm-up time in the lower right corner of the display until the word “READY” is displayed in the lower left corner



Since the analyzer sucks in the gas sample autonomously, do not insert gas under pressure into the analyzer. The gas sample must not contain any water at all.

To protect the sensors a dust/dirt/moisture filter is included in the delivery.

A new hydrophobic filter can be ordered separately, see Table 2: Spare parts.





Never work with the analyzer without this hydrophobic filter.



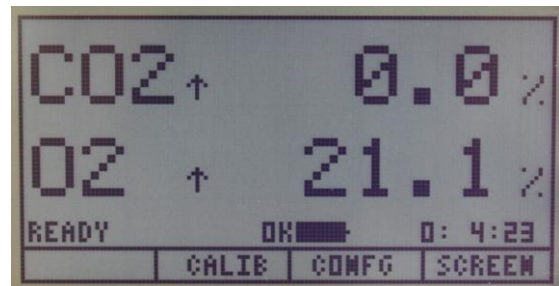
The analyzer has to be recharged with the battery charger included in the delivery. Take care that the built-in battery is always completely recharged. Charge battery only at a temperature higher than 5 °C. During a long time of inactivity, charge battery onto 40% and recharge it to this level every 2 to 3 months. This avoids a deep discharge of the battery which could lead to a breakdown of the battery.

After warming up the screen will display the current O₂ and/or CO₂ measurement:

CO₂ ↑ = trend upwards
O₂ ↓ = trend downwards

READY = ready for use
OK  Battery full indication
LA  Battery low indication

0: 4: 23 = Operating time [h:mm:ss] is 0 hours 4 minutes 23 seconds



4.1 Checking the analyzer

All portable analyzers are being calibrated before delivery.

To carry out and obtain reliable measurements the analyzer has to be checked regularly. This can be done by comparing the values of the analyzer with a calibrating gas, see chapter 5: Control procedure. If the given values on the display **do not** match with the values of the calibrating gas, calibration is necessary, see chapter 6: Calibration.



The user is entirely responsible if the user carries out calibration himself.
In this case, Schele Electronic cannot be held to account for any damages.

In the event of no sample gas suction, the suction hoses and the connected filter have to be checked. The filter could be blocked, in which case it has to be replaced.

5. Control procedure



Please carry out the control procedure only outdoors, since the effluent gas can be a health risk for every person located in a closed room.

First turn the portable analyzer on.



For a reliable measurement, please observe the minimum warm-up time in the lower right corner of the display until "READY" is displayed in the lower left corner

For the inspection of the analyzer, calibrating gases are needed.

Because gas must not be inserted under pressure, the feeding hose of the calibrating gas bottle has to be interrupted.

It is recommended to use the included hose for this process, see image 1.

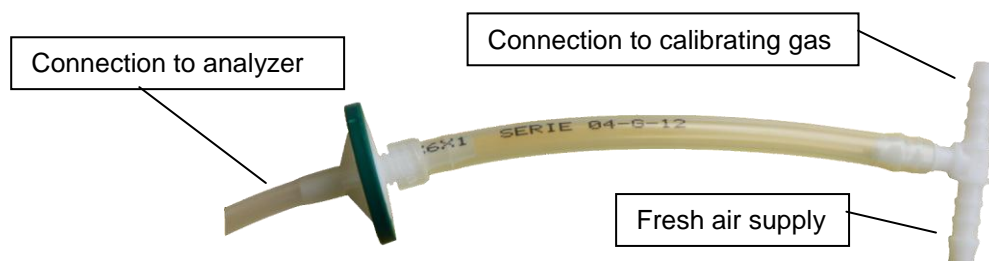


Image 1: Calibrating gas connection with the included hose

To ensure no fresh air or other gases from outside the analyzer are able to enter into the hose, it is important that more gas flows into it than the analyzer can suck in. This can be identified by gas escaping the open connector.

Alternatively a small plastic or glass bottle can be used, from which the analyzer can draw a gas sample through another hose by itself, see Image 2.



The plastic or glass bottle with a neck diameter between 20 and 30 mm has to be absolutely clean and dry on the inside.

There must not be any dust or moisture inside the bottle.

The quantity of gas in the bottle has to be a bit larger than the quantity drawn by the analyzer to avoid air from the outside from entering, see Image 2: Connection of calibrating gas with a testing **bottle**. This can be identified by gas escaping the testing bottle.

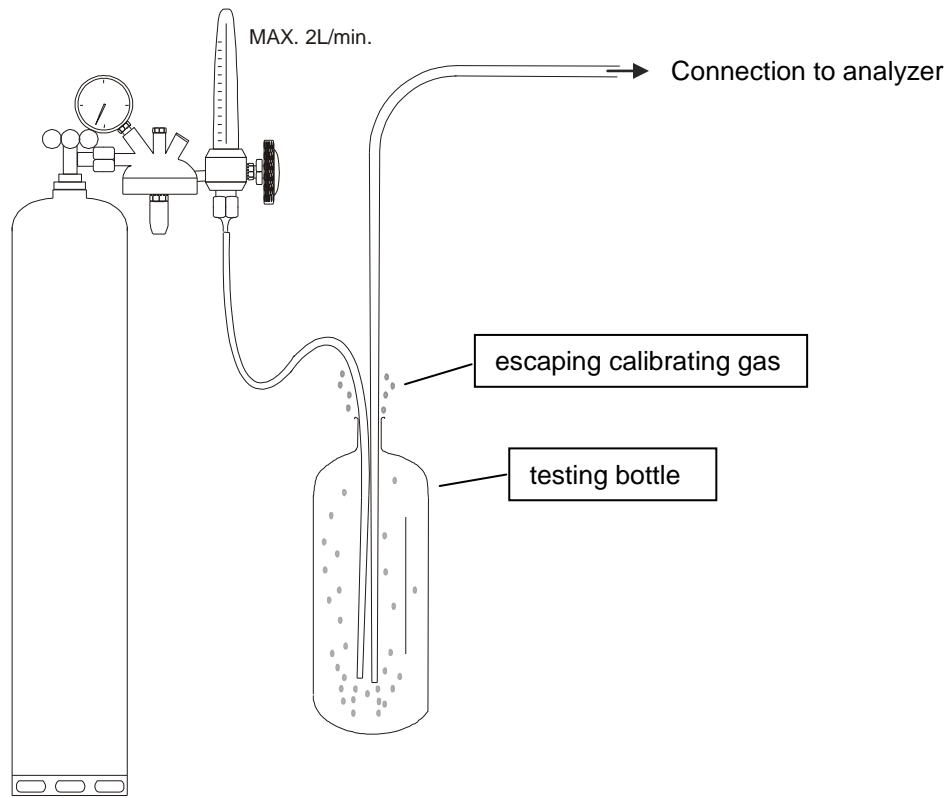


Image 2: Connection of calibrating gas with a testing bottle

6. Calibration



Please carry out the calibration only outdoors, since the effluent gas can be a health risk for every person located in a closed room.

Like in chapter 5: Control procedure you have to use calibrating gas to calibrate the analyzer. During calibration two calibration points are set for both sensors (O_2 and CO_2), “low” and “high”.

Sensor	Point	Used medium	Value
O_2	Low	Calibrating gas (i.e. nitrogen)	0,0%
	High	Fresh air	20,9%
CO_2	Low	Fresh air	0,04%
	High	Calibrating gas (CO_2)	5,0%

From these calibration points a linear gradient emerges which offers a reliable measurement.



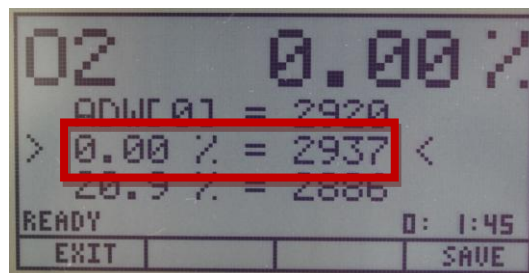
For a reliable measurement, please observe the minimum warm-up time in the lower right corner of the display until “READY” is displayed in the lower left corner.

6.1 Calibrating the O_2 sensor with zero % - gas (nitrogen)

- Open calibration menu by pressing function key F2 (CALIB)
- For O_2 sensor press function key F2 (O_2)
- Press function key F3 (REF 0%)
- Connect nitrogen (zero gas $O_2=0\%$ $N_2=100\%$), see image 1 or 2
- Press function key F4 (NEXT)
 - Calibration can be interrupted by pressing function key F1 (EXIT)



- If the measured value is stable, save the value with function key F4 (SAVE)



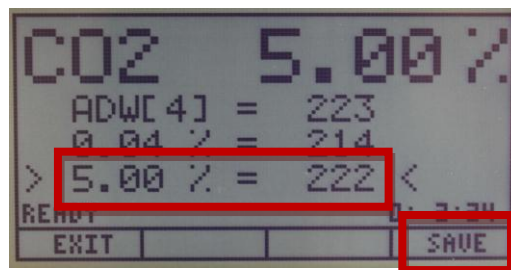
- To stop the calibration press function key F1 (EXIT)

6.2 Calibrating the CO₂ sensor with reference gas

- Open calibration menu by pressing function key F2 (CALIB)
- For CO₂ sensor press the function key F3 (CO2)
- Press function key F3 (REF %)
 - If necessary, adjust the CO₂ reference value with function key F3 (SETVAR) and the arrow keys ← → ↓ ↑
 - When the value is changed, close with key RET
- Connect the reference gas, see Image 1 or 2
- Press function key F4 (NEXT)
 - Calibration can be interrupted by pressing function key F1 (EXIT)



- If the measured value is stable, save the value by pressing function key F4 (SAVE)



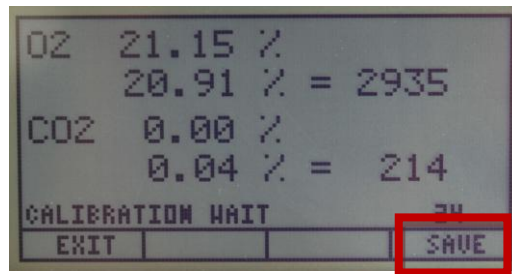
- To stop the calibration press function key F1 (EXIT)

6.3 Calibration of fresh air

- Open calibration menu by pressing function key F2 (CALIB)
- Press function key F4 (F.AIR)
- If you use the included hose:
 - Close the valve of the calibrating gas
- If you use the testing bottle:
 - Take out the hose connected to the analyzer of the bottle
- Press function key F4 (NEXT)
 - Calibration can be interrupted by pressing function key F1 (EXIT)



- If the measured value is stable, save the value with function key F4 (SAVE)



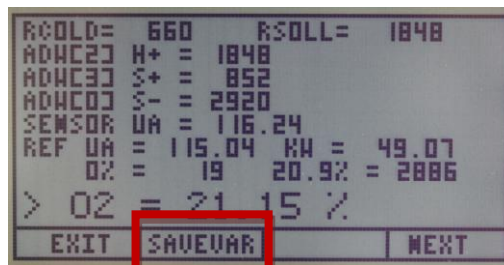
- To stop the calibration press function key F1 (EXIT)

7. Save and reload default settings

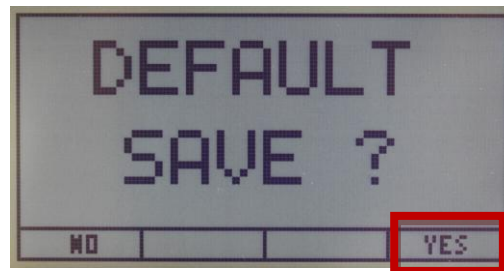
If all settings and calibration are as desired, it is possible to save them as default settings. If a problem occurs, these default settings can be recalled.

7.1 Save default settings

- Make sure the screen with the current measurement is displayed
- Press the right arrow key twice until the following screen is displayed

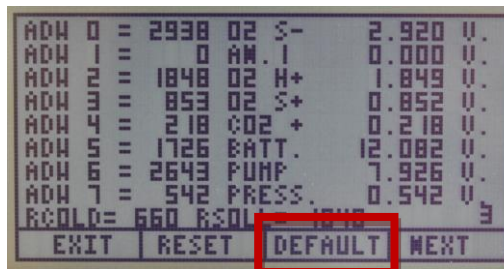


- Press function key F2 (SAVEVAR)
- Confirm default save with function key F4 (YES) or cancel the process with function key F1 (NO)

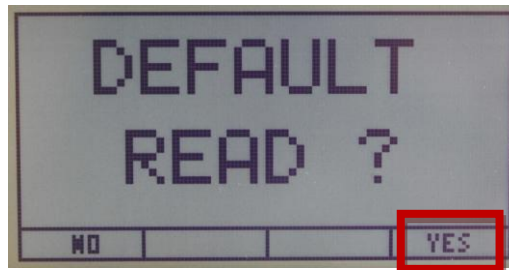


7.2 Reset to default settings

- Make sure the screen with the current measurement is displayed
- Press the right arrow key until the following screen is displayed



- Press function key F3 (DEFAULT)
- Confirm default read with function key F4 (YES) or cancel with function key F1 (NO)



From now on the analyzer works with the previously saved standard (default) settings.

7.3 Reset to factory settings

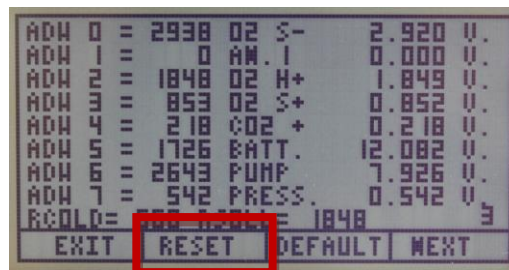
If even the default settings are not working correctly, you are able to reset the analyzer to factory settings.



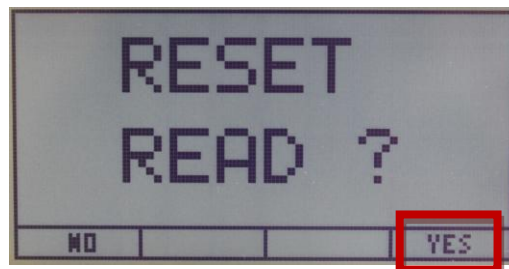
Important:

After reset the analyzer has to be recalibrated for reliable measurements!

- Make sure the screen with the current measurement is displayed
- Press the right arrow key until the following screen is displayed:



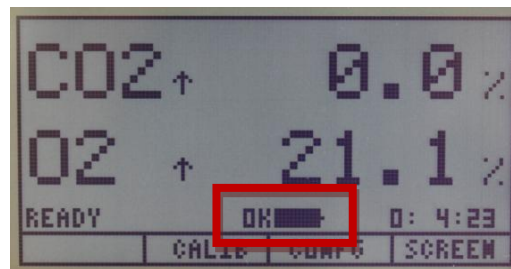
- Press function key F2 (RESET), see above
- Confirm reset read with function key F4 (YES) or cancel with function key F1 (NO)







8. Battery

8.1 General

With a new and fully charged battery, the analyzer runs for about 3 to 4 hours. The current battery level is indicated on the bottom of the screen with the current measurements, see below.



- OK  Battery full indication (3 to 4 hours left)
- LA  Battery low indication (5 to 15 minutes left) → battery has to be recharged!
- I>  Charge battery, by current (first recharge phase)
- U>  Charge battery, by voltage (last recharge phase)



Important:

**Charge battery only at a temperature above 5 °C.
Below this temperature the battery may suffer a malfunction.**



Recharge battery only with the supplied charger.
Charging time is about 1 to 1.5 hours.



In regular use, make sure the battery is always fully charged.



During a long time of inactivity, charge battery onto 40% and recharge it to this level every 2 to 3 months. This avoids a deep discharge of the battery which could lead to a breakdown of the battery.



Avoid discharging the battery completely, as this tends to damage the battery capacity.

8.2 User manual battery

LiPo rechargeable batteries offer very high energy density, but they do require special care. This applies to handling the cells in general, but particularly when charging and discharging them. Mistreatment may lead to premature ageing and defects, and even to fire and explosion in an extreme case.

- Keep the battery out of the reach of children.

- Do not allow escaped electrolyte to come into contact with fire; the substance is highly inflammable and may ignite. In case of fire or explosion do not try to extinguish with water. Only extinguish with dry extinguishing agents (Sand, etc.) or by covering the flame.
- Do not allow the fluid electrolyte to contact the eyes. If it does, rinse it off immediately with plenty of clean water, then seek medical attention.
- If fluid electrolyte gets onto your clothes or other objects, wash it off using plenty of water.
- LiPo batteries must not be subjected to excessive heat or cold, nor to direct sunshine exposure. Do not heat the battery, incinerate it, or place it in a microwave oven. These batteries must be stored and charged in a fireproof container or a LiPo safety bag.
- Do not subject the battery to mechanical pressure or shock and never distort or throw it. Protect from crashes and accidental damage. If a battery is damaged in any way, it must not be used again and has to be disposed.
- Never place the charger and the battery connected to it on an inflammable or electrically conductive surface. Do not use the battery in the vicinity of any combustible substance or gas. Never leave the battery unsupervised during the Charge / discharge process, nor when in use. Make sure to read through the instructions provided with the charger carefully before using it to charge the battery.
- Do not charge a battery which is hot to the touch. Allow the battery to cool down to ambient temperature before recharging.
- Be sure to maintain correct polarity of the battery, and avoid short-circuits - especially involving non-insulated connector systems.
- Do not allow the battery to contact water or any other fluid.
- Do not charge the battery with reversed polarity.
- Do not solder directly to the battery cells.
- Do not modify or open the battery.
- Lithium batteries must be charged using a suitable Lithium charger only. Never connect directly to a main PSU (power supply unit).
- Do not use the battery in any location where there is a risk or severe static discharge.
- Any of these errors may lead to damage to the battery, explosion or fire.
- Never leave batteries unattended while charging.

Battery temperature range

Charge -> 0° ... max. +45°C

Discharge -> +15° ... max. +60°C

Temperature characteristics

Lithium cells feature a pronounced temperature index. This means that the nominal battery capacity is not available at very low and very high temperatures. It is important to avoid exceeding the maximum external cell temperature both when charging and discharging; failure to observe this will result in cell damage and permanent capacity loss. If the maximum temperature is exceeded for a long period, the cells may be ruined, explode, or even ignite.

Self-discharge

LiPo cells feature an extremely low rate of self-discharge (approx. 0.2% per day), and can therefore be stored for longer periods without any problems. If the voltage falls below 3 Volts / cell, it is essential to recharge the battery. Deep-discharging must be avoided, as the cells will be damaged permanently (capacity loss), eventually rendering the pack unusable for service.

Storage

Before a protracted period of storage batteries should be charged up to the storage voltage of around 3.8 ... 3.9 Volts / cell. After about 3 to 5 months the packs should be recharged again. Do not keep or

store the batteries fully charged. Charge them immediately before operation. Keep or store the batteries at room temperature (17-22° C) and in a fireproof container or a LiPo safety bag.

Useful lifetime

The theoretical lifetime of a LiPo cell is around 500 Charge/ discharge cycles, but this only applies to when it is discharged at a low current.

When discharged at moderate discharge currents the effective life of the cells is lower at around 300 cycles. At high discharge currents the cycle count falls to the region of 150 to 200 cycles, and at very high discharge currents it is significantly less.

At the end of its useful lifetime the battery is exhausted and has to be disposed.

If you only discharge LiPo batteries to about 70 - 75% when using them, they will repay you by lasting much longer. We recommend you to cease operations before there is a detectable loss of performance. To avoid further discharging, disconnect the pack from the consumer unit after use.

Memory effect, cell capacity

Since LiPo cells do not suffer from the memory (lazy battery) effect, the discharge/charge process required with NC and NiMH batteries (cycling, cell matching) is not necessary. In fact, you should avoid discharging a battery before recharging. Every time you charge a LiPo battery, its capacity is reduced slightly, so this would lead to unnecessary loss of cell capacity.

Disposal of batteries



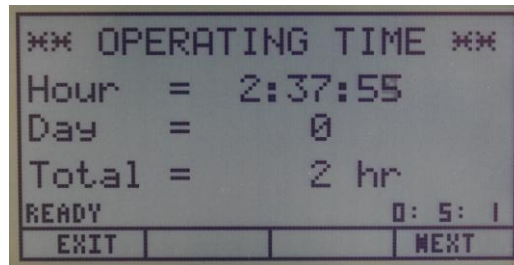
On no account dispose exhausted batteries into the domestic waste. To protect the environment it is important first to discharge the faulty or exhausted battery completely and then to take it to the appropriate toxic waste collection point or battery retailer. To avoid short-circuits, wrap any bare contacts with adhesive insulating tape.

Exclusion of liability

Since Schele Electronic is unable to monitor the way you handle these batteries, we expressly deny any liability and any claim under guarantee if the battery is charged, discharged or handled incorrectly.

9. Display operating time

- Make sure the screen with the current measurements is displayed.
- Press function key F4 (SCREEN)



The operating time is displayed in [h:mm:ss], the number of days and total number of hours.

- Return to current measurements screen by pressing function key F1 (EXIT) or F4 (NEXT)

10. Technical specifications

O₂ sensor:

Measuring range : 0..25% O₂
 Accuracy : 0.1%
 Output : 4-20mA

Zirconium dioxide sensor
 Deviation: ± 1%
 12-bits, max. 200 Ohm

CO₂ sensor:

Measuring range : 0..10% CO₂
 Accuracy : 0.1%
 Output : 4-20mA

Infrared-Technology (NDIR)
 Deviation: ± 1%
 12-bits, max. 200 Ohm

General:

Supply Voltage : 12..24V DC – 7W
 LCD Display : 70 x 38 pixels
 Air flow max. : 0.4 l/min
 PVC tube : D = 3mm / 5mm
 Case aluminum : L=260 x B=150 x H=60 mm

Operating temp.: -20..70 °C
 Nylon filter, 0.45 µm, 30mm
 Pump: Electronics control

Battery:

Nexspor NXP-1120-5C or similar type
 Li-Po 2000 (Lithium-Polymer)
 Voltage: 11.1V (3 LiPo cells)
 Capacity: 2000 mAh
 Discharge constant: 5C (5x capacity)
 Charge: 1C (1x capacity)

Automatic charger	GS40A24-P1J
Input voltage	230V AC 50Hz
Output voltage	24VDC 1,67A 40W

Table 1: Automatic charger

Description	Type	Article code
Filter	Hydrophobic 30mm PTFE 0,2 µm	OANA100023

Table 2: Spare parts