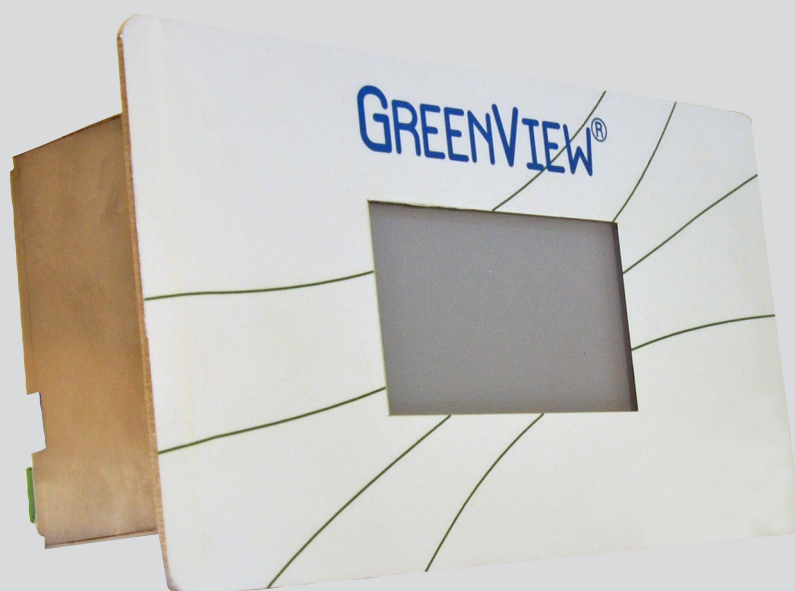


G36p

# Oxygen Analyzer Manual



Document ID number.: 01381

# Program Menu Structure

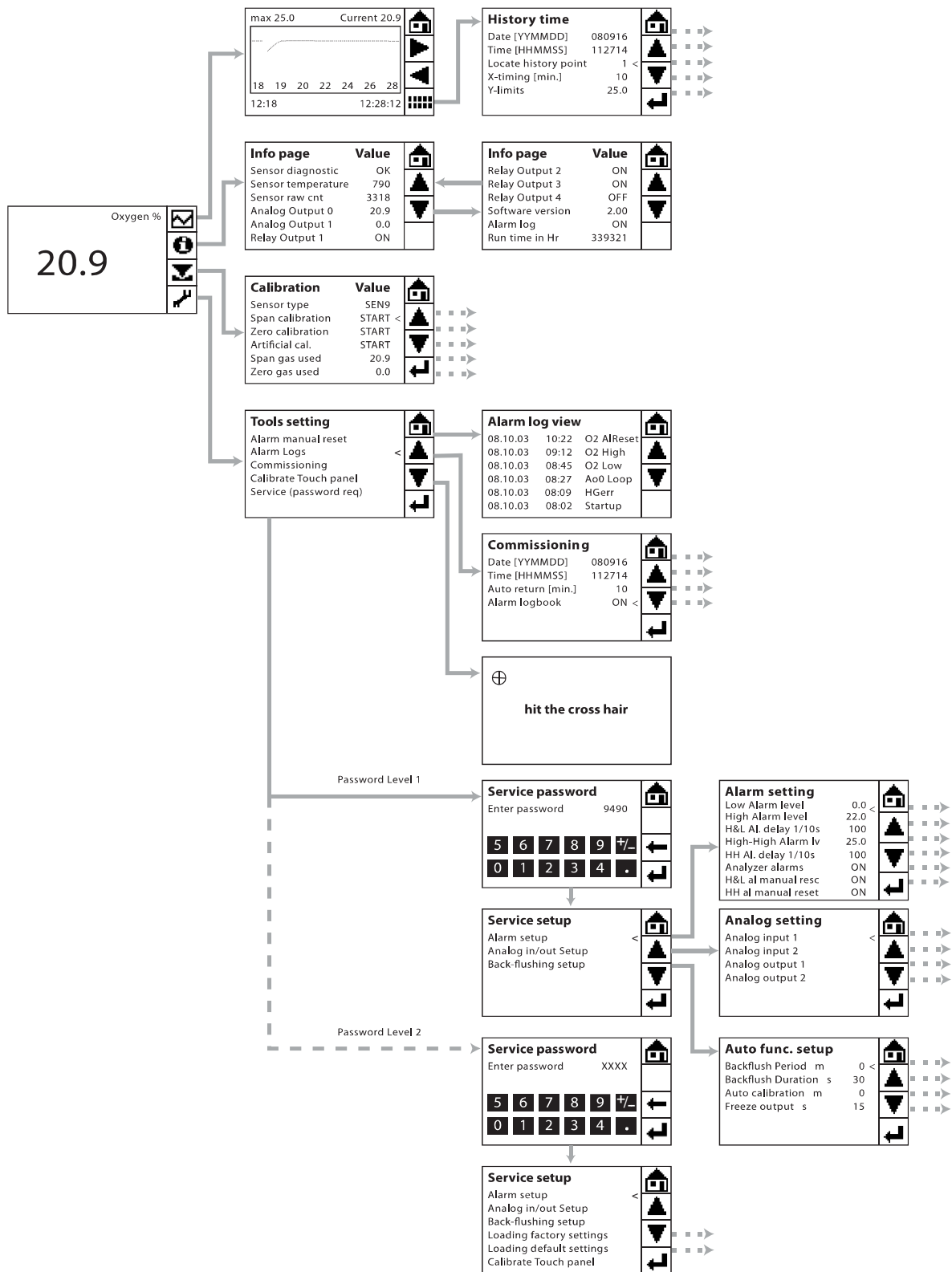


Figure 1: Program menu structure of the G36p Oxygen Analyzer

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# 1 Introduction

## 1.1 About this Manual

This manual contains data and instructions for the installation, operation, and maintenance of the G36p Oxygen Analyzer.

The instructions have been made in general terms and do not take into consideration a specific installation. The instructions & figures have been made in general terms and do not take into consideration specific installations. The figures used in the manual are only for general illustration purposes. As such, the instruction manual is designed only for the G36p Oxygen Analyzer.

The instructions for the installation, operation, and maintenance of the complete analyzing system including sampling board designed for the G36 Oxygen Analyzer by Green Instruments A/S are provided in a separate manual.

This manual does not describe all possible situations but only the most common and known situations and cannot replace the necessary education of the personnel. Should situations not described in the manual occur which cannot be solved in accordance with normal known practice and good workmanship, the operator should contact Green Instruments A/S for instructions.

### Attention

Before operation read all instructions and warnings within this manual and associated documentation. Improper use may cause personal injury and/or damage of equipment and may void the warranty.

Green Instruments A/S disclaims any responsibility for damage and/or injury caused by improper installation, use or maintenance of the equipment.

Green Instruments A/S reserves the right to minor alterations and improvements owing to developments without being obliged to enter the corresponding changes in this manual.

Green Instruments A/S reserves the copyright of the manual. Without prior written permission of Green Instruments A/S, the manual may not be copied and given to unauthorized people.

## 1.2 Inquiries and Feedback

All claims and inquiries for spares shall be addressed to Green Instruments A/S or our distributors.

In all correspondence or when ordering spare parts, please carefully state the equipment type and serial number which can be found on the label on the back of the analyzer.

Green Instruments A/S appreciates all feedback and suggestions for improvement. If any questions appear or any discrepancies can be found in the manual, kindly contact Green Instruments:

**Green Instruments A/S**  
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DK-9700 Brønderslev  
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Web: [www.greeninstruments.com](http://www.greeninstruments.com)

## 1.3 About the Analyzer

The G36p Oxygen Analyzer continuously measures the content of oxygen with concentrations up to 21.0 %. The analyzer can be used to measure the content of oxygen in N<sub>2</sub> or CO<sub>2</sub> based inert gas, or in stack gas, or in connection with exhaust gas recirculation (EGR). The G36p Oxygen Analyzer is designed for front panel mounting.

The G36p Oxygen Analyzer uses a zirconia sensor. The zirconium dioxide sensors have long been established as industry standards. The G36p uses a new type of zirconia sensor, which can be used in a wide range of applications.

The most important element of the sensor is the zirconia cell. At high temperatures, the oxygen ions can diffuse through the zirconium dioxide membrane. When the membrane is exposed to environment that contains different amounts of oxygen (e.g. the sensor internal reference gas on one side and sample gas on the other), nature seeks to balance itself, and the transportation of ions through the membrane will generate an electrical charge.

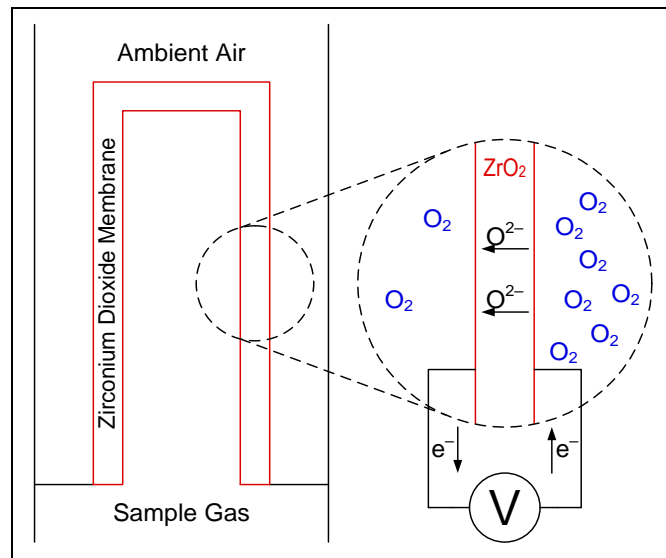


Figure 1-1: Simplified schematic of the zirconia cell

This charge depends on the amount of the passing oxygen ions i.e. the difference between the oxygen levels in the sample gas and the reference gas. This voltage will be detected and converted into a signal that is proportional to the oxygen concentration in the sample gas. The signal will be processed in the analyzer and the oxygen concentration of the sample gas will be shown in the display.

The G36p Oxygen Analyzer has CE and MED markings as well as DNV, Bureau Veritas and Lloyd's Register Type Approvals.

Download all product certificates at <https://greeninstruments.com/>

## 2 Specifications

### G36p Analyzer

|  |  |
|--|--|
| Analyzer types:  |  |
| <ul style="list-style-type: none"> <li>• Inert Gas O<sub>2</sub> Analyzer</li> <li>• Stack Gas O<sub>2</sub> Analyzer</li> <li>• EGR-O<sub>2</sub> Analyzer</li> </ul> | <p>Monitors O<sub>2</sub> content in inert gas (N<sub>2</sub> or CO<sub>2</sub> based)</p> <p>Monitors O<sub>2</sub> content in stack gas</p> <p>Monitors O<sub>2</sub> content in exhaust gas recirculation</p> |
| Sensor types   | Zirconia sensor type SEN1 or SEN9  |
| Measurement range  | 0.0 % ... 21.0 % O <sub>2</sub>  |
| Ambient temperature  | 0°C ... 70°C   |
| Ambient humidity   | Up to 100 % at all relevant temperatures   |
| Power supply   | 24 VDC   |
| Power consumption  | Max. 40 VA per analyzer – recommended fuse: 4 AT   |
| Sample flow  | 0.2 ... 8.0 l/m  |
| Sample temperature   | SEN1: ≤ 250 °C; SEN9: ≤ 650 °C   |
| Sample pressure  | SEN1: max. 1 bar; SEN9: max. 4 bar   |
| Digital display  | Touch screen 71 x 39 mm  |
| Output signals   | Active 4...20 mA – range selectable – default 0.0...25.0 %   |
| Load output (max.)   | 600 ohm/24 VDC   |
| Relays   | 4 relays, volt free, 24 V AC/DC, 5 A   |
| Alarm functions  | <p>Low or High O<sub>2</sub> level – set points freely configurable</p> <p>High-High O<sub>2</sub> level – set point freely configurable</p> <p>System failure alarm</p>   |
| Response time*   | 90 % of measuring scale in less than 45 sec. with sample flow rate of 0.8 l/m, sample line of 1 m  |
| Repeatability  | +/- 0.1 % of the measuring range   |
| Linearity/Accuracy   | +/- 0.5 % of the measuring range   |
| Drift (one month)  | +/- 0.1 % of the measuring range   |
| Dimensions   | 95 × 178 × 71 mm (H×W×D)   |
| Cut-out dimensions   | 75 x 155 mm (H x W)  |
| Weight (analyzer only)   | 0,8 kg without packaging   |
| Enclosure  | IP55 when the included gasket is mounted   |

Optional: O<sub>2</sub> analyzer with pressure compensation module, BV's product certificate.

Specifications are subject to changes without notice.

\* Response time depends on the sample flow rate and the length of the sample line.



## 3 Installation & Connections

**Read this chapter in its entirety before installing the analyzer.**

---

### 3.1 Control at Delivery

When you receive the G36p Oxygen Analyzer, control that the received scope of supply is in accordance with the packing list and nothing is damaged. Any discrepancy should be reported to the supplier immediately. If any of the received parts are damaged, the shipping company should be informed, and new parts should be made available before completing the installation

### 3.2 Where to Install the Analyzer

The G36p is designed for front mounting in control panels. To obtain IP55 tightness, the included gasket must be mounted between the hole that is cut in the panel and the display front.

Satisfactory operation, faultless functions, and minimal maintenance of the G36p are achieved by paying attention to the following notes:

- The equipment should be installed in a clean area away from dust, oil mist, and moisture. The analyzer should be installed at viewing level in an area with good access for operating and servicing. The location and installation of the analyzer must be chosen, so that the ambient temperature is below 70°C at any time.
- The gasses supplied to the sensor must have a constant flow and pressure. This flow and pressure control is achieved with the sampling system that is typically delivered with the analyzer. Please consult the respective manual or contact Green Instruments A/S.
- The sensor houses for both SEN1 and SEN9 have 1/8" BSP connection. Sampling tube and vent line should be arranged in the way which ensures the flow and pressure at sensor house constant and within the required range.
- The sensor can be installed up to 6 m from the analyzer. The sensor and the sensor house shall be mounted horizontally (sensor pointing sideways) or downwards (sensor pointing down) to prevent the water condensation collecting at the sensor house.

### 3.3 Safety Aspects

#### Attention



- Follow the operating instructions!
- Make sure that all power and signal cables are connected correctly before operating the analyzer.
- The sensor must not be exposed to strong mechanical shocks. Otherwise the sensor element may crack without visible damage.
- The sensor and sensor housing are hot and can cause severe burning of personnel if not handled with care.
- The G36p Oxygen Analyzer is only suitable for installation in a safe, non-hazardous area and not suitable for use with flammable sample gases.
- The installation and operation of the G36p Oxygen Analyzer and associated equipment must be carried out by skilled, trained, and certified personnel. Green Instruments A/S does not take any responsibility for the operation of the analyzer and associated equipment whatsoever.
- The analyzer must only be applied as described in this instruction manual. If the analyzer is used in a manner not specified by Green Instruments, the protection provided by the analyzer may be impaired.
- Successful and safe operation of this equipment is dependent upon proper handling, installation, operation, and maintenance.

---

#### Hazardous voltage!

Always disconnect the power before installing or servicing the analyzer. Ignoring this warning can result in severe personal injury or material damage. Read the manual carefully to ensure that all power and signal leads are connected correctly.

Make sure that the analyzer is connected to the correct voltage (see rating marked on the analyzer name plate).



#### Circuit breaker!

The installation must include a way to switch off the electrical power by a clearly marked switch or circuit breaker external to the analyzer. The external switch or circuit breaker shall be placed in close proximity to the analyzer and within easy reach of the operator.

**Overload protection!**

For compliance with the IEC 61010-1 (2003) safety requirements, the installation must include a means of overcurrent protection to provide protection against excessive energy being drawn from the power supply system in case of a fault in the analyzer.

**Installation and fault finding!**

Electrical installation and fault finding on the analyzer should only be undertaken by a suitably trained and qualified engineer.

**EMC!**

For compliance with the EMC product standard IEC 60533 (1999), the connection cables for the main supply, relays, interface, and analog output signals should be shielded or provided with equivalent protection. Special precautions have to be taken in connection to "long" signals or control lines of more than 30 meter.

**Sensor!**

The sensor must not be exposed to strong mechanical shocks. Mechanical shocks may cause the sensor element to crack without visible damage.

The sensor must be connected to the analyzer before the analyzer is powered up (risk of damage). As soon as the analyzer is under voltage, the connection to the sensor must not be interrupted. Therefore, please disconnect the power when you need to connect or disconnect the sensor.

**Connections!**

The power supply and all electrical connections are accessed at the back of the analyzer.

**Poisonous gases!**

Both sensor types, SEN1 and SEN9 are not suitable for installation in an area with a high concentration of methane (CH<sub>4</sub>).

Besides, a reduced lifetime can occur if the sensor is subjected to lead, phosphor, silicon, halogens, or high concentration of sulfur.

**Recycling!**

Please do not dispose the G36p Oxygen Analyzer with regular refuse. Disposal should be in accordance with the requirements of the current statutory regulations.

**Symbol identification**

Caution, risk of danger



Caution, hot surface



Caution, risk of electrical shock



Protective earth



The CE mark proves the compliance of the instrument with the requirements of the relevant EU directives

### 3.4 Electrical Connection

#### Note

Each analyzer will be configured at the factory to be either:

- An Inert Gas Oxygen Analyzer for monitoring O2 in inert gas
- A Stack Gas Oxygen Analyzer for monitoring O2 in stack gas
- An EGR Oxygen Analyzer for monitoring O2 in the EGR system

For the default configuration and connection of each analyzer, check the Testing & Configuration Sheet attached to each analyzer.

The electrical connections are dependent on the actual system configuration. The terminals are all located on the back of the analyzer. For details, please see Figure 3-1. Only those functions to be used shall be connected.

Please choose the cables that fulfill the following requirements:

Wire size for analog input and CAN connection: 1 x 1.0 mm<sup>2</sup> w/screen

Wire size for all other connections: 1 x 1.5 mm<sup>2</sup> w/screen

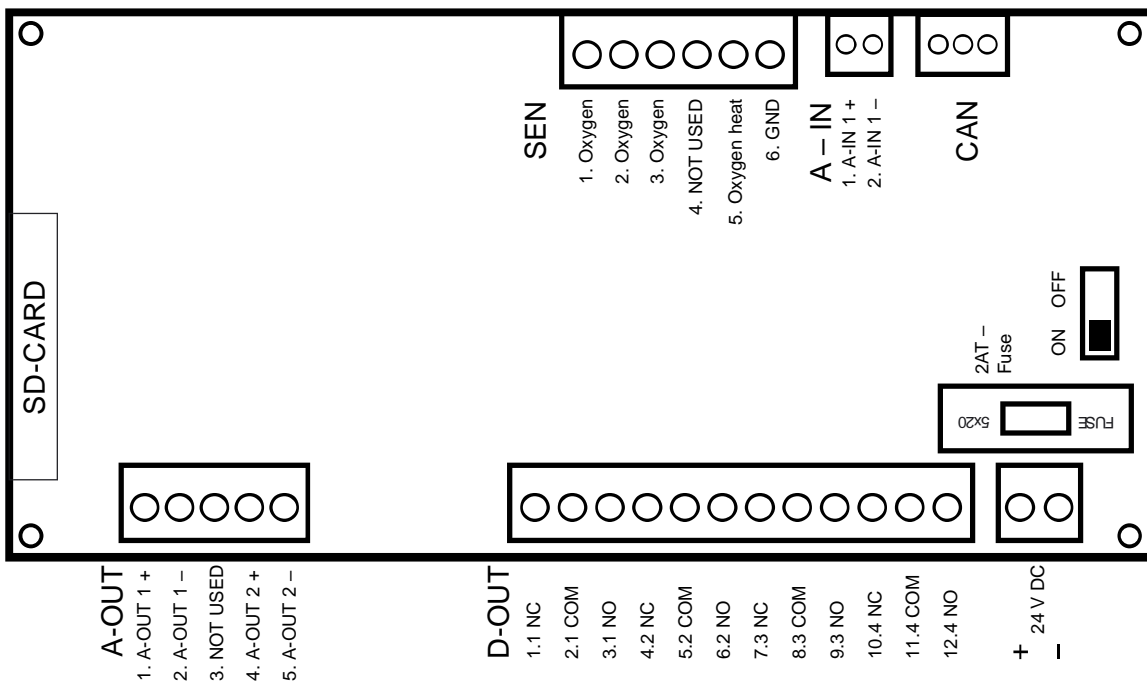


Figure 3-1: The G36p connection terminals

### 3.4.1 Power Supply

The power supply terminal is located at the bottom right corner and is marked supply rating (24 VDC). For details please see figure 3-1. Before connecting the power supply, please make sure that the power supply rating of the analyzer corresponds with the power supply available.

### 3.4.2 Sensor Connections – SEN

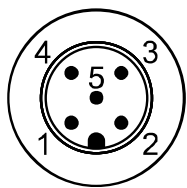
The analyzer is equipped with either a SEN1 or a SEN9 sensor (see the Testing & Configuration Sheet). The sensor is connected to the terminal SEN in the analyzer.

#### Note

Each analyzer is delivered with cable connections that are fit for use for either SEN1 or SEN9. See chapter 9 for the spare parts.

The sensors are connected to the terminal SEN as follows:

| Terminal SEN                  | Pins at SEN1 | Pins at SEN9's connection |
|-------------------------------|--------------|---------------------------|
| Terminal 1 (Sensor electrode) | 3            | 1 (black)                 |
| Terminal 2 (Sensor electrode) | 2            | 2 (yellow)                |
| Terminal 3 (Sensor electrode) | 1            | 3 (red)                   |
| Terminal 4 (No connection)    |              |                           |
| Terminal 5 (Sensor heating)   | 4            | 4 (grey)                  |
| Terminal 6 (Ground)           | 5            | 5 (white)                 |



The cable between sensor and the analyzer can be delivered up to 6 m in length.

### 3.4.3 Relay Outputs – D-OUT

The analyzer is arranged with four relay outputs connected to D-OUT with 12 terminals.

It is important to note that the configuration of the analyzer might deviate from the configurations listed below. Please see the Testing & Configuration Sheet that is attached to each analyzer.

The default relay functions, and connections of the Inert Gas Oxygen Analyzer are as follows:

| Relay No. | Relay function                       | Terminal Connections                    |                                |
|-----------|--------------------------------------|---|--------------------------------|
| Relay 1   | Alarm High/Low O <sub>2</sub> level  | Terminals 1.1-2.1-3.1<br>(NC-COM-NO)    | Inverted<br>Normally energized |
| Relay 2   | Alarm High High O <sub>2</sub> level | Terminals 4.2-5.2-6.2<br>(NC-COM-NO)    | Inverted<br>Normally energized |
| Relay 3   | System failure alarm*                | Terminals 7.3-8.3-9.3<br>(NC-COM-NO)    | Inverted<br>Normally energized |
| Relay 4   | Calibration Span Gas                 | Terminals 10.4-11.4-12.4<br>(NC-COM-NO) | Normally de-energized          |

The Stack Gas Oxygen Analyzer relay functions and connections are as follows:

| Relay No. | Relay function                                | Terminal Connections                    |                                |
|-----------|---|---|--------------------------------|
| Relay 1   | Alarm High/Low/High-High O <sub>2</sub> level | Terminals 1.1-2.1-3.1<br>(NC-COM-NO)    | Inverted<br>Normally energized |
| Relay 2   | System failure alarm                          | Terminals 4.2-5.2-6.2<br>(NC-COM-NO)    | Inverted<br>Normally energized |
| Relay 3   | Auto Back-flushing                            | Terminals 7.3-8.3-9.3<br>(NC-COM-NO)    | Normally de-energized          |
| Relay 4   | Auto-Calibration                              | Terminals 10.4-11.4-12.4<br>(NC-COM-NO) | Normally de-energized          |

## Alarms

The values for three O<sub>2</sub> level alarms (Low, High, and High-High) can be set following instruction in section 5.2.

The system failure alarm includes a sensor alarm and alarm for open loop of the analog outputs.

## Normally energized

Normally energized means that the relay is energized in the alarm free condition during operation. The relay will be de-energized when there is an alarm or when the supply voltage disappears from the analyzer. Thus, the normally energized relays will give a fault signal in the event of failure of power to the analyzer.

### **Normally de-energized**

Normally de-energized means that the relay is de-energized in the normal operating condition. For the Inert Gas Oxygen Analyzer, relay 4 (normally de-energized) will be energized in span calibration condition. For the Stack Gas Oxygen Analyzer or the EGR Oxygen Analyzer, relay 3 or 4 respectively will be energized when the analyzer is back-flushing or auto calibrating.

### **3.4.4 Input Connections – A-IN**

The analog input connections A-IN are placed next to the sensor connections SEN. The terminal is arranged with two poles for one active analog input signal 4...20 mA (Analog Input 1). Active input signal means signal voltage from external source.

For setting of the analog input please see appendix 10.1.

### 3.4.5 Analog Output Connections – A-OUT

There are two active 4...20 mA output signals\* for load up to 600 ohm. The configuration is as follow:

Terminals 1 & 2 = Analog Output 1 for the remote indication of oxygen level

Terminal 3 = No connection

Terminals 4 & 5 = Analog Output 2 (optional)

\* Active output signal means signal voltage from the G36p analyzer.

For setting of analog outputs please see section 5.4.

### 3.4.6 SD Card

The SD card is used for storage of the historical trend of O<sub>2</sub> and the logbook. The SD card can also be used to load a new software version to the analyzer.

#### Data log

The internal memory of the analyzer measures and saves six values every minute. However, the internal memory can only store one hour of logging, which is equal to 360 log values. If there is no SD card installed the new log values will supersede the old log values. This means there will be no historical trend curve and alarm logs as well.

However, if you place an SD card in the analyzer, the internal memory will be saved on the SD card every minute. If the analyzer alarm and logbook functions are ON, the alarms will also be logged on the SD card.

There are two log files in the SD card, a log file for O<sub>2</sub> values ***g1x.log*** and a log file for alarms ***g1x.alm***.

#### Attention

The log files can be read directly from the SD card using a Windows-operated computer. The user has to use Notepad.

Do not open the log files in WordPad. WordPad will damage the format of the log files, and the analyzer will be unable to log any more data on the SD card.

---



The best way to read the log files is to copy them to the local disk of your computer and then open them from your computer. This way, you can use any program that can open a txt-file including Notepad, WordPad, MS Word and MS Excel

The data in the log file – *g1x.log* includes 5 columns, i.e.:

| YYYY-MM-DD | HH:MM:SS | Datalog of A–OUT<br>1 (O <sub>2</sub> *100) | Datalog of A–OUT 2 | Unix time  |
|------------|----------|---|--------------------|------------|
| 2009-11-12 | 13:01:54 | 2089  | 0000               | 1258027314 |

The SD card shall be replaced after two years due to the limited capacity.

### Software and default configuration uploading

The folder *bin* at the SD card includes two files: *G1.bin* and *g1parm.bin*. *G1.bin* is the software file and *g1parm.bin* is the default configuration file.

If Green Instruments delivers a new software version with two files named *G1.bin* and *g1parm.bin*, the following steps will guide you through the installation:

- Replace the old files at the SD card with the new files *G1.bin* and *g1parm.bin* that you have received.
- Set the SD card back in the analyzer. Then, restart the analyzer. Now the analyzer will automatically check the SD card to see if there is a new software version. If yes, the new software will automatically be loaded to the internal memory of the analyzer.
- After uploading the new software version, reload our default settings by choosing Load default settings in *Tools setting\Service (password level 2)\Load default settings*.
- After uploading the new software version, you have to reset the analyzer following the instructions in chapter 5.

### 3.4.7 Other Connections

The CAN connection is not in use by default.

# 4 Menu structure

Please see Figure 1 for the Program Menu Structure

## 4.1 Main Menu

The analyzer is designed with a touch screen. The Main Menu displays the current oxygen value in percent, and to the right four function keys are displayed. The function keys are connected to four different functional menus: Graph, Information, Calibration and Tools.

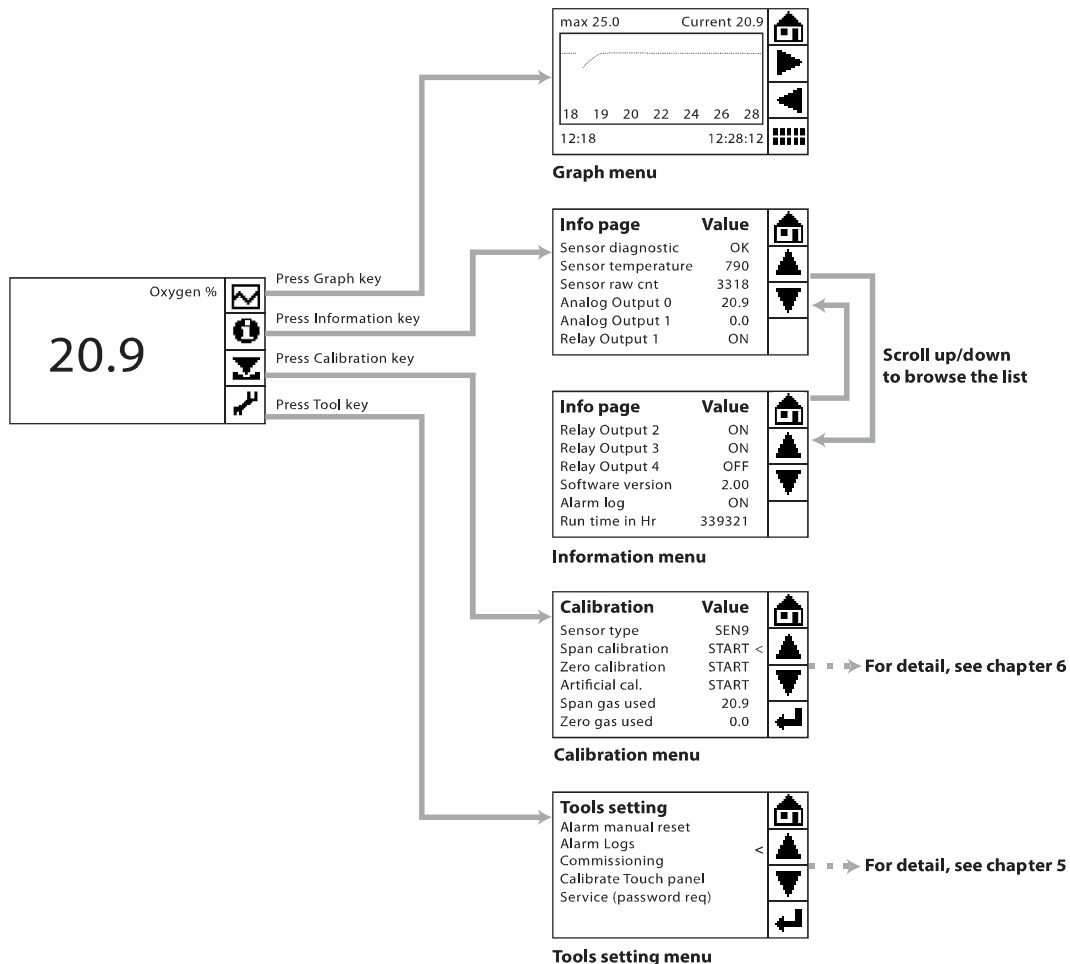



Figure 4-1: The G36p main menu and four functional menus

If the alarm function is on and the alarm condition starts, the alarm message will be displayed at the bottom left corner of the screen.


## 4.2 Graph Menu

Pressing  changes the display into a graphical mode in which a trend curve of the log values (Y-axis) is shown on a time scale (X-axis).

The actual oxygen value in percent is displayed in the upper right corner of the graph screen as **Current**.

The trend curve displays the log values from the SD card. The trend screen has 108 dots in the timeline. Therefore, the trend curve will show 1 log value per dot if the X timing is set at 18 minutes (6 log values/minute x 18 minutes = 108 values). If the X timing is less than 18 minutes, the trend curve will be shown as a dotted line.

If the X timing is 36 minutes, two values will be printed at the same X-position. Similarly, if the X-timing is 180 minutes, 10 values will be printed at the same X-position with all different Y values.

Pressing  gives access to the **History time** menu, where you can choose to see the trend curve in a specific historical period and change the setting for the trend curve.

### Note for Stack Gas Oxygen Analyzer

During back-flushing, the **Current** status is changed to **Frozen** with the oxygen value measured before the backflushing.

During auto calibration, the **Current** status is changed to **Frozen** with the oxygen value measured before the calibration.

### History time & Graph settings

To see the trend curve in a specific historical period, it is possible to change the values in **Date & Time**. If for example it is now 12:28 and you want to see the trend curve at 11:00 you must go through the following steps

- First, select **Time** and enter the historical point of time.
- Then, select **Locate history point**, and the screen will show to the trend curve at that specific time.

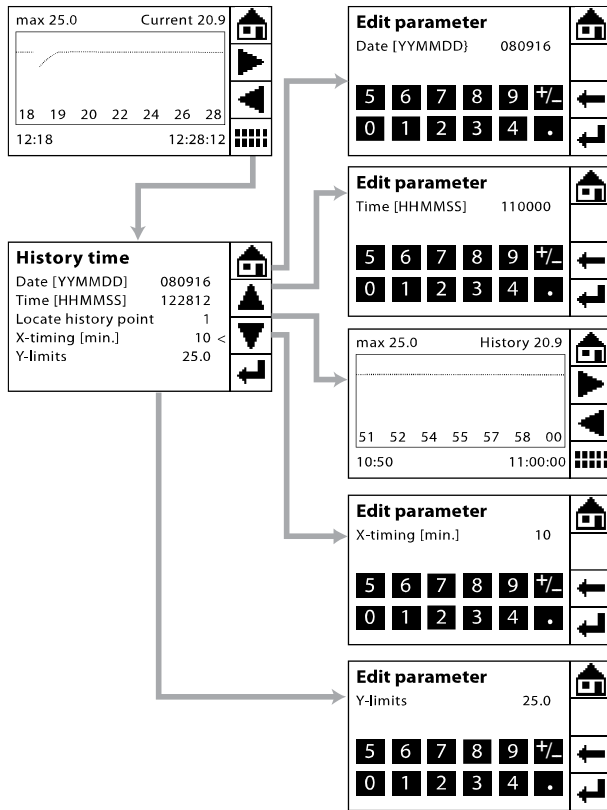


Figure 4-2: History and settings


It will take time for the analyzer to browse an old history point. The longer time you want to go back, the longer time the analyzer will require to recall the history. When the analyzer is recalling history, the touch screen will freeze and will not immediately react to touching.

If you want to browse a history point that dates back more than a week, it will be best to read the history data directly from the log file at the SD card. For details of how to read the log file, please refer to section 3.4.6.



X-timing shows the time range of the trending graph, which can be set as required. However, the time range should not be over 1440 minutes (24 hours). The time range is displayed on the lower part of the graph screen with the starting point in the bottom left corner and the ending point in the bottom right corner.

Y-limits shows the maximum measurement range displayed in the trend curve. Default setting is 25 %. Y-limits are displayed in the top left corner of the graph screen as Max.


## 4.3 Information Menu

If you press  the following information will appear:

|                    |  |
|--------------------|--|
| Sensor diagnostic  | Shows the status of the sensor:<br>OK indicates the sensor is working<br>HGerr, VMerr, UNerr, IAerr, IPerr, and HDerr indicate sensor failure or connection failure of a sensor cable.   |
| Sensor temperature | Shows the current temperature of the sensor. After starting the analyzer, it will take about five minutes for the sensor to reach its normal operating temperature.<br>The operating temperature of SEN9 is approx. 785 °C.<br>The operating temperature of SEN1 is approx. 750 °C.<br>If the sensor temperature is much lower than the normal operating temperature, the display of oxygen will be incorrect. This can be caused a bad connection between the sensor and the sensor connection terminal SEN, a defect sensor, or too high sample/gas flow through the sensor. |
| Raw sensor cnt     | Shows the raw adc count signal from the sensor.  |
| Analog output 0    | Shows the current O <sub>2</sub> in percent from Analog output 1 (Ao00).1  |
| Analog output 1    | Not in use as per default (Ao01).  |
| Relay outputs 1-4  | Shows the status of relay outputs 1-4: ON or OFF.  |
| Software version   | Shows the software version of the analyzer. For installation of new software version, see section 3.4.6.   |
| Alarm log          | Shows the status of alarm logbook: ON or OFF. When the status is OFF, no alarm will be logged. The alarm logbook view in the Service Menu is also OFF.   |
| Run time in Hr     | Shows the analyzer's running time in hours - power ON only.  |




To browse the list in the information menu, please go up and down the list by using the scrolling keys  .

## 4.4 Calibration Menu


Pressing  gives access to the calibration function. In the calibration menu, you can:




- See the sensor type selected for the analyzer (SEN1 or SEN9)
- Access zero, span, and artificial calibration START functions for the analyzer

- Set values for the test gases: zero and span

Use the scrolling keys   to browse the list and press  to select the action to be taken, e.g. selecting Span cal. will start the span calibration. See chapter 6 for calibration.

## 4.5 Tools Menu

Pressing  gives access to the Alarm manual reset function, Alarm logs and the operating system of the analyzer including Commissioning, Calibrate touch panel, and Service.

Use the scrolling keys   to browse the list and press  to select the action to be taken.

Alarm manual reset: When the Analyzer alarms is set ON and either H&L alarm manual reset or HH alarm manual reset is set ON, it is required to reset the relevant alarm manually.

To reset an alarm, enter the *Tools menu* and choose Alarm manual reset. Please note that an alarm will remain in operation while the alarm condition is still present. Thus it is only possible to reset an alarm when the alarm condition no longer exists.

Alarm logs show all log alarms if the Alarm Logbook in *Tool settings\Commissioning\Alarm Logbook* and Analyzer Alarm in *Tool settings\Service (password level 1)\Alarm setting\Analyzer Alarm* are ON.

An O<sub>2</sub> level alarm is logged only after the alarm delay runs out (default at 10 seconds for all three alarm levels). The alarm delay for O<sub>2</sub> limit can be changed in the Alarm setup menu - see section 5.2.

The failure alarms (sensor or analog output loop alarms) have no alarm delay and are logged immediately. Data log is saved on the SD card every minute.

The alarm logbook might have the following displays:

|                                     |                                      |
|-------------------------------------|--------------------------------------|
| O2 Low                              | O <sub>2</sub> low level alarm       |
| O2 High                             | O <sub>2</sub> high level alarm      |
| Al manual reset                     | Alarm manual reset                   |
| O2 High High                        | O <sub>2</sub> high high-level alarm |
| HGerr/VMerr/UNerr/IAerr/IPerr/HDerr | Sensor failure                       |
| Ao0 Loop                            | Open loop of analog output 1 (Ao00)  |
| Ao1 Loop                            | Open loop of analog output 2 (Ao01)  |
| Startup:                            | The analyzer is restarted            |

## Commissioning

Commissioning gives access to the settings of the basic display including Date and Time, Auto returns, and Alarm logbook. For parameter settings - see section 5.1.

## Calibrate Touch Panel

The touch panel requires calibration every time the user reloads the factory settings.

To calibrate select the Calibrate touch panel and follow the instructions on the screen, i.e. hitting the cross hairs when they appear on the screen.

- If the touch panel is calibrated correctly, i.e. that means it is hit the cross hairs on the screen; the message Saved – hit the touch panel will appear. Complete the calibration by touching the panel one more time.
- If the touch panel is calibrated incorrectly, i.e. you have not hit all the cross hairs, the display will show the message Error try again – hit the touch panel. In this case, it is important to calibrate the touch panel again.

Please note that it can be useful to calibrate the touch panel using a small pointed object such as a pencil. However, the pointed object can be too sharp and can damage the touch screen. Thus, do not push it too hard.

## Service (requires an access password)

- Password level 1 is 9490. This gives you access to the analyzer configuration including Alarm setup and Analog input/out setup. For details of these settings - see sections 5.2, 5.3, and 5.4.
- Password level 2 gives access to two other functions: Load factory settings and Load default settings. For password level 2, see the Testing & Configuration Sheet delivered with each analyzer.

Please see the inside cover (Figure 1) for the overview of the program menu structure.

### Note

The Testing & Configuration Sheet is an important document. It includes the factory settings as well as the password for level 2 functions.

Please keep this Testing & Configuration Sheet in your files.

## 4.6 Navigating the Menu Structure

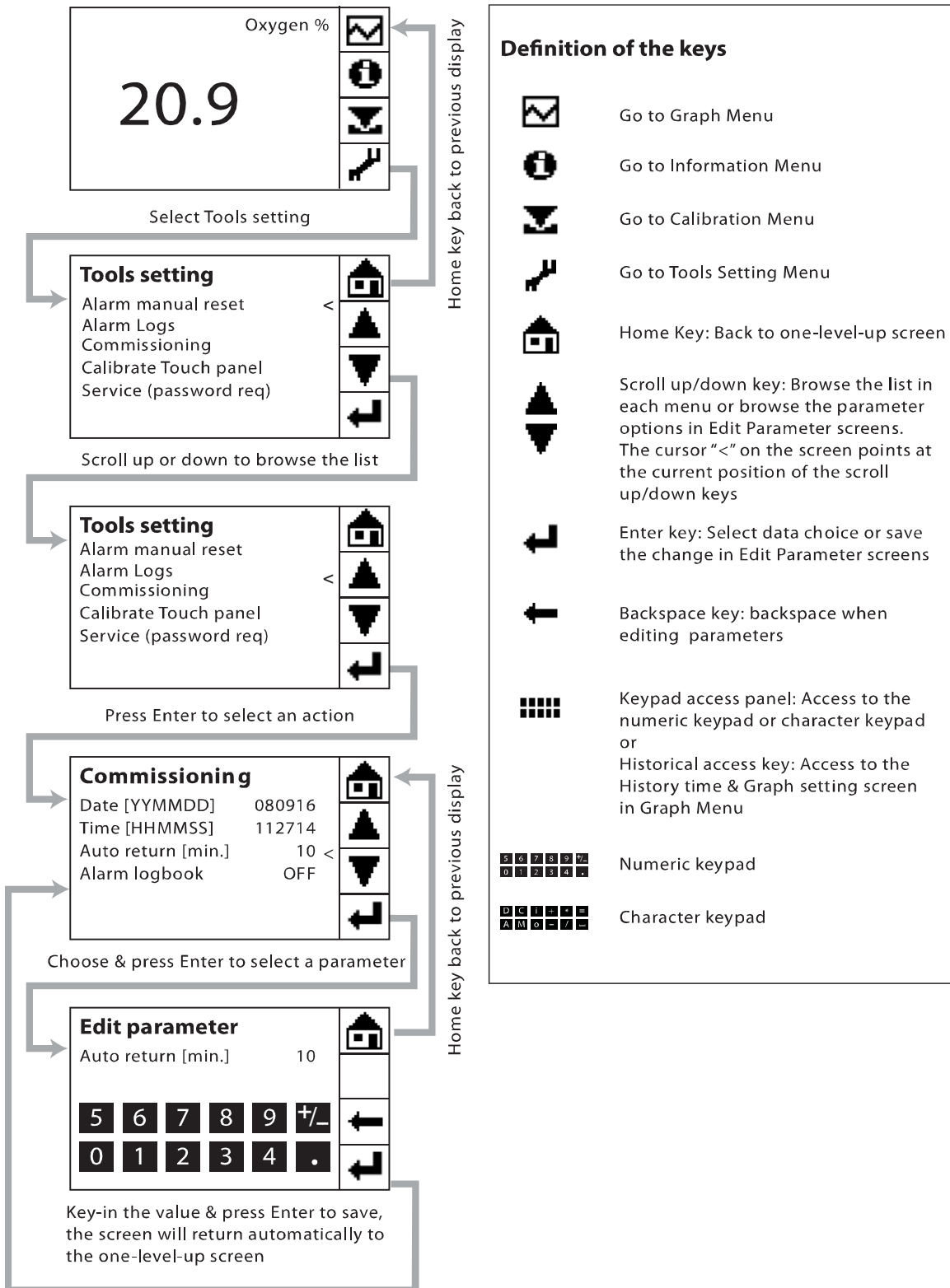


Figure 4-3: Navigating the menu structure



## 5 Configuration & Commissioning

**Before starting the analyzer for the first time after completing the installation, control that all electrical connections are installed according to the instruction.**

After switching the power on, the analyzer readings shall be stable before starting calibration. It normally takes about five minutes to warm up. During the heating up of the sensor, the Main Menu will display the oxygen content of 0.0. After several minutes, when the sensor has reached its operation temperature, the Main Menu starts displaying the actual oxygen content.

### 5.1 Setting of Basic Display Parameters

The route for setting the basic display parameters is *Tools menu\Commissioning*.

**Date & Time:** The logbook and trend graph use calendar and clock as reference. The date and time are per default set to follow the Coordinated Universal Time (UTC). The current time is displayed in the Graph Menu. Date and Time can be set upon your requirement. However, it is recommended not to change date and time too often as it will be difficult to keep track on the historical data.

**Auto return [min.]:** Sets the timeout period. If there is no action taken during that period, the system automatically reverts to the Main Menu from anywhere in the functional menus (except for the Graph Menu). Default setting for auto return is 10 minutes. Minimum setting is 1 minute.

**Alarm logbook:** ON/OFF mode is set here. When the Alarm logbook is ON, the alarm logbook starts to record all of the alarms. The last 12 alarms are shown in *Tools menu\Alarm Logs*. If the Alarm logbook is OFF, no alarms are saved.

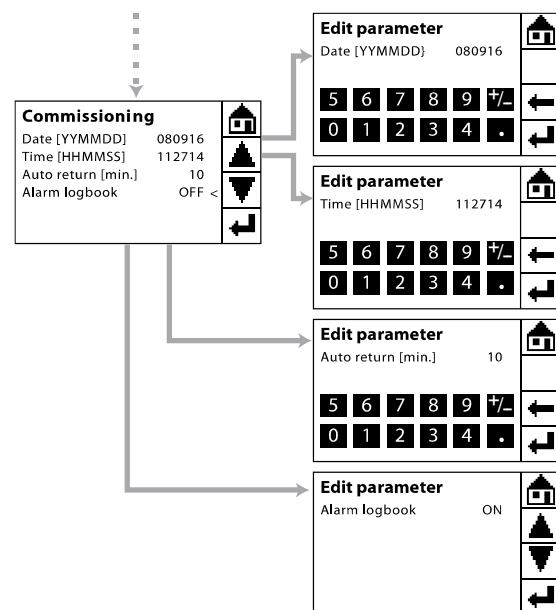


Figure 5-1: Basic display settings

## 5.2 Setting of Alarm Limits

The route for setting the alarm limits is *Tools menu*\Service (Password level 1: 9490)\Alarm setup.

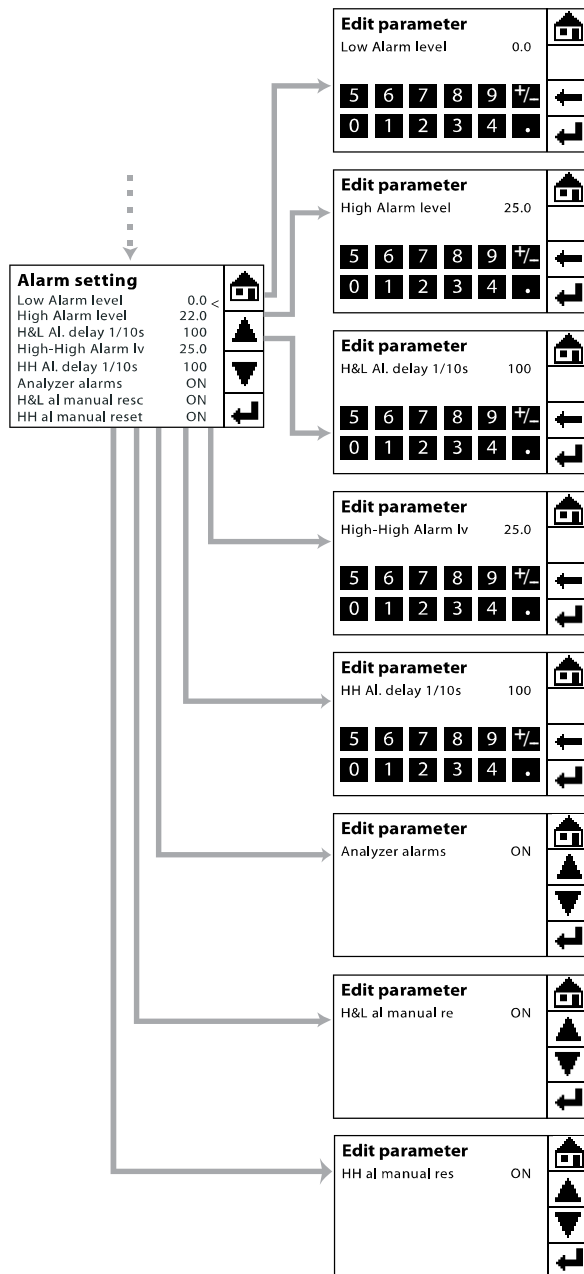


Figure 5-2: Settings of alarm limits

The G36p has three alarms for oxygen level:

**Low Alarm level** sets the low O<sub>2</sub> level alarm – default set to 0.0 %.

**High Alarm level** sets the high O<sub>2</sub> level alarm – default set to 22.0 %.

**High-High Alarm lv** sets the high O<sub>2</sub> level alarm – default set to 25.0 %.

Besides, there are other settings for alarms as follows:

**H&L Al. delay 1/10s** sets the alarm delay for both Low and High O<sub>2</sub> level alarms. Default set to 100 (equal to 10 seconds).

**HH Al. delay 1/10s** sets the delay for High-High O<sub>2</sub> alarm. Default set to 100 (equal to 10 seconds).

**Analyzer alarms** is used to turn ON/OFF the alarm function of the analyzer including analyzer failure alarm and oxygen level alarms.

When the Analyzer alarms is ON and one of the alarm conditions is present, the Main Menu will display the alarm message (e.g. Alarm: Low O<sub>2</sub>) in the bottom left corner of the screen. Then, the alarm relay will be triggered after the delay period is over. For alarm relay output function and connection, please following the instruction in section 3.4.3.

**H&L alarm manual res** is used to switch the manual reset function of the High or Low alarm ON/OFF.

When the “H&L alarm manual res” is OFF, the High or Low alarm will disappear automatically when the reading of the O<sub>2</sub> value is no longer in the alarm zone (O<sub>2</sub> level alarms).

When the “H&L alarm manual res” is ON, it is required a deliberate manual action to reset either High or Low alarm.

To reset an alarm, enter *Tools menu* and choose *Alarm manual reset*.

**HH alarm manual res** is used to switch the manual reset function of the High High alarm ON/OFF.

When the “HH alarm manual res” is OFF, the High High alarm will disappear automatically when the reading of the O<sub>2</sub> value is no longer in the alarm zone (O<sub>2</sub> level alarms).

When the “HH alarm manual res” is ON, it is required a deliberate manual action to reset the High High alarm.

To reset an alarm, enter *Tools menu* and choose *Alarm manual reset*.

### Attention

If the analyzer is intended to detect a potentially hazardous gas concentration and the Analyzer alarms is set ON, the manual reset functions of the intended alarm should also be set ON to compliance with the common safety requirement.

## 5.3 Setting of the Analog Input

The route for setting the analog input is *Tools menu*\Service (Password level 1: 9490)\Analog in/out settings\Analog input 1.

Both analog inputs are not used by default. Therefore, the parameters in both analog input settings must not be edited.

However, if the analyzer has been specifically ordered with preset analog inputs, please see Appendix 74H10.1 for more information.

## 5.4 Setting of Analog Outputs

### 5.4.1 Analog Output 1

The route for setting Analog output 1 is *Tools menu*\Service (Password level 1: 9490)\Analog in/out settings\Analog output 1.

Analog output 1 (Ao00) is connected to terminal A-OUT connection 1 & 2 with default setup to indicate the actual oxygen value in percent.

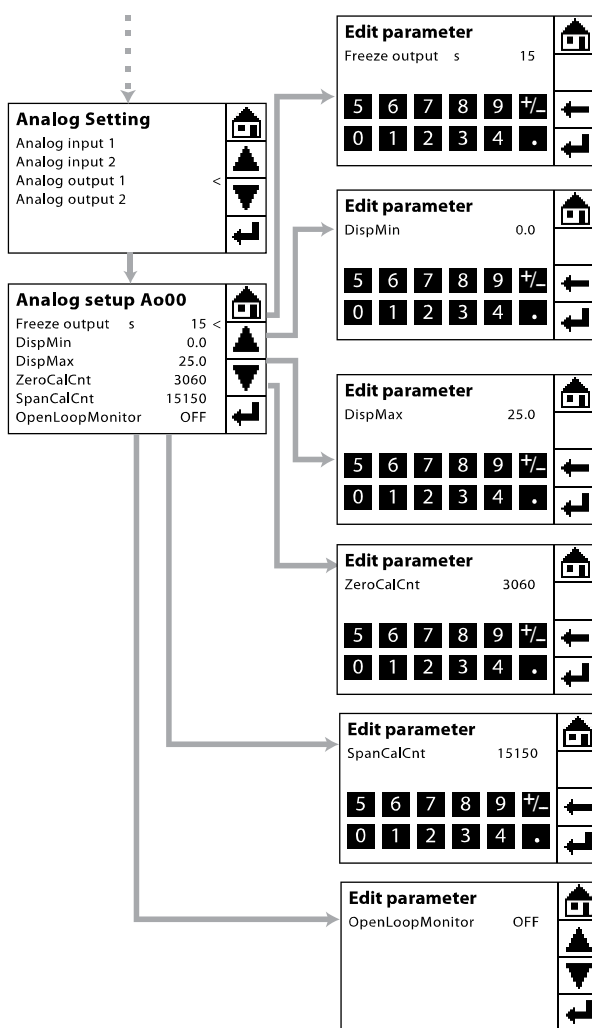


Figure 5-3: Settings of analog output 1

**Freeze output:** The freezing of the output signal after back-flushing or calibration is set up at 20 seconds by default.

**Analog Output Scale:** The analog output signal can be scaled by editing the minimum and maximum values (DispMin/DispMax).

The scale is freely configurable, but usually only the maximum setting is changed. The range of the output signal must correspond to the requirements and settings of the external instrumentation or system.



The default setting is 0.0–25.0 % oxygen (0.0 %  $\cong$  4 mA and 25.0 %  $\cong$  20 mA). This is appropriate where the external instrumentation is operating with an input scale of 4–20 mA and display of 0.0–25.0 % oxygen.

If however, the external instrumentation is working with an input in a different range – for example 0.0–10.0 % O<sub>2</sub>, i.e. 0.0 %  $\cong$  4 mA and 10.0 %  $\cong$  20 mA – then the maximum value in DispMax has to be changed – in this example to 10.0.

## Calibration of Analog Output Signal

Calibration of the analog output signal is usually only relevant after reloading new factory/default settings. The calibration of the analog signal is carried out in one of the following ways:

### Option 1: Input of tested values

- Select ZeroCalCnt and key in the value according to the ZeroCalCnt value in the Testing & Calibration Sheet attached to each specific analyzer. Press  to save. The screen will automatically return to the Analog setup Ao00 screen.
- Select SpanCalCnt and key in the value according to the value in the SpanCalCnt value in the Testing & Calibration Sheet attached to each specific analyzer. Press  to save.

### Option 2: Manual calibration

Only if the analog signal does not function properly with the input of the tested values – Calibration Option 1, the analog signal shall be calibrated manually. For manual calibration of analog signal 1 (Ao00), zero test gas and instrument air shall be used.

Connect a current meter with a range 4-20 mA between terminal A-OUT connection 1 & 2.

#### For zero calibration:

- Select DispMin. Enter the oxygen value of the zero test gas and save
- Introduce zero test gas to the sensor
- Select ZeroCalCnt. Then adjust and save the value to correspond with 4 mA output.
- Select DispMin. Change the value back to the minimum value of the scale required by the external instrumentation (usually 0 % O<sub>2</sub> – in rare cases other values).

#### For span calibration:

- Select DispMax. Enter 20.9 (oxygen % in the instrument air), and save
- Introduce the instrument air to the sensor
- Select SpanCalCnt. Then adjust and save the value to correspondent with 20mA output.
- Select DispMax. Change the value back to the maximum value of the scale required by the external instrumentation (usually 25 % O<sub>2</sub> – in some cases 10 % O<sub>2</sub> – in rare cases other values).

## Open Loop Monitor

The function can be switched ON/OFF. The default setting is OFF. If the function is ON, there will be an alarm displayed Alarm: Loop in the Main Menu if the loop between A-OUT connection 1 & 2 is open.

### 5.4.2 Analog Output 2

The route for setting Analog output 2 is *Tools menu*\Service (Password level 1: 9490)\Analog in/out settings\Analog output 2.

Analog output 2 (Ao01) is connected to terminal A-OUT connection 4 & 5. Analog output 2 is per default arranged to display the oxygen value just as Analog output 1. The adjustment of settings and calibration is done as described in section 5.4.1.

If ordered, Analog output 2 can be set to display Analog input 1 (Ai01). Most settings are done equivalently to the description in section 5.4.1 with the exception of the manual calibration of the output signal. If Analog output 2 is connected to Analog output 1 then follow these instructions for a manual calibration of the output signal.

Connect a current meter to terminal A-OUT connection 4 & 5 for measuring the analog output 2.

#### For zero calibration:

- Simulate a 4mA current to Analog input 1.
- Select ZeroCalCnt. Then adjust and save the value that corresponds to 4 mA showed on the current meter connected to the analog output 2

#### For span calibration:

- Simulate a 20mA current to Analog input 1.
- Select SpanCalCnt. Then adjust and save the value that corresponds to 20 mA showed on the current meter connected to the analog output 2.

## 5.5 Back-flushing & Auto Calibration

### Attention

Not relevant for the Inert Gas Oxygen Analyzer!

The backflushing and auto calibration functions are not used by default for the Inert Gas Oxygen Analyzer. The parameters in this menu, therefore, must not be edited.

This section is only valid for the Stack Gas Oxygen Analyzer and the EGR Oxygen Analyzer.

---

The route for setting of back-flushing and auto calibration is *Tools setting\Services (password level 1: 9490)\Back-flushing setup*.

**Back-flush period** is used to set the interval between two backflushing. The default setting for auto back-flushing interval is 6 hours (360 minutes). There will be no back-flushing if the Back-flush period is set to 0.

**Back-flush duration** is per default set to 30 seconds.

**Auto calibration** is used to set the interval between two auto calibrations. By default, the analyzer is set for auto calibration every 24 hours (1440 minutes). There will be no auto calibration if the Auto Calibration is set to 0.

**Freeze output** is the freezing time of output signals after calibration or back-flushing. Default setup is 15 seconds. This parameter can be set either here or in the setting of the Freeze output under Analog in/out setup. See section 5.4.

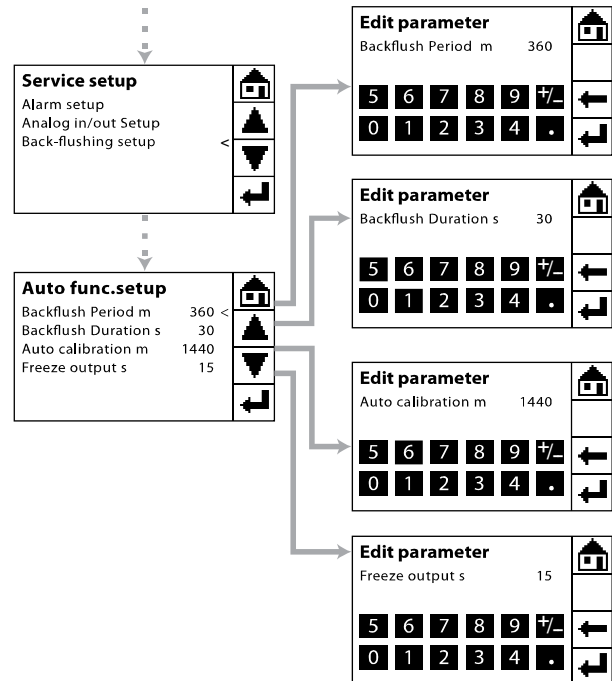


Figure 5-4: Setting of back-flushing

## 5.6 Loading Default Settings & Factory Settings

The route for these two functions is *Tools setting\Services (password level 2 – see configuration sheet for password)*.

### Load default settings

This function makes it possible to return to the standard settings. After loading the default settings, the analyzer will restart automatically loading the default settings from the SD card to the analyzer. After reload default settings, please calibrate the touch panel and reset the analyzer using the Testing & Configuration Sheet attached to each analyzer or following the instruction in chapter 5.

In case the g1parm.bin at the SD card has been deleted accidentally, please contact Green Instruments for resending the standard setting file.

## Load factory settings

Loading factory settings should only be used under the instructions from Green Instruments. After loading factory setting, please calibrate the touch panel following the instructions in section 4.5, and load default settings following the above instructions.

## 5.7 Commissioning of the Analyzer

After completing the configuration, please verify the installation and setup of the analyzer with the following steps:

- Check that the span calibration gas is connected before span calibration; and zero calibration gas is connected before zero calibration. Calibration gases shall be connected to the sensor without any leaking and in accordance with a good installation practice. A leaking connection will result in loss of calibration gas and may result in poor calibration. In order to have the accurate result, the pressure and flow rate of the sample gas should be the same as the pressure and flow rate of the calibration gasses.
- Check that the setup of analog output signals is correct.
- Check that the setup of alarm levels is correct.
- Check that the setup of calibration values for zero and span calibration gas is correct.

Calibration can be performed when the indication of oxygen content on the Main Menu has stabilized, normally about five minutes after starting the analyzer. Calibration is carried out as described in the following chapter.





## 6 Calibration

**After completing the installation and before setting the analyzer in operation, the analyzer must be calibrated.**

---

---


After switching the power on, the analyzer readings shall be stable before starting calibration, which will normally take about five minutes of warm-up time.

The analyzer is arranged for calibration by using certified calibration gases or instrument air. In addition, the analyzer can be artificially calibrated. However, artificial calibration should only be used for intermediate purposes and cannot replace manual calibration with a known and certified calibration gas.

### Attention

For the purpose of calibration, the signal from sensor shall be stable for at least 10 seconds. Therefore, during calibration there must not be variations in pressure or flow in the calibration gas supplied to the sensor.

In order to have an accurate result, the pressure and flow rate of the sample gas should be the same as the pressure and flow rate of the calibration gases.

During the calibration with known oxygen gases, press  will restart the analyzer without changing any change of settings and calibration values.

---

### 6.1 Calibration with Known Oxygen Gases

The zero-calibration gas to be used shall be a mixture of pure nitrogen with a known amount of oxygen. The best practice of zero calibration is to use a calibration gas just below the target range of the application.

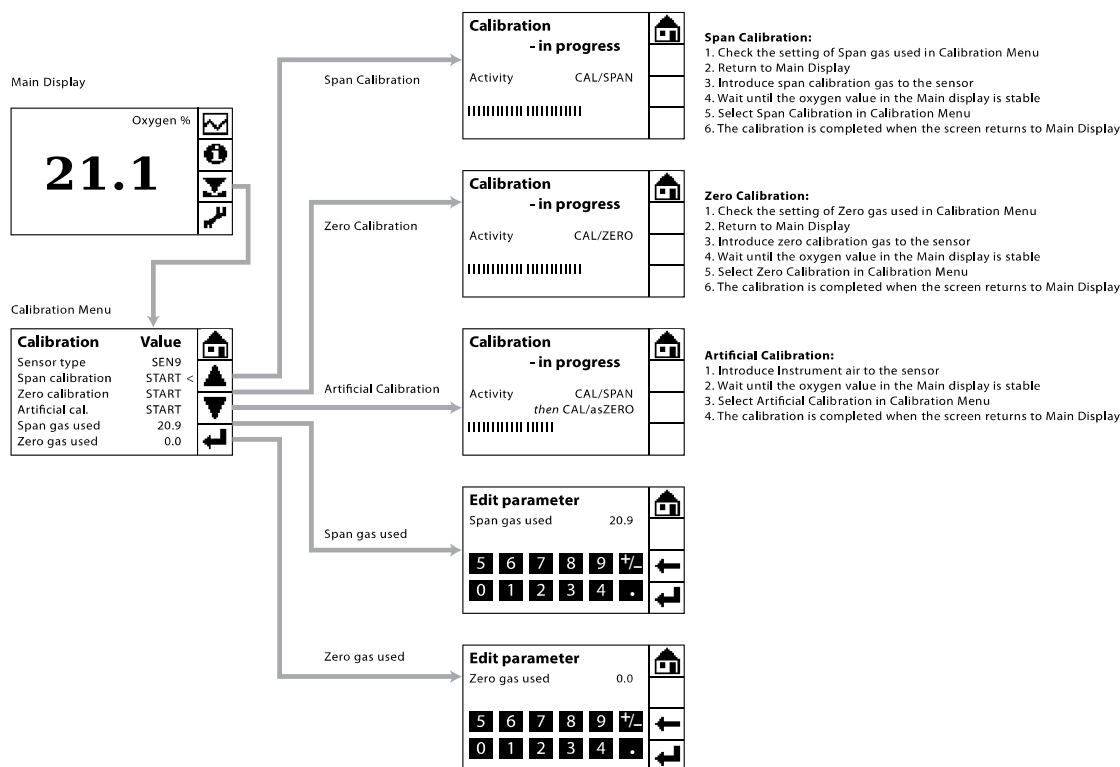



Figure 6-1: Calibration menu structure and quick guide

For the span calibration gas, clean dry instrument air with oxygen content of 20.9 % is recommended.

Before starting to calibrate the analyzer, check the settings of zero and span gas used in the Calibration Menu.

- If the value of zero gas used is not correct, select Zero gas used and enter the value of the zero gas used.
- If the value of span gas used is not correct, select Span gas used, and enter the value of the span gas used.
- Press  to go back to the Main Menu
- To calibrate the oxygen signal, do the following steps:
  - Introduce zero calibration gas to the sensor and wait for the zero-value reading to stabilize, e.g. 1.8 %. Then enter Calibration Menu and select Zero calibration. The zero calibration is completed when the analyzer returns to the Main Menu. The new calibration value will be displayed after 15 seconds (as per default setting of freeze output).
  - Introduce the span calibration gas to the sensor, and wait for the span value reading to stabilize, e.g. 21.1 %. Enter Calibration Menu and select Span calibration. The span

calibration is completed when the display returns to the Main Menu. The new calibration value will be displayed after 15 seconds (as per default setting of freeze output).

The calibration should be checked according to the requirements of each application.

## 6.2 Artificial Calibration of Oxygen Signal

The analyzer is arranged with the possibility to carry out an artificial calibration using only instrument air. Artificial calibration is carried out as follows:

- Apply instrument air with 20.9 % oxygen to the sensor
- Enter Calibration Menu and select Artificial Calibration. The artificial calibration will now start calibrating first Span using the instrument air as the reference; then Zero using the reference Zero point generated by the analyzer.
- The calibration is completed when the analyzer returns to normal reading (i.e. 20.9 displayed on the main menu.)

### Note

For the Stack Gas Oxygen Analyzer

With the default configuration, the analyzer is automatically calibrated every 6 hours using the artificial calibration. The interval between two calibrations can be changed as described in section 5.5.

---

## 7 Routine Maintenance

### 7.1 Analyzer

The analyzer is tested from the factory. The analyzer does not require any special maintenance. The LCD shall be kept clean to give a clear view and allow proper operation of the touch screen. The touch screen shall be cleaned using a soft damp cloth or soft tissue. Dirt and oil on the surface of the analyzer need to be removed carefully using neutral detergent and a clean rag.

### 7.2 Calibration

The most important routine maintenance task is to calibrate the analyzer regularly. The analyzer must be calibrated after each startup of the G36p Oxygen Analyzer. If in operation continuously, experience has shown that one calibration per week is sufficient. See chapter 6.

### 7.3 Sensor

#### Attention

The sensor/sensor house is hot and can cause severe burning of personnel if not handle with care.

Turnoff the analyzer before working with the sensor.

Before removing the sensor from the sensor house, make sure that there is no overpressure or hot sampling gas inside the sensor house.

The sensor is a consumable part and needed to be changed when its lifetime is over. To change the sensor, following the below steps:

- Turn off the analyzer first; then unplug the sensor connection
- Loose the sensor from the sensor house, and replace it by a new sensor
- Plug the new sensor back to the sensor house. Then turn on the analyzer.


## 7.4 Gas Connection

The calibration and sample gas connections to the sensor should always be checked and ensured no leaking. A leaking connection might result in inaccurate measuring results.

To have accurate measuring results, the gasses supplied to the sensor must have a constant flow and pressure. The pressure and flow rate of the sample gas should be the same as the pressure and flow rate of the calibration gasses.

## 8 Trouble Shooting

Troubleshooting should always be carried out by skilled personnel. The G36p Oxygen Analyzer is connected to hazardous electric voltages, which can cause personal injury or mechanical damage if not handled correctly and in accordance with normal safety regulations.

| Trouble  | Possible Cause → Action   |
|--|---|
| No display at all                                    | →Check the circuit breaker<br>→Check the power supply – make sure that the power supply is the correct voltage<br>→Check the ON/OFF switch at the back of the analyzer – make sure it is ON<br>→Check the fuse on the back of the analyzer  |
| No display despite power supply and fuse is found OK | The analyzer is defect → reboot, repair, or exchange the analyzer   |
| Display only indication 0.0                          | No signal from sensor → check the connection both at the analyzer and sensor. Then wait several minutes and re-plug the sensor or restart the analyzer.<br><br>Check the sensor temperature in  Information Menu, see section 4.3.<br><br>If the sensor temperature could not reach its operating temperature before it starts working, the sensor's diagnostic status will show OK, but the display only indicates 0.0 → check if the sample flow is too high.<br><br>Try taking the sensor out of the sensor house and let it hang in the ambient air to see if the sensor temperature can reach its operating condition. |
| Incorrect indication of oxygen level                 | →Try to recalibrate the analyzer<br>→ If normal calibration is not working, try artificial calibration see section 6.2.<br>→Check the sensor's diagnostic status and temperature in Information Menu, see section 4.3. Check the sensor connection or replace the sensor if it is defect  |
| Incorrect remote                                     | There might be a mismatch in the output range of the analyzer   |

| Trouble                                     | Possible Cause →Action   |
|---|--|
| display and recording                       | and the input range of the remote system<br>→Check and correct output signal settings, see section 5.4   |
| No trend curves<br>Graph Menu may be frozen | Y-limits is set too low → reset Y-limits, see section 5.1<br>X-timing is set too high → restart the analyzer, reset X-timing, see section 5.1  |
| Touch panel errors                          | →Calibrate the touch panel, see section 4.5  |
| No data log<br>No historical trend curve    | →Check if the SD card is in position<br>→If yes, check the SD card's lock mode. The lock button should always be in the unlock position.<br>→Replace the SD card if it is defect   |
| Unable to reload default settings           | → If the screen shows Error!! No SD card, please check the SD card inside the analyzer. Replace the SD card if it is defect. Contact Green Instruments for a new SD card with the default setting file<br>→ If the screen shows Error!! No parm file, please Contact Green Instruments to resend the default setting file. Copy the g1parm.bin to the SD card:\bin, then try to reload default settings one more time. |



## 9 Spare Parts






When ordering parts, please quote the serial number of the analyzer, which can be found on the label on the back of the analyzer.





### Attention

All spare parts must be stored in the original packaging at a dry place.

The maximum storage time of the sensor is 2 years.

Storage temperature: -15 °C...55 °C

| Part No. | Part Description   | the specific appearance of the spare parts is subject change without notice; the function however will not change |
|----------|--|---|
| 00328    | O-ring for IG-sensor                                       |                              |
| 00390    | SEN1 Oxygen sensor plug-in type – complete with O ring     |                              |
| 00477    | Sensor cable for SEN1 0.8 m                                |                              |
| 01121    | Sensor cable for SEN1 1.5 m                                |   |
| 00922    | Sensor cable for SEN1 3.0 m                                |   |
| 01052    | Sensor Housing for SEN1 with stay with 1/8" BSP connection |                              |
| 01378    | Sensor Housing for SEN9 with stay with 1/8" BSP connection |   |
| 01251    | Fuse 2 AT (pkg of 10)                                      |                              |

| Part No.   | Part Description   | the specific appearance of the spare parts is subject change without notice; the function however will not change |
|--|--|---|
| 01258  | SEN9 Oxygen sensor screw-in type – with male connector   |                                 |
| 01381  | This Manual  |   |
| 01382  | G36p OA 24 VDC Front Panel Mounted for IG (includes 01388)   |                                 |
| 01388  | Gasket for panel mounted analyzer  |                                |
| 01434  | Panel feed through, M12, 5 poles (optional)  |                              |
| 01462  | Sensor cable – female connector 1.5 m  |                               |
| 01524  | Sensor cable – female connector 3.0 m  |   |
| 01471  | SD card with Green Instruments' software & standard settings files<br>Please inform the serial number of the analyzer when you order an SD card. |                              |
| Optional equipment – including pressure transmitter (part #01390), remote digital display (part # 33590), signal amplifier for logarithmic output (part # 33593), flow alarm (part # 01527) can be supplied. |  |   |

## 10 Appendix

### 10.1 Setting of Analog Input

The analog inputs are not in use by default. If however, the analyzer has been specifically ordered with preset analog inputs they are set accordingly. See the specific arrangement in the Testing & Configuration Sheet.

The two analog input signals of the G36p can be configured for most input requirements such as pressure, temperature, flow and opacity. The analyzer can be optional arranged with one or both analog inputs. For the analyzer with pressure compensation module, Analog Input 1 is per default setup for pressure transmitter.

The analog input signal can also be configured to be displayed on the Main Menu. See Figure 10-1 for details of the Main Menu the analog input is in use.

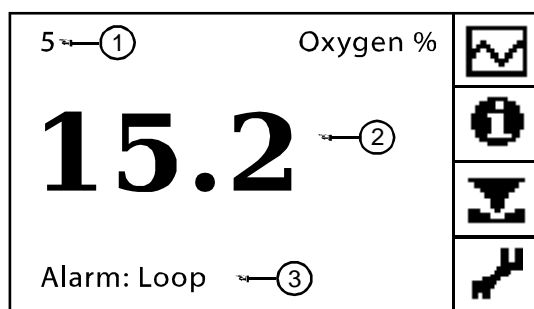


Figure 10-1: Main menu if the analog input is agreed to be used

- Position 1: Display of Analog input 1 (e.g. pressure in kPa)
- Position 2: Current oxygen value in percent
- Position 3: Display of the current alarm (e.g. Alarm of open analog output loop) – if there is no alarm, there will be no display here.

The route for setting of the analog input is *Tools menu*\Service (Password level 1: 9490)\Analog in/out settings\Analog input 1.

#### Freeze output

No setting is required for this parameter. The default setting is 15 seconds.

#### Analog Input Scale

The analog input signal should be 4-20 mA.

The display range of the input signal is from 0.0 to 999.9. The input signal can be scaled freely within this range by editing the minimum and maximum display (DispMin/DispMax).



- The minimum display is correspondent to a signal of 4 mA.
- The maximum display is correspondent to a signal of 20 mA.

### **Calibration of the analog input signal**

The route for calibration of the analog input is *Tools menu\Service (Password level 1: 9490)\Analog in/out settings\Analog input 1*.

This procedure should usually only be relevant after reloading the factory settings. The calibration of analog input signal is carried out in one of the following ways:

#### **Option 1: Input of tested values**

- Select ZeroCalCnt and key in the value according to the ZeroCalCnt value in the Testing & Configuration Sheet attached to each specific monitor. Press  to save. The screen will automatically come back to the Analog setup Ai01 screen. Then,
- Select SpanCalCnt, and key in the value according to the value in the SpanCalCnt value in the Testing & Configuration Sheet attached to each specific monitor. Press  to save.

#### **Option 2: Manual calibration**

Do the manual calibration of analog signal only if the analog signal does not function properly with the input of the tested values (Option 1).

The manual calibration of analog input signal requires you to go back and forth between the Analog setup Ai01 screen and the Main Menu.

#### **For zero calibration:**

- Simulate a current of 4 mA to the analog input terminal.
- Select ZeroCalCnt and adjust the value in ZeroCalCnt until value of analog input Ai01 in the Main display equal to the MinDisp value. Then save the new value of ZeroCalCnt.

#### **For span calibration:**

- Simulate a current of 20 mA to the analog input terminal.
- Select SpanCalCnt and adjust the value in SpanCalCnt until value of analog input Ai01 in the Main display equal to the MaxDisp value. Save the new value of SpanCalCnt.

### Open Loop Monitor

No setting is required for this parameter. The default setting is OFF and shall not be changed.

## 10.2 Cutout Dimensions

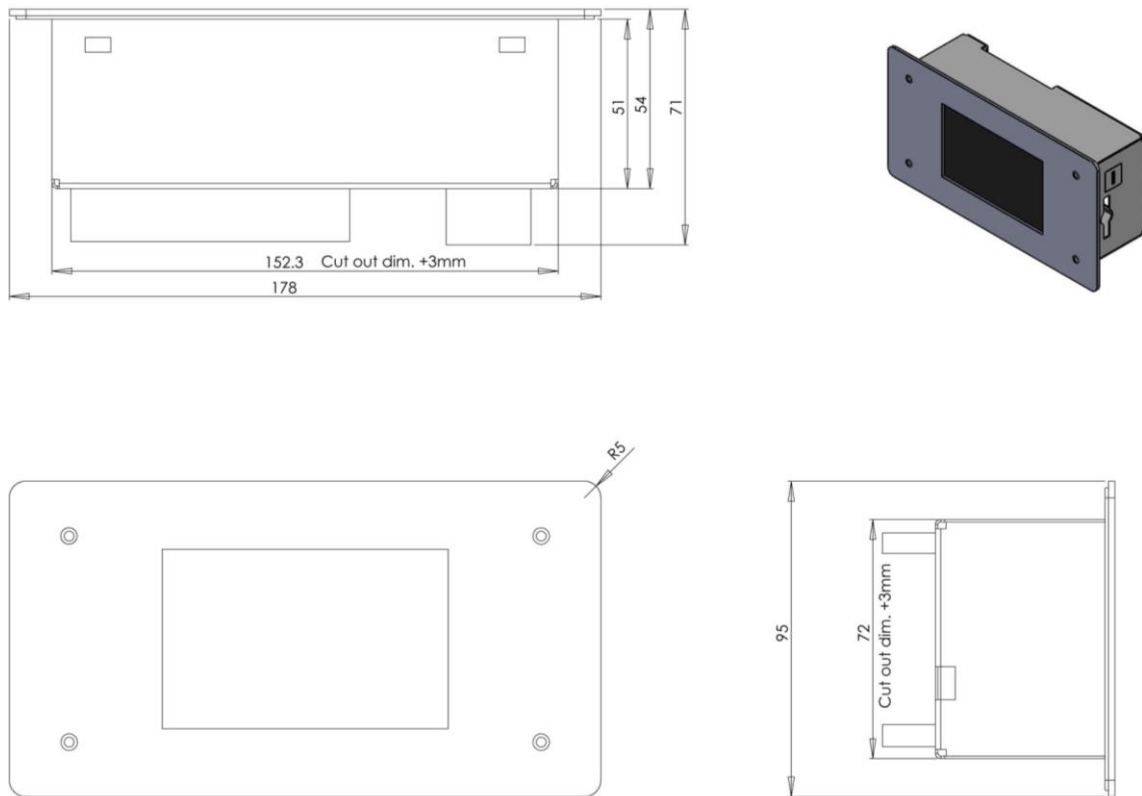


Figure 10-2: Cutout dimensions for G36p Oxygen Analyzer



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