EXPERTS IN WATER CHEMISTRY SINCE 1903

9065 Luminescent Dissolved Oxygen Analyzer User Manual

Revision 2.05

WALTRON CUSTOMER COMMITMENT

This instruction manual is a technical guide to aid the customer in the set-up, operation, and maintenance of their new Waltron measuring system. Waltron provides continuous product improvement and reserves the right to make any modifications to the information contained herein without notice.

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Technical questions concerning this product should be addressed to:

Waltron Technical Service Department
Flemington, New Jersey
Phone: (908)-534-5100
Fax: (908)-534-5546
www.waltron.net

Please be ready to provide the following information:

- Date analyzer was purchased
- Analyzer model and serial number
- Recent maintenance history
- Calibration slope values and detailed description of problem

Waltron's technical expertise and extensive experience provides personalized solutions to the water quality industry. It is Waltron's commitment to provide the customer with timely and accurate technical service and support.

Waltron fully expects the customer to be satisfied with the quality, performance, and cost of this product.

If there are any questions or concerns regarding this product, please feel free to contact Waltron at (908)-534-5100.

Thank you for choosing Waltron!

Please note the Waltron mailing and shipping address:

Waltron Bull & Roberts, LLC
25 Minneakoning Road, Suite 101
Flemington, NJ 08822

SAFETY

Please observe proper safety and handling precautions when installing, operating, maintaining, and servicing this product. The following should be noted and adhered to:

- Read and understand manual before working with analyzer.
- Pay special attention to warning labels on enclosures, containers, packages and chemicals.
- Only qualified personnel should be involved in the installation, operation, and servicing of the analyzer.
- Follow safety precautions when operating analyzer in conditions of high pressure and/or temperature.
- Keep analyzer chemicals away from heat and extreme temperatures. Reagent powders must be kept dry.
- Follow all regulations and warning labels when disposing of chemicals. Do not mix chemicals.

To obtain analyzer safety information or Safety Data Sheets (SDS), please contact Waltron or visit the website at www.waltron.net .

WARRANTY AGREEMENT

If, within one year from the date of shipment, the customer experiences any equipment defects or is not satisfied with the analyzer manufacturing, Waltron will repair, or at its option, replace any defective part(s) free of charge. This warranty requires that the defective part(s) be returned to Waltron with shipping charges prepaid.

At Waltron discretion, a Technical Service Specialist may be sent out to repair or replace the defective part(s) on location. Traveling time and expenses of the Technical Service Specialist is at the customer's expense.

Equipment sent to Waltron must be appropriately packaged and the following information must be provided prior to returning to Waltron:

- The Return Authorization (RA) number assigned to the customer by the Waltron Technical Service Department
- Customer name, address and department
- Name and telephone number of the individual responsible for returning items for repair
- Brief problem description

Ship to Waltron service center:

Waltron Bull & Roberts, LLC
25 Minneakoning Road, Suite 101
Flemington, NJ 08822

The Waltron Warranty Agreement:

- Covers expendable sensors for one month after shipment and reusable electrodes for six months after shipment.
- Does not apply to damages occurred during shipping.
- Warranty will be nullified if goods have been used for purposes other than those for which they are intended or if any seal has been removed, broken or tampered with or if the Waltron trademark or serial number has be removed, defaced, or altered.
- Does not cover expendable supply items such as reagents, tubing and electrolytes.
- Does not cover misuse or mistreatment by the user.
- Does not cover previous repair or alteration by unauthorized individuals.

Waltron does not assume responsibility for contingent liability through alleged failure or failures of products or product accessories.

CHECKLIST OF MATERIALS

- In order to ensure customer satisfaction, Waltron does its best to provide adequate and timely packaging and shipping services. Please perform the following after receiving a shipment:

- Inspect all shipping containers upon receipt and record any visible damage. If there are any outward signs of damage, please retain all containers and packages for inspection by carrier. Please retain all packing material so that it can be used for future moving and shipping needs.

- Check all items received against those on the packing list. Chemicals are usually shipped in a separate package and will be itemized accordingly.

- Verify that the number of packages received agrees with the packing list and shipping papers.

- Notify both Waltron and the carrier if any problems occur.

Important Notice:

- All analyzers are inspected and tested prior to shipment.
- In normal use, the unit should require only minor maintenance and should operate correctly and without fault over a long period of time.
- Please note that if electronic components need to be replaced, it may be necessary to adjust and/or calibrate the analyzer.
- Failure to carry out correct maintenance procedures may result in inaccurate analyzer readings.

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1 OVERVIEW

1.1 TECHNICAL SPECIFICATIONS

Range		[ppb]	0.0 to 2,000
		[µg/l]	0.0 to 2,000
		[ppm]	0.00 to 2.00
		[%] O_2	0.000 to 4.180
		[% a.s.]	0.00 to 20.0
		[mg/l]	0.00 to 2.00
Temperature		[^{o} C]	- 5.0 to 45.0
		[^{o} F]	23.0 to 113.0
Accuracy *	Measurement	[ppb]	± (1 ppb + 2% of the measured value)
		[µg/l]	± (1 µg/l + 2% of the measured value)
		[ppm]	± (0.001 ppm + 2% of the measured value)
		[mg/l]	± (0.001 mg/l + 2% of the measured value)
	Temperature	[° C]	± 0.1° C
		[° F]	± 0.2° F
Max. Pressure		[barg]	10.00 barg
		[psi]	145.0 psi
		[kg/cm^2]	10.20 kg/cm^2
		[kPa]	1,000 kPa
Measurement frequency		[s]	Adjustable to every 2 sec. up to 999 s + automode
Memory			500 measurements/ O2 probe
Voltage	Standard		90 – 240 V ~ 50 – 60 Hz, 25 W
	Optional		24 V DC, 25 W
Installation	Sensor		One or Two Sensor Configurations
Transmitter	Standard		Wall-mounted
	Optional		Panel-mounted
IP class	Sensor		IP67
	Transmitter		IP67
Dimensions	Sensor	mm	Ø 84 x 240, excluding plug

	Transmitter	mm	W178 x H278 x D90
Weight	Sensor	kg	2.2 kg
	Transmitter	kg	1.2 kg
O_2-probes per Transmitter			2 max.

* The accuracy from the 9065 is determined at 20° C

1.2 INTENDED USE

The Waltron 9065 Dissolved Oxygen Analyzer utilizes new luminescent technology for measuring dissolved oxygen in water at ppb levels. Luminescent technology has unique features and benefits compared to traditional dissolved oxygen sensing technologies. The 9065 provides high accuracy with excellent long-term stability. The 9065 Dissolved Oxygen Analyzer can be used in a variety of online analysis applications throughout many different industries.

The 9065 must be connected to a sample line. The connections to the flowcell are ¼" (6mm) Swagelok fittings. The dissolved oxygen must be measured in a full, flowing sample line. Using the sensor in a pipe that is not full or taking the measurement while the product is not flowing will cause errors or will it cause damage to the device.

Features:

- Analysis range: 0.10ppb – 2000ppb (others available upon request)
- No calibration for up to 2 years
- Extremely fast response
- No sample interference
- Excellent results regardless of sample flowrate
- Use in liquid and gas applications
- High temperature alarm
- Multiple sensor configuration

Benefits:

- No sensor maintenance (no membrane, no electrolyte)
- Simple operation
- Compact design

1.3 SAFETY

1.3.1 SYMBOLS

The symbols 'Note:', 'Warning!' and 'Danger' used in this instruction manual have the following meanings.

NOTE:	Instructions for the correct and effective use of the instrument.
WARNING!	Incorrect or careless use may cause serious damage to the instrument.
	Incorrect or careless use may place the user or the surroundings in **DANGER**.

1.3.2 PRECAUTIONARY MEASURES AND SAFETY INSTRUCTIONS

WARNING!	To avoid a short circuit, never insert metal objects into the connector. The use of chlorite-based or fluorine-based cleaning products is not permitted. These may cause damage to the instrument.
	Ensure that the pipe is not pressurized and that the instrument is disconnected from the power supply during assembly and disassembly. This will prevent electric shocks.
	During CIP/cleaning, the outside of the instrument may become hot. The sensor will turn itself off automatically when the inside of the sensor reaches a temperature of 65°C. Do not touch the outside of the instrument.

2 INTRODUCTION

2.1 ANALYZER OVERVIEW

The 9065 has two main sections:

1. Transmitter
2. Sensor Housing

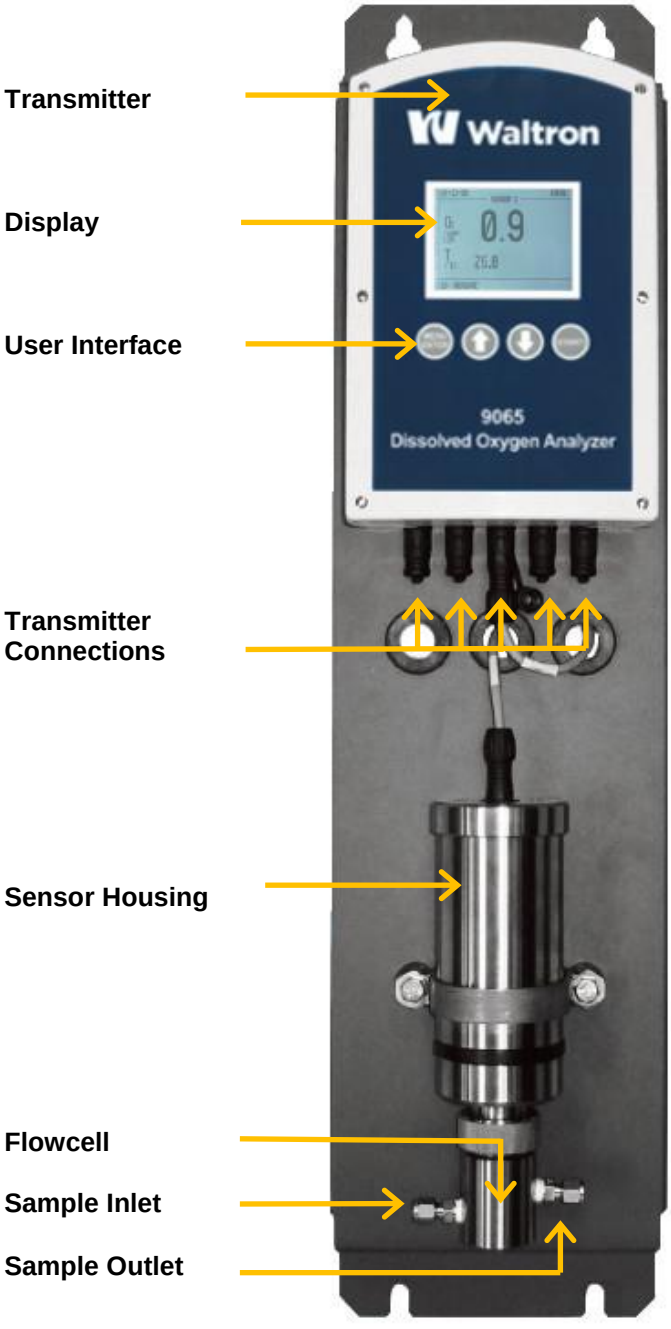


Figure 2.1: Analyzer overview.

2.2 SENSOR

The bottom of the sensor housing provides the location of the dissolved oxygen sensor, shown in the figure below.

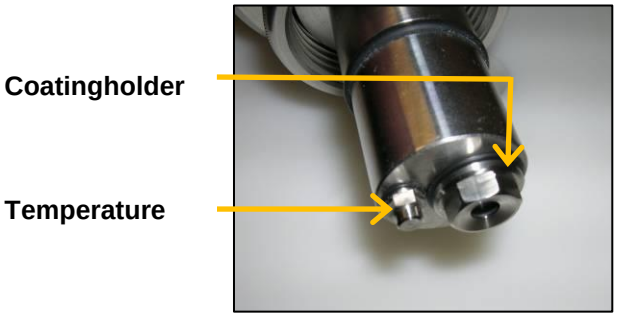


Figure 2.2: 25 mm Sensor.

2.3 COATINGHOLDER

The 9065 coatingholder is recognizable by its hexagonal shape.

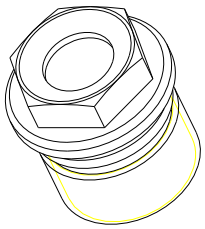


Figure 2.3: 9065 Coatingholder.

2.4 O_2 MEASUREMENT PRINCIPLE

The O_2 measurement is based on measuring the luminescence of a layer that is sensitive to oxygen. The luminescence changes according to the partial oxygen pressure. The quantity of dissolved oxygen gas in the liquid is calculated with the aid of the measured partial oxygen pressure and the temperature.

The oxygen sensor optically measures the liquid's O_2 content based on the luminescence measurement principle, where an oxygen-sensitive layer is exposed to blue light. As a result, molecules in the oxygen-sensitive layer are excited.

In the absence of oxygen, the molecules light up red. In the presence of oxygen, the oxygen molecules collide with the molecules in the oxygen-sensitive layer. The molecules that collide with oxygen no longer light up. Through this process, a link is created between the oxygen concentration and both the light intensity and the speed at which the light intensity is reduced. The light intensity reduces when the oxygen concentration is higher, whilst the light intensity reduces at a faster speed.

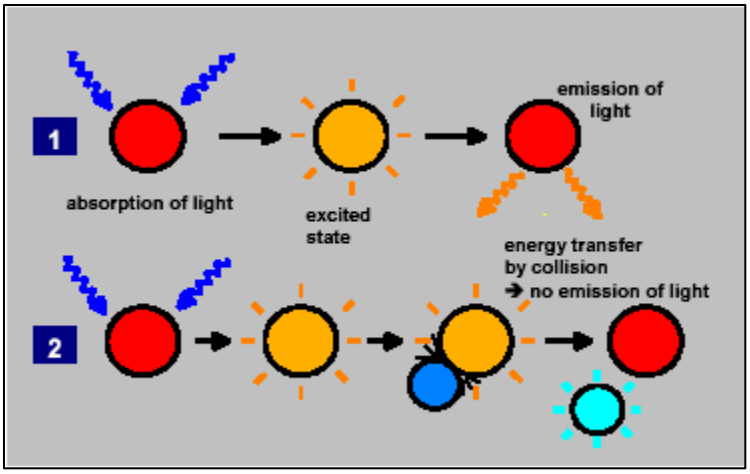


Figure 2.4: Luminescence in the absence of oxygen (1) and in the presence of oxygen (2).

The oxygen content is calculated using the time difference between the exposure to the blue light and the molecules lighting up (phase shift) and the product temperature. The sensor in the 9065 is located behind the inlet and before the throttle.

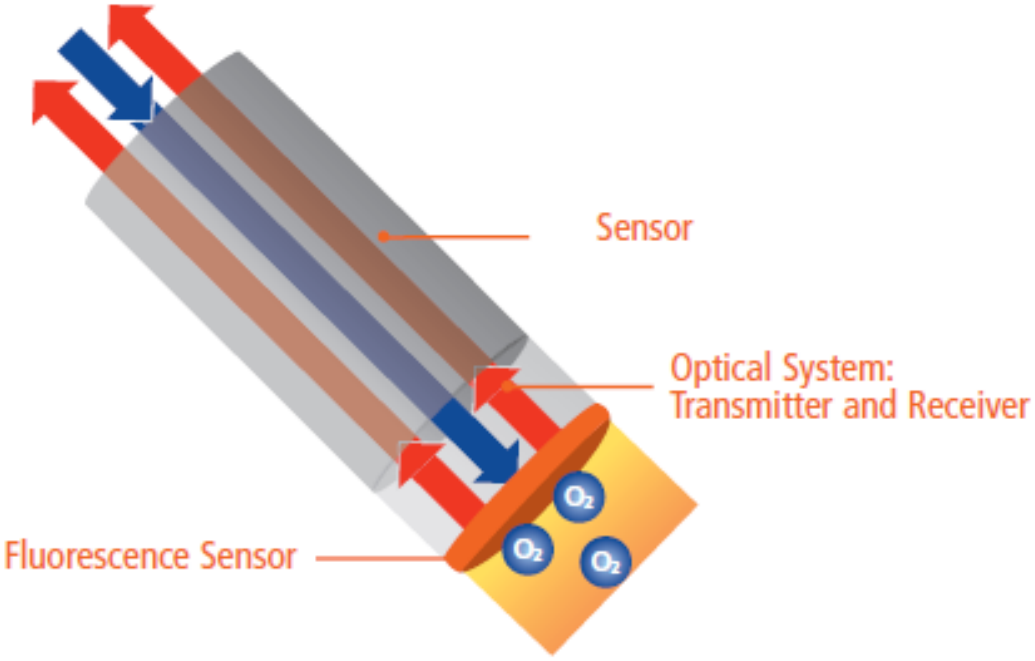


Figure 2.5: Optical sensor depiction.

3 INSTALLATION

3.1 CONTENT OF THE DELIVERY

The 9065 is calibrated, checked and tested by Waltron before shipment and the instrument is, therefore, ready for immediate use. It is not necessary to calibrate the instrument again before it is used for the first time.

Check whether the delivery is complete and undamaged. If the delivery is incomplete or damaged, contact Waltron or the Waltron representative in your region immediately (see www.waltron.net). Always state the serial number, the order number or the invoice number (as given by Waltron) of the 9065 in all correspondence.

NOTE: Before using the instrument, you must make sure the instrument is complete and no parts are missing.

The delivery includes:

- Transmitter
- Sensor
- Mounting plate
- Power cable
- Sensor communication cable
- I/O cable for the analog outputs
- Instruction manual
- RS-232 Cable

Optional extras that can be ordered:

- CD-rom with PC software for reading data incl. RS-232 Cable.
- Sensor houseing mounting bracket

See Appendix C for a complete list of spare parts and components.

3.2 PRE-INSTALLATION

Make sure the 9065 is not connected to a sampling point that produces pressures or pressure peaks greater than 10 bar.

3.3 MOUNTING THE 9065

The 9065 can be mounted on a wall or a flat surface using the dimensions shown in the figure below.

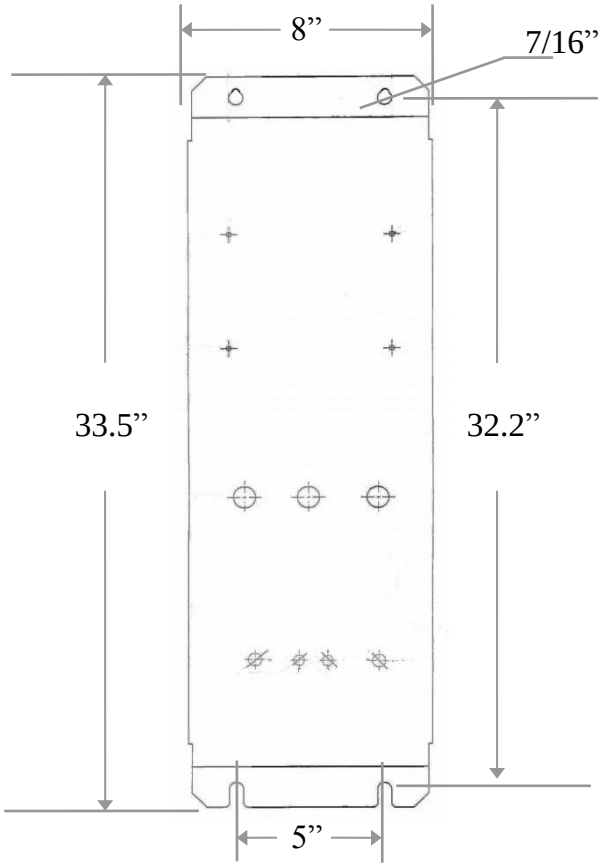


Figure 3.1: Dimensions of the 9065 mounting plate for wall mounting.

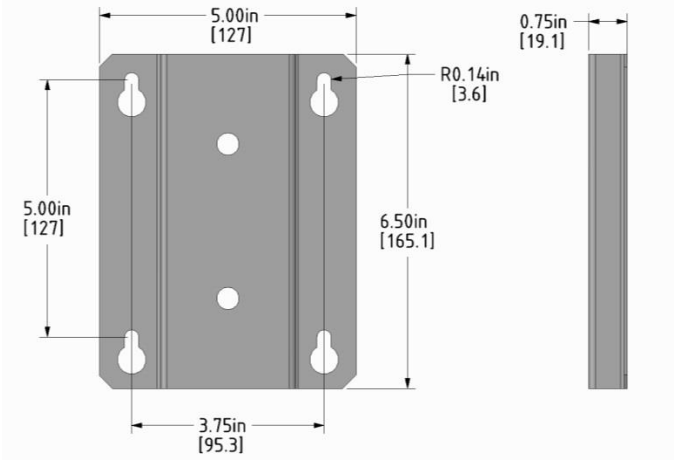


Figure 3.2: Dimensions of the 9065 sensor mounting bracket.

3.4 ASSEMBLING THE SENSOR

The sensor housing and transmitter are fully assembled to the mounting plate. The figure below shows how the sensor properly fits into the flowcell. It is important that the coating is always the first to be in contact with the flowing product. The sensor can be located a cable distance of up to 15 meters from the transmitter.

Figure 3.3: Fitting the sensor into the flowcell.

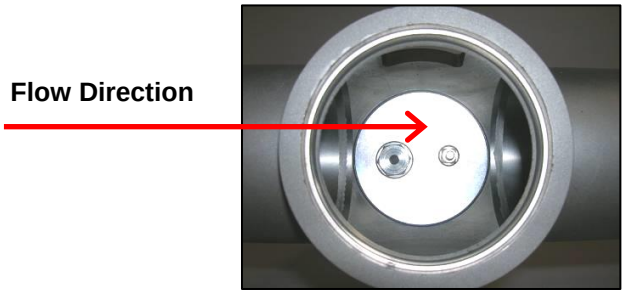


Figure 3.4: Sensor orientation relative to flow direction.

3.5 SAMPLE CONNECTIONS

The inlet and outlet sample connections to the flowcell are ¼" Swagelok fittings. It is highly recommended to us stainless steel tubing for the sample lines to prevent outside oxygen from entering the sample stream.

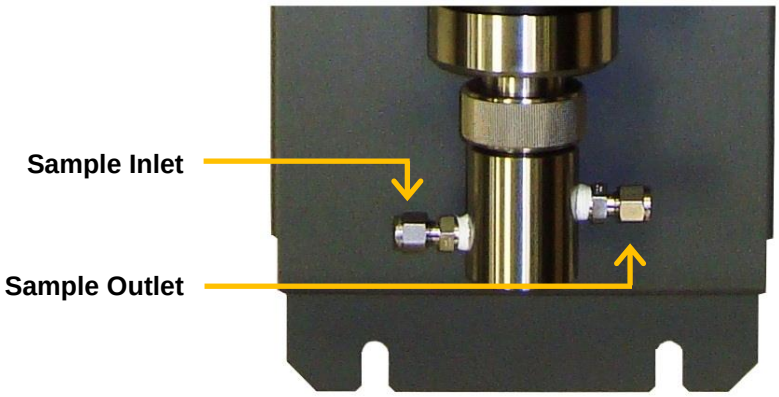


Figure 3.5: Sample Connections.

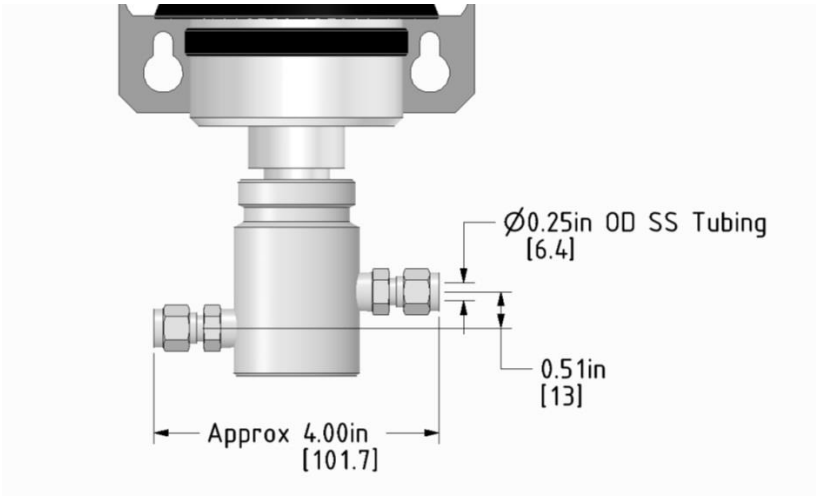


Figure 3.6: Sample Connection Dimensions.

3.6 ELECTRICAL CONNECTIONS

3.6.1 TRANSMITTER CONNECTIONS

Figure 3.7: Connections to the Transmitter.

Table 3.1: Connections to the Transmitter.

Connector No.	Cable Connection
1	Power supply
2	RS communication
3	Sensor communication 1
4	Sensor communication 2
5	I/O communication / Profibus (Depending on model)

3.6.2 POWER CABLE

Table 3.2: Connector 1: Power supply range: 90V AC – 230V AC.

Pin No.	Type	Wire color
1	Phase	Brown
2	Neutral	Blue
3	PE	Yellow/green

Table 3.3: Connector 1: Power supply 24V DC.

Pin No.	Type	Wire color
1	+ 24V DC	Red
2	Ground	Black
3	PE	Yellow/green

3.6.3 RS-232 COMMUNICATION CABLE

Table 3.4: Connector 2: RS-232 communication.

Pin No.	Type	Wire color
1	Txd RS232	White
2	Rxd RS232	Brown
3	Shielding	Green
4	D+ RS485	Yellow
5	D- RS485	Grey

3.6.4 SENSOR CABLE

Table 3.5: Connector 3 and 4 (Sensor 1 and 2): Sensor communication.

Pin No.	Type	Wire color
1	Ground	White
2	+ 12V DC	Brown
3	Common	Green
4	Com1-RXd	Yellow
5	Com1-Txd	Grey
6	NTC An-inp	Pink
7	NTC common	Blue
8	Shielding	-

3.6.5 I/O CABLE

Table 3.6: Connector 5: I/O Cable.

Pin No.	I/O	Type	Comment	Wire color
1	Ground	Ground		White
2	+ 24V DC	Supply		Brown
3	24V control-A1	Out-24V (alarm)	General alarm	Green
4	24V control-A2	Out-24V (alarm)	O_2 alarm	Yellow
5	24V control-A3	Out-24V (alarm)	Alarm O_2 extra sensor 1	Grey
6	24V-control-A4	Out-24V (alarm)	Alarm O_2 extra sensor 2	Pink
7	20 mA-output 1	Out-20mA	Logging sensor 1	Blue
8	20 mA-output 2	Out-20mA	Logging sensor 2	Red
9	24V input 1	Input 24V	Sensor 1 on/off	Black
10	24V input 2	Input 24V	Sensor 2 on/off	Purple
11	Not connected			Grey/pink
12	Shielding	ground		-

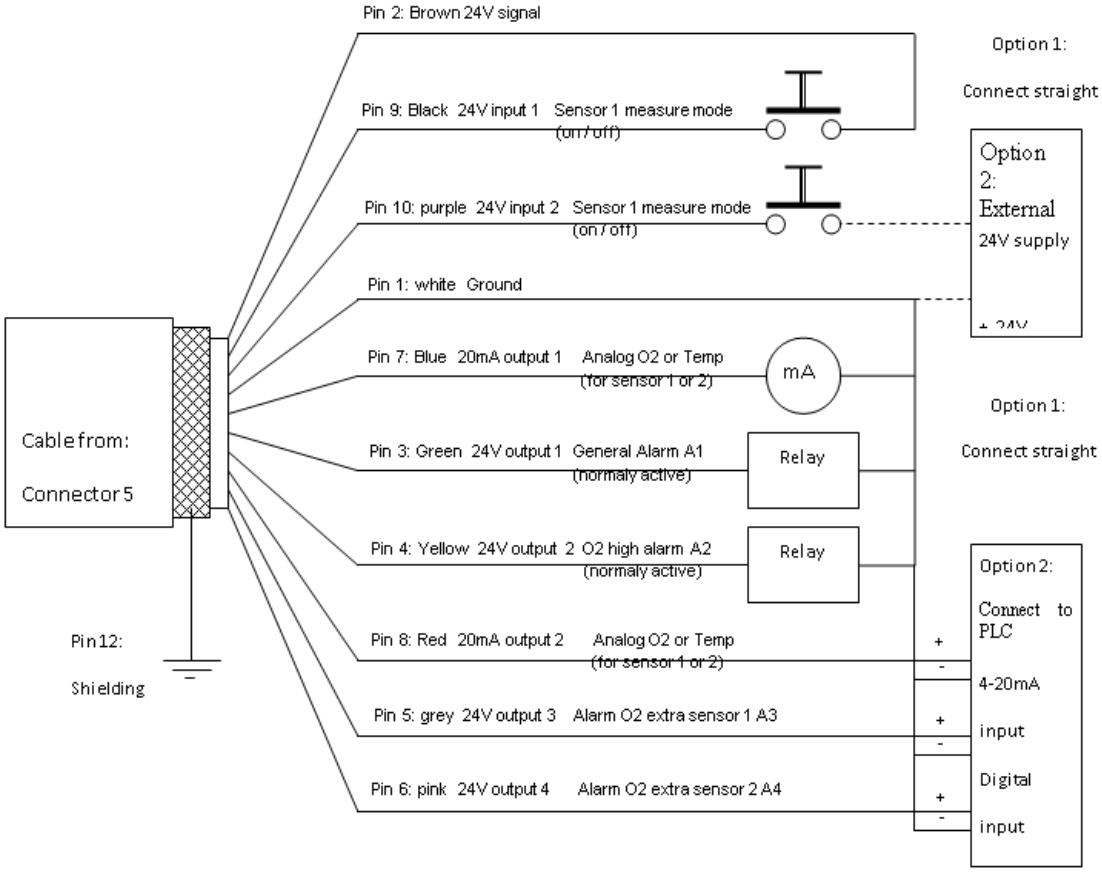


Figure 3.8: An example of the I/O connections.

3.7 PREPARATION AND START-UP

Power can be supplied to the analyzer afternall the cables have been connected. The 9065 will initialize automatically once the power is turned on.

Hard materials, such as woodchip and/or grindings, may damage the 9065 measuring head.

4 USER INTERFACE

4.1 CONTROL BUTTONS

The transmitter faceplate contains the display screen and four buttons which allow the user to navigate through the user interface and communicate with the analyzer.

Figure 4.1: Transmitter with display screen and user interface buttons.

Menu / Enter Button

If the Enter button is pressed for 3 seconds whilst the measurement screen is displayed, then the main menu screen will be displayed.

Up Arrow

For a quick overview, the up arrow button can be used to scroll to the SHORTCUT menu for additional measurement values, graphs and alarms.

Down Arrow

If two sensors are connected to the transmitter, the down arrow can be used to scroll between the measurement screens. The down arrow also allows the user to select various sub-menus and options.

Start Button

The start button is used to toggle the sensor measurement mode between online measurement and standby mode.

4.2 DISPLAY SCREEN

The main measurement screen will be displayed three seconds after the power has been supplied to the analyzer.

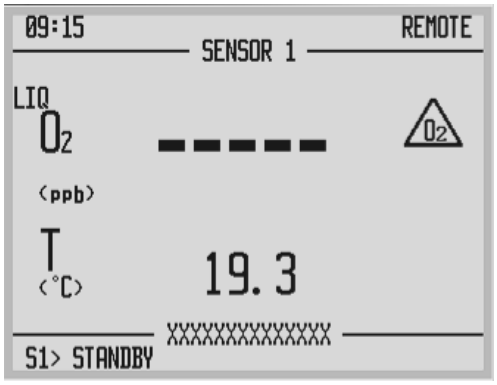


Figure 4.2: Main screen with the analyzer in stand-by mode.

When the control box starts up for the first time, the main display screen will appear.

- If two sensors are connected/turned on, the measurement screen for two sensors will be displayed as the main screen and the down arrow button can be used to scroll to the sensor 1 or sensor 2 measurement screen.
- If only one sensor is turned on, only the measurement screen of the sensor concerned will be displayed and it will not be possible to scroll to a different screen.
- If two sensors are connected and one or both do not give a measurement value, then a dotted line will be displayed on the screen and the status message will change.

The current time and the operating mode (remote/local) will be displayed on the top line. A line – XXXXXXXX – is displayed at the bottom of the screen where an alarm/message can be displayed. If there is more than one alarm, then each one will be displayed in turn for 3 seconds. The status of the O_2 measurement is displayed on the bottom line.

4.3 OPERATING MODES

The possible operating modes of the 9065 are as follows:

INIT

Directly after the start up sequence from the control box the INIT-message will appear at the bottom of the screen. The INIT-message means: The control box is receiving the calibration data from the sensor (s). This will take between 30 and 60 seconds.

MEASURING

Depending on the number of sensors that have been connected, the following measurement screens will be displayed

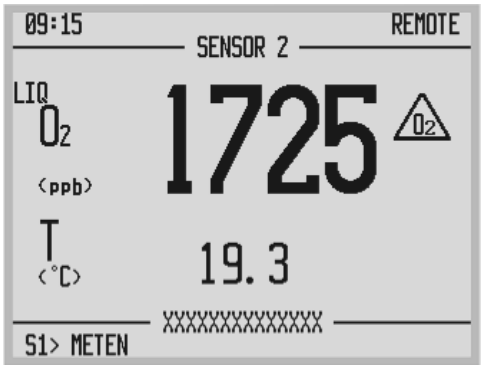


Figure 4.3: Main screen with one sensor connected.

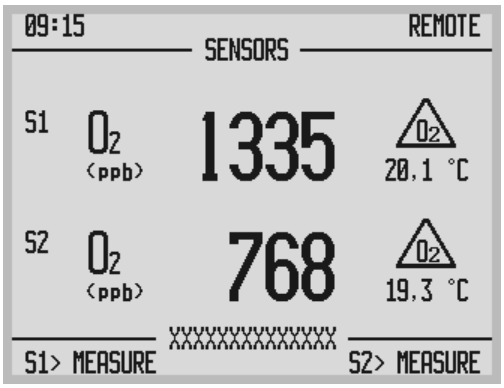


Figure 4.4: Main screen with two sensors connected.

STANDBY

In Standby mode, an O_2 measurement is not taken and a dotted line is displayed instead of the O_2 value. The sensor's temperature is, however, still displayed.

CALIBRATION

The measurement cell will be calibrated when the Calibration mode is activated. During calibration mode it is not possible to take a measurement.

4.4 USER LEVEL

The default settings can be changed to the preferred user settings before the 9065 is used for the first time. The 9065 has two operator levels:

- Operator level (A)
- Supervisor level (B)

Appendix B (Software structure) describes the screens to access both levels.

Carry out the following to enter the Supervisor level:

1. In the main measurement menu, press the Enter button for three seconds. The main menu will be displayed.
2. Use the cursor keys to select 'User' and press the Enter button to confirm the selection.

The password menu will be displayed.

3. Use the cursor keys to select ‘Password’ and press the Enter button to confirm the selection.
4. Use the cursor keys to enter the correct password [6848] and press the Enter button to confirm the password.
   - ‘Correct entry’ or ‘Incorrect entry’ will be displayed after the code has been entered and confirmed.
5. Use the cursor keys to select the Return sign and press the Enter button to confirm the selection.
6. All of the screens for the Operator level and the Supervisor level will now be visible.

If the user does not log out or if a button is not pressed for 30 minutes wihle in the Supervisor level, the software will automatically switch back to the Operator level. This cannot be altered.

4.5 CONFIGURATION

The 9065 can be configured as desired.

To access the Configuration menu:

1. In the main measurement menu, press the Enter button for three seconds. The main menu will be displayed.
2. Use the cursor keys to select ‘Configuration’ and press the Enter button to confirm the selection. The Configuration menu will be displayed.
3. The following sections outline the settings that can be configured by the user.

4.5.1 UNITS

The 9065 allows the user to select the display units for the O_2 measurement and temperature values. To change the display units:

1. In the Configuration menu, use the cursor keys to select ‘Units’ and confirm the selection by pressing the Enter button.
2. Select sensor 1, sensor 2 or the temperature and confirm the selection by pressing the Enter button.
3. The following units can be selected using the arrow buttons.
   a. Gas application:
      i. O_2: %, % a.s. , ppm
      ii. Temperature: ° C, ° F
   b. Liquid application:
      i. O_2: ppb, ppm, mg/l; µg/l, %, % a.s.
      ii. Temperature: ° C, ° F
   c. The units ppb, ppm, mg/l and µg/l in liquid are all dissolved oxygen values.
4. Press the Enter button to return to the menu.
5. Select the Return sign to return to the Configuration menu.

4.5.2 INFO

This screen displays the software version and the 9065 serial number.

4.5.3 DATE

The arrow buttons can be used to change the date. The day can be changed by pressing the Enter button. By pressing the Enter button again, it is possible to alter the month and the year. Press the Enter button again to return to the Configuration menu.

4.5.4 TIME

The arrow buttons can be used to change the time. The hours can be changed by pressing the Enter button once. By pressing the Enter button again, it is possible to change the minutes and seconds. Press the Enter button again to return to the Configuration menu.

4.5.5 LANGUAGE

The arrow buttons can be used to select Dutch, German or English as the language. Press the Enter button to confirm the selected language. The Configuration menu will then be displayed again.

4.5.6 CONTRAST

'Contrast' alters the contrast of the display. Press the Enter button to return to the Configuration menu.

4.5.7 SENSOR SETTINGS

The Sensor Settings menu can be used to indicate the sensors in operation and the sample measurement time.

Table 4.1: Configurable sensor settings.

Item	Setting options	Default setting
O_2 sensor 1	OFF, ON	ON
O_2 sensor 2	OFF, ON	OFF

Item	Range	Default	Unit
Sample time (sensor 1)	AUTO, 2 … 999	30	s
Sample time (sensor 2)	AUTO, 2 … 999	30	s

The sample time can be set to Auto mode. In Auto mode, the sample time will be automatically adjusted based on the deviations of consecutive measurement readings. By default, the sample

time will be 2 seconds. If, after this time, the measurement value deviates by more than 10%, the sample time will remain 2 seconds between sensor readings. If the measurement value deviates less than 5%, the sample time will be doubled up to a maximum of 60 seconds between sensor readings.

Therefore:

1. If the deviation is > 10% between consecutive readings:
   - The sample time is changed to 60 → 30 → 15 → 8 → 4 → 2 seconds, respectively.

   OR

2. If the deviation is < 5% between consecutive readings:
   - The sample time is changed to 2 → 4 → 8 → 15 → 30 → 60 seconds, respectively.

4.5.8 SAMPLE APPLICATION

4.5.8.1 Gas Application

When the gas application is selected, the sensor will always measure partial oxygen pressure. That means the sensor will measure oxygen values in relation to the calibration air. O_2 values at atmospheric pressure do not need to be compensated. When O_2 in gas is measured under pressure then the O_2 value has to be compensated with the measured pressure.

For example:
Patm during calibration: 1013 mBar
O_2 measured 1.033 Bar (20 cm H_2O) = 1.0 %
O_2 Patm= 0.981 %

4.5.8.2 Liquid Application

When the sensor will be used in liquid, the O_2 value is fully independent of the pressure.

The settings can be set/changed as follows:

1. Select ‘Sensor settings’ in the Configuration menu and press the Enter button. The Sensor settings menu will be displayed.
2. In this menu, use the cursor keys to select the desired item and press the Enter button to confirm the selection.
3. The cursor keys can then be used to select the desired settings.
4. Press the Enter button to return to the Sensor settings menu.
5. Use the cursor keys to select the Return sign and press the Enter button to return to the Configuration menu.

4.5.9 ANALOG OUTPUTS

The 9065 offers two analog outputs that can be configured as desired. After selecting and confirming ‘Config. Output’, the corresponding settings for the unit will be displayed automatically. The settings depend on the unit that has been selected in ‘Units’. The range will be altered accordingly if the unit is changed. An overview of the settings and the default settings is given below.

Table 4.2: Configurable settings for the analog outputs.

Item	Setting Options	Default Setting
Configure output 1	O_2 sensor 1, O_2 sensor 2, Temp. Sensor 1, Temp. Sensor 2	O_2 sensor
Configure output 2	O_2 sensor 1, O_2 sensor 2, Temp. Sensor 1, Temp. Sensor 2	Temp. sensor

Item	Range	Default	Unit
Minimum value (if O_2 sensor)	0 …. 45,000	0	ppb; ppm; mg/l; ug/l; % as; %
Maximum value (if O_2 sensor)	0 …. 45,000	2,000	ppb; ppm; mg/l; ug/l; % as; %
Minimum value (if temperature sensor)	- 10 … 150	0	° C ° F
Maximum value (if temperature sensor)	- 10 … 150	100	° C ° F

The settings can be set/changed as follows:

1. Select ‘Analogue output’ in the Configuration menu and press the Enter button. The Analog outputs menu will be displayed.
2. In this menu, use the cursor keys to select the desired item and press the Enter button to confirm the selection.
3. Use the cursor keys to select the setting concerned.
4. Press the Enter button to return to the Analog outputs menu.
5. Use the cursor keys to select the Return sign and press the Enter button to return to the Configuration menu.

NOTE: The settings output 1 and 2 are defined for the measuring values at the IO. See Section 3.6.5 for the IO connections.

4.5.10 ALARM SETTINGS

In this menu, the alarm level can be set to the desired level. The settings apply to both Sensor 1 and Sensor 2. If only one sensor is connected, then the other choices will not be displayed. An overview of the possible settings and the default settings is given below.

The settings can be made as follow:

1. Select ‘Alarm settings’ in the Configuration menu and press the Enter button. The Alarm settings menu will be displayed.
2. In this menu, use the cursor keys to select the desired item and press the Enter button to confirm the selection.
3. Use the cursor keys to select the setting concerned.
4. Press the Enter button to return to the Alarm settings menu.
5. Use the cursor keys to select the Return sign and press the Enter button to return to the Configuration menu.

Table 4.3: Configurable Alarm Settings.

Item	Range	Default	Unit
O_2 alarm	0 …. 45,000	100	ppb; ppm; mg/l; ug/l; % as; %
O_2 extra	0 …. 45,000	200	ppb; ppm; mg/l; ug/l; % as; %
Low temperature	- 10 … 150	20	° C; ° F
High temperature	- 10 … 150	20	° C; ° F

4.5.11 ALARM OUTPUTS

An overview is given below of the alarm outputs and the corresponding activation conditions. See Section 3.6.5 for an overview of the physical I/O connections.

General Alarm (A1):

- All faults.
- All error messages.
- Temperature alarms for sensor 1 and/or sensor 2.
- O_2 alarms for sensor 1 and/or sensor 2.

Digital output A1 (Normally Close, NC) is zero if there has been an alarm during two measurements. The alarm can be reset by selecting 'ACK/RESET ALARM' in the Shortcut menu. The digital output is then high (and remains high during the alarm signal).

O_2 Alarm (A2):

If the O_2 value of sensor 1 and/or sensor 2 is greater than the set value, then output A2 is zero. N.B. output 1 is also zero in the case of an O_2 alarm.
These outputs can be reset by selecting 'ACK/RESET ALARM' in the Shortcut menu and will then remain high (if the alarm signal continues).

O_2 Extra (Alarm) for Sensor 1(A3):

If the O_2 value of sensor 1 is greater than this value, then output A3 is zero.
For example, in the case of filtration, if the value is greater than the O_2 alarm high-high value (O_2 extra), then output A3 cuts out. As a result, the process of the sensor 1 circuit can be stopped. Or, for example, if the value is less than the O_2 low alarm value (O_2 extra), then output A3 is activated. As a result, the aeration of the sensor 1 circuit can be started.

O_2 Extra (Alarm) for Sensor 2 (A4):

If the O_2 value of sensor 2 is greater than this value, then output A4 is zero.
The same conditions apply here as for the O_2 extra alarm for sensor 1.

Table 4.4: Alarm Output Summary.

Sensor	Alarm	A1	A2	A3	A4
1	Temp < > min./max.	X	.	.	.
1	O_2 > O_2 alarm	X	X	.	.
1	O_2 > O_2 extra	.	.	X	.
1	Sensor error/fault	X	.	.	.
2	Temp < > min./max.	X	.	.	.
2	O_2 > O_2 alarm	X	X	.	.
2	O_2 > O_2 extra	.	.	.	X
2	Sensor error/fault	X	.	.	.

x The output becomes zero immediately (the relay cuts out due to the alarm function).
. The state of the relay remains unchanged.

5 OPERATION

5.1 GENERAL INFORMATION

Prior to using the 9065 for online measurement, be sure that all installation and start-up procedures have been properly followed.

5.2 MEASUREMENT

Once the Start button is pressed, the 9065 will begin online measurement. The measurement frequency depends on the sample time that has been selected during the configuration (see Section 4.6.2). Below is an overview for different functions of the start button.

One sensor connected:

- Start button function → Start/Stop measurement

Two sensors connected:

- Measurement screen sensor 1: Start button function → Start/Stop measurement sensor 1.
- Measurement screen sensor 2: Start button function → Start/Stop measurement sensor 2.
- Measurement screen sensor 1+2: Start button function → Start/Stop measurement sensor 1 + 2.

The last 500 measurements of each sensor are saved in the memory. When the memory is full, the oldest measurements are deleted and the most recent measurements are saved (see Section 5.4).

5.3 LOCAL AND REMOTE OPERATION

Before the 9065 is used for the first time, all of the desired parameter configurations must be set locally at the transmitter. It is then possible to choose remote or local operation. Once remote operation is chosen the transmitter can no longer be controlled locally (loss of start/stop capabilities).

Two remote operation options are possible:

1. RS 232 (protocol available on request)
2. Profibus

5.4 DATA LOGBOOK

The logbook screen can be selected from the Main menu. This screen displays various values, statistics and graphs. See Appendix B (Software structure) for a detailed overview of the various screens that can be displayed in the logbook. A short overview of these screens is given below.

Measurement values:

In this menu, the measurement values of sensor 1 and sensor 2 can be viewed individually. A maximum of 500 measurements are saved in the memory. The O_2 value, temperature, date and time are saved for each measurement. With a full memory the oldest measurement will be deleted and replaced by the most recent.

Trending:

In this menu, a graph is displayed of all the measurement values. There are two possibilities in this screen:

1. Auto scale: Automatic scaling between the lowest measured value and the highest measured value with a maximum value for the O_2 alarm 'High-High'.
2. Fixed scale: A fixed scale with the minimum and maximum values that have been selected for controlling the analog outputs concerned.

A trend line consists of a maximum of 150 measurement values. Trend lines can be displayed for both the oxygen content and the temperature.

Operating hours:

In this menu, the operating hours of the sensor are displayed. A distinction is made between measurement hours and standby hours.

Extremes:

The extreme values for the oxygen content and the temperature are saved in this menu.

Calibration:

The last three calibration dates of the O_2 sensor are saved in this menu. The last calibration parameters are stored in the control box memory. If a restore is given to a sensor, the last calibration will be restored. This option is not functional if the transmitter box or the sensor is exchanged in between two calibrations. (The calibration data doesn't match anymore between the sensor and the control box)

Alarms:

A maximum of 50 alarms is saved in this menu, including the date and time. The user cannot alter this menu. With a full memory the oldest alarm will be deleted and replaced by the most recent.

Reset:

The Reset menu can be used to delete all stored measurements.

6 CALIBRATION

6.1 CALIBRATION OF THE TEMPERATURE SENSOR

The temperature sensor is an accurate NTC. It has precise tolerances and, therefore, does not require calibrating.

6.2 CALIBRATING THE O_2 SENSOR

Since the oxygen sensor only experiences a very slight amount of wear as a result of exposure, regular calibration is not necessary. It has been empirically determined that after 1 million exposures (equal to 1 million O_2 measurements), the O_2 deviation from the zero point is just 5 ppb and that at higher O_2 values, no deviation is detectable.

There is a light pulse counter integrated in the software, which counts the number of light exposures. When 1 million exposures have taken place, the warning "Calibrate or replace the O_2 sensor" will be displayed and the sensor must be calibrated or replaced. The warning symbol will be displayed as a reminder.

After successfully calibrating the sensor, the light pulse counter will be reset and the warning symbol will no longer be displayed.

The following two principle methods are described to calibrate the oxygen sensor:

1. One point calibration
   - This method is recommended if a high accuracy for higher oxygen concentration is required.
2. Calibration with two gasses
   - This method is recommended to ensure the specified accuracy over the whole oxygen measuring range.

6.2.1 CALIBRATION FREQUENCY

It is recommended to recalibrate the sensor after 1 million exposures. If the default sample time (1 measurement/30 seconds) is used, the sensor must be recalibrated once a year, assuming that the sensor is in operation 24 hours a day, seven days a week. If a shorter sample time is used, the sensor will reach 1 million light exposures sooner and will, therefore, require calibration sooner.

6.2.2 ONE POINT CALIBRATION

For most applications in the low oxygen measuring range a calibration of the zero point is sufficient.
Preparation:

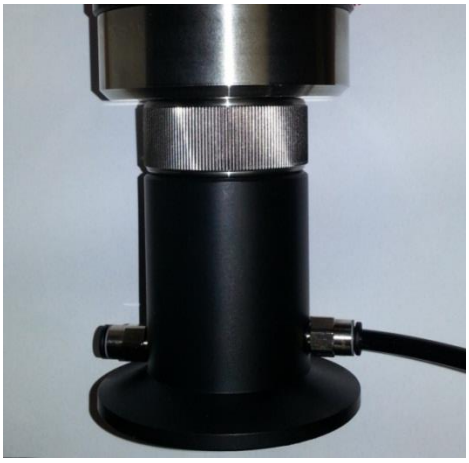
- The calibration gases must be dry.
- The zero-point calibration should be carried out using a gas with a certified oxygen content of ≤ 0.001%. The use of nitrogen or carbon dioxide with a purity of 99.9990% (Class 5.0) is reccomended.

- The inside of the 9065 must be dry during calibration with a gas. Rinse the 9065 for approx. 15 minutes with N_2, CO_2 or oil-free compressed air. During the calibration process, the % unit or the % a.s. unit must be used. Since the oxygen sensor measures the oxygen partial pressure, the oxygen content measured in the gas during the calibration process depends on the atmospheric pressure.
- The manually entered atmospheric pressure in the "P-atm" parameter in the "Calibration" menu is taken into consideration when determining the oxygen content in the % O_2 unit and the % a.s. unit.

NOTE: For an accurate O_2 calibration, the sensor must be at the same temperature as the gas. To achieve this, allow the sensor and calibration gas to acclimatize for 4 hours in the same room.

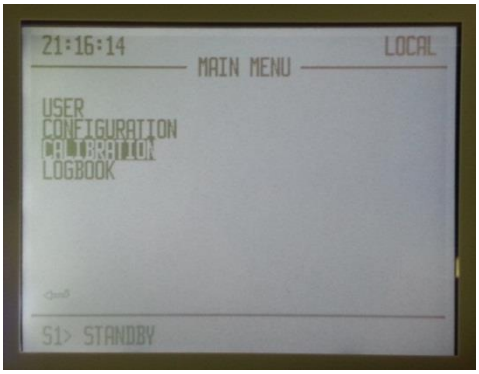
Procedure:

1. Put analyzer into standby mode by pressing the Start button.
2. Turn off sample flow to the sensor and disconnect sample inlet and outlet tubings from the sensor flowcell.
3. Remove the flowcell by loosening the knurled nut. Take care not to damage the sesnor spot and temperature sensor while removing the flowcell.
4. Install the calibration beaker onto the bottom of the sensor.

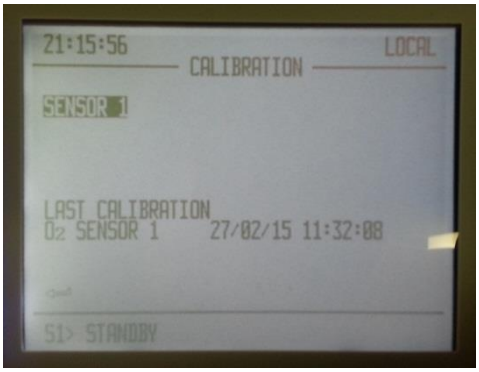


5. Connect calibration gas to the inlet of the calibration beaker.
6. Turn the calibration gas flow on at a maximum flowrate of 30 l/h and let the gas dry the sensor for 15 minutes.
7. Hold enter for 3 seconds to display main menu
8. Select User and then password to enter the supervisor level password 6848.

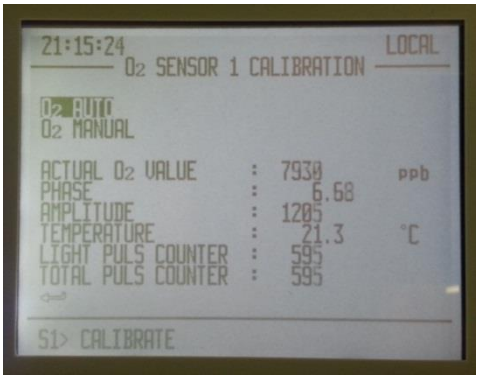
9. Return to the main menu and Calibration should now be an option. Select Calibration and press enter.



10. Select the sensor that will be calibrated. Note that a single stream analyzer will only display Sensor 1 as an option.



11. Select O2 Auto and press enter.

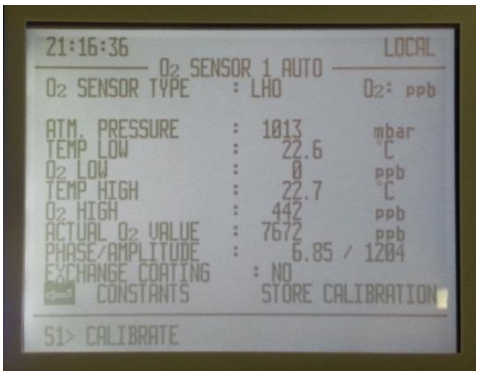


12. Select O2 Low and press enter.

13. Press Enter again and calibration is now in progress. A message will display on the screen indicating that the calibration is in progress.
14. After approximiately 1 ½ minutes, the message on the display will change to say Calibration Step Successful; Press any key.

15. Press any key to return to the calibration menu.
16. Scroll down to select Store Calibration. Press Enter to save calibration. Note that exiting this menu without storing calibration will result in the calbration not being saved.

17. After pressing Enter to save the calibration, a message will display on the screen indicating that the save is in progress. This process will last approximately 1 minute.
18. While the analyzer is storing the calibration result, it is now safe to turn off the flow of calibration gas to the sensor.
19. The screen will display a message saying that the Calibration has been stored successfully, press any key.
20. Press any key to return to the calibration menu.
21. Select the back arrow to return to the previous menu. Repeat until arriving at the main measurement screen. The calibration process is complete.



22. Disconnect the calibration gas from the calibration beaker and remove the calibration beaker from the sensor.
23. Replace the flowcell on the sensor, again taking caution to prevent damaging the sensor spot and temperature sensor.
24. Reconnect sample lines and restore sample flow to the sensor.
25. Press the Start button to put the analzer back into online measurement mode.

6.2.3 CALIBRATION WITH TWO GASES

Preparation:

- Both the zero point and a high calibration point can be calibrated with a defined oxygen concentration. The calibration gases must be dry.
- The zero-point calibration should be carried out using a gas with a certified oxygen content of ≤ 0.001%. The use of nitrogen or carbon dioxide with a purity of 99.9990% (Class 5.0) is reccomended.
- The high calibration point for the sensor must be calibrated with an accuracy of ± 1%

using a gas with a certified oxygen content of up to 4%. N_2 or CO_2 with 4% or 1% O_2 can be used for this.

- The inside of the 9065 must be dry during calibration with a gas. Rinse the 9065 for approx. 15 minutes with N_2, CO_2 or oil-free compressed air. During the calibration process, the % unit or the % a.s. unit must be used. Since the oxygen sensor measures the oxygen partial pressure, the oxygen content measured in the gas during the calibration process depends on the atmospheric pressure.
- The manually entered atmospheric pressure in the "P-atm" parameter in the "Calibration" menu is taken into consideration when determining the oxygen content in the % O_2 unit and the % a.s. unit.

NOTE: For an accurate O_2 calibration, the sensor must be at the same temperature as the gas. To achieve this, allow the sensor and calibration gas to acclimatize for 4 hours in the same room.

Procedure:

21. Connect the high calibration gas to the calibration flowcell and turn the gas flow on at a maximum flowrate of 30 l/h and let the gas dry the sensor for 15 minutes.
22. From the Calibration Menu, select O2 High and press enter.

23. Press Enter again and calibration is now in progress. A message will display on the screen indicating that the calibration is in progress.
24. After approximiately 1 ½ minutes, the message on the display will change to say Calibration Step Successful; Press any key.
25. Press any key to return to the calibration menu.
26. Scroll down to select Store Calibration. Press Enter to save calibration. Note that exiting this menu without storing calibration will result in the calbration not being saved.

27. After pressing Enter to save the calibration, a message will display on the screen indicating that the save is in progress. This process will last approximately 1 minute.
28. While the analyzer is storing the calibration result, it is now safe to turn off the flow of calibration gas to the sensor.
29. The screen will display a message saying that the Calibration has been stored successfully, press any key.
30. Press any key to return to the calibration menu.
31. Select the back arrow to return to the previous menu. Repeat until arriving at the main measurement screen. The calibration process is complete.

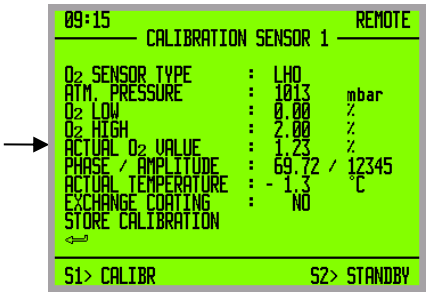
32. Disconnect the calibration gas from the calibration beaker and remove the calibration beaker from the sensor.
33. Replace the flowcell on the sensor, again taking caution to prevent damaging the sensor spot and temperature sensor.
34. Reconnect sample lines and restore sample flow to the sensor.
35. Press the Start button to put the analzer back into online measurement mode.

NOTE: The calibration data for the previous calibration will be kept if you return to the previous menu without selecting 'Store calibration.'

6.2.4 CHECK CALIBRATION

The calibration of the sensor can be checked with calibration gasses using this calibration menu.

1. Connect the calibration gas to the calibration beaker and enter the current air pressure.
2. The current O_2 value will be shown in "Actual O_2 value".



NOTE: During a calibration check, never use "Store calibration."

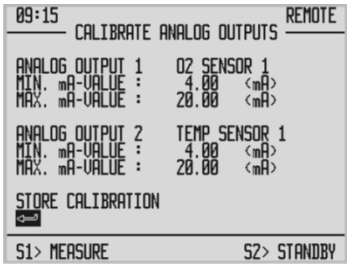
6.2.5 CALIBRATING THE ANALOG OUTPUTS

The analog outputs of the 9065 transmitter can be calibrated according to the following procedure.

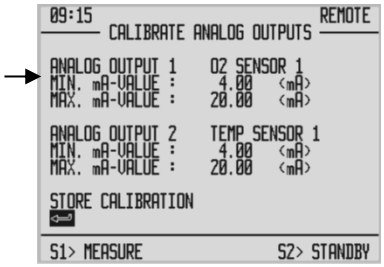
- They can be set to any value from 0 mA to 20 mA, depending on the user's needs.
- These values correspond to the values that are set for the analog outputs.
- The default settings are 4 mA and 20 mA.

Procedure:

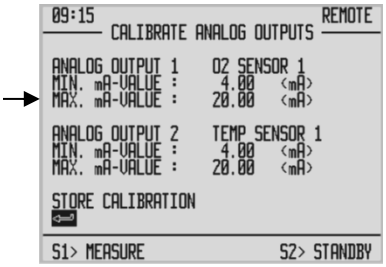
1. In the main measurement screen, press the Enter button for longer than 3 seconds. The main menu will be displayed.
2. Use the cursor keys to select 'Configuration' and press the Enter button to confirm the selection. (Note: the Calibration menu is level B Supervisor Level.)
3. Use the cursor keys to select 'Analog outputs' and press the Enter button to confirm the selection.
4. Use the cursor keys to select 'Calibrate analog outputs' and press the Enter button to confirm the selection.
5. In this screen, the analog outputs can be calibrated to the correct mA value. A milliammeter (or a multimeter) must be connected to the appropriate output to measure the flow through the output.



6. When selecting 'MIN. mA value', the corresponding analog output will cut out. The value can be increased or decreased using the cursor keys. The count value will increase or decrease as the flow rate is increased or decreased. This is how the output is calibrated.



7. When selecting 'Max. mA value', the corresponding analog output will cut out. The value can be increased or decreased using the cursor keys. The count value will increase or decrease as the flow rate is increased or decreased. This is how the output is calibrated.



8. After the outputs have been calibrated, select 'Store calibration' to save the settings in the 9065 memory. Select the Return option to return to the previous menu.

NOTE: The calibration data for the previous calibration will be kept if you return to the previous menu without selecting 'Store calibration.'

7 CLEANING AND MAINTENANCE

7.1 INSPECTION

Whenever possible, it is recommended to inspect the 9065 for the following and correct if necessary:

- Make sure there is no dirt or dust on the instrument.
- Check whether the plugs and cables have been inserted correctly.
- Connectors that are not used must be covered.

7.2 CLEANING

Only use water (or water with a detergent) to clean the sensor or the outside of the control box.

Warning!	Never use tools to clean the sensor coating. Touching the coating may cause serious damage to the instrument.

Regular CIP of the process pipes with a suitable cleaning product.

Required cleaning products:

- Product- Alkaline cleaner with an NaOH or KOH base.
  - (≤ 95° C, ≤ 5% NaOH or KOH)
- Acid cleaner with an HNO_3 or H_3PO_4 base.
  - (≤ 60° C, ≤ 3% HNO_3 or H_3PO_4)
- Flow 0 – 10 m/s

NOTE:	Maintenance must be carried out by personnel who are familiar with the applicable maintenance regulations.

Wear suitable protection against chemicals and pay special attention to hot cleaning agents.

8 TROUBLESHOOTING AND REPAIR

8.1 TROUBLESHOOTING

Problem	Cause	Solution
Nothing is displayed on the screen when a button is pressed.	The power supply has not been connected. The power supply is in the safe mode (too hot).	Connect the power supply. Wait 10 minutes and turn the power supply back on.
The O_2 value seems to be incorrect.	The temperature sensor is faulty.	Check whether a realistic temperature value is given. Check the O_2 sensor using calibration gases and, if necessary, recalibrate it.
The message 'O_2 sensor does not react' is displayed on the measurement screen.	An oxygen sensor has not been connected. The oxygen sensor is faulty.	Connect the oxygen sensor. Contact Waltron.

8.2 ALARM MESSAGES

Error message	Cause	Solution
'O_2 high'	O_2 value > set O_2 'high' alarm	Check the process. Change the 'high' level.
'O_2 high-high'	O_2 value > set O_2 'high – high' alarm	Check the process. Change the 'high – high' level.
Sensor x, Temp high alarm	Temp value > set Temp high value	Check the process Change the 'Temp high' level
Sensor x, Temp low alarm	Temp value > set temp low value	Check the process Change the 'Temp low' level
Sensor x, not connected	No sensor is connected No communication is possible with the sensor	Connect the sensor
Sensor 'INIT' error	Not all the calibration data has been loaded into the control box	Connect the sensor to the control box and restart the control box.
Sensor x, NTC broken wire	NTC broken	Contact Waltron.
Sensor x, short circuit	NTC Short circuit	Contact Waltron.
Sensor x, calibration expired	The sensor has taken more than 1,000,000 measurements	The sensor must be recalibrated
Communication error	No sensor connected Sensor Broken Broken wire communication Cable Thermal shutdown sensor (> 65°C)	Check connection Reset 9065 Cool down the sensor
symbol appears in the display	The sensor has taken more than 1,000,000 measurements.	The sensor must be recalibrated.

8.3 REPAIR AND MAINTENANCE

Before performing any maintenance on the 9065, make sure the instrument is disconnected from the power supply during assembly and disassembly so that there is no risk of an electric shock.

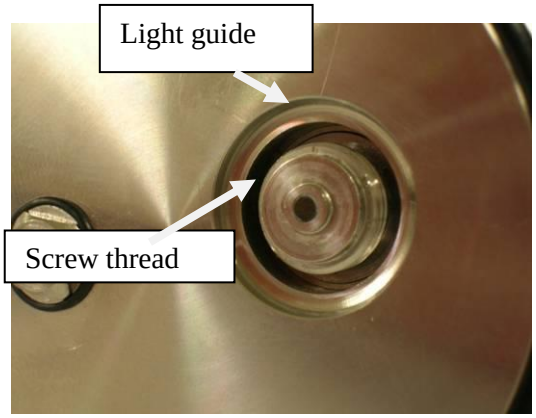
8.3.1 REPLACING THE COATING HOLDER

If the coating is faulty or damaged, then a new coating holder must be placed on the sensor. The instructions for replacing the coating are given below.

1. Remove the sensor from the mounting plate and place it on a level surface so that it cannot roll onto the floor.

2. Use a 10mm open or closed ended spanner to unscrew the coating holder from the measuring head.

3. Use a brush or a small screwdriver to remove any glue or dirt from the screw thread around the light guide. Do not damage the light guide.



4. Fit the O-ring to the new coating holder.

5. Apply a drop of Loctite 572 to the inside of the coating holder's screw thread. This is to stop the coating holder from shaking loose. **Make sure no glue gets on the pink side!**

6. Screw the coating holder back on to the sensor, return the sensor to the mounting plate, and calibrate the sensor.

Warning!	Never unscrew or loose the temperature sensor. Unscrewing the temperature sensor will void the warranty.

9 DEACTIVATING, STORAGE AND TRANSPORT

9.1 DEACTIVATING

If the 9065 is no longer used, the components must be sent to an appropriate waste disposal organization or the entire unit can be returned to Waltron. The materials from which the main components are made are given below:

- Control box: ABS housing, various prints.
- Sensor: stainless steel, oxygen print, POM.

9.2 STORAGE

The instrument must be stored in a dry location and be protected against mechanical and/or chemical damage. If the 9065 is not going to be used for a long time, the instrument must be thoroughly rinsed with water to clean it. The instrument must then be emptied, flushed with air and dried.

The 9065 must be completely empty (dry) when it is stored away.

9.3 TRANSPORT

When the 9065 is transported, the transmitter display must be protected against direct mechanical impact. It is recommended to save the packaging materials provided by Waltron for reuse whenever the 9065 is transported.

The 9065 must be completely empty (dry) when it is transported.

10 SPARE PARTS

If you order spare parts, we kindly request you to include all the information given below.

- Serial number of the 9065
- Description
- Part number

Table 10.1: Spare Parts Listing.

Description	Part No.
Coating holder set 25mm	K5000-010
O-ring 20x2,5 25mm connection	K5000-011
Male blind cover	K5000-012
Female blind cover	K5000-013
Connector for wide range power supply 3p female	K5000-014
Connector for 24V DC power supply 3p male	K5000-015
Power cable wide range 110 – 240 VAC 5 m	K5000-005
Power cable wide range 110 – 240 VAC 15 m	K5000-016
Power cable wide range 110 – 240 VAV 40 m	K5000-017
Power cable 24V DC 5 m	K5000-018
Power cable 24V DC 15 m	K5000-019
Power cable 24V DC 40 m	K5000-020
Sensor communication cable 5 m	K5000-006
Sensor communication cable 10 m	K5000-021
Sensor communication cable 15 m	K5000-022
Sensor communication cable 5 m with coupling nut	K5000-003
Sensor communication cable 10 m with coupling nut	K5000-023
Sensor communication cable 15 m with coupling nut	K5000-024
Separate connector I/O 12p	K5000-025
I/O cable 15 m	K5000-026
I/O cable 40 m	K5000-027

LDO sensor	K5000-001
Calibration set	K5000-028
Flowcell	K5000-002
CD-rom with PC software for reading data to PC, Incl RS-232 cable	On request
Swagelok connector ¼”	P1000-106
25 mm Orbisphere adapter	K5000-029
LDO Sensor Bracket	K5000-008
Set plug 25 mm sensor	K5000-030

APPENDIX A: FORMULAS

Converting the temperature units:

Temperature T (° C) = (T (° F)-32)*5/9

Conversion of O_2 units:

The 9065 can be set to various oxygen units, where the instrument then makes the following conversions:

$$\%O_2 = \%\,\text{air saturation} \cdot \frac{20{,}95}{100}$$

With
Tm : Temperature in ° C
patm : Atmospheric air pressure during the oxygen calibration (bar).

$$c_T = \left(48{,}998 - 1{,}335 \cdot T_m + 0{,}02755 \cdot \mathrm{T_m^2} - 0{,}000322 \cdot \mathrm{T_m^3} + 0{,}00000159 8 \cdot \mathrm{T_m^4}\right)$$

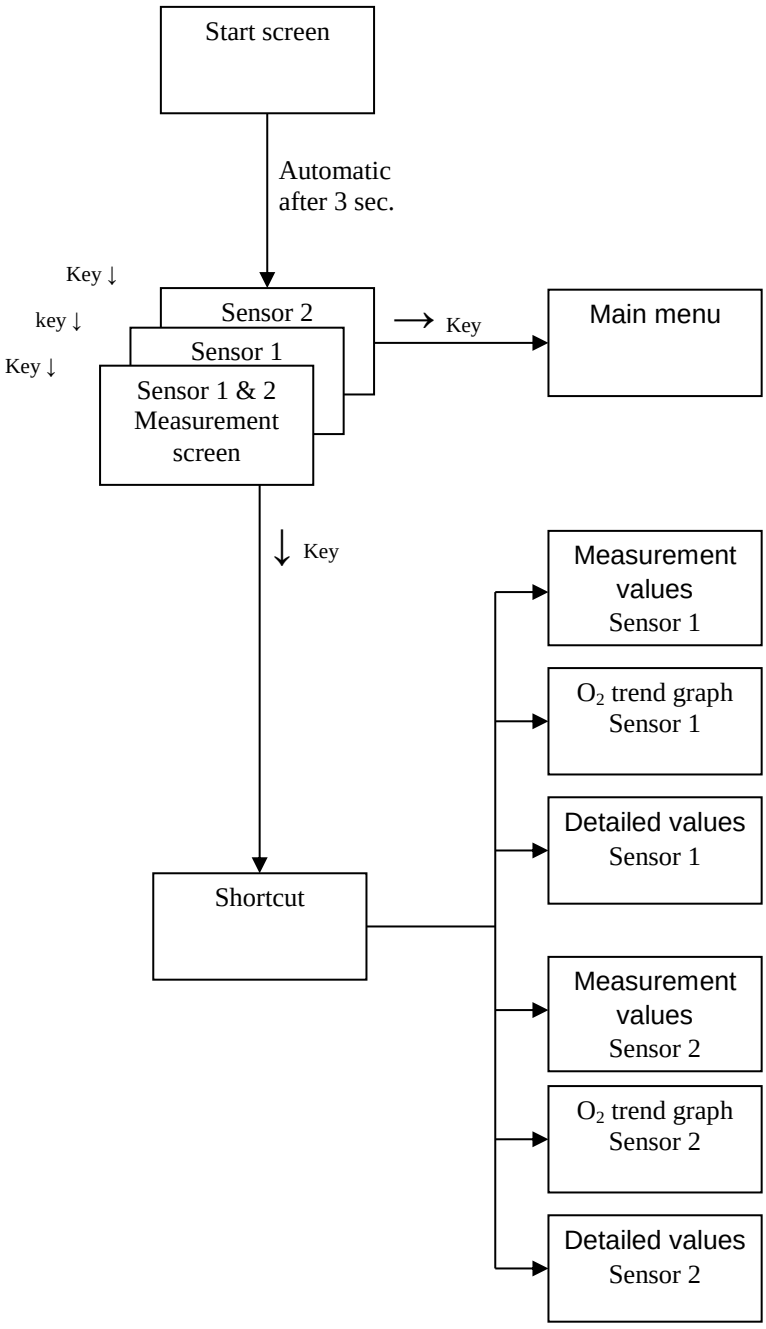
temperature correction

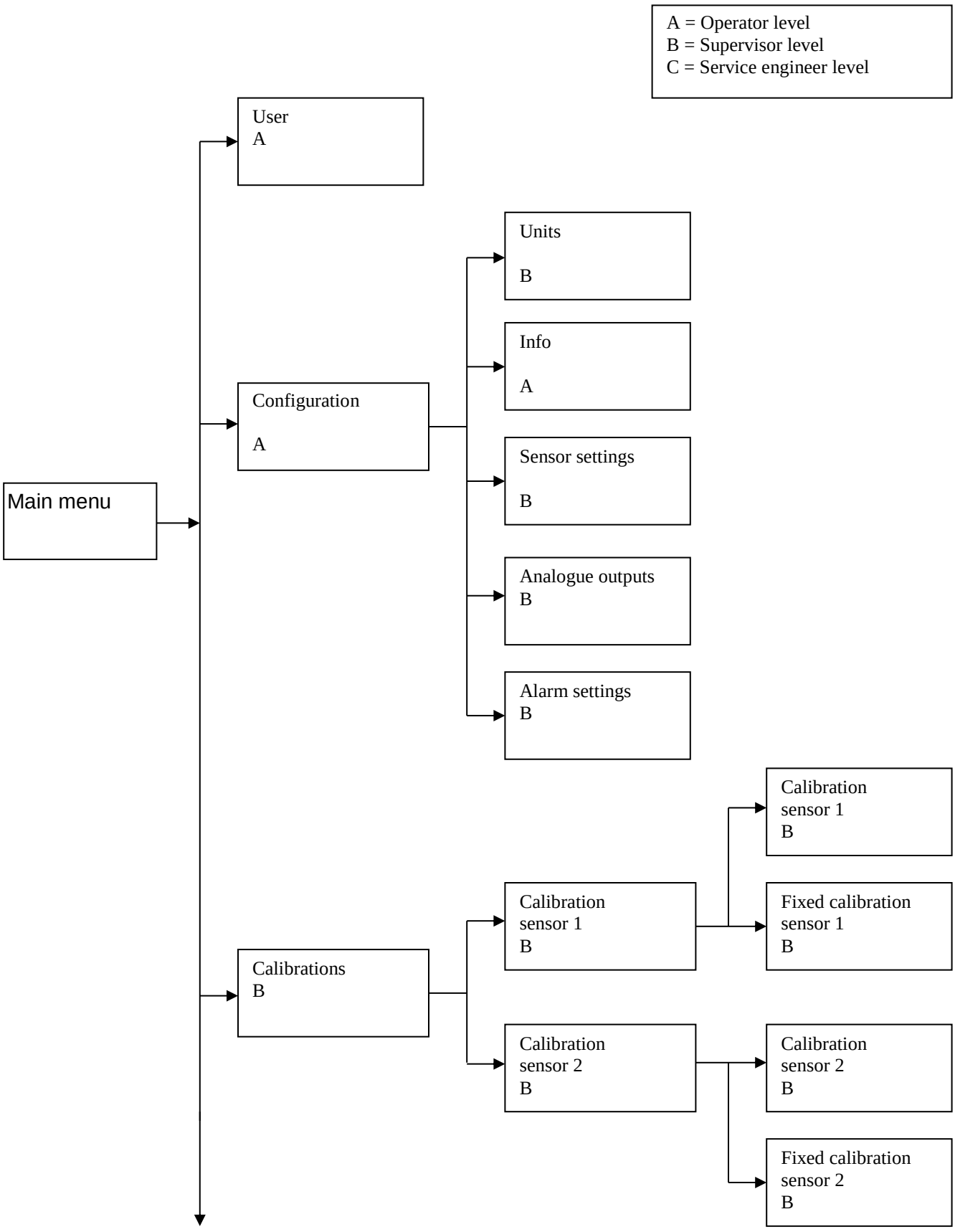
$$\frac{mg}{l} = p_{atm} \cdot \frac{\%\text{air saturation}}{1013} \cdot \frac{0{,}2095}{100} \cdot c_T \cdot \frac{32}{22{,}414}$$

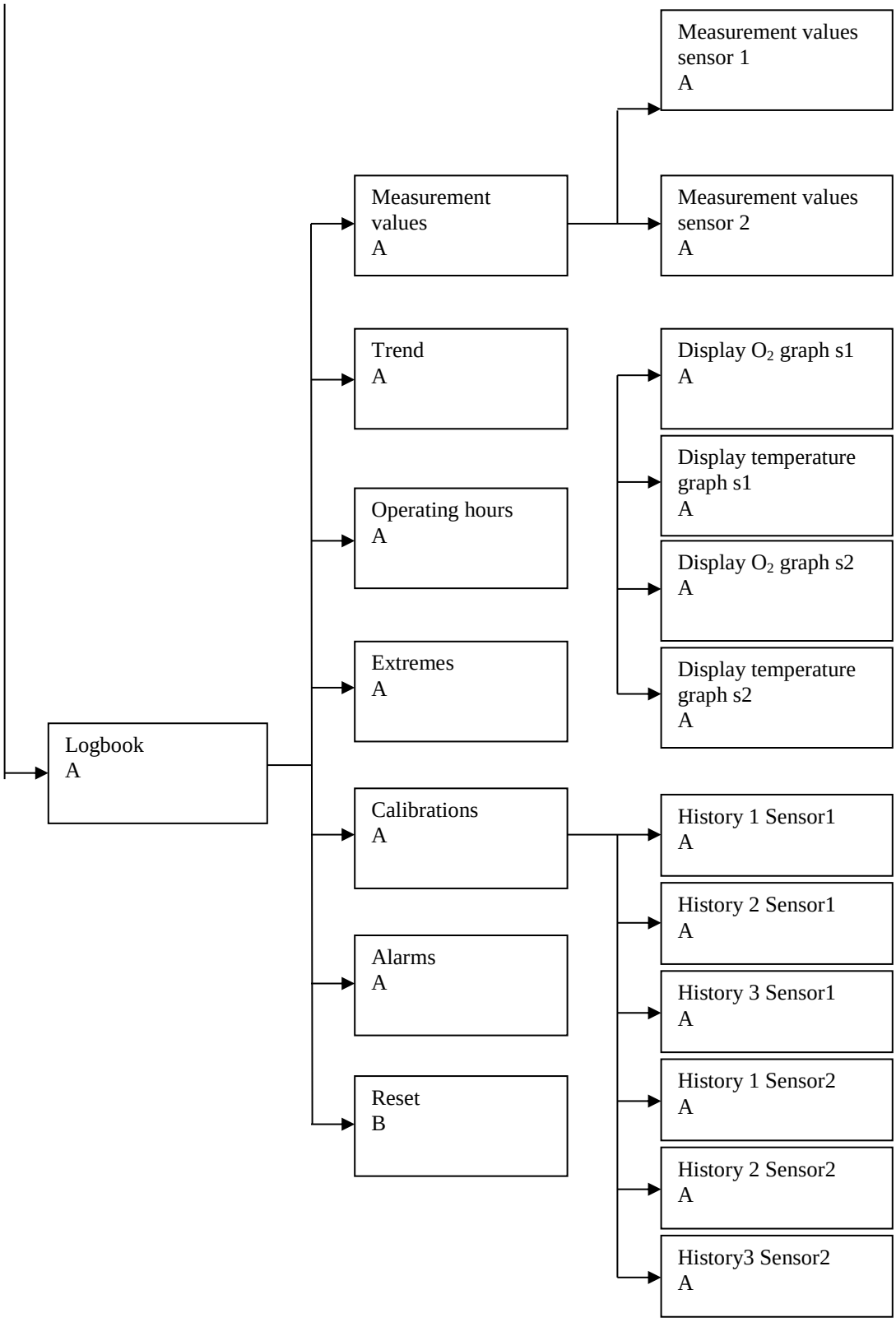
$$ppm = \frac{mg}{l}$$

$$\frac{\mu g}{l} = \frac{mg}{l} \cdot 1000 = ppb$$

APPENDIX B: SOFTWARE STRUCTURE




A = Operator level
B = Supervisor level
C = Service engineer level
Main menu
User
A
Configuration
A
Units
B
Info
A
Sensor settings
B
Analogue outputs
B
Alarm settings
B
Calibrations
B
Calibration
sensor 1
B
Fixed calibration
sensor 1
B
Calibration
sensor 2
B
Calibration
sensor 2
B
Fixed calibration
sensor 2
B


Logbook
A
Measurement values
A
Measurement values sensor 1
A
Measurement values sensor 2
A
Trend
A
Display O_2 graph s1
A
Display temperature graph s1
A
Operating hours
A
Display O_2 graph s2
A
Display temperature graph s2
A
Extremes
A
Calibrations
A
History 1 Sensor1
A
History 2 Sensor1
A
Alarms
A
History 3 Sensor1
A
Reset
B
History 1 Sensor2
A
History 2 Sensor2
A
History3 Sensor2
A