OXL Series
Optical Oxygen Sensors

PRELIMINARY

■ FEATURES

• Oxygen pressure range 0 to 300 mbar
• High accuracy
• No reference gas required
• Non-depleting luminescence based technology
• Factory calibrated
• Digital 3.3V TTL level USART output
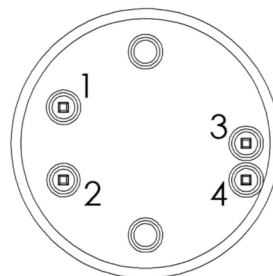

■ SPECIFICATIONS

Maximum Ratings

Supply voltage	4.5…5.5 V_{DC}
Supply current	
Streaming 1 sample per second	7.5 mA
Peak	20 mA
Temperature	
Operating	-30…+60 °C
Storage	-30…+60 °C
Humidity (non-condensing)	0…99 %rH
Maximum flow rate (OXL-W4-…)	1.0 litre/min

■ ELECTRICAL CONNECTIONS

Pin	Connection
1	V_S
2	GND
3	3.3V USART Sensor Transmit[2]
4	3.3V USART Sensor Receive[2]

OXL Series
Optical Oxygen Sensors

■ PERFORMANCE CHARACTERISTICS

| Characteristics		Min.	Typ.	Max.	Unit
Oxygen pressure range		0		300	mbar
Barometric pressure range		500		1200	mbar
Oxygen range		0		25	%O2
Accuracy	ppO2			2	%FS
	Temperature		indication	only	
	Pressure	-5		+5	mbar
	O2%		na[1]		
Resolution	ppO2		0.1		mbar
	Temperature		0.1		°C
	Pressure		1		mbar
	O2%		0.01		%
Response time (10 to 90 %)			30		s
Lifetime		5			yrs

■ OUTLINE DRAWING

Connection:
Au-plated pins 0.64 mm² on a 2.54mm grid for PCB mounting via sockets or hand soldering with a no clean flux.

Note:
- Do NOT put the sensor through a PCB washing process.
- Always apply power to sensor pins 1 and 2 before attempting to communicate on pins 3 and 4.

OXL-D4-…
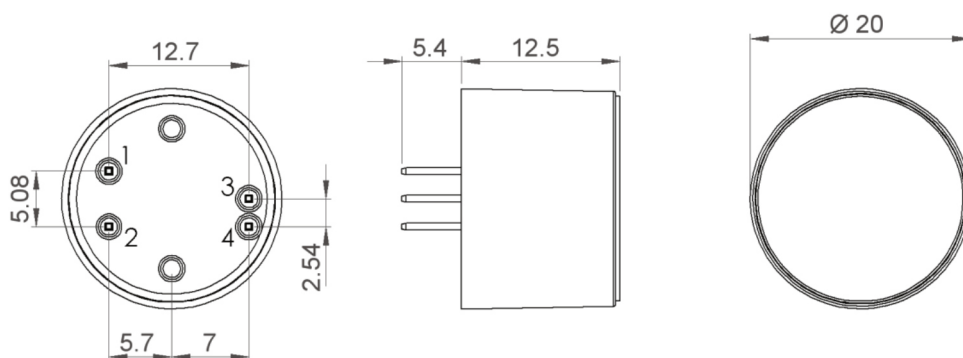
Dimension in mm

Notes:
1   Determined by ppO2 and pressure accuracy
2   5V tolerant

OXL Series
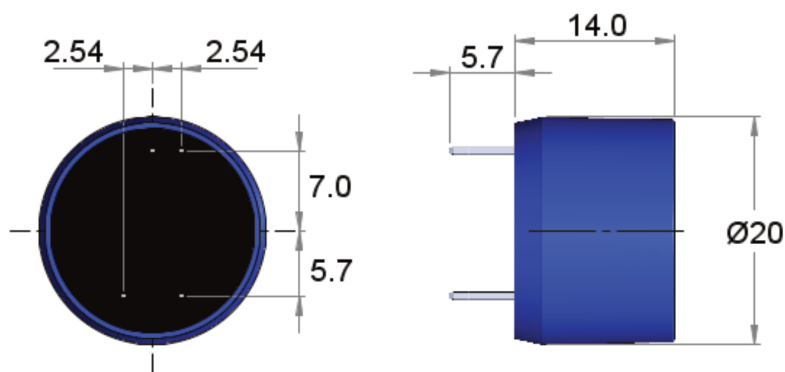Optical Oxygen Sensors

■ OUTLINE DRAWING

Connection:
Au-plated pins 0.64 mm² on a 2.54mm grid for PCB mounting via sockets or hand soldering with a no clean flux.
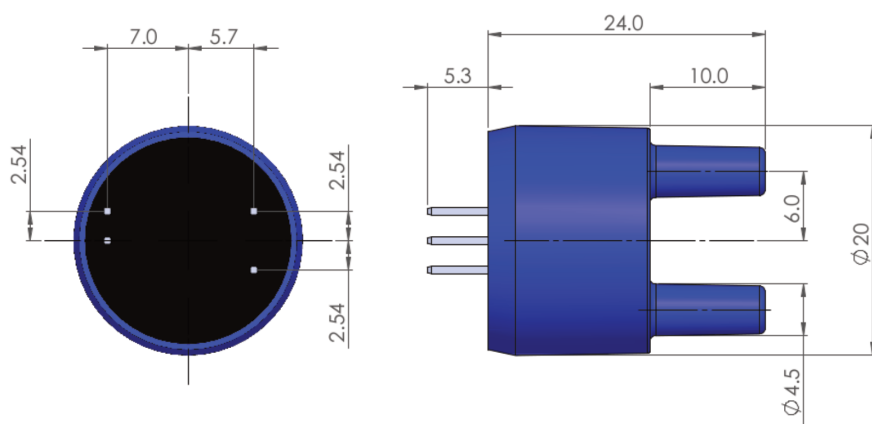
Note:
- Do NOT put the sensor through a PCB washing process.
- Always apply power to sensor pins 1 and 2 before attempting to communicate on pins 3 and 4.

OXL-S4-…

OXL-W4-…

Dimension in mm

OXL Series
Optical Oxygen Sensors

■ RS232 PROTOCOL AND COMMANDS

USART Setup

The following setup should be used when using the USART interface:

- Baudrate: 9600
- Flow Control: None
- Parity: None
- Stop bits: One
- Data Length: 8 bits

USART Command Set

All USART communication is performed using ASCII characters; the table below shows the legal characters for each description block.

Description Block	Legal character(s)	Hex
<Command>	"M", "O", "%", "T", "P", "A", "#", "e"	0x4D, 0x4F, 0x25, 0x54, 0x50, 0x41, 0x23, 0x65
<Command>	"0" – "9"	0x30 – 0x39
<Separator>	" "	0x20
<Terminator>	"\r\n"	0x0D 0x0A

There are three modes available; Poll Mode, Stream Mode and Off Mode.

Poll Mode (M1)

Each request is built using a combination of the description blocks shown in the table above. A typical arrangement will be one of the following formats:

- <Command><Terminator>
- <Command><Separator><Argument><Terminator>

Each response will reply in the following format:

- <Command><Separator><Argument><Terminator>

Note: Use the frame terminator "r\r\n" to detect that the response has been received before sending the next request. A timeout should also be included and should be no less than one second.

Table below provides a description of all commands and the valid arguments that can be applied to the interface when in Poll Mode (M1).

Note: All commands are case sensitive.

Command	Description	Argument	Response
"M"	Output Mode	0 = Stream 1 = Poll 2 = Off	"M xx\r\n" Where xx equals the Argument of the command
"O"	Request current ppO2 value	N/A	"O xxxx.x\r\n" Where xxx.x equals the ppO2 in mbar
"%"	Request current O2 value	N/A	"% xxx.xx\r\n" Where xxx.xx equals the O2 in percent %"
"T"	Request current temperature inside sensor	N/A	"T yxx.x\r\n" Where y equals the sing "-" or "+" and xx.x equals the temperature in °C
"P"	Request current barometric pressure	N/A	"P xxxx\r\n" Where xxxx equals the pressure in mbar
"e"	Sensor status	N/A	"e 0000\r\n" = Sensor Status Good "e xxxx\r\n = any other response contact All Sensors for advice
"A"	Request all values (see above: O, %, T, P and e)	N/A	See stream Mode on following pages
"#"	Sensor information	0 = Date of manufacture 1 = Serial Number 2 = Software Revision	"# YYYY DDDDD\r\n" "# xxxxx xxxxx\r\n" "# xxxxx\r\n"

OXL Series
Optical Oxygen Sensors

■ RS232 PROTOCOL AND COMMANDS cont.

Poll Mode Examples
Example 1:
- Request (what is the current oxygen partial pressure?):
  "O\r\n"   "0x4F 0x0D 0x0A"
- Response (210,3mbar):
  "O 210.3\r\n"   "0x4F 0x20 0x30 0x32 0x31 0x30 0x2E 0x33 0x0D 0x0A"

Example 2:
- Request (Put sensor into streaming mode):
  "M 0\r\n"   "0x4D 0x20 0x30 0x0D 0x0A"
- Response (sensor is no in streaming mode):
  "M 0O\r\n"   "0x4D 0x20 0x30 0x30 0x0D 0x0A"

Error Codes
When a request has been unsuccessfully received, an error code may appear in a response format. The table below provides more information on possible causes and actions. For more information contact All Sensors.

Response	Description	Possible Cause	Action
"E 00\r\n"	USART Receiver Overflow	No <Terminator> received	- Check USART Setup - Confirm correct termination
"E 01\r\n"	Invalid Command	Unrecognised <Command> received	- Check command is valid - Check command is uppercase "M" instead of "m"
"E 02\r\n"	Invalid Frame	Incorrect character in frame <Separator>	- Check correct separator is used
"E 03\r\n"	Invalid Argument	<Argument> not allowed or in limits	- Check argument is no longer the 6 characters - Check argument is within limits - Check arguments is available for command

Stream Mode (M0)
By default, stream mode is initiated on sensor power-up and will supply an output string approximately once every second. This provides the data for ppO2, temperature, pressure %O2, and sensor status. Format is shown below, for more details on the argument see table in the Poll Mode (M1) sections.
- "O xxxx.x T yxx.x P xxxx % xxx.xx e xxx\r\n"

Or the equivalent block description:
- "<Command><Separator><Argument><Separator><Command><Separator><Argument><Separator>
  <Command><Separator><Argument><Separator><Command><Separator><Argument><Separator>
  <Command><Separator><Argument><Terminator>"

Off Mode (M2)
In this mode, the sensor stops taking measurements and current consumption reduces to less than 6mA constantly.

Cross Sensitivity
The list below details the gases that have been tested for cross sensitivity with the OXL range. The below list is not exhaustive. Compatibility with gases not on this list needs to be tested by the customer. The luminescence technology used in the OXL is inherently extremely selective to O2 so cross sensitivity is generally unlikely.

Gas Measured	Cross Sensitivity	Gas Measured	Cross Sensitivity
200 ppm NO in N2	None	5 pppm Ethylene	None
100 ppm Acetaldehyde	None	1% Methane in N2	None
100 ppm SO2 in N2	None	0,5% CO	None
100 ppm H2S in N2	None	100% CO2	None
100 ppm HCl in N2	None	100 ppm NO2 in air	no result observed NO2 to in-stable

OXL Series
Optical Oxygen Sensors

■ ORDERING INFORMATION

Series	Housing Style		Temperature Range		Response Time	
OXL-	D4-	Diffusion	L-	-30 … 60 °C	T	<30 sec
	S4-	Sealed				
	W4-	Flow Through				

Order code example: OXL-W5-L-T

For all devices MOQ of 10 pieces applies.

All Sensors GmbH reserves the right to make changes to any products herein. All Sensors GmbH does not assume any liability arising out of the application or use of any product or circuit described herein, neither does it convey any license under its patent rights nor the rights of others.