FEATURES

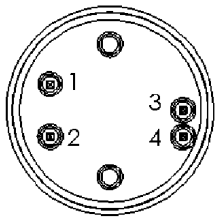
- **Oxygen measuring range 0...300 mbar ppO_2 and temperature measurement**
- **Optional pressure sensor enables additional 0...25 $\%O_2$ measurements**
- **Non-depleting optical technology (fluorescence quenching by oxygen)**
- **Factory calibrated**
- **Low power operation**
- **3.3 V TTL level USART interface**
- **RoHS compliant**

SPECIFICATIONS

Maximum ratings

Supply voltage	4.5...5.5 V_{DC}
Supply current	<7.5 mA (streaming 1 sample per second) <20 mA peak
Temperature limits	
Storage	-30...60 °C
Operating	-30...60 °C
Barometric pressure range	
ppO_2 output	100...1400 mbar
$\%O_2$ output	500...1200 mbar
Humidity limits (non-condensing)	0...98 %RH

ELECTRICAL CONNECTION



Pin	Connection
1	$+V_S$
2	GND
3	3.3 V USART Sensor Transmit
4	3.3 V USART Sensor Receive

Note:
Always apply power to the sensor pins 1 and 2 before attempting to communicate on pins 3 and 4.

Pins are on a 2.54 mm grid for PCB mounting via sockets or hand soldering with a no-clean flux (do not put the sensor through a PCB washing process)

PERFORMANCE CHARACTERISTICS

(T_A=20 °C, P_A=1013 mbar. Following extreme temperature fluctuations, re-calibration may be required.)

Characteristics		Min.	Typ.	Max.	Unit
Oxygen measuring range	ppO_2 partial pressure	0		300	mbar
	O_2 concentration (XYO...P...)	0		25	$\%O_2$
ppO_2 partial pressure	Accuracy			2	%FS
	Resolution			0.1	mbar
O_2 concentration (XYO...P...)	Accuracy	Determined by ppO_2 and pressure accuracy			
	Resolution			0.01	%
Pressure (XYO...P...)	Measuring range	500		1200	mbar
	Accuracy			±5	
	Resolution			1	
Temperature	Measuring range	-30		60	°C
	Accuracy	Indication only			
	Resolution			0.1	°C
Response time (10...90 %)	XYO...S		<30		s
	XYO...F		<10		
Lifetime		5			years

USART 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 shows the legal characters for each description block. There are three modes available: Poll Mode, Stream Mode and Off Mode.

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

Poll Mode (M 1)

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

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

Each response will be in the following format:

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

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

Command description

Description of all commands and the valid arguments that can be applied to the interface when in Poll Mode (M1). All commands are case sensitive.

Command	Description	Arguments	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 ppO_2 value	N/A	"O xxxx.x\r\n" where xxxx.x equals the ppO_2 in mbar
"%"	Request current O_2 value (only valid for XYO...P. Otherwise returns "- - - - - -")	N/A	"% xxx.xx\r\n" where xxx.xx equals the O_2 in %
"T"	Request current temperature inside sensor	N/A	"T yxx.x\r\n" where y equals the sign '-' or '+' and xx.x equals the temperature in °C
"P"	Request current barometric pressure (only valid for XYO...P. Otherwise returns "- - - - - -")	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 First Sensor for advice.
"A"	Request all values (see above: O, T, P, % and e)	N/A	See section Stream Mode (M 0)
"#"	Sensor information	0=Date of manufacture 1=Serial number 2=Software revision	"# 0YYYY00DDD\r\n"(DDD=day of the year) "# xxxxx xxxxx\r\n" "# xxxxx\r\n"

Example 1	Legal characters	Hex
Request: current ppO_2 value	"O\r\n"	"0x4F 0x0D 0x0A"
Response: 210.3 mbar	"O 0210.3\r\n"	"0x4F 0x20 0x30 0x32 0x31 0x30 0x2E 0x33 0x0D 0x0A"

Example 2	Legal characters	Hex
Request: streaming mode	"M 0\r\n"	"0x4D 0x20 0x30 0x0D 0x0A"
Response: streaming mode	"M 00\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.

Response	Description	Possible cause	Action
"E 00\r\n"	USART Receiver Overflow	No <Terminator> received before overflow	Check USART setup, confirm correct termination.
"E 01\r\n"	Invalid Command	Unrecognised <Command> received	Check command is valid. Check command is upper Case "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 than 6 characters. Check Argument is within limits. Check Argument is available for command.

Stream Mode (M 0)

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 ppO_2 , Temperature, Pressure, $\%O_2$ and Sensor Status. The format and equivalent block description is as follows:

"O xxxx.x T yxx.x P xxxx % xxx.xx e xxxx\r\n"

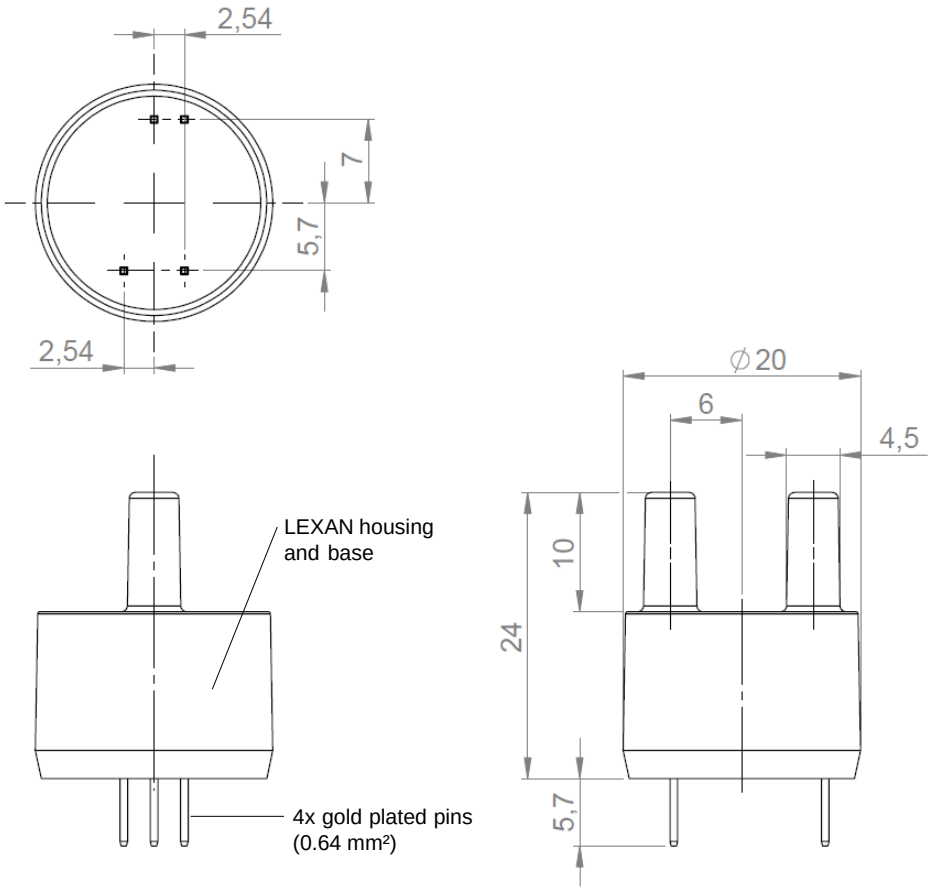
<Command><Separator><Argument><Separator> ... <Command><Separator><Argument><Terminator>

Off Mode (M 2)

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

OUTLINE DRAWING

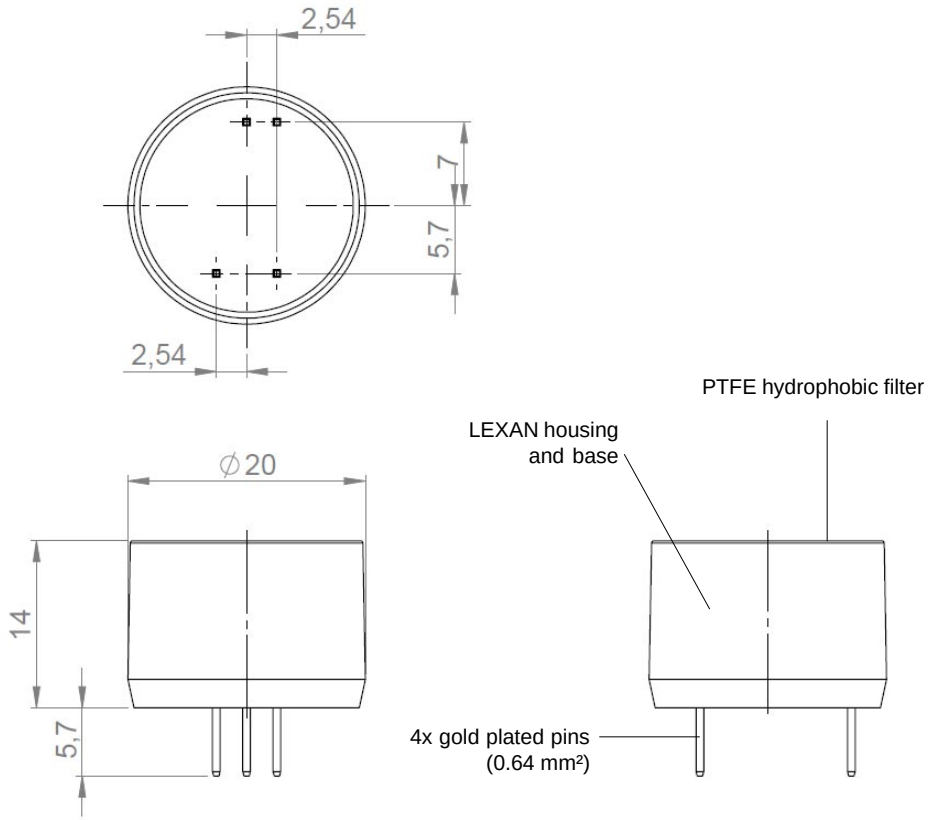
XYO...F (flow-through)



dimensions in mm

OUTLINE DRAWING

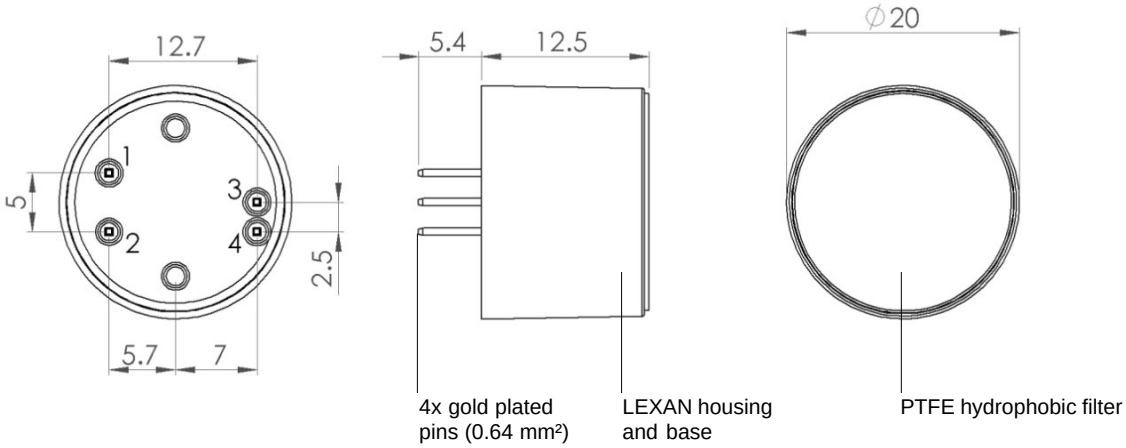
XYO...S (sealed base)



dimensions in mm

OUTLINE DRAWING

XYOM300N, XYOM300P (non-sealed)



dimensions in mm

ORDERING INFORMATION

	Series	Measuring range		Options		Housing	
Options	**XYO**	**M300**	0...300 mbar ppO_2 and temperature*	**N***	None	**F**	Flow-through
				P	Integrated pressure sensor	**S**	Sealed base
						( )	Non-sealed
		* with optional pressure sensor (P) additional measurement of 0...25 $\%O_2$ and barometric pressure 500...1200 mbar		* only available with non-sealed housing. NF/NS type on request. MOQ applies.			
Example:	**XYO**	**M300**		**P**		**S**	