

PO2ES I2C-to-RS485 Converter

Datasheet



1 Features

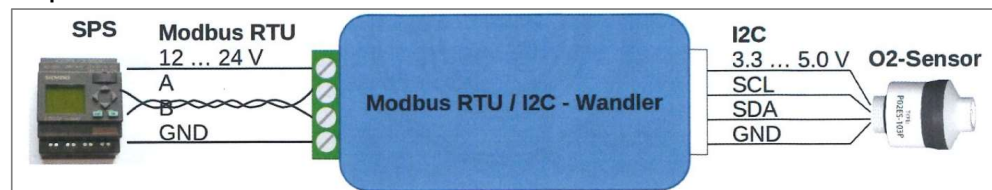
The PO2ES I2C-to-RS485 Converter provides RS485 Modbus protocol for I2C PO2S Oxygen concentration sensors.

- Modbus communication protocol
- 100ms sampling rate
- Device status information – 2 LEDs
- Enclosure IP-rating IP65
- RS485 Connector: industry standard M12
- Max RS485 cable length: 1200 m
- Sensor cable length: 50cm

Device Information

Product Name	PO2ES I2C-to-RS485 Converter
Product MPN	1620141690
Compatible Sensors	O2 25%Vol: PO2ES-103PD O2 100%Vol: PO2ES-103D

Simplified Schematic



Status	Released
Revision	1.1
Date	21.12.2020

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Revision History

Rev. No.	Change	Date	Author
1.1	Preliminary version	21.12.2020	W.Osmelak

References

Ref. No.	Document	Date	Author
1	O2 25%Vol: PO2ES-103PD		APSP
2	O2 100%Vol: PO2ES-103D		APSP

2 Description

The Modbus-I2C-Converter communicates the PO2S Sensor every 500ms, reads out the ADC count and saves it in the internal memory.

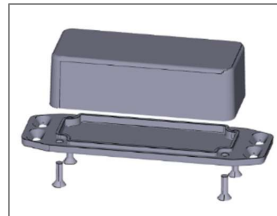


Figure 1 Modbus adapter box prototype.
On the right-hand side with RS485 Modbus M12 TE Socket; on the left-hand side with attached strain relief and sensor cable.



3 Specifications

3.1 Enclosure

- Type: Hammond, 1590AFL
- Size: 92/ 39/ 27 mm (H/ W/ D)
- IP rating: IP65
- Opening for Status-LED's
- Openings for connectors
- CAD Data available on manufacturer Website: [1590 Part Details](#)



3.2 Connections and Connectors

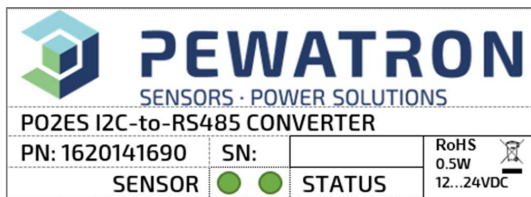
Connection	Details
Sensor Cable 	I2C & supply for the sensor Fixed to the enclosure with strain relief Length: 500 mm Molex KK 254, 4-pin, female Pinning: 1(yel) – VCC, 2(gm) – SCL, 3(red) - SDA, 4(wht) - GND
RS485 Modbus connector 	Connector type: M12, male, 4-pol, shielded TE Connectivity T4132012041-000 Pinning: 1-Vin, 2-A, 3- GND, 4-B Fitting receptacle: TE Connectivity, T4110001041-000

4 Electrical characteristics

Parameter	Condition	Value	Unit
Supply voltage	T _A = 25°C	12 ... 24	VDC
Power dissipation	T _A = 25°C	500	mW
Operating temperature	No condensation		°C
Storage temperature	No condensation	-	°C
I2C Pull-up resistors		4.7	kOhm
ESD Ratings	Human body model (HBM)	±1000	V

5 UI/ LED Information

On the top of the converter enclosure there are located 2 LEDs, which inform about status of the converter



LED	Color	Description
Status	Off	No communication
Status	Green	Last transfer was successful
Status	Red	Last transfer unsuccessful
Sensor	OFF	The converter is switched off
Sensor	Green	The O2 sensor was successfully read-out by the converter
Sensor	Red	The sensor-converter read-out failed

6 RS485 Interface

Standard settings for communication protocol:

Modbus-Address	0xAB (171)
Baud rate	9600
Parity	Odd
Stop bits	1
Data bits	8, LSB first
Max message size incl. CRC16	32 Bytes

7 Application and Implementation

The sensor communicates via RS485 interface

Communication via Modbus RTU protocol.

Max sampling frequency: 10Hz (sampling time 100ms)

7.1 Measurement value query

The query format:

	Addr	Func	Data	CRC16	CRC16
Query	0xAB	0x0A	CMD	CRC L	CRC H

CMD – reserved for future development; the value will be ignored. The best CMD = 0

7.2 Response to the query

The sensor responds automatically after receiving the command with the most recent measured value.

The delay is < 20ms.

The response format:

	Addr	Func	Data	Data	Data	Data	CRC16	CRC16
Response	0xAB	0x0A	STAT	TYPE	RAW L	RAW H	CRC L	CRC H

STAT - Status of the ADC value

1: valid value

0: invalid value, error at O2 sensor

TYPE – O2-Sensor type

0: PO2ES-103D

1: PO2ES-103PD

RAW – last ADC value, LSB first

Note: The first read out raw-value is not valid, check the STAT

Example:

Query in HEX to calculate CRC:

AB 0A 00 06 80

7.3 Echo-function

In order to test the proper communication in between sensor and system there is implemented the echo function.

After the query, the sensor responds with incremented both data bytes values DATA0 and DATA1.

The delay is < 20 ms.

	Addr	Func	Data	Data	CRC16	CRC16
Query	0xAB	0x0E	DATA0	DATA1	CRC L	CRC H
Respond	0xAB	0x0E	DATA0+1	DATA1+1	CRC L	CRC H

Example:

Echo command for CRC calculation:

AB 0E AB CD FF 66

7.4 CRC Calculation

According to the Modbus specification

Examples:

Input, bytes in HEX	Calculated CRC16
AB 0E AB CD	0x66ff (Transferred: FF 66)
AB 0A 00	0x8006 (Transferred: 06 80)

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