

# Transmitter HC302

Technical information

Version 1.0

## Generally

- \* HC302 is a transmitter for oxygen measurement
- \* Measuring range 0 - 120nA (Other ranges on demand)
- \* Polarization voltage: -670mV
- \* Readout of mg/l or % (100% = 8,26mg/l)
- \* Compensation via temperature sensor (NTC) from 5 - 60°C
- \* Analogue output: 0(4)-20mA
- \* Scalable analogue output: 20mA at 100 - 200%
- \* Galvanical insulation between input and output
- \* Option: Serial communication via MODbus



## Features

### The HC300 Family Features

The Transmitter HC300 Family presently consists of the modules:

**HC300:** Datalogger/MODbusmaster w/ dual serial com. 4 analogue inp.

**HC301:** pH/temp. transmitter with MODbus and 4-20mA output.

**HC302:** O<sub>2</sub> transmitter with MODbus and 4-20mA output

**HC303:** Conductivity transmitter with MODbus and 4-20mA output

**HC304:** Transmitter for 4 analogue inputs. w/MODbus and 4-20mA output

### Display

The HC300 family has a 3 digit display and 6 LEDs for setup and displaying measured values. The 'Mode' key is used to navigate. The LED marked 'Com.' is lit when the MODbus is active.

### Programming

The module is programmed by the use of 3 keys located on the front panel. The 'Mode' key is used for selecting setup and the 'Up' og 'Down' keys are used to scroll through the programmable parameters. The parameter to be altered is selected with the 'Mode' key and the value is changed using the 'Up' og 'Down' keys. Parameter no. 01 is a softwarelock which must be set to 'Off' in order to change any parameter.

### Inputs

The measuring sensor for oxygen must be connected to connectors 1 and 2. Connector 1 is polarization voltage and 2 is input. The sensor typically yields 60 nA at saturation, but via calibration the transmitter may be adjusted from -50% to +100%. The calibrated and amplified nA signal is the basis for the display readout and the analogue output. The build-in temperature sensor in the oxygen sensor must be connected to connectors 4 and 5. The measured value is the basis for the temperature compensation, which is performed by the transmitter's microprocessor. The connector 3 has no connection inside the transmitter but may be used as connection point for eventual wire shield.

### Display

The display shows the measured oxygen in mg/l or %, where 100% corresponds to 8,26mg/l. For calibration select the 'Gain' LED with the 'Mode' key and use the 'Up' and 'Down' keys to alter the value. 'Aux' has no function in this version of HC302. For 'Setup', see page 2.

### Analogue output

The unit has a (0)4-20mA analogue output. The output, which is galvanically insulated from the inputs, is proportional to the measured oxygen compensated for the temperature. Via Setup the output may be scaled to give 20mA at 100% (8,26 mg/l) - 200% (16,5 mg/l).

## Technical Specifications for HC302

### Mechanical

Housing:	Lexan UL94V-0 (Upper part) Noryl UL94V-0 (Lower part)
Mounting:	M36 for 35 mm DIN rail
IP Class:	Housing IP40. Connector IP20
Connector:	Max 16A. Max 2,5 mm <sup>2</sup> Max torque 0,6 Nm
Temp.:	-15 to +50 °C
Weight:	75 g
Dimens.:	D 58 x W 36 x H 86 mm
CE mark:	EN61326A

### Electrical

Supply:	24Vdc ±10%
Consumption:	60 mA max
Sensor:	Electrolytic sensor
Polarization voltage:	-670mV ± 20mV
Measuring range:	0-120nA
Accuracy:	Class 1 excl. sensor
Temperature sensor:	NTC 22kΩ
Temperature range:	0-60 °C
Analogue output:	0(4)-20mA.
Max. load:	Max 500Ω

## Parameters and installation

### Function and Programming

For programming select Setup with the 'Mode' key and use the 'Up'/'Down' keys to select the actual parameter. Pressing the 'Mode' key again makes the parameter changable using the 'Up'/'Down' keys. Parameter no. 01 is a software lock, which must be set to 'Off' before changing the parameters.

The 6 programmable parameters are shown in the table to the right. The table shows **Par. no.**, name, function, programming range and default setting. If the softwarelock (**Par. no. 1**) is active the parameter setting can be read but not altered.

**Par. no. 2** is used to set the module's address for MODbus communication, if the module has been ordered with MODbus - otherwise only „- -“ is shown (See paragraph about MODbus).

**Par. no. 3.** The scaling of the analogue output indicates where the transmitter gives 20mA (or 0(4)mA, if inverted - see Par. no. 05). If for instance the scaling is set to 100, it means that the analogue output gives 20mA at a measurement of 100% relative to 8,26mg/l.

**Par. no. 4.** The analogue output may be 0-20mA or 4-20mA.

**Par. no. 5.** If the output signal is used in a feed back loop it may be necessary to invert it. This is done with this parameter. The output now does 20-0mA or 20-4mA.

**Par. no. 6.** The MODbus standard prescribes a baud rate of 9.600 baud or 19.200 baud. With this parameter the baud rate is selected in accordance with the MODbus master. The master may be either the transmitter family's HC300V1 or a SCADA system. If the HC302 is not ordered with MODbus interface only „- -“ is displayed.

To return to normal display of measurements select parameter no. **P00** and press the 'Mode'-key.

To prolongue the lifetime of the display and reduce the consumption the display is turned off after 10 minutes, if no key has been activated during this time. The display now only shows a flashing bar in the middle segment.

### Parameter list

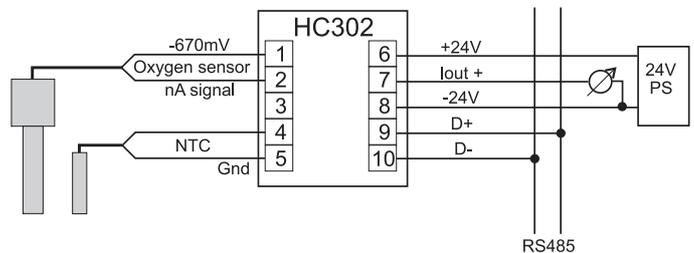
No	Parameter	Description	Range	Default
01	Lock	Software lock	On / Off	On
02	Address	Address for MODbus	Off, 1-247	Off
03	Scale	Scaling of analogue output	100 - 200 %	200
04	lout	Analogue output	0-20mA/4-20mA	4-20
05	lout mode	Analogue output	non inv/ inv	n.in
06	Baud rate	MODbus baud rate	9.6/19.2	19.2

### Calibration

To calibrate the transmitter in accordance with the used sensor use the 'Mode' key to select 'Gain', and then using the 'up' and 'Down' keys adjust the readout in accordance with the expected. The readout in mg/l is the basis of the analogue output value as well as the MODbus value (In this connection see Parameter no. 3).

The calibration adjustment does not affect the nA readout, which may be shown by activating the 'Down' key in the 'mg/l'-mode. This value corresponds to the actual uncalibrated signal from the sensor. The value is not compensated for temperature, and may thus be used to evaluate the condition of the sensor.

### Typical Installation



## MODbus

In order to utilize the MODbus interface the HC302 must be ordered with MODbus.

HC302 may be used as a slave for the 'Dat' - unit HC300 or as a slave in a SCADA system. The setup / communication for each case will be explained in the following.

### With HC300

If HC302 is used together with the HC300, the user must pay attention to two things: The baud rate on the MODbus as well as the address of the HC302.

**The baud rate (P06)** must be set to the baud rate of the HC300. Whether a baud rate of 19.200 or 9.600 is used is of no importance, as long as all units on the MODbus are set to the same baud rate.

**The address (P02)** must be unique in the network; Two units are not allowed to have the same address. In a network with the HC300 as the master, all addresses must be assigned without leaving any address out; i.e. if 3 units are connected to an HC300, the addresses 1, 2 & 3 must be assigned to the three units. The order of the addresses is of no importance. In a network with an HC300, up to 14 slaves may be connected, allowing only the addresses 1..14.

### In a SCADA system

Since different SCADA systems may have different restrictions only the general are mentioned here:

**The baud rate (P06)** must be set to the baud rate of the SCADA system.

**The address (P02)** must be unique in the network; Two units are not allowed to have the same address.

The HC302 contains 2 measurement values (oxygen and temperature), but only the oxygen value is available via MODbus. Access is given through the function code *Read\_Input\_Registers (04)*. In addition the HC302 gives access to various diagnostic values through *Diagnostics (08)*, as shown in the following.

### Read\_Input\_Registers

Function code	Start address	Number of values
04	1	1

The transmitted measurement value is oxygen rated to 0-1000, where 1000 corresponds to the measuring range of the transmitter in mg/l (16.52 mg/l = 200%). Transmission of values is thus performed with a resolution of 0,1%. The start address is of no importance.

### Diagnostics

Function code	Sub code (HEX)	Description
08	00	Return Query Data
	0A	Clear counters and diagnostics register
	0B	Return Bus Message Count
	0C	Return Bus Communication Error count
	0D	Return Exception Error count
	0E	Return Slave Message count
	0F	Return Slave No Response count
	12	Return Bus Character Overrun count

If the HC302 receives an invalid command, an exception error will be returned to the master.