

# Transmitter HC301

Technical information

English Version 1.3

- \* **HC301 is a transmitter for pH/mV-measurement**
- \* **Data range: 0-14pH,  $\pm 1000\text{mV}$ , 0-150°C**
- \* **Single- or dual slope calibration of pH-electrode**
- \* **Temperature compensation via Pt100 / Pt1000 sensor**
- \* **Display pH/mV or temperature**
- \* **Analogue output 0(4) - 20mA for pH/mV or °C**
- \* **Analogue output may be inverted for use in a control loop**
- \* **Galvanic insulation between input and I/O (incl. 24V)**
- \* **Optional: Serial communication via Modbus**



## Features

### The HC300 Family Features

The Transmitter HC300 Family presently consists of the modules:  
**HC301:** pH/temp. transmitter with 4-20mA output and optionally Modbus interface.

**HC303:** Conductivity transmitter with 4-20mA output and optionally Modbus interface.

**HC320:** Control unit for 0(4)-20mA input with 2 independant relay outputs

### 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.

The actual uncompensated mV measurement may be displayed by pressing the „Down“ key in the main pH display mode. Please note that negative values are displayed flashing.

### 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.

### Input

The pH electrode is connected to pin 1-2 on the unit (see figure on page 2). The mV signal from the electrode is amplified by a highimpedance amplifier before entering the microprocessor. The Pt100/Pt1000 sensor is connected to pin 4-5 on the unit. The measured values are basis for the temperature display and compensation performed by the built-in microprocessor. Pin 3 has no internal connections and may be used as coupling for a conductor shield.

### Analogue output

The HC301 Module has an analogue output 0(4)-20 mA. Using Setup 0-20mA or 4-20mA may be selected. The output is proportional to pH/mV or temperature and is galvanic insulated from the inputs.

### Modbus (Optional)

Aquired data is transferred using the Modbus standard for multidrop communication.. The hardware connection is via RS485 two-wire system. The Modbus-master may be a SCADA system with installed software for Modbus. Parameter 02 is used to set the address of the module to 'Off' (disabled) or 1..247.

## Technical Specifications

### 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

Power Supply:	24Vdc $\pm 10\%$
Consumption:	60 mA max
Sensor:	Combination electrode
pH/mV range:	0-14 pH, $\pm 1000\text{mV}$
pH input:	< 1pA, >10G $\Omega$
Accuracy:	$\pm 0,2\%$
Temperature sensor:	Pt100, Pt1000
Temperature range:	0-150°C $\pm 0,3\text{°C}$
Temp. compensation:	Fixed or via measurement
Analogue output:	0(4)-20mA, max. 250 $\Omega$

# Parameters

## Function and Programming

The 15 programmable parameters are shown in the table to the right. The table show **Par. no.**, name/function, programming range and default setting. For access see the paragraph about programming on page 1. 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.

**Par. no. 3** indicates the type of input for the pH/mV input.

**Par. no. 4** indicates the type of input for the temperature input.

**Par. no. 5.** If Par. no. 3 is set to pH, the signal is temperature compensated.

Par. no. 5 is used to set the temperature compensation to either fixed or based on the measured temperature.

**Par. no. 6** is used to set the fixed temperature for compensation of the pH measurement.

**Par. no. 7.** If a long cable is used for the Pt100 sensor the serial impedance should be entered and compensated for.

**Par. no. 8** is used to set how the pH electrode may be slope calibrated. If dual slope (On) is selected, the electrode has to be calibrated at both an acidic and an alkaline pH. If single-slope (Off) is selected, the calibration may be performed at either acidic or alkaline pH.

**Par. no. 9.** If Par.no. 3 is set to mV, the range is set using this parameter. It is possible to select the whole range ( $\pm 1000\text{mV}$ ), the negative range ( $-1000-0\text{mV}$ ) or the positive range ( $0-1000\text{mV}$ ). This setting has an influence on the scaling of the analogue output and the transferred data.

**Par. no. 10** is used to set the analogue output proportional to either the pH/mV signal or the temperature signal.

**Par. no. 11** is used to set the analogue output to either 0-20 mA or 4-20 mA.

**Par. no. 12** is used if the output signal has to be inverted i.e. for use in a control loop. The resulting output corresponds to 20-0mA or 20-4mA.

## List of Parameters

Nr.	Parameter	Setting	Default
P01	Softwarelock	On/Off	On
P02	Adresse on modbus	Off, 1..247	Off
P03	Type of input	pH/mV (ORP)	pH
P04	Temperature input	Pt100/Pt1000	Pt100
P05	Temperature comp. of pH	Automatic/ fixed	fixed
P06	Compensation temperature	0..150 °C	25 °C
P07	Cable impedance @ Pt100	0,0..9,9 Ohm	0,0
P08	Calibration of pH-electrode	Off, on (Dual slope)	Off
P09	Range for mV (ORP)	$\pm 1000, -1000..0, 0..1000$	$\pm 1000$
P10	Input for the analogue output	pH/mV or temperature	pH/mV
P11	Type of analogue output	0-20mA, 4-20mA	4-20mA
P12	Mode of analogue output	n.inv, inv.	n.inv
P13	Energy saving functionality	Off, On	On
P14	Baudrate for modbus	9.600/19.200	19.200
P15	Parity for modbus	Even/none	Even

**Par. no. 13** Energy savings mode. If no keys are pressed for approx. 10 min. the display will show a flashing bar. Pressing any key will return to normal display.

**Par. no. 14** The Modbus standard specifies a baudrate of 9.600 or 19.200, this is set using Par. no.14. The baudrate is set in accordance with the Modbus master.

**Par. no. 15** Parity can be selected according to the modbus standard (even) or omitted (none).

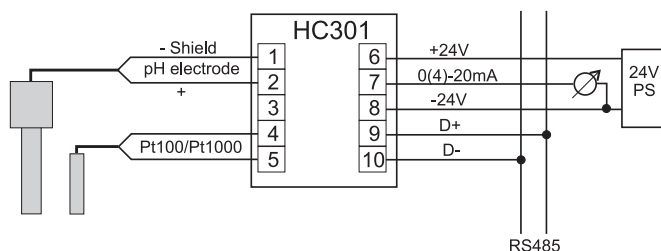
After setup is completed **Par. no. 00** is selected and the 'Mode' key is pressed in order to return to the normal display.

## Calibration of the pH/mV electrode

Calibration of the pH electrode is done via the Up/Down keys on the front. Using the 'Mode' key select 'Buffer' and calibrate the electrode to the required value using the Up/Down keys until the display reads the value corresponding to the reference buffer fluid. Next select 'Slope' (only applies to a pH electrode) and use the Up/Down keys, until the display reads the desired value. If dual-slope is selected (Parameter 8) the slope must be calibrated at two points - one above pH7 and one below (Only applies to a pH electrode).

All settings are stored in EEPROM, so as to remember the values after a power down of the unit.

## Typical Installation



## modbus

Please note that in order to take advantage of the Modbus interface the HC301 must be ordered with Modbus. A standard unit only has the analogue output.

HC301 is used as a slave unit on a Modbus in a SCADA system. When attaching a unit on a Modbus, the user must pay attention to two things: The baud rate on the Modbus as well as the address of the HC301. Since different SCADA systems may have different restrictions only the general are mentioned here:

**The baud rate (P14)** must be set to the baud rate of the SCADA system.

**The Parity (P15)** must be selected according the used protocol.

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

The HC301 contains 2 measurements (pH/mV and temperature). Access to these are gained through the function code *Read\_Input\_Registers (04)*. Further more the HC301 gives access to different diagnostic values via *Diagnostics (08)*, as shown in the following.

### Read\_Input\_Registers

Function code	Start address	Number of values
04	1	1 or 2

Value 1 is pH/mV and value 2 is temperature. Please note that the measurements are transmitted in sequence; If 2 values are chosen both pH/mV and temperature are transmitted. If for instance the value for temperature is wanted, 2 values must be requested. Both values are rated to 0-1000 corresponding to the range. I.e. 0-14pH is transmitted as 0-1000 and 0-150°C as 0-1000. The start address is of no importance - only the number of values determines the returned values.

### 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 HC301 receives an invalid command, an exception error will be returned to the master.