Transmitter HC303

Technical information Version 1.2

Generally

*** HC303 is a transmitter for conductivity measurement**

*** Measuring range: See parameters 14 & 15 in unit**

*** Temperature compensation via Pt100/Pt1000 sensor**

*** Readout of conductivity & temperature**

*** Analogue output (0)4 - 20mA**

*** Galvanic isolation between input and I/O (incl. 24V)**

*** Option: Serial communication via MODbus**

Availability for transmitter HC303

Measuring range: 30 µs - 100ms
Cell constant: 0.01 - 10

Features

The HC300 Familiy Features

The Transmitter HC300 Familiy 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_2 transmitter with MODbus and 4-20mA output
HC303: Conductivity transmitter with MODbus and 4-20mA output
HC304: Transmitter for 4 analogue inp. 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. The parameter list for HC303 is found on page 2.

Input

The cell for conductivity is connected to terminals 1 and 2. The current through the cell is proportional to the conductivity of the solution and measurement of the current is the basis of the readout, the analogue output as well as the value sent over the MODbus. The Pt100/Pt1000 sensor is connected to terminals 4 and 5 and the measured value is the basis of the temperature correction, which is performed by the built-in microprocessor.
Terminal 3 is unit ground and should be connected to wire shield.

Analogue output

The unit contains an analogue output (0)4 - 20mA. The output, which is galvanically isolated from the inputs, is proportional to the measured conductivity or temperature.

Modbus

Measured values may be transferred via the MODbus standard for multi-drop communication. The hardware connection is via RS485 two-wire system. The Modbus master may be the transmitter family's 'Dat' module HC300 or a SCADA system with installed software for Modbus. With parameter 02 the unit address is selected or disabled ('Off').

Technical Specifications for HC303

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^2
	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 ±10%
Consumption:	60 mA max
Sensor:	2-wire
Measuring range:	See parameter 14 in unit
Cell constant:	See parameter 15 in unit
Accuracy:	Class 2 excl. Sensor
Temperature sensor:	Pt100, Pt1000
Temperature range:	0-150°C ±0,3°C
Temp. comp.	1.50 - 3.00 %/°C
Analogue output:	0(4) - 20mA

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Parameter setup and installation

Function and setup

Entering Setup is done by selecting Setup with the 'Mode' key and using the 'Up'/'Down' keys to select the desired parameter. After repressing the 'Mode' key, the selected parameter may be altered with the 'Up'/ 'Down' keys. Ending Setup is done by selecting parameter no. 00 and pressing the 'Mode' key where after the display returns to showing measured values. Parameter no. 01 is a softwarelock, which must be set to 'Off' before any changes can be done to the parameters.

The table shows the 13 parameters, which may be altered by the user. Here is shown **Par. no.**, name, description and programming range as well as default values. If the unit is locked (Software lock) the parameters may be read but not altered.

Par. no. 2. The unit address in the MODbus network (see paragraph about MODbus).

Par. no. 3. Scaling of the analogue output specifies at which measured conductivity the output gives 20mA (or 0(4)mA, if inverted - see Par. no. 10). If for instance the scaling is set to 50.0, it means that the analogue output gives 20mA at a conductivity of 50mS.

Par. no. 4. The temperature measurement may be performed with either a Pt100 or a Pt1000 sensor.

Par. no. 5. Compensating for temperature may be done automatically (via measurement) or by constant temperature (Measurement is not necessary).

Par. no. 6. If compensation for temperature is done by constant temperature, this temperature is set via this parameter.

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. The factor, with which the conductivity measurement is compensated, may be set in the range from 1,50%/^{O}C - 3,00%/^{O}C.

Par. no. 9. The analogue output corresponds to either the conductivity or the temperature signal.

Par. no. 10. The analogue output is 0-20mA or 4-20mA.

Par. no. 11. If the need for inverting the analogue signal for use in a feedback loop should arise, this is also possible - hereby setting the analogue output to 20-0mA or 20-4mA.

Par. no. 12. 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. 13. The MODbus standard dictates a baudrate of 9,600 baud or 19,200 baud. With parameter 13 the baudrate is selected in accordance with the MODbus master. The master may be the transmitter family's HC300 or a SCADA system.

Par. no. 14. Range of the unit (Read only)

Par. no. 15. Cell constant of sensor (Read only)

After completing setup please select **Par. no. 00** followed by 'Mode' for returning to normal display.

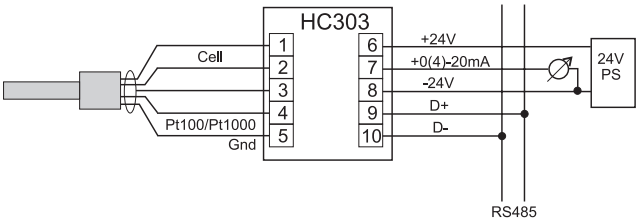
Parameterlist

Nr	Parameter	Description	Range	Default
01	Lock	Software lock	On / Off	On
02	Address	Address for MODBus	Off, 1-247	Off
03	Scale	Scale of Analogue output	Range/2 - Range	Range
04	Temperature	Type of temperature sensor	Pt100/Pt1000	Pt100
05	Compensation	Temperature compensation	Auto/Fixed	Auto
06	Comp. Temp.	Compensation temperature	0 - 150	25
07	Cable impedance	Impedance of Pt100 cable	0.0 - 9.9 Ohm	0.0
08	Comp. Factor	Compensation factor	1.50 - 3.00 %/^{O}C	2.10
09	Input for Iout	Input for analogue output	S or ^{O}C	S
10	Iout	Analogue output	0-20mA/4-20mA	4-20
11	Iout mode	Analogue output	non inv/ inv	n,in
12	Energy save	Energy savings functionality	On / Off	Off
13	Baud rate	MODbus baudrate	9.6/19.2	19.2
14	*Range*	*Measuring range*		
15	*Cell constant*	*Sensor's cell constant*		

Calibration

Use the 'Mode' key to select 'Gain', followed by 'up' or 'Down' to adjust the readout corresponding to the expected. The Adjustment may be performed in the range of ±40%. The readout is the basis for the analogue output as well as the MODbus value (In this connection please see Parameter no. 3).

Typical Installation



MODbus

In order to utilize the MODbus interface the HC303 must be ordered with MODbus.

HC303 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 HC303 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 HC303.

The baud rate (P13) 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 (P13) 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 HC303 contains 2 measurements (conductivity and temperature). Access to these are gained through the function code *Read_Input_Registers (04)*. Further more the HC303 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 conductivity and value 2 is temperature. Please note that the measurements are transmitted in sequence; If 2 values are chosen both conductivity 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, but the temperature has an offset of 1024; I.e. the conductivity measurement is transmitted as 0-1000 and 0-150^{O}C as 1024-2024. 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 HC303 receives an invalid command, an exception error will be returned to the master.