

Modbus - HART Converter User Guide



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1. Introduction

The MODBUS RTU to HART Converter is used to connect Arkon flowmeters to HART sensor network. Arkon flowmeter than becomes a slave device on HART network.

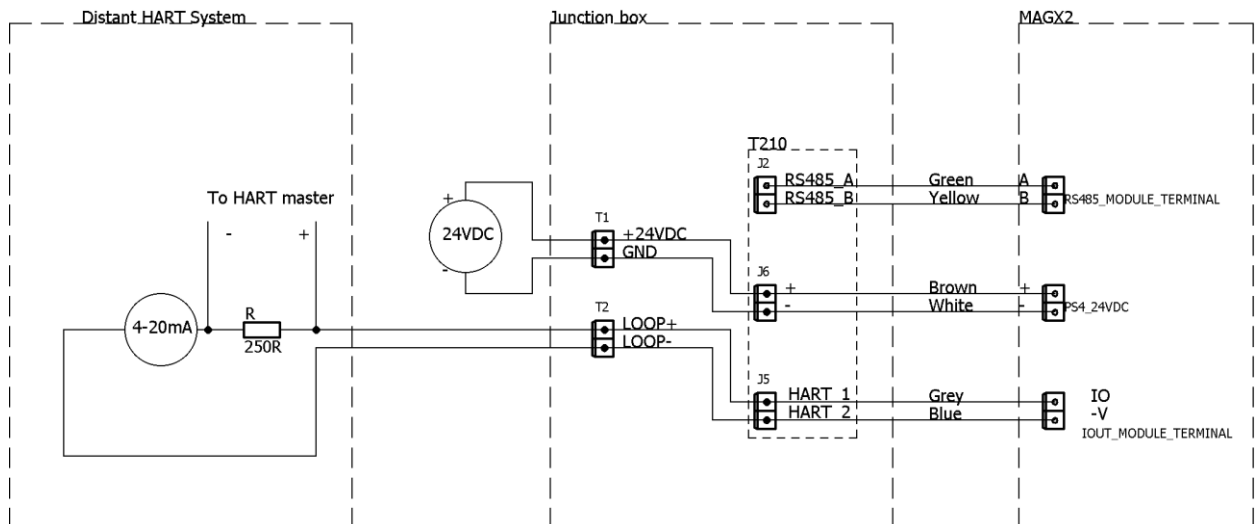
In case of MAGX2 the Converter uses RS485 MODBUS RTU line to communicate with the flowmeter and 4-20mA output to get the analogue flow information.

The Converter has form of a junction box outside of the flowmeter with IP65 protection.

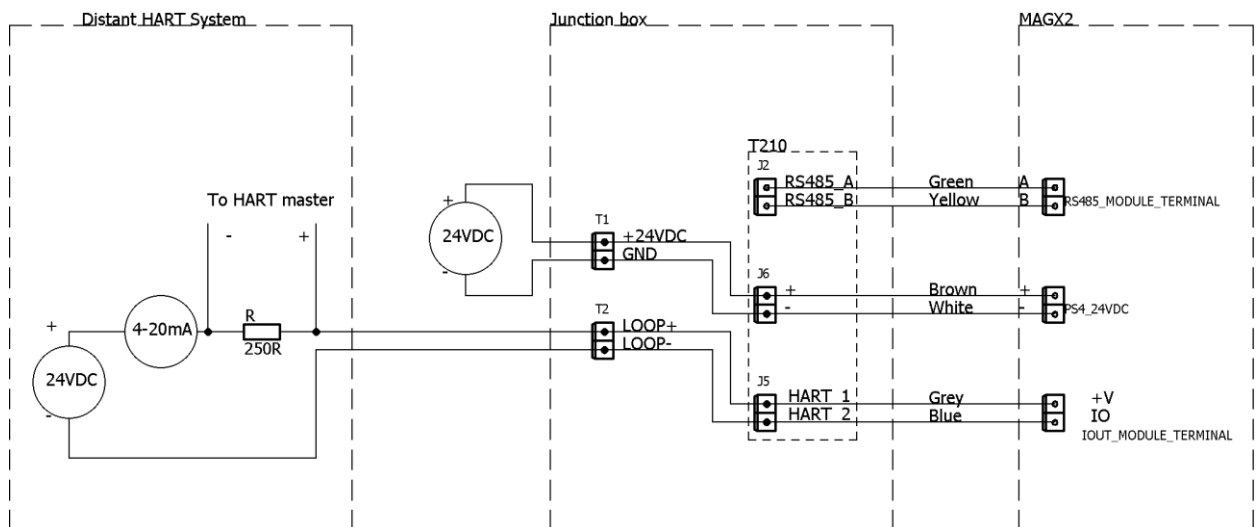
2. Schematics

The HART connection to the system as well as the power connection to the system is done inside the junction box.

2.1. Active Loop



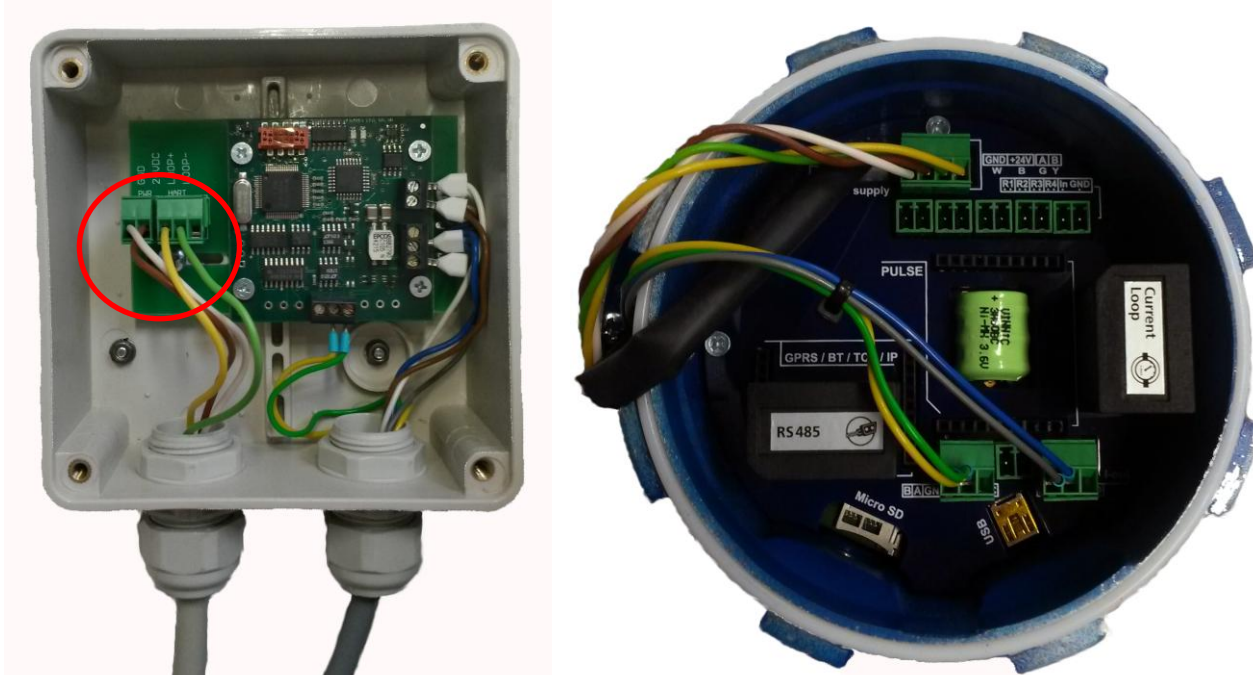
2.2. Passive Loop



2.3. Connection to the system

All the connection to the superior system is done inside the junction box aside the flowmeter transmitter. User needs to connect power supply to the flowmeter and converter: 24VDC +-5% (Terminals 24VDC and GND) and 4-20mA current loop including HART master (Terminals Loop+ and Loop-). For passive and active loop connection please refer to 2.2 schematics – section Distant HART System.

Example of passive system:



User connect the wires on most left

- Brown to PWR-24VDC
- White to PWR-GND
- Yellow to HART-Loop+
- Green to HART-Loop-

All other connections are done from the factory.

This system being passive the only connection to be done is to connect power supply to Brown and White wire at the other end of the cable and 4-20mA reading device (i.e. PLC) to Green and Yellow wires. HART master connects over 250Ohms resistor in the path of the current – see section 2.2 Passive Loop.

There are two LED status indicators on the converter.

Green LED flashes every time the converter reads MODBUS RTU data from Arkon flowmeter.

Red LED flashes with every HART command.

Those LED can be used for troubleshooting – every time the data from HART are requested the Red LED flashes.

3. HART Communication

3.1. General

The converter is reading four values from Arkon Flow System flowmeter using MODBUS RTU RS485 channel and represent them in the HART (rev. 5) registers (PV, SV, TV, QV). All those values and connections are already preset in the converter and do not need to be changed.

The Percent of range and the analog value of Current of the Primary Variable (PV) are calculated according to flow actual value as follow:

- Percent of range = $\left(\frac{PV - Lower_Range}{Upper_Range - Lower_Range} \right) \times 100\%$
- Current = $(Percent_of_Range \times 0.16) + 4.00 \Rightarrow Range (4.00 \text{ to } 20.0 \text{ mA})$

Range values and sensor limits for primary variable are set as fixed according to Qn of given size of the flowmeter. Any change of sensor limits please consult with technical support.

DN	Q _N [m ³ /hr]	DN	Q _N [m ³ /hr]	DN	Q _N [m ³ /hr]	DN	Q _N [m ³ /hr]
10	0,8	65	36,0	300	800,0	800	5000,0
15	2,0	80	50,0	350	1000,0	900	6000,0
20	3,2	100	80,0	400	1300,0	1000	8000,0
25	5,0	125	150,0	450	1700,0		
32	8,0	150	200,0	500	2000,0		
40	13,0	200	300,0	600	3000,0		
50	20,0	250	500,0	700	4000,0		

Note: The absolute maximum of upper limit is 4*Qn, the absolute minimum is 0m³/hr

3.2. Registers and Commands

The HART commands consist of three groups: "Universal", "Common-Practice" and "Device-specific" commands and are numbered 0 – 255.

"Universal Commands" are in the range 0 to 30.

"Common-Practice Commands" are in the range 32 to 126.

"Device-Specific Commands" are in the range 128 to 253.

3.2.1. Universal commands

Command Number and Function	Data in Command	Data in reply	Response code	Comment
0 Read unique identifier	None	Byte 0 "254" (expansion) Byte 1 Manufacturer ID Byte 2 Mfr. Device. Type Byte 3 Number of preamble Byte 4 Universal command revision Byte 5 transm. Specific cmd rev Byte 6 software revision Byte 7 hardware revision Byte 8 device function flag Byte 9-11 Device ID number	0 No command error	Fieldbus International =0xA0 Used for long address, Hydro instrument = 0x7C Used for long address Default 5, Universal cmd 5 Dev Specific 1 Dev Application software rev 1 HART module rev. Multisensor device = No , EEPROM control = No -> 0 Serial number
1 Read PV	None	Byte 0 PV unit code Byte 1-4 Primary variable F	0 No command error	Read as Flow from Arkon Flowmeter. Read as Float value in m ³ /hr
2 Read Current & % of range	None	Byte 0-3 current (mA) F Byte 4-7 % of range F	0 No command error	Calculated for PV value
3 Read Current & four variables	None	Byte 0-3 Current Value F Byte 4 PV unit code (19 = m ³ /hr) F Byte 5-8 PV (Flow in m ³ /hr) F Byte 9 SV unit Code (43 = m ³) F Byte 10-13 SV (Total+ in m ³) F Byte 14 TV unit Code (43 = m ³) F Byte 15-18 TV (Total- in m ³) F Byte 19 QV unit Code (32 = °C) F Byte 20-23 QV (Temperature) F	0 No command error	
11 Read Uniq id associated with tag	Byte 0-5 TAG (8 characters)	Same as Command 0	0 No command error	
12 Read message	None	Byte 0-23 message	0 No command error	
13 Read tag descriptor, date	None	Byte 0-5 Tag A Byte 6-17 descriptor A Byte 18-20 date D	0 No command error	
14 Read PV sensor info.	None	Byte 0-2 Sensor serial number Byte 3 Unit code for sensor limits Byte 4-7 Upper sensor limit F Byte 8-11 Lower sensor limit F Byte 12-15 Minimum span F	0 No command error	
15 Read PV output information	None	Byte 0 Alarm select code Byte 1 Transfer code Byte 2 Range values unit code Byte 3-6 Upper range value F Byte 7-10 Lower range value F Byte 11-14 Damping value (sec) F Byte 15 Write protect code Byte 16 Private-label distributor code	0 No command error	250 = Not Used 0 = Always linear PV unit code Register 40007 = Upper range Register 40005 = Lower range 250 Not Used = Damping value 0 No write protect mode supported. 255 No distributor code
16 Read final Assembly number	None	Byte 0-2 final assembly number	0 No command error	
17 Write message	Byte 0-23 message A	As in command	0 No command error	
18 Write tag, descriptor and date	Byte 0-5 Tag A Byte 6-17 Descriptor. A Byte 18-20 Date D	As in command	0 No command error	
19 Write final assembly number	Byte 0-2 Final assembly number	As in command	5 Too few data bytes 16 Access restricted	

A = ASCII string (packed 4 characters per 3 bytes) – valid ASCII codes 32-96

D = Date(day, month, year –1990)

F = Floating point (4 bytes IEEE 754)

For common practice and device specific commands please contact technical support.

4. Warranty

The warranty conditions are covered by Arkon Flow Systems, s.r.o. Terms & Conditions of Sale and by Arkon Flow Systems, s.r.o Return Regulations and Warranty Conditions. The Arkon Flow Systems, s.r.o Terms & Conditions of Sale and the Arkon Flow Systems, s.r.o Return Regulations and Warranty Conditions are an integral part of the Resellers contract and of any Order Confirmation. Please see your Resellers contract or www.arkon.co.uk; Support section. The Warranty sheet is part of the Packing note of any new goods sent. For the claim or return procedure, please consult our web site www.arkon.co.uk or call the Arkon Flow Systems, s.r.o sales office.

4.1. Contact



Technical support: support@arkon.co.uk
Skype: support.arkon

Sales office: office@arkon.co.uk

Office hours:
8:30 – 18:00 (GMT+1)

Direct technical support:
8:00 – 17:00 (GMT+1)