Technical Note
00840-0100-4662, Rev AA
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HART to Modbus Converter, HMC

1.1 Rosemount 8732E magnetic flow transmitter with HMC:

Figure 1-1. Terminal block connections.

Step 1:

Supply 12-30 V_{dc} power to the positive (+) and negative (-) terminals on the HMC module. Ensure the red and black wire ends remain connected.

Step 2:

Connect Modbus RTU communication wires to MA and MB terminals on the HMC. Modbus Parameters can be configured via HART message field in 8732E.

Parameter	Default Value	Configurable Values
Baud Rate	9600	1200, 2400, 4800, 9600, 19200
Start Bits(1)	One	One
Data Bits (1)	Eight	Eight
Parity	None	None, Odd, Even
Stop Bits	One	One or Two
Address range	246	1-255

(1)Start Bits and Data Bits cannot be changed.

EMERSON
Process Management

Connect HART hand held communicator or HART modem directly to the HMC HART terminals.

There is sufficient resistance built into the HMC for HART communication. No additional resistance is required.

Full Rosemount 8732E configuration can be made through the standard HART communication menus.

Modbus parameter configuration is made via the HART Message field of the Rosemount 8732E.

1.2 Here is an example HART message:

HMC A44 B4800 PO S2

HMC: These three letters are used for safety and will eliminate the risk of changing the configuration data by mistake.

A44: A indicates that the following number is the new Address (address 44). Leading zeros are not needed.

B4800: B indicates that the following number is the new Baud rate (1200, 2400, 4800, 9600, 19200).

PO: P identifies the following letter as Parity type (O = odd, E = even, and N = none).

S2: S indicates that the following figure is the number of Stop bits (1 = one, 2 = two).

Only values that differ from the current values need to be included. For example, if only the address is changed, the following text string is written into the Rosemount 8732E HART Message Area: HMC A127.

To return HMC to default configuration, use only HMC in message field

After making Modbus parameter change, disconnect HART modem and wait 60 seconds to ensure Modbus configuration is complete.

Note
Modbus communication is disabled during Rosemount 8732E configuration.

When using Modbus RTU, the registers to receive status and variables must be correctly configured in the host system.

The transmission of single-precision (4 bytes) IEEE 754 floating point numbers can be rearranged in different byte orders specified by the Floating Point Format Code. The format code information, stated for each Remote Terminal Unit (RTU) respectively, specifies which registers to poll from the Rosemount 8732E transmitter in order for the RTU to correctly interpret floating point numbers. The byte transmission order for each format code is demonstrated in the Table below.

Format code	Byte transmission order	Description
0	[AB] [CD]	Straight word order, most significant byte first
1	[CD] [AB]	Inverse word order, most significant byte first
2	[DC] [BA]	Inverse word order, least significant bye first
3	[BA] [DC]	Straight word order, least significant byte first

Note
Some Modbus hosts cannot read the information described here using Input Registers (Modbus function code 4). The Input Register information can also be read using Holding Register (Function code 3). In this case, Input Register number + 5000 are used as Holding Register number.

Between host system and device, it is recommended to use 60 seconds or less between polls, and three retries.

1.3 Input registers (Modbus function code 4)

1.3.1 Registers for floating point format code 0

Register name	Register number	Note
Slave 1 Status	2000	Bit information in bitfield. Bit 0: Invalid Measurement Slave 1 PV. Bit 1: Invalid Measurement Slave 1 SV. Bit 2: Invalid Measurement Slave 1 TV. Bit 3: Invalid Measurement Slave 1 FV. Bit 14: HART bus busy (slave in burst or other master present). Bit 15: HTM Task not running (option not available). Note: Bit 1-3 is set when Invalid Measurement of Slave 1 Non PV, i.e. all three bits are set simultaneously.
Slave 1 PV	2002	Primary variable from slave 1 represented in IEEE 754 format, using Floating Point Format Code 0.
Slave 1 SV	2004	Secondary variable from slave 1 represented in IEEE 754 format, using Floating Point Format Code 0.
Slave 1 TV	2006	Tertiary variable from slave 1 represented in IEEE 754 format, using Floating Point Format Code 0.
Slave 1 FV (QV)	2008	Fourth variable from slave 1 represented in IEEE 754 format, using Floating Point Format Code 0.
Slave 2 data	2010-2018	Same data as for Slave 1.
Slave 3 data	2020-2028	Same data as for Slave 1.
Slave 4 data	2030-2038	Same data as for Slave 1.
Slave 5 data	2040-2048	Same data as for Slave 1.

1.3.2 Registers for floating point format code 1

Register name	Register number	Note
Slave 1 Status Conf	1300	Bit information in bitfield. Bit 0: Invalid Measurement Slave 1 PV. Bit 1: Invalid Measurement Slave 1 Non PV. Bit 2: Invalid Measurement Slave 1 Non PV. Bit 3: Invalid Measurement Slave 1 Non PV. Bit 14: HART bus busy (slave in burst or other master present). Bit 15: HTM Task not running (option not available). Note: Bit 1-3 is set when Invalid Measurement of Slave 1 Non PV, i.e. all three bits are set simultaneously.
Slave 1 PV Conf	1302	Primary variable from slave 1 represented in IEEE 754 format, using Floating Point Format Code register.
Slave 1 SV Conf	1304	Secondary variable from slave 1 represented in IEEE 754 format, using Floating Point Format Code register.
Slave 1 TV Conf	1306	Tertiary variable from slave 1 represented in IEEE 754 format, using Floating Point Format Code register.
Slave 1 FV Conf	1308	Fourth variable from slave 1 represented in IEEE 754 format, using Floating Point Format Code register.
Slave 2 data	1310-1318	Same data as for Slave 1.
Slave 3 data	1320-1328	Same data as for Slave 1.
Slave 4 data	1330-1338	Same data as for Slave 1.
Slave 5 data	1340-1348	Same data as for Slave 1.

1.3.3 Registers for floating point format code 2

Register name	Register number	Note
Slave 1 Status	2100	Bit information in bitfield. Bit 0: Invalid Measurement Slave 1 PV. Bit 1: Invalid Measurement Slave 1 SV. Bit 2: Invalid Measurement Slave 1 TV. Bit 3: Invalid Measurement Slave 1 FV. Bit 14: HART bus busy (slave in burst or other master present). Bit 15: HTM Task not running (option not available). Note: Bit 1-3 is set when Invalid Measurement of Slave 1 Non PV, i.e. all three bits are set simultaneously.
Slave 1 PV	2102	Primary variable from slave 1 represented in IEEE 754 format, using Floating Point Format Code 2.
Slave 1 SV	2104	Secondary variable from slave 1 represented in IEEE 754 format, using Floating Point Format Code 2.
Slave 1 TV	2106	Tertiary variable from slave 1 represented in IEEE 754 format, using Floating Point Format Code 2.
Slave 1 FV (QV)	2108	Fourth variable from slave 1 represented in IEEE 754 format, using Floating Point Format Code 2.
Slave 2 data	2110-2118	Same data as for Slave 1.
Slave 3 data	2120-2128	Same data as for Slave 1.
Slave 4 data	2130-2138	Same data as for Slave 1.
Slave 5 data	2140-2148	Same data as for Slave 1.

1.3.4 Registers for floating point format code 3

Register name	Register number	Note
Slave 1 Status	2200	Bit information in bitfield. Bit 0: Invalid Measurement Slave 1 PV. Bit 1: Invalid Measurement Slave 1 SV. Bit 2: Invalid Measurement Slave 1 TV. Bit 3: Invalid Measurement Slave 1 FV. Bit 14: HART bus busy (slave in burst or other master present). Bit 15: HTM Task not running (option not available). Note: Bit 1-3 is set when Invalid Measurement of Slave 1 Non PV, i.e. all three bits are set simultaneously.
Slave 1 PV	2202	Primary variable from slave 1 represented in IEEE 754 format, using Floating Point Format Code 3.
Slave 1 SV	2204	Secondary variable from slave 1 represented in IEEE 754 format, using Floating Point Format Code 3.
Slave 1 TV	2206	Tertiary variable from slave 1 represented in IEEE 754 format, using Floating Point Format Code 3.
Slave 1 FV (QV)	2208	Fourth variable from slave 1 represented in IEEE 754 format, using Floating Point Format Code 3.
Slave 2 data	2210-2218	Same data as for Slave 1.
Slave 3 data	2220-2228	Same data as for Slave 1.
Slave 4 data	2230-2238	Same data as for Slave 1.
Slave 5 data	2240-2248	Same data as for Slave 1.

1.4 Alarm handling:

The output from the Modbus transmitter in case of an error (such as a field device malfunction) can be configured. The values for Modbus registers corresponding to PV, SV, TV, and QV will be changed accordingly (applicable registers in area 1300, 2000, 2100, and 2200).

Write HART Message field for HART address 1 device per table below:

Modbus RTU

String	Alarm output
HMC EN	Not a number (NaN), default
HMC EF	Freeze, hold last value
HMC EU-0.1	User defined value, -0.1 in this example

1.4.1 Useful information:

- Rosemount 8732E HART address = 1. Pre-configured at factory

  Damage to HMC will occur if Rosemount 8732E is HART address 0

  Up to 5 HART slaves can be used with one HMC

  HART address 1, 2, 3, 4 and 5 only

  HART address 1 message field configures HMC

- Analog power switch on electronics board = External.

  Damage to HMC will occur if Analog power switch is Internal

- HART variables from factory when HMC ordered with 8732E:

  PV = Flow

  SV = Net Total

  TV = Electrode Coating Value

  QV = Empty Pipe Value

- HART variables can be changed using HART communicator

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