Dynasonics®
Ultrasonic Flow Meters

Modbus RTU Communication Protocol

for UHC-120 Ultrasonic Thermal Energy Meter and FC-215 Heat Calculator

Badger Meter

HYB-UM-04745-EN-01 (September 2024)

User Manual

OVERVIEW

The Modbus RTU Module is designed for use with UHC-120 Ultrasonic Thermal Energy meter and FC-215 Heat Calculator to connect them to Modbus RTU network using EIA-485 channel. Modbus RTU can be wired on a single daisy chain network and be queried for totals, readings and diagnostic information. Power the module externally.

For further information on the proper installation of the meter or calculator, see the UHC-120 meter or FC-215 Heat Calculator user manual.

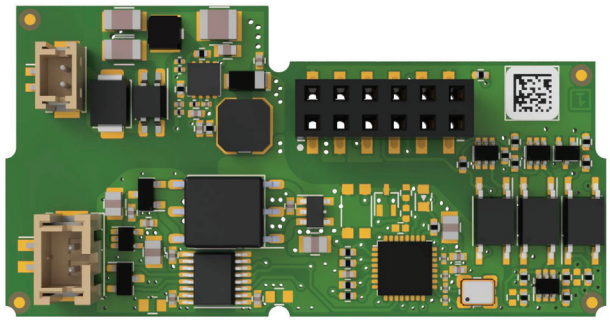

Figure 1: Modbus RTU board

SPECIFICATIONS

<table>
<tr><td rowspan="4">Wiring</td><td>Power supply</td><td>CN100: Polarity independent</td></tr>
<tr><td>EIA-485</td><td>CN101: B (+) and A (–)</td></tr>
<tr><td colspan="2"> 
<table>
<tr><td>CN100</td><td>±</td><td>±</td><td>B (+)</td><td>A (–)</td><td>CN101</td></tr>
</table></td></tr>
<tr><td></td><td></td></tr>
<tr><td rowspan="4">Power Supply</td><td>Connectors</td><td>CN100</td></tr>
<tr><td>Supply voltage</td><td>12…24V DC ± 10% (SELV power supply only</td></tr>
<tr><td>Polarity</td><td>Independent</td></tr>
<tr><td>Maximum power consumption</td><td>500 mW</td></tr>
<tr><td rowspan="4">Communication Interface</td><td>Connectors</td><td>CN101</td></tr>
<tr><td>Communication protocol</td><td>Modbus RTU</td></tr>
<tr><td>Channel</td><td>EIA-485 (galvanically isolated)</td></tr>
<tr><td>Baud rate (bits per second)</td><td>1200, 2400, 4800, 9600, 14400, 19200, 38400, 56000, 57600, 115200</td></tr>
<tr><td>Data format</td><td>Data bits 8
Parity bit even, odd, none</td></tr>
<tr><td rowspan="2">Environmental Conditions</td><td>Ambient operating temperature</td><td>0…55° C</td></tr>
<tr><td>Storage temperature</td><td>–25…70° C</td></tr>
<tr><td>Communication Setup</td><td colspan="2">When 24V DC power is applied to Modbus module, the meter initially displays the setup screens in loop 6.
Mod 9
Id 1
br 9600
dF 81n
Ur 600
ASId 0
As an alternative, connect to the meter over Modbus to set the slave ID at register 41001.</td></tr>
</table>

MODBUS DATA REGISTER LIST

Designation	Modbus Register	Modbus Register Type	Modbus Address	Data Value Range	Unit	Read only (RO) Read/write (R/W)
Energy	30001 or 40001	Input or Holding	0	int32	[1]	RO
Energy (Unit factor)	30003 or 40003	Input or Holding	2	uint16	-	RO
Energy (Unit)	30004 or 40004	Input or Holding	3	4 char ASCII	-	RO
Energy (Float)	30006 or 40006	Input or Holding	5	IEEE754	[1]	RO
Cooling Energy	30008 or 40008	Input or Holding	7	int32	[1]	RO
Cooling Energy (Unit factor)	30010 or 40010	Input or Holding	9	uint16	-	RO
Cooling Energy (Unit)	30011 or 40011	Input or Holding	10	4 char ASCII	-	RO
Cooling Energy (Float)	30013 or 40013	Input or Holding	12	IEEE754	[1]	RO
Tariff 1 Energy	30015 or 40015	Input or Holding	14	int32	[1]	RO
Tariff 1 Energy (Unit factor)	30017 or 40017	Input or Holding	16	uint16	-	RO
Tariff 1 Energy (Unit)	30018 or 40018	Input or Holding	17	4 char ASCII	-	RO
Tariff 1 Energy (Float)	30020 or 40020	Input or Holding	19	IEEE754	[1]	RO
Tariff 2 Energy	30022 or 40022	Input or Holding	21	int32	[1]	RO
Tariff 2 Energy (Unit factor)	30024 or 40024	Input or Holding	23	uint16	-	RO
Tariff 2 Energy (Unit)	30025 or 40025	Input or Holding	24	4 char ASCII	-	RO
Tariff 2 Energy (Float)	30027 or 40027	Input or Holding	26	IEEE754	[1]	RO
Volume	30029 or 40029	Input or Holding	28	int32	[2]	RO
Volume (Unit factor)	30031 or 40031	Input or Holding	30	uint16	-	RO
Volume (Unit)	30032 or 40032	Input or Holding	31	4 char ASCII	-	RO
Volume (Float)	30034 or 40034	Input or Holding	33	IEEE754	l	RO
Power	30050 or 40050	Input or Holding	49	int32	-	RO
Power (Unit factor)	30052 or 40052	Input or Holding	51	uint16	-	RO
Power (Unit)	30053 or 40053	Input or Holding	52	4 char ASCII	-	RO
Power (Float)	30055 or 40055	Input or Holding	54	IEEE754	W	RO
Flow	30057 or 40057	Input or Holding	56	int32	-	RO
Flow (Unit factor)	30059 or 40059	Input or Holding	58	uint16	-	RO
Flow (Unit)	30060 or 40060	Input or Holding	59	4 char ASCII	-	RO
Flow (Float)	30062 or 40062	Input or Holding	61	IEEE754	l/h	RO
Forward temperature (Fixed)	30064 or 40064	Input or Holding	63	int16	1 °C	RO
Forward temperature (Float)	30066 or 40066	Input or Holding	65	IEEE754	°C	RO
Return temperature (Fixed)	30068 or 40068	Input or Holding	67	int16	1 °C	RO
Return temperature (Float)	30070 or 40070	Input or Holding	69	IEEE754	°C	RO
Temperature difference (Fixed)	30072 or 40072	Input or Holding	71	int16	0.01 °K	RO
Temperature difference (Float)	30074 or 40074	Input or Holding	73	IEEE754	°K	RO
Heat Meter Serial Number (Fixed)	30076 or 40076	Input or Holding	75	uint32	-	RO
Heat Meter Serial Number (ASCII)	30078 or 40078	Input or Holding	77	8 char ASCII	-	RO
Error Code	30082 or 40082	Input or Holding	81	uint32	-	RO
Modbus Slave ID [4]	41001	Holding	1000	uint16	-	R/W
Update Rate Data from Meter	41002	Holding	1001	uint16	1 s	R/W
Baud Rate [5]	41003	Holding	1002	uint32	-	R/W
Data Bits [5]	41005	Holding	1004	uint16	-	R/W
Parity[5, 6]	41006	Holding	1005	uint16	-	R/W
Stop Bits [5]	41007	Holding	1006	uint16	-	R/W
Automatic Slave ID [7]	41008	Holding	1007	uint16	-	R/W
Module Serial Number	32001	Input	2000	uint64	-	RO
Module Model Number	32005	Input	2004	uint32	-	RO
Firmware Version [3]	32007	Input	2006	uint16	-	RO
Firmware Revision	32008	Input	2007	uint32	-	RO

[1] Specified registers can hold data present energy in different units. Data unit is visible in (Unit) register. Available units for the register are MWh, MBTU, GJ or Gcal.

[2] Specified registers can hold data present volume in different units. Data unit is visible in (Unit) register. Available units for the register are ml, l or m3.

[3] Higher byte of the register is major number of firmware version (0x##00). Lower byte of the register is minor number of firmware version (0x00##).

[4] This register is Modbus address of the module in the range 1-247 (01-F7 hex).

[5] Only the values corresponding to the data format of the serial EIA-485 interface should be set in the registers (see section "Communication interface").

[6] This register is set by the ASCII char value – 'E' for Even parity (69 dec, 45 hex), 'O' for Odd parity (79 dec, 4F hex) and 'N' for None parity (78 dec, 4E hex).

[7] This register with value 1 enable setting Modbus Slave ID based on heat meter primary M-Bus address. To disable set value 0.

ERROR CODES

Error Bit	Error Description	Trigger for Error	Effect
0	Temperature Sensor 1: Cable Break	—	No calculation of energy value.
1	Temperature Sensor 1: Short Circuit		
2	Temperature Sensor 2: Cable Break		
3	Temperature Sensor 2: Short Circuit		
4	Error at Flow Measurement System	Depends on used Measurement System: Coil Error No Water	No calculation of volume and energy values.
5	Electronic Defect	Checksum in FRAM has an unexpected value.	—
6	Reset	Restart of Device has been done: by watchdog (only on FW or HW error) by power off / power on	—
7	Low Battery	Battery voltage is equal to or less than 2.5 V: voltage level is detected on everyday change	—
8…15	Reserved	—	—
16	No readout from heat meter	Communication with the meter is not possible.	Delivered data on the Modbus is not updated with last data from meter and therefore invalid.
17…31	Reserved	—	—

Meaning of the error bit state:

If error bit is set to 1, the corresponding error is active.

If error bit is set to 0, the corresponding error is not active. Reserved error bits are always 0.

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