HUR Series Modbus RTU Remote I/O Devices User Manual

1. About HUR Series Modbus RTU Remote I/O Devices

HUR Series Modbus RTU Remote Input/Output (I/O) Devices are designed for facilities of rugged industry and infrastructure. HUR Series Modbus RTU Remote I/O Devices are tailored to perform various features such as wide temperature, wide range power input range... etc. HUR Series Modbus RTU Remote I/O Devices offers different I/O combinations, which provide greater flexibility and are compatible with many different applications that makes them the perfect choice for establishing a cost-effective remote I/O system.

2. Hardware Features

HUR Series Modbus RTU Remote I/O Devices has several versions with different I/O options such as:

- [8 Channel 5-275V AC-DC, 100mA Digital Optocoupler Output](#)

- [8 Channel Digital 5Amps 250VAC/30VDC Relay Output](#)

- [8 Channel 12-275V AC-DC, 60mA Digital Optocoupler Input](#)

- [8 Channel 0-10V and 0-20mA Selectable Analog Input](#)

- [5 Channel 4-20mA Analog Output](#)

All versions can be selected with 100 - 240V AC (120 – 370V DC), 50Hz to 60Hz AC input or 5-48V (max. 60V) DC wide range power input. HUR Series Modbus RTU Remote I/O Devices communicate in Modbus RTU protocol with 115200 8N1 data type over standard RS485 serial line.

2.1 Features

- Device Address changeable with Modbus RTU commands

- Easy to Monitor Device Parameters such as Device Up Time, Modbus RTU read counter etc. with Modbus Commands

- Supports Modbus RTU Protocol over RS485 with 115200 8N1 Data Type

- Easy to Use Test and Parameter Change Software

- Easy Firmware Upgrade over Serial Line

- AC or DC wide range power options

- Wide operating temperature range from -30 to 70 °C AC and -40 to 85 °C DC power input versions

- Rugged Metal IP-40 housing design

- DIN-Rail mounting

2.2 Extra Features for Output Models

- Output configuration can be defined by user for restart
- Output values can be saved and applied during auto restart

3. Installation

Each device has a Din-Rail kit on rear panel. The Din-Rail kit helps device to fix on the Din-Rail. Slant the switch and mount the metal spring to Din-Rail.
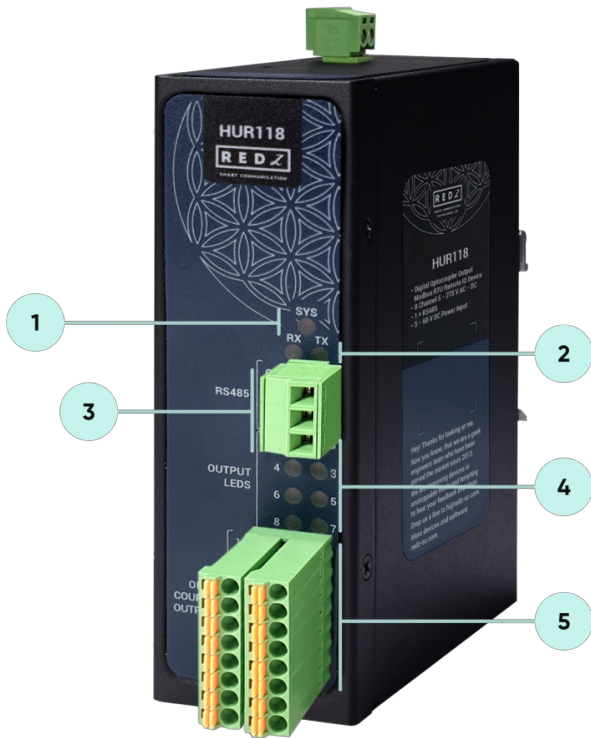

Then Push the switch toward the Din-Rail until you heard a "click" sound.

4. Front Panel Description

4.1 HUR118 & HUR218

1. System LED: Flashes during normal operation.

2. Activity LEDs

   Tx LED: Flashes when the device sends Modbus RTU packages.

   Rx LED: Flashes when the device receives Modbus RTU packages.

3. Terminal Connector for 2 wire RS485 connection and GND.
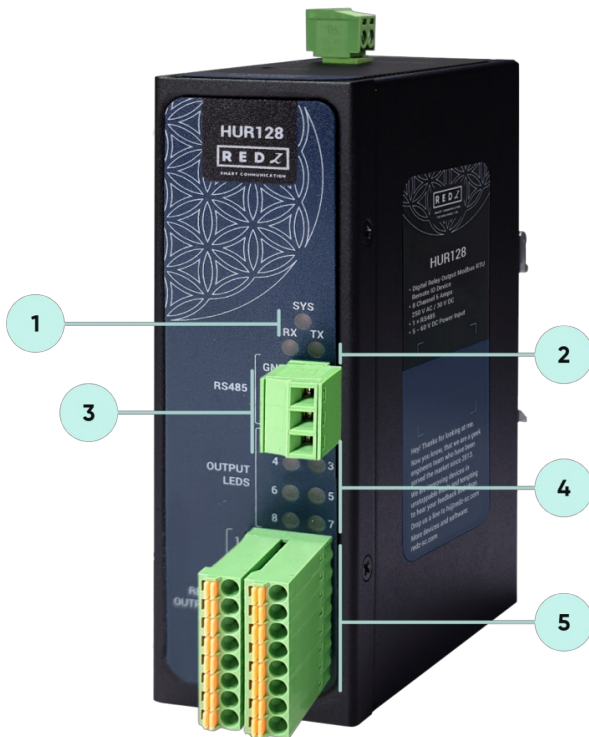
Pin Number	Description
1	GND
2	B

3	A

4. Output Status LEDs: Shows which pin is ON (conducting) and OFF (cut off) for Digital Outputs

LED Number	LED Status and Description
1	
2	
3	
4	ON: Output ON, circuit is closed and running
5	
6	OFF: Output is OFF, circuit is open and cut off
7	
8	

5. Output Channels: 8 Channel Output terminals and polarity is not important. 2 pins for each connection and total 16 connection pins. 5-275V AC-DC, 100mA Digital Optocoupler Outputs.

4.2 HUR128 & HUR228

1. System LED: Flashes during normal operation.

2. Activity LEDs

   Tx LED: Flashes when the device sends Modbus RTU packages.

   Rx LED: Flashes when the device receives Modbus RTU packages.

3. Terminal Connector for 2 wire RS485 connection and GND.

| Pin Number	Description
1	GND
2	B

3	A

4. Output Status LEDs: Shows which pin is ON (conducting) and OFF (cut off) for Digital Outputs.

LED Number	LED Status and Description
1	
2	
3	ON: Output ON, circuit is closed and running
4	
5	OFF: Output is OFF, circuit is open and cut off
6	
7	
8	

5. Output Channels: 8 Channel Output terminals and polarity is not important. 2 pins for each connection and total 16 connection pins. Maximum 5 Amperes 250VAC/30VDC for each channel.

4.3 HUR318 & HUR418
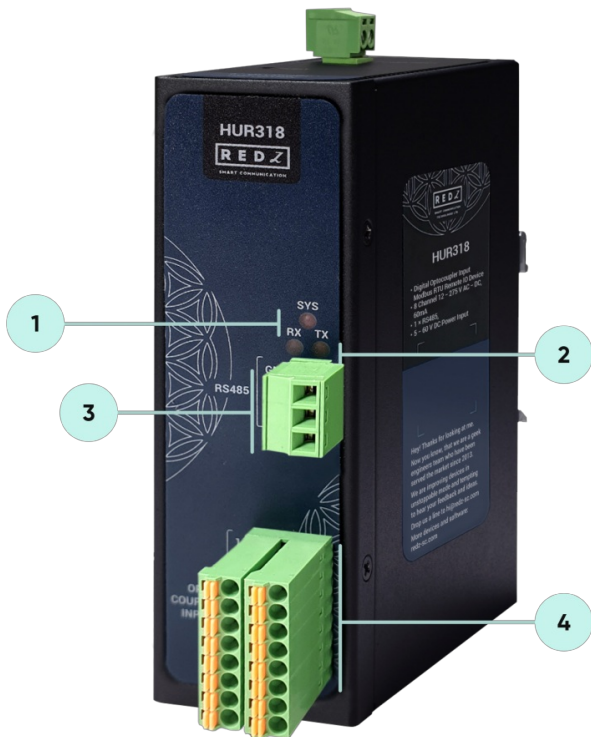
1. System LED: Flashes during normal operation.

2. Activity LEDs

   Tx LED: Flashes when the device sends Modbus RTU packages.

   Rx LED: Flashes when the device receives Modbus RTU packages.

3. Terminal Connector for 2 wire RS485 connection and GND.

Pin Number	Description
1	GND
2	B
3	A

4. Input Channels: 8 Channel Input terminals and polarity is not important. 2 pins for each connection and total 16 connection pins. 12-275 AC-DC, 60mA Digital Optocoupler Inputs.

4.4 HUR518 & HUR618

1. System LED: Flashes during normal operation.

2. Activity LEDs

   Tx LED: Flashes when the device sends Modbus RTU packages.

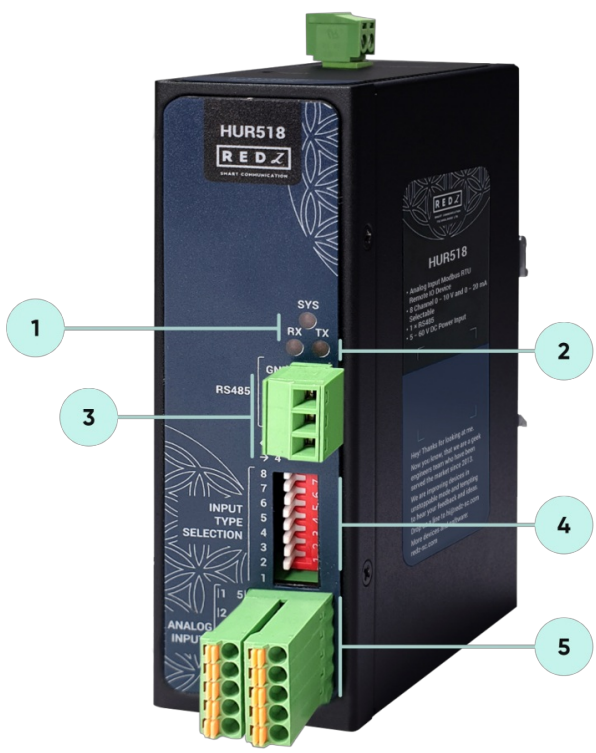   Rx LED: Flashes when the device receives Modbus RTU packages.

3. Terminal Connector for 2 wire RS485 connection and GND.

Pin Number	Description

1	GND
2	B
3	A

4. Operation Mode Selection Switches for Analog Inputs: 8 pin Switch to select operation mode of each Analog Input either 0-10V or 0-20mA.

Switch Number	Switch Status and Description
1	
2	
3	
4	Switch Position ON: 4-20mA analog input expected
5	Switch Position OFF: 0-10V analog input expected
6	
7	
8	

5. Input Channels: 8 Channel Input terminals and polarity is important. All inputs references to Common point. 2 Common points and 8 Analog Inputs total 10 connection pins. 0-10V and 0-20mA Individually Selectable Analog Inputs.

4.5 HUR555 & HUR655

1. System LED: Flashes during normal operation.

2. Activity LEDs

   Tx LED: Flashes when the device sends Modbus RTU packages.

   Rx LED: Flashes when the device receives Modbus RTU packages.

3. Terminal Connector for 2 wire RS485 connection and GND.

Pin Number	Description
1	GND
2	B
3	A

4. Output Channels: 5 Channel Output terminals and polarity is important. 2 pins for each connection and total 10 connection pins. 4-20mA Analog Outputs designed for 24V 250ohm load or 12V 125ohm load.
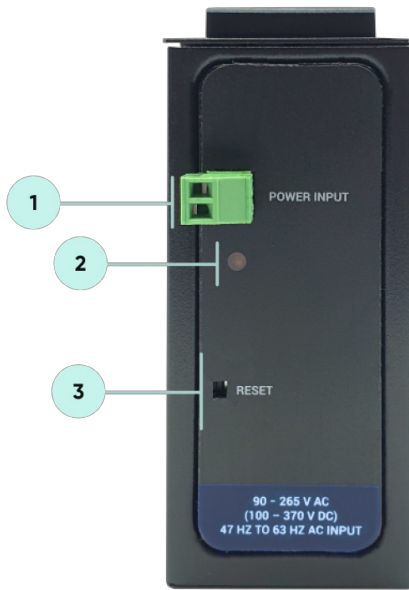
5. Top Panel Description

5.1 HUR118 & HUR128 & HUR318 & HUR518 & HUR555
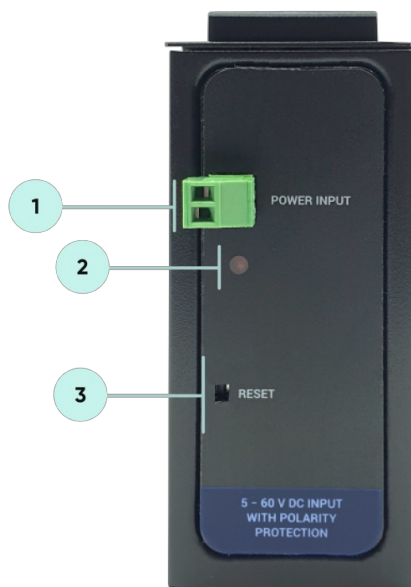
1. Power Input DC: 5-48V (max. 60V) DC. Polarity protected so that the power input can be connected in any direction.

2. Power LED: Turns ON when there is power in device.

3. Reset Button to reset device.

5.2 HUR218 & HUR228 & HUR418 & HUR618 & HUR655

1. Power Input AC: 100 – 240V AC (120 – 370V DC), 50Hz to 60Hz AC input

2. Power LED: Turns ON when there is power in device.
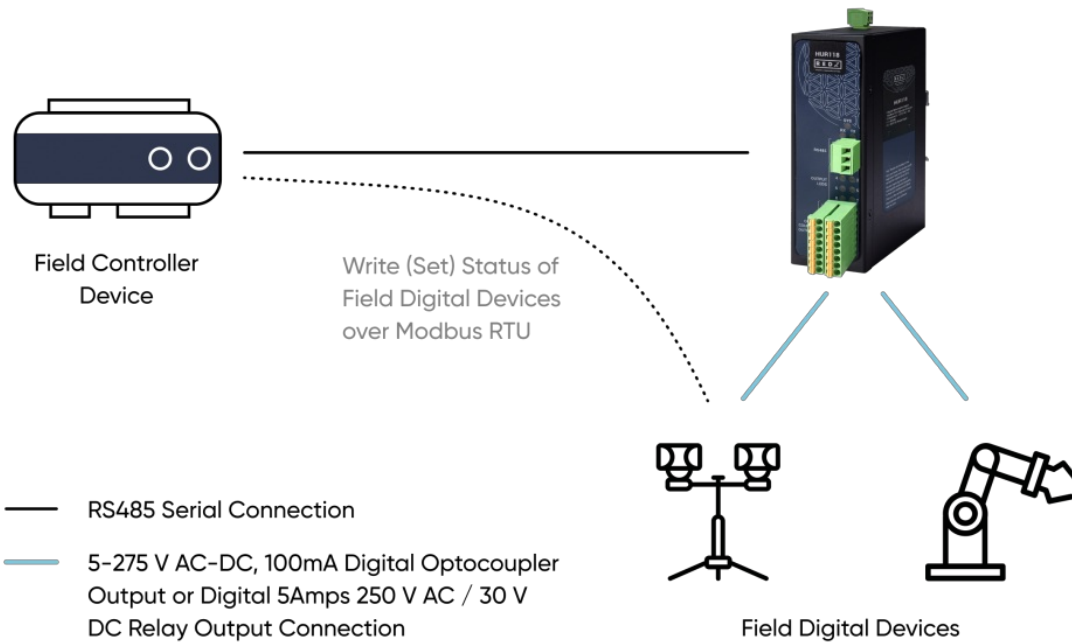
3. Reset Button to reset device.

6. Usage Scenarios and Connection Diagrams

HUR Series Modbus RTU Remote I/O Devices can be used in different scenarios. Usages are not limited to that examples and user may create their own usage scenario.

6.1 Scenario 1: Write/Set Status of Digital Field Devices

HUR Series Modbus RTU Remote I/O Devices can be connected to Digital field devices and Field Control or Central Software Control System can write parameters such as Turn ON a light or Turn on a valve. Communication protocol will be Modbus RTU. Outputs will be 5-275V AC-DC, 100mA Digital Optocoupler Output or 5Amperes 250VAC/30VDC Relay Output. Following devices can be used for this application:
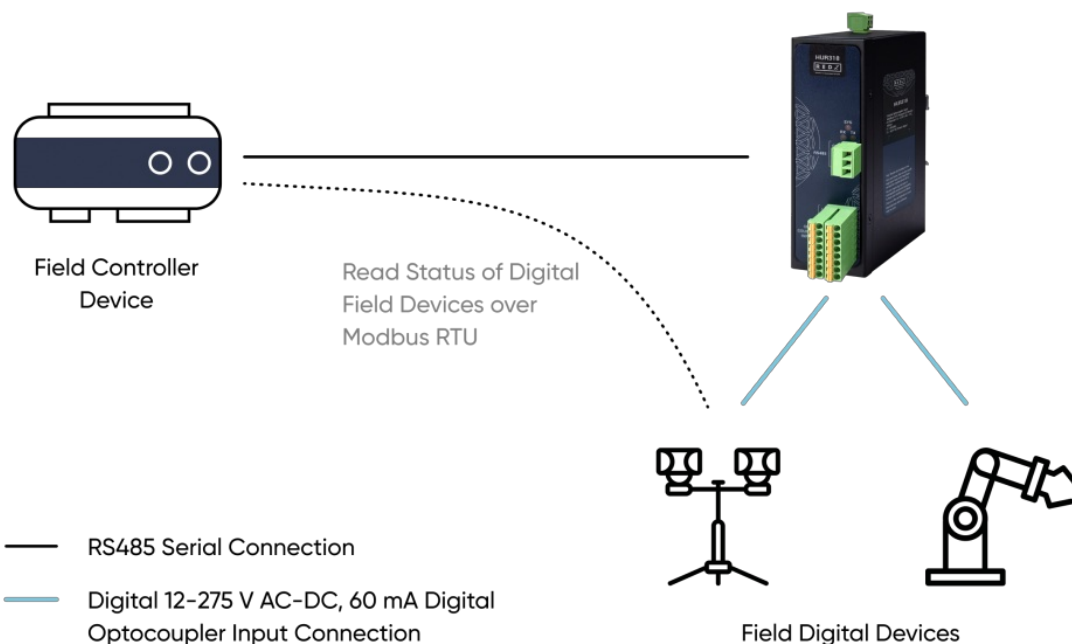
- HUR118 and HUR218 with 8 Channel 5-275V AC-DC, 100mA Digital Optocoupler Output

- HUR128 and HUR228 with 8 Channel Digital 5Amps 250VAC/30VDC Relay Output

Field Controller Device

Write (Set) Status of Field Digital Devices over Modbus RTU

—— RS485 Serial Connection

—— 5-275 V AC-DC, 100mA Digital Optocoupler Output or Digital 5Amps 250 V AC / 30 V DC Relay Output Connection

Field Digital Devices

6.2 Scenario 2: Read Status of Digital Field Devices

HUR Series Modbus RTU Remote I/O Devices can be connected to Digital field devices and Field Control or Central Software Control System can read status of the field devices such as status of light or status of a circuit breaker. Communication protocol will be Modbus RTU. Inputs will be 12-275V AC-DC, 60mA Digital Optocoupler Input. Following devices can be used for this application:

- HUR318 and HUR418 with 8 Channel 12-275V AC-DC, 60mA Digital Optocoupler Input

Field Controller Device

Read Status of Digital Field Devices over Modbus RTU

—— RS485 Serial Connection

—— Digital 12-275 V AC-DC, 60 mA Digital Optocoupler Input Connection

Field Digital Devices

6.3 Scenario 3: Read Analog Field Devices

HUR Series Modbus RTU Remote I/O Devices can be connected to Analog field devices and Field Control or Central Software Control System can read status of the field devices such as status temperature sensors or pressure sensors. Communication protocol will be Modbus RTU. Inputs will be 0-10V and 0-20mA Selectable Analog Input. Following devices can be used for this application:
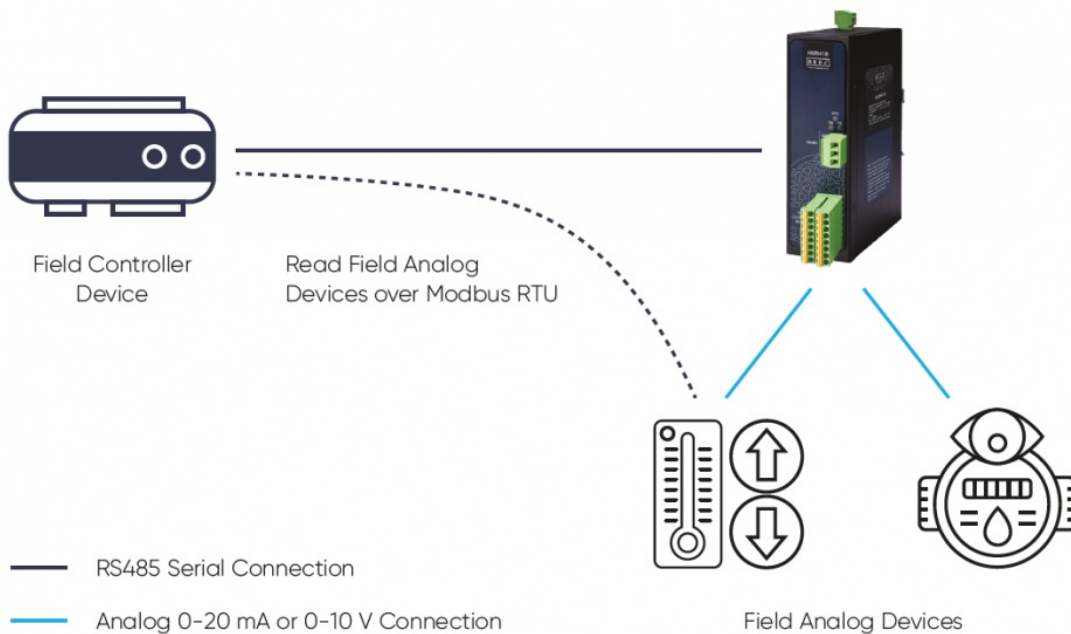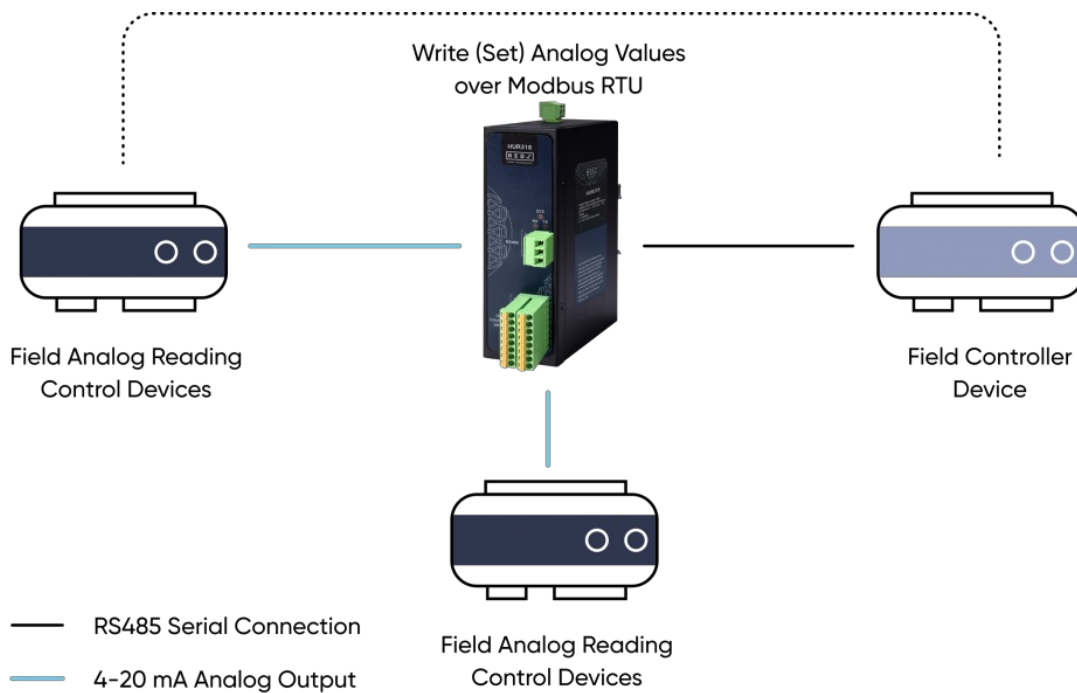
- HUR518 and HUR618 with 8 Channel 0-10V and 0-20mA Selectable Analog Input

Field Controller Device

Read Field Analog Devices over Modbus RTU

──── RS485 Serial Connection

──── Analog 0-20 mA or 0-10 V Connection

Field Analog Devices

6.4 Scenario 4: Write Analog Values for Field Control Devices

HUR Series Modbus RTU Remote I/O Devices can be connected to field control devices and Field Main Control or Central Software Control System can write Analog Values for that secondary field control devices such as duplicating or generating an analog value like flow of a fluid value for a field control device. Communication protocol will be Modbus RTU. Outputs will be 4-20mA Analog Output. Following devices can be used for this application:

- HUR555 and HUR655 with 5 Channel 4-20mA Analog Output

Write (Set) Analog Values
over Modbus RTU

Field Analog Reading
Control Devices

Field Controller
Device

Field Analog Reading
Control Devices

— RS485 Serial Connection

— 4-20 mA Analog Output

6.5 Scenario 5: Read Analog Field Devices with Modbus TCP Protocol Over TCP/IP Network

REDZ CKL Series Modbus, Serial to Ethernet Gateways can connect field serial device to TCP/IP Network to control that devices remotely with a software on a server or with a TCP/IP device. For example, with CKL Series Modbus, Serial to Ethernet Gateways, users can connect HUR Series Modbus RTU Remote I/O Devices and create a system to read that devices remotely.

CKL Gateway devices in field configured for Transparent Communication and act as TCP Server to Serial Device Gateway. HUR Series Modbus RTU Remote I/O Devices are connected over RS485 serial line and communication data type and baud rate fixed.

HUR Series Modbus RTU Remote I/O Devices can be connected to Analog field devices and Field Control or Central Software Control System can read status of the field devices such as status temperature sensors or pressure sensors.

Communication protocol will be Modbus TCP thanks to CKL connection.

Inputs will be 0-10V and 0-20mA Selectable Analog Input. Following devices can be used for this application:

- CKL154: Modbus, Serial to Ethernet Gateway, 2x 10/100 T(x) ETH ports, 1 x RS232 & 1 x RS485, 5-60V DC Power Input

- CKL254: Modbus, Serial to Ethernet Gateway, 2x 10/100 T(x) ETH ports, 1 x RS232 & 1 x RS485, 90 - 265V AC (100 – 370V DC), 47Hz to 63Hz AC Power Input

- CKL655: Modbus, Serial to Ethernet Gateway, 2x 10/100 T(x) ETH ports + 1 x BPL (Broadband

Power Line) Link, 1 x RS232 & 1 x RS485, 3 Phase AC Power Input, 110V–240V/50-60Hz

(User needs to create a Broadband Powerline Network with REDZ devices by using CKL or BSB series in order to use that model)

- HUR518 and HUR618 with 8 Channel 0-10V and 0-20mA Selectable Analog Input
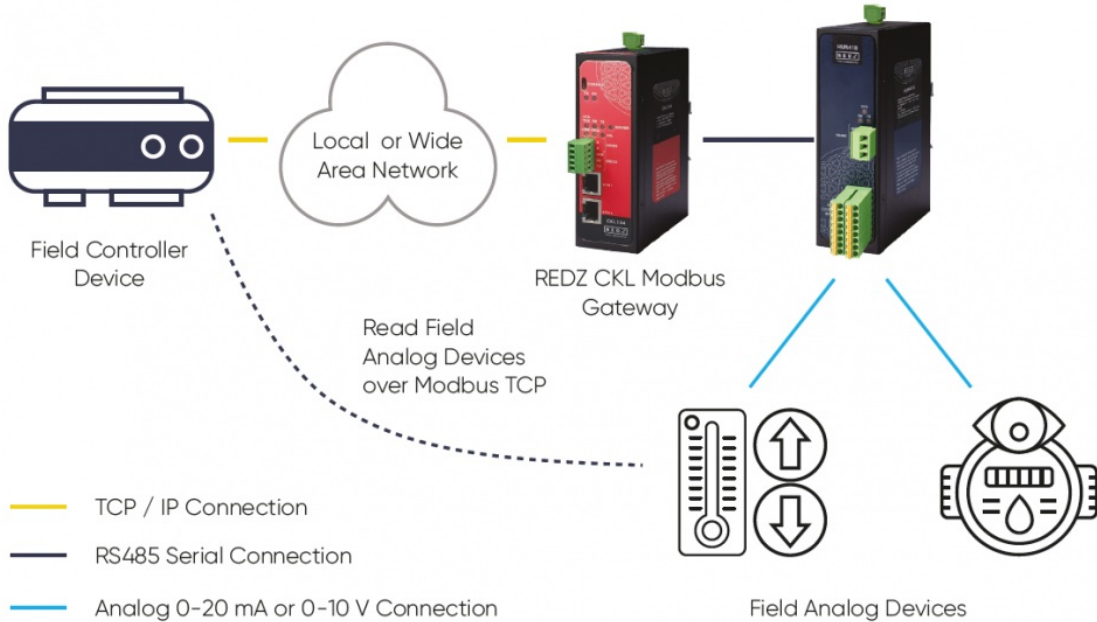
6.6 Scenario 6: Read Status of Digital Field Devices Over LoRa RF Wireless Network

REDZ TLM Series LoRa Based RF Gateways can link RS232 and/or RS485 serial devices and create a network over RF. For example, with TLM Series LoRa Based RF Gateways users can connect HUR Series Modbus RTU Remote I/O Devices with Field Control Devices over RF network and create wireless automation.

TLM act as Serial to LoRa RF Gateway configured as Client Mode (Client mode suggested to use in serial communication since TCP server capabilities will not be used), Serial communication is enabled and settings are done based on field device.

HUR Series Modbus RTU Remote I/O Devices can be connected to Digital field devices and Field Control or Central Software Control System can read status of the field devices such as status of light or status of a circuit breaker.

Communication protocol will be Modbus RTU over Lora RF Network thanks to TLM connection.

Inputs will be 12-275V AC-DC, 60mA Digital Optocoupler Input. Following devices can be used for this application:
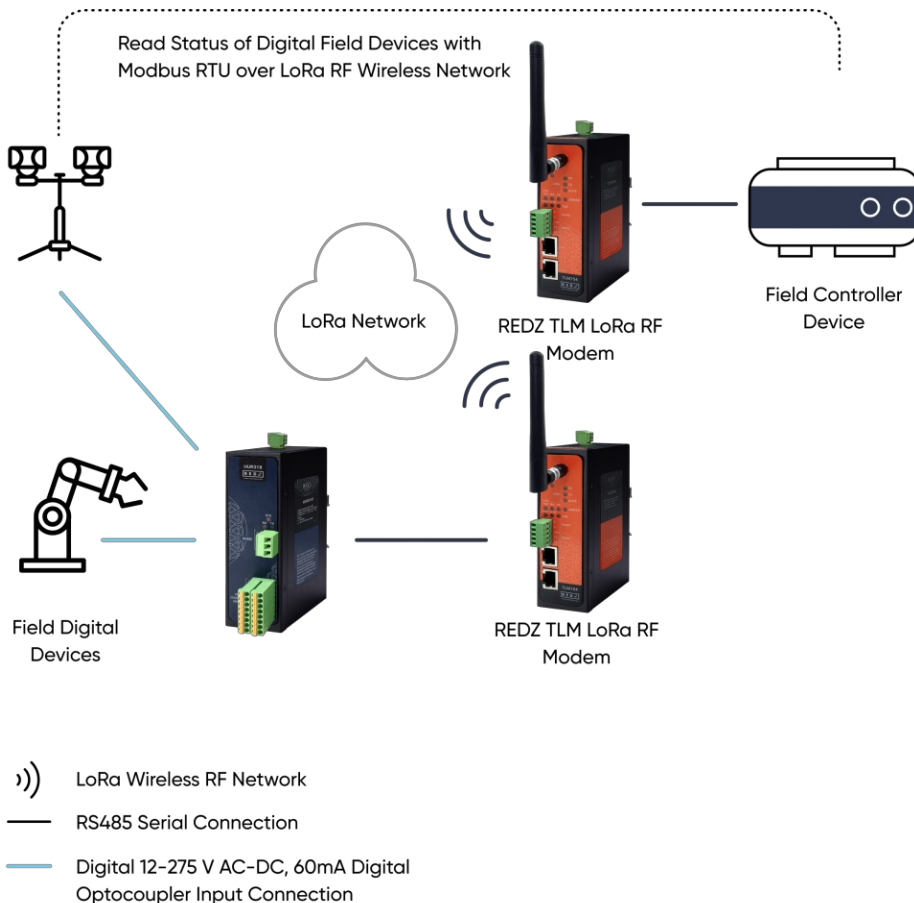
- TLM154: 868MHz LoRa based gateway, 2x 10/100 T(x) ETH ports, 1 x RS232 & 1 x RS485, 5-60V DC Power Input

- TLM254: 868MHz LoRa based gateway, 2x 10/100 T(x) ETH ports, 1 x RS232 & 1 x RS485, 90 –

265V AC (100 – 370V DC), 47Hz to 63Hz AC Power Input

- TLM655: 868MHz LoRa based gateway, 2x 10/100 T(x) ETH ports + 1 x BPL (Broadband Power Line) Link, 1 x RS232 & 1 x RS485, 3 Phase AC Power Input, 110V–240V/50-60Hz

  (User needs to create a Broadband Powerline Network with REDZ devices by using TLM or BSB series in order to use that model)

- HUR318 and HUR418 with 8 Channel 12-275V AC-DC, 60mA Digital Optocoupler Input

Read Status of Digital Field Devices with Modbus RTU over LoRa RF Wireless Network

LoRa Network

REDZ TLM LoRa RF Modem

Field Controller Device

Field Digital Devices

REDZ TLM LoRa RF Modem

))) LoRa Wireless RF Network

— RS485 Serial Connection

— Digital 12-275 V AC-DC, 60mA Digital Optocoupler Input Connection

7. MODBUS Definitions

HUR Series Modbus RTU Remote I/O Devices communicate in Modbus RTU protocol with 115200 8N1 data type over standard RS485 serial line. HUR Series Modbus RTU Remote I/O Devices has several versions with different I/O options and different version uses different Modbus Function codes:

- **HUR118 and HUR218 with 8 Channel 5-275V AC-DC, 100mA Digital Optocoupler Output**

  Uses Function Code 0x01: Read Coil Status to read status of output values

  Uses Function Code 0x03: Read Holding Registers to read device parameters and status

of monitoring values

Uses Function Code 0x05: Force Single Coil to set value of individual output values

Uses Function Code 0x06: Preset Single Register to set value of individual device parameter values

Uses Function Code 0x0F: Force Multiple Coils to set value of all output values at once

- HUR128 and HUR228 with 8 Channel Digital 5Amps 250VAC/30VDC Relay Output

  Uses Function Code 0x01: Read Coil Status to read status of output values

  Uses Function Code 0x03: Read Holding Registers to read device parameters and status of monitoring values

  Uses Function Code 0x05: Force Single Coil to set value of individual output values

  Uses Function Code 0x06: Preset Single Register to set value of individual device parameter values

  Uses Function Code 0x0F: Force Multiple Coils to set value of all output values at once

- HUR318 and HUR418 with 8 Channel 12-275V AC-DC, 60mA Digital Optocoupler Input

  Uses Function Code 0x02: Read Input Status to read status of input values

  Uses Function Code 0x03: Read Holding Registers to read device parameters and status of monitoring values

  Uses Function Code 0x06: Preset Single Register to set value of individual device parameter values

- HUR518 and HUR618 with 8 Channel 0-10V and 0-20mA Selectable Analog Input

  Uses Function Code 0x03: Read Holding Registers to read device parameters and status of monitoring values

  Uses Function Code 0x04: Read Input Registers to read input values

  Uses Function Code 0x06: Preset Single Register to set value of individual device

parameter values

- HUR555 and HUR655 with 5 Channel 4-20mA Analog Output

  Uses Function Code 0x03: Read Holding Registers to read device parameters and status of monitoring values

  Uses Function Code 0x06: Preset Single Register to set value of individual device register values and device parameter values

7.1 HUR Digital Output Devices: HUR118 & HUR128 & HUR218 & HUR228

HUR Series Digital Output Modbus RTU Remote I/O Devices

- HUR118 and HUR218 with 8 Channel 5-275V AC-DC, 100mA Digital Optocoupler Output

- HUR128 and HUR228 with 8 Channel Digital 5Amps 250VAC/30VDC Relay Output

Has following Modbus Functions:

Uses Function Code 0x01: Read Coil Status to read status of output values

Uses Function Code 0x03: Read Holding Registers to read device parameters and status of monitoring values

Uses Function Code 0x05: Force Single Coil to set value of individual output values

Uses Function Code 0x06: Preset Single Register to set value of individual device parameter values

Uses Function Code 0x0F: Force Multiple Coils to set value of all output values at once

A. Read Output Values with Read Coil Status (FC=01)

Request

This command is requesting the ON/OFF status of discrete outputs # 01 to 08

from the slave device with address 1.

01 01 0001 0008 6C0C

01: The Slave Address (01 hex = address 1)

01: The Function Code 1 (read Coil Status)

0001: The Data Address of the first output to read.

(0001 hex = 01)

0008: The total number of outputs requested. (08hex = 8)

6C0C: The CRC (cyclic redundancy check) for error checking.

<u>Response</u>

01 01 01 19 9042

01: The Slave Address (01 hex = address 1)

01: The Function Code 1 (read Coil Status)

01: The number of data bytes to follow (8 Outputs / 8 bits per byte = 1 byte)

19: Outputs 1 - 8 (0001 1001)

9042: The CRC (cyclic redundancy check).

The more significant bits contain the higher output variables. This shows that outputs 8-7-6 is off (0) and 5-4 is on (1), outputs 3-2 is off (0) and 1 is on (1).

B. Read Device Parameters with Holding Registers (Function Code=3)

HUR Series Digital Output Modbus RTU Remote I/O Devices has following settings that can be read:

Register Number	Definition	Explanation	Modbus Address (Decimal)	Modbus Address (Hexadecimal)	Data Type
1	Modbus Address	HUR Series Modbus RTU Remote I/O Device Address for Communication. Default Address is 0x01	128	0x80	Unsigned Integer (UInt16)
2	Save Data Before Auto Restart Option	HUR Series Modbus RTU Remote I/O Device restart itself in an automated manner to keep stability. Duration for each restart is 24 hours. This option is to save Output Values before restart and apply it after successful auto restart. It can be either Enabled (0x01) or Disabled (0x00) Default Value is 0x01: Enabled	129	0x81	Unsigned Integer (UInt16)

3	Use Custom Output Values on Power On	HUR Series Modbus RTU Remote I/O Device can accept user to set output values for next Power On. It is like keeping a constant configuration, so that Users can alter register values of outputs and when the device is Powered On, outputs will be in action based on configuration. User must also set the relevant registers after Enabling this option. It can be either Enabled (0x01) or Disabled (0x00) Default Value is 0x01: Disabled	130	0x82	Unsigned Integer (UInt16)

Request

This command is requesting the content of device parameter holding registers # 40128 to 40130 from the slave device with address 1.

01 03 0080 0003 0423

01: The Slave Address (01hex = address 1)

03: The Function Code 3 (read Holding Registers)

0080: The Data Address of the first register requested.

    (0080hex = 128)

0003: The total number of registers requested. (read 3 registers 40128 to 40130)

0423: The CRC (cyclic redundancy check) for error checking.

<u>Response</u>

01 03 06 0001 0001 0000 4D75

01: The Slave Address (01hex = address 1)

03: The Function Code 3 (read Holding Registers)

06: The number of data bytes to follow (3 registers x 2 bytes each = 6 bytes)

0001: The contents of register 40128

0001: The contents of register 40129

0000: The contents of register 40130

4D75: The CRC (cyclic redundancy check).

C. Read Status of Monitoring Values with Holding Registers (Function Code=3)

HUR Series Digital Output Modbus RTU Remote I/O Devices has following monitoring parameters that can be read:

Register Number	Definition	Explanation	Modbus Address (Decimal)	Modbus Address (Hexadecimal)	Data Type
1	Modbus Read Counter	This value increments 1 after successful sending a Modbus Response Package from HUR device side.	160	0xA0	Unsigned Long (UInt32)
2	Second Counter	Increments 1 every second since the device is powered up. Device restarts after 24 hours (86400 seconds)	162	0xA2	Unsigned Long (UInt32)
3	FW Version Original	Gives device firmware info when the device is sold from stock. Includes version and build date 4 byte data example: 0x1A37E401: 0x1A: DAY = 26 0x3: MONTH = 3 0x7E4: YEAR = 2020 0x01: VERSION = 1	164	0xA4	Unsigned Long (UInt32)

| 4 | FW Version Upgraded | Gives device firmware info and it differs from FW Original version if the device firmware changed in the field. Includes version and build date

4 byte data example:

0x1B37E401:

0x1B: DAY = 27

0x3: MONTH = 3

0x7E4: YEAR = 2020

0x01: VERSION = 1 | 166 | 0xA6 | Unsigned Long (UInt32) |

Request

This command is requesting the content of device parameter holding registers # 40160 to 40166 from the slave device with address 1.

01 03 00A0 0008 442E

01: The Slave Address (01hex = address 1)

03: The Function Code 3 (read Holding Registers)

00A0: The Data Address of the first register requested.

    (00A0 hex = 160)

0008: The total number of registers requested. (read 4 registers each holding Unsigned Int32 values)

442E: The CRC (cyclic redundancy check) for error checking.

Response

01 03 10 0000000D 00000AB4 1A37E401 1B37E401 004D

01: The Slave Address (01hex = address 1)

03: The Function Code 3 (read Holding Registers)

10: The number of data bytes to follow (4 registers x 4 bytes each = 16 bytes)

0000000D: The contents of register 40160

00000AB4: The contents of register 40162

1A37E401: The contents of register 40164

1B37E401: The contents of register 40166

004D: The CRC (cyclic redundancy check).

D. Read Output Configuration Register Values with Holding Registers (Function Code=3)

HUR Series Modbus RTU Remote I/O Device can accept user to set output values for next Power On. It is like keeping a constant configuration on outputs, so that Users can alter register values of outputs and when the device is Powered On, outputs will be in action based on configuration. Those registers can be read with Function Code 3.

Register Number	Definition	Explanation	Modbus Address (Decimal)	Modbus Address (Hexadecimal)	Data Type
1	Output 1	Custom Output Value on Power On for Output 1 if option 3 (Use Custom Output Values on Power On) is Enabled	65	0x41	Unsigned Integer (UInt16)
2	Output 2	Custom Output Value on Power On for Output 1 if option 2 (Use Custom Output Values on Power On) is Enabled	66	0x42	Unsigned Integer (UInt16)

3	Output 3	Custom Output Value on Power On for Output 3 if option 3 (Use Custom Output Values on Power On) is Enabled	67	0x43	Unsigned Integer (UInt16)
4	Output 4	Custom Output Value on Power On for Output 4 if option 3 (Use Custom Output Values on Power On) is Enabled	68	0x44	Unsigned Integer (UInt16)
5	Output 5	Custom Output Value on Power On for Output 5 if option 3 (Use Custom Output Values on Power On) is Enabled	69	0x45	Unsigned Integer (UInt16)
6	Output 6	Custom Output Value on Power On for Output 6 if option 3 (Use Custom Output Values on Power On) is Enabled	70	0x46	Unsigned Integer (UInt16)
7	Output 7	Custom Output Value on Power On for Output 7 if option 3 (Use Custom Output Values on Power On) is Enabled	71	0x47	Unsigned Integer (UInt16)

8	Output 8	Custom Output Value on Power On for Output 8 if option 3 (Use Custom Output Values on Power On) is Enabled	72	0x48	Unsigned Integer (UInt16)

Request

This command is reading the contents of output configuration registers

to the slave device with address 01.

01 03 0040 0008 45D8

01: The Slave Address (01 hex = address 1)

03: The Function Code 3 (read Holding Registers)

0040: The Data Address of the first register requested.

    (0040 hex = 64)

0008: The total number of registers requested. (read 8 registers each holding Unsigned Int16 values. Digital Output device has 8 outputs and uses 8 registers)

45D8: The CRC (cyclic redundancy check) for error checking.

Response

01 03 10 0001 0001 004B 0000 0001 0001 0001 0001 EA3D

01: The Slave Address (01hex = address 1)

03: The Function Code 3 (read Holding Registers)

10: The number of data bytes to follow (8 registers x 2 bytes each = 16 bytes)

0001 : The contents of register 40041

0001 : The contents of register 40042

004B : The contents of register 40043

0000 : The contents of register 40044

0001 : The contents of register 40045

0001 : The contents of register 40046

0001 : The contents of register 40047

0001 : The contents of register 40048

EA3D : The CRC (cyclic redundancy check).

For Example, for output 3, value is set to : Hexadecimal 004B which is 75 Decimal

Digital Output Value = 1 - ON

For Example, for output 4, value is set to : Hexadecimal 0000 which is 0 Decimal

Digital Output Value = 0 - OFF

For Example, for output 5, value is set to : Hexadecimal 0005 which is 5 Decimal

Digital Output Value = 1 - ON

E. Write Individual Output Value with Force Single Coil (FC=05)

<u>Request</u>

This command is writing the contents of discrete output # 7 to ON in the slave device with address 1.

01 05 0006 FF00 6C3B

01: The Slave Address (01 hex = address 1)

05: The Function Code 5 (Force Single Coil)

0006: The Data Address of the coil. (output# 7 = 7 hex)

        (0007 hex = 7 = output # 7)

FF00: The value to write (FF00 = ON, 0000 = OFF)

4E8B: The CRC (cyclic redundancy check) for error checking.

<u>Response</u>

The normal response is an echo of the query, returned after the coil has been written.

01 05 0006 FF00 6C3B

01: The Slave Address (01 hex = address 1)

05: The Function Code 5 (Force Single Coil)

0006: The Data Address of the coil. (output# 7 - 1 = 6 = 06 hex)

FF00: The status written (FF00 = ON, 0000 = OFF)

4E8B: The CRC (cyclic redundancy check) for error checking.

F. Write Device Parameter and Register Values with Preset Single Register (FC=06)

HUR Series Digital Output Modbus RTU Remote I/O Devices has following settings that can be altered:

Register Number	Definition	Explanation	Modbus Address (Decimal)	Modbus Address (Hexadecimal)	Data Type
1	Modbus Device Address	HUR Series Modbus RTU Remote I/O Device Address for Communication. Default Address is 0x01	128	0x80	Unsigned Integer (UInt16)
2	Save Data Before Auto Restart Option	HUR Series Modbus RTU Remote I/O Device restart itself in an automated manner to keep stability. Duration for each restart is 24 hours. This option is to save Output Values before restart and apply it after successful auto restart. It can be either Enabled (0x01) or Disabled (0x00) Default Value is 0x01: Enabled	129	0x81	Unsigned Integer (UInt16)

3	Use Custom Output Values on Power On	HUR Series Modbus RTU Remote I/O Device can accept user to set output values for next Power On. It is like keeping a constant configuration, so that Users can alter register values of outputs and when the device is Powered On, outputs will be in action based on configuration. User must also set the relevant registers after Enabling this option. It can be either Enabled (0x01) or Disabled (0x00) Default Value is 0x01: Disabled	130	0x82	Unsigned Integer (UInt16)

<u>Request</u>

This command is writing the contents of device parameter register # 40130

to the slave device with address 01.

01 06 0082 0001 E822

01: The Slave Address (01 hex = address 1)

06: The Function Code 6 (Preset Single Register)

0082: The Data Address of the register.

    (0082 hex = 130)

0001: The value to write (Enable option 3 (Use Custom Output Values on Power On))

E822: The CRC (cyclic redundancy check) for error checking.

<u>Response</u>

The normal response is an echo of the query, returned after the register contents have been written.

01 06 0082 0001 E822

01: The Slave Address (01 hex = address 1)

06: The Function Code 6 (Preset Single Register)

0082: The Data Address of the register.

0001: The value written (Option 3 (Use Custom Output Values on Power On) Enabled)

E822: The CRC (cyclic redundancy check) for error checking.

HUR Series Digital Output Modbus RTU Remote I/O Devices also has following registers that can be altered and used if option 3 in settings part is Enabled

Register Number	Definition	Explanation	Modbus Address (Decimal)	Modbus Address (Hexadecimal)	Data Type
1	Register 1	Custom Output Value on Power On for Output 1 if option 3 (Use Custom Output Values on Power On) is Enabled	65	0x41	Unsigned Integer (UInt16)
2	Register 2	Custom Output Value on Power On for Output 2 if option 3 (Use Custom Output Values on Power On) is Enabled	66	0x42	Unsigned Integer (UInt16)
3	Register 3	Custom Output Value on Power On for Output 3 if option 3 (Use Custom Output Values on Power On) is Enabled	67	0x43	Unsigned Integer (UInt16)
4	Register 4	Custom Output Value on Power On for Output 4 if option 3 (Use Custom Output Values on Power On) is Enabled	68	0x44	Unsigned Integer (UInt16)
5	Register 5	Custom Output Value on Power On for Output 5 if option 3 (Use Custom Output Values on Power On) is Enabled	69	0x45	Unsigned Integer (UInt16)

6	Register 6	Custom Output Value on Power On for Output 6 if option 3 (Use Custom Output Values on Power On) is Enabled	70	0x46	Unsigned Integer (UInt16)
7	Register 7	Custom Output Value on Power On for Output 7 if option 3 (Use Custom Output Values on Power On) is Enabled	71	0x47	Unsigned Integer (UInt16)
8	Register 8	Custom Output Value on Power On for Output 8 if option 3 (Use Custom Output Values on Power On) is Enabled	72	0x48	Unsigned Integer (UInt16)

Request

This command is writing the contents of device parameter register # 40043

to the slave device with address 01.

01 06 0042 0001 E81E

01: The Slave Address (01 hex = address 1)

06: The Function Code 6 (Preset Single Register)

0042: The Data Address of the register.

    (0042 hex = 66 , + 40001 offset = register #40043)

0001: The value to write (Set Register 3 for Output 3)

E81E: The CRC (cyclic redundancy check) for error checking.

Response

The normal response is an echo of the query, returned after the register contents have been written.

01 06 0042 0001 E81E

01: The Slave Address (01 hex = address 1)

06: The Function Code 6 (Preset Single Register)

0042: The Data Address of the register.

0001: The value to write (Register 3 for Output 3 is Set)

E81E: The CRC (cyclic redundancy check) for error checking.

G. Write Output Values at Once with Force Multiple Coils (FC=15)

Request

This command is writing the contents of a series of 8 discrete outputs from #1 to #8

to the slave device with address 17.

01 0F 0001 0008 01 98 C2FF

01: The Slave Address (11 hex = address17)

0F: The Function Code 15 (Force Multiple Coils, 0F hex = 15)

0001: The Data Address of the first output.

      (0001 hex = 1)

0008: The number of outputs to write (08 hex = 8)

01: The number of data bytes to follow (8 outputs / 8 bits per byte = 1 byte)

98: Outputs 1 – 8 (1001 1000)

BF0B: The CRC (cyclic redundancy check) for error checking.

The more significant bits contain the higher output variables. This shows that outputs 8-5-4 is on (1) and 7-6-3-2-1 is off (0).

Response

01 0F 0001 0008 05CD

01: The Slave Address (11 hex = address17)

0F: The Function Code 15 (Force Multiple Coils, 0F hex = 15)

0001: The Data Address of the first output.

      (0001 hex = 1)

0008: The number of outputs to write (08 hex = 8)

05CD: The CRC (cyclic redundancy check) for error checking.

7.2 HUR Digital Input Devices: HUR318 & HUR418

HUR Series Digital Output Modbus RTU Remote I/O Devices

- HUR318 and HUR418 with 8 Channel 12-275V AC-DC, 60mA Digital Optocoupler Input

Has following Modbus Functions:

Uses Function Code 0x02: Read Input Status to read status of input values

Uses Function Code 0x03: Read Holding Registers to read device parameters and status of monitoring values

Uses Function Code 0x06: Preset Single Register to set value of individual device parameter values

A. Read Input Values with Read Input Status (FC=02)

Request

This command is requesting the ON/OFF status of discrete inputs # 10001 to 10008

from the slave device with address 1.

01 02 0001 0008 280C

01: The Slave Address (01 hex = address 1)

02: The Function Code 2 (read Input Status)

0001: The Data Address of the first input to read.

(0001hex = 1)

0008: The total number of inputs requested. (8 hex = 8, inputs 1 to 8)

280C: The CRC (cyclic redundancy check) for error checking.

Response

01 02 01 44 A1BB

01: The Slave Address (01 hex = address 1)

02: The Function Code 2 (read Input Status)

01: The number of data bytes to follow (8 Inputs / 8 bits per byte = 1 byte)

44: Discrete Inputs 10001 to 10008 (0100 0100)

A1BB: The CRC (cyclic redundancy check).

The more significant bits contain the higher Discrete inputs. This shows that input 1-2-4-5-6-8 is OFF (0) and 3-7 is ON (1).

B. Read Device Parameters with Holding Registers (Function Code=3)

HUR Series Digital Input Modbus RTU Remote I/O Devices has following settings that can be read:

Register Number	Definition	Explanation	Modbus Address (Decimal)	Modbus Address (Hexadecimal)	Data Type
1	Modbus Device Address	HUR Series Modbus RTU Remote I/O Device Address for Communication. Default Address is 0x01	128	0x80	Unsigned Integer (UInt16)

Request

This command is requesting the content of device parameter holding registers # 40128 from the slave device with address 1.

01 03 0080 0001 85E2

01: The Slave Address (01hex = address 1)

03: The Function Code 3 (read Holding Registers)

0080: The Data Address of the first register requested.

  (0080hex = 128)

0001: The total number of registers requested. (read registers #40128)

85E2: The CRC (cyclic redundancy check) for error checking.

Response

01 03 02 0001 7984

01: The Slave Address (01hex = address 1)

03: The Function Code 3 (read Holding Registers)

02: The number of data bytes to follow (1 registers x 2 bytes each = 2 bytes)

0001: The contents of register 40128

7984: The CRC (cyclic redundancy check).

C. Read Status of Monitoring Values with Holding Registers (Function Code=3)

HUR Series Digital Input Modbus RTU Remote I/O Devices has following monitoring parameters that can be read:

Register Number	Definition	Explanation	Modbus Address (Decimal)	Modbus Address (Hexadecimal)	Data Type
1	Modbus Read Counter	This value increments 1 after successful sending a Modbus Response Package from HUR device side.	160	0xA0	Unsigned Long (UInt32)
2	Second Counter	Increments 1 every second since the device is powered up. Device restarts after 24 hours (86400 seconds)	162	0xA2	Unsigned Long (UInt32)
3	FW Version Original	Gives device firmware info when the device is sold from stock. Includes version and build date 4 byte data example: 0x1A37E401: 0x1A: DAY = 26 0x3: MONTH = 3 0x7E4: YEAR = 2020 0x01: VERSION = 1	164	0xA4	Unsigned Long (UInt32)

| 4 | FW Version Upgraded | Gives device firmware info and it differs from FW Original version if the device firmware changed in the field. Includes version and build date

4 byte data example:

0x1B37E401:

0x1B: DAY = 27

0x3: MONTH = 3

0x7E4: YEAR = 2020

0x01: VERSION = 1 | 166 | 0xA6 | Unsigned Long (UInt32) |

Request

This command is requesting the content of device parameter holding registers # 40160 to 40166 from the slave device with address 1.

01 03 00A0 0008 442E

01: The Slave Address (01hex = address 1)

03: The Function Code 3 (read Holding Registers)

00A0: The Data Address of the first register requested.

    (00A0 hex = 160)

0008: The total number of registers requested. (read 4 registers each holding Unsigned Int32 values)

442E: The CRC (cyclic redundancy check) for error checking.

Response

01 03 10 0000000D 00000AB4 1A37E401 1B37E401 004D

01: The Slave Address (01hex = address 1)

03: The Function Code 3 (read Holding Registers)

10: The number of data bytes to follow (4 registers x 4 bytes each = 16 bytes)

0000000D: The contents of register 40160

00000AB4: The contents of register 40162

1A37E401: The contents of register 40164

1B37E401: The contents of register 40166

004D: The CRC (cyclic redundancy check).

D. Write Device Parameter Value with Preset Single Register (FC=06)

HUR Series Digital Input Modbus RTU Remote I/O Devices has following settings that can be altered:

Register Number	Definition	Explanation	Modbus Address (Decimal)	Modbus Address (Hexadecimal)	Data Type
1	Modbus Device Address	HUR Series Modbus RTU Remote I/O Device Address for Communication. Default Address is 0x01	128	0x80	Unsigned Integer (UInt16)

Request

This command is writing the contents of device parameter register # 40128

to the slave device with address 01.

01 06 0080 0002 09E3

01: The Slave Address (01 hex = address 1)

06: The Function Code 6 (Preset Single Register)

0080: The Data Address of the register.

(0080 hex = 128)

0002: The value to write (set new Modbus Address as 2)

09E3: The CRC (cyclic redundancy check) for error checking.

The normal response is an echo of the query, returned after the register contents have been written.

01 06 0080 0002 09E3

01: The Slave Address (01 hex = address 1)

06: The Function Code 6 (Preset Single Register)

0080: The Data Address of the register.

0002: The value to write (New Modbus Address as 2 is set)

09E3: The CRC (cyclic redundancy check) for error checking.

7.3 HUR Analog Input Devices: HUR518 & HUR618

HUR Analog Input Modbus RTU Remote I/O Devices

- HUR518 and HUR618 with 8 Channel 0-10V and 0-20mA Selectable Analog Input

Has following Modbus Functions:

Uses Function Code 0x03: Read Holding Registers to read device parameters and status of monitoring values

Uses Function Code 0x04: Read Input Registers to read input values

Uses Function Code 0x06: Preset Single Register to set value of individual device parameter values

A. Read Device Parameters with Holding Registers (Function Code=3)

HUR Series Analog Input Modbus RTU Remote I/O Devices has following settings that can be read:

Register Number	Definition	Explanation	Modbus Address (Decimal)	Modbus Address (Hexadecimal)	Data Type

1	Modbus Device Address	HUR Series Modbus RTU Remote I/O Device Address for Communication. Default Address is 0x01	128	0x80	Unsigned Integer (UInt16)

Request

This command is requesting the content of device parameter holding registers # 40128 from the slave device with address 1.

01 03 0080 0001 85E2

01: The Slave Address (01hex = address 1)

03: The Function Code 3 (read Holding Registers)

0080: The Data Address of the first register requested.

(0080hex = 128)

0001: The total number of registers requested. (read registers #40128)

85E2: The CRC (cyclic redundancy check) for error checking.

Response

01 03 02 0001 7984

01: The Slave Address (01hex = address 1)

03: The Function Code 3 (read Holding Registers)

02: The number of data bytes to follow (1 registers x 2 bytes each = 2 bytes)

0001: The contents of register 40128

7984: The CRC (cyclic redundancy check).

B. Read Status of Monitoring Values with Holding Registers (Function Code=3)

HUR Series Analog Input Modbus RTU Remote I/O Devices has following monitoring parameters that can be read:

Register Number	Definition	Explanation	Modbus Address (Decimal)	Modbus Address (Hexadecimal)	Data Type
1	Modbus Read Counter	This value increments 1 after successful sending a Modbus Response Package from HUR device side.	160	0xA0	Unsigned Long (UInt32)
2	Second Counter	Increments 1 every second since the device is powered up. Device restarts after 24 hours (86400 seconds)	162	0xA2	Unsigned Long (UInt32)
3	FW Version Original	Gives device firmware info when the device is sold from stock. Includes version and build date 4 byte data example: 0x1A37E401: 0x1A: DAY = 26 0x3: MONTH = 3 0x7E4: YEAR = 2020 0x01: VERSION = 1	164	0xA4	Unsigned Long (UInt32)

4	FW Version Upgraded	Gives device firmware info and it differs from FW Original version if the device firmware changed in the field. Includes version and build date 4 byte data example: 0x1B37E401: 0x1B: DAY = 27 0x3: MONTH = 3 0x7E4: YEAR = 2020 0x01: VERSION = 1	166	0xA6	Unsigned Long (UInt32)

Request

This command is requesting the content of device parameter holding registers # 40160 to 40166 from the slave device with address 1.

01 03 00A0 0008 442E

01: The Slave Address (01hex = address 1)

03: The Function Code 3 (read Holding Registers)

00A0: The Data Address of the first register requested.

　　(00A0 hex = 160)

0008: The total number of registers requested. (read 4 registers each holding Unsigned Int32 values)

442E: The CRC (cyclic redundancy check) for error checking.

Response

01 03 10 0000000D 00000AB4 1A37E401 1B37E401 004D

01: The Slave Address (01hex = address 1)

03: The Function Code 3 (read Holding Registers)

10: The number of data bytes to follow (4 registers x 4 bytes each = 16 bytes)

0000000D: The contents of register 40160

00000AB4: The contents of register 40162

1A37E401: The contents of register 40164

1B37E401: The contents of register 40166

004D: The CRC (cyclic redundancy check).

C. Read Analog Input Values with Read Input Register (FC=04)

This command is requesting the content of analog input registers from # 30001 to 30008 from the slave device with address 1.

Request

01 04 0001 0008 A00C

01: The Slave Address (01 hex = address 1)

04: The Function Code 4 (read Analog Input Registers)

0001: The Data Address of the first register requested.

    (0001 hex = 1)

0008: The total number of registers requested. (Read 8 registers)

A00C: The CRC (cyclic redundancy check) for error checking.

Response

01 04 10 2AB4 0000 0000 0000 0000 0000 0000 0000 7E24

01: The Slave Address (01 hex = address 1)

04: The Function Code 4 (read Analog Input Registers)

10: The number of data bytes to follow (8 registers x 2 bytes each = 16 bytes)

2AB4: The contents of register 30001 (Input 1)

0000: The contents of register 30002 (Input 2)

0000: The contents of register 30003 (Input 3)

0000: The contents of register 30004 (Input 4)

0000: The contents of register 30005 (Input 5)

0000: The contents of register 30006 (Input 6)

0000: The contents of register 30007 (Input 7)

0000: The contents of register 30008 (Input 8)

7E24: The CRC (cyclic redundancy check).

HUR Analog Input Modbus RTU Remote I/O Devices may have 2 modes, if selected 0-20mA mode

Register 1 is Hexadecimal 2AB4 = 10932 Decimal

Analog value for 0-20mA can be calculated with following formula

AnalogValue = (20.0 / 65535) * readInputValue;

In this example it is

AnalogValue = (20.0 / 65535) * 10932 = 3,337mA

Analog value for 0-10V can be calculated with following formula

AnalogValue = (10.0 / 65535) * readInputValue;

In this example it is

AnalogValue = (10.0 / 65535) * 10932 = 1,668V

D. Write Device Parameter Value with Preset Single Register (FC=06)

HUR Series Digital Input Modbus RTU Remote I/O Devices has following settings that can be altered:

Register Number	Definition	Explanation	Modbus Address (Decimal)	Modbus Address (Hexadecimal)	Data Type
1	Modbus Device Address	HUR Series Modbus RTU Remote I/O Device Address for Communication. Default Address is 0x01	128	0x80	Unsigned Integer (UInt16)

<u>Request</u>

This command is for writing the contents of device parameter register # 40128

to the slave device with address 01.

01 06 0080 0002 09E3

01: The Slave Address (01 hex = address 1)

06: The Function Code 6 (Preset Single Register)

0080: The Data Address of the register.

    (0080 hex = 128)

0002: The value to write (set new Modbus Address as 2)

09E3: The CRC (cyclic redundancy check) for error checking.

<u>Response</u>

The normal response is an echo of the query, returned after the register contents have been written.

01 06 0080 0002 09E3

01: The Slave Address (01 hex = address 1)

06: The Function Code 6 (Preset Single Register)

0080: The Data Address of the register.

0002: The value to write (New Modbus Address as 2 is set)

09E3: The CRC (cyclic redundancy check) for error checking.

7.4 HUR Analog Output Devices: HUR555 & HUR655

HUR Series Analog Output Modbus RTU Remote I/O Devices

- HUR555 and HUR655 with 5 Channel 4-20mA Analog Output

Has following Modbus Functions:

<u>Uses Function Code 0x03:</u> Read Holding Registers to read device parameters and status of monitoring values

<u>Uses Function Code 0x06:</u> Preset Single Register to set value of individual device register values and device parameter values

A. Read Device Parameters with Holding Registers (Function Code=3)

HUR Series Analog Output Modbus RTU Remote I/O Devices has following settings that can be read:

Register Number	Definition	Explanation	Modbus Address (Decimal)	Modbus Address (Hexadecimal)	Data Type

| 1 | Modbus Device Address | HUR Series Remote I/O Device Address for Communication.

Default Address is 0x01 | 128 | 0x80 | Unsigned Integer (UInt16) |
|---|---|---|---|---|---|
| 2 | Save Data Before Auto Restart Option | HUR Series Modbus RTU Remote I/O Device restart itself in an automated manner to keep stability. Duration for each restart is 24 hours. This option is to save Output Values before restart and apply it after successful auto restart.

It can be either Enabled (0x01) or Disabled (0x00)

Default Value is 0x01: Enabled | 129 | 0x81 | Unsigned Integer (UInt16) |

3	Use Custom Output Values on Power On	HUR Series Modbus RTU Remote I/O Device can accept user to set output values for next Power On. It is like keeping a constant configuration, so that Users can alter register values of outputs and when the device is Powered On, outputs will be in action based on configuration. User must also set the relevant registers after Enabling this option. It can be either Enabled (0x01) or Disabled (0x00) Default Value is 0x01: Disabled	130	0x82	Unsigned Integer (UInt16)

Request

This command is requesting the content of device parameter holding registers # 40128 to 40130 from the slave device with address 1.

01 03 0080 0003 0423

01: The Slave Address (01hex = address 1)

03: The Function Code 3 (read Holding Registers)

0080: The Data Address of the first register requested.

    (0080hex = 128)

0003: The total number of registers requested. (read 3 registers 40128 to 40130)

0423: The CRC (cyclic redundancy check) for error checking.

Response

01 03 06 0001 0001 0000 4D75

01: The Slave Address (01hex = address 1)

03: The Function Code 3 (read Holding Registers)

06: The number of data bytes to follow (3 registers x 2 bytes each = 6 bytes)

0001: The contents of register 40128

0001: The contents of register 40129

0000: The contents of register 40130

4D75: The CRC (cyclic redundancy check).

B. Read Status of Monitoring Values with Holding Registers (Function Code=3)

HUR Series Analog Output Modbus RTU Remote I/O Devices has following monitoring parameters that can be read:

Register Number	Definition	Explanation	Modbus Address (Decimal)	Modbus Address (Hexadecimal)	Data Type
1	Modbus Read Counter	This value increments 1 after successful sending a Modbus Response Package from HUR device side.	160	0xA0	Unsigned Long (UInt32)
2	Second Counter	Increments 1 every second since the device is powered up. Device restarts after 24 hours (86400 seconds)	162	0xA2	Unsigned Long (UInt32)
3	FW Version Original	Gives device firmware info when the device is sold from stock. Includes version and build date 4 byte data example: 0x1A37E401: 0x1A: DAY = 26 0x3: MONTH = 3 0x7E4: YEAR = 2020 0x01: VERSION = 1	164	0xA4	Unsigned Long (UInt32)

| 4 | FW Version Upgraded | Gives device firmware info and it differs from FW Original version if the device firmware changed in the field. Includes version and build date

4 byte data example:

0x1B37E401:

0x1B: DAY = 27

0x3: MONTH = 3

0x7E4: YEAR = 2020

0x01: VERSION = 1 | 166 | 0xA6 | Unsigned Long (UInt32) |

Request

This command is requesting the content of device parameter holding registers # 40160 to 40166 from the slave device with address 1.

01 03 00A0 0008 442E

01: The Slave Address (01hex = address 1)

03: The Function Code 3 (read Holding Registers)

00A0: The Data Address of the first register requested.

(00A0 hex = 160)

0008: The total number of registers requested. (read 4 registers each holding Unsigned Int32 values)

442E: The CRC (cyclic redundancy check) for error checking.

Response

01 03 10 0000000D 00000AB4 1A37E401 1B37E401 004D

01: The Slave Address (01hex = address 1)

03: The Function Code 3 (read Holding Registers)

10: The number of data bytes to follow (4 registers x 4 bytes each = 16 bytes)

0000000D: The contents of register 40160

00000AB4: The contents of register 40162

1A37E401: The contents of register 40164

1B37E401: The contents of register 40166

004D: The CRC (cyclic redundancy check).

C. Read Output Configuration Register Values with Holding Registers (Function Code=3)

HUR Series Modbus RTU Remote I/O Device can accept user to set output values for next Power On. It is like keeping a constant configuration on outputs, so that Users can alter register values of outputs and when the device is Powered On, outputs will be in action based on configuration. Those registers can be read with Function Code 3.

Register Number	Definition	Explanation	Modbus Address (Decimal)	Modbus Address (Hexadecimal)	Data Type
1	Output 1	Custom Output Value on Power On for Output 1 if option 3 (Use Custom Output Values on Power On) is Enabled	65	0x41	Unsigned Integer (UInt16)
2	Output 2	Custom Output Value on Power On for Output 1 if option 2 (Use Custom Output Values on Power On) is Enabled	66	0x42	Unsigned Integer (UInt16)
3	Output 3	Custom Output Value on Power On for Output 3 if option 3 (Use Custom Output Values on Power On) is Enabled	67	0x43	Unsigned Integer (UInt16)

| 4 | Output 4 | Custom Output Value on Power On for Output 4 if option 3 (Use Custom Output Values on Power On) is Enabled | 68 | 0x44 | Unsigned Integer (UInt16) |
| 5 | Output 5 | Custom Output Value on Power On for Output 5 if option 3 (Use Custom Output Values on Power On) is Enabled | 69 | 0x45 | Unsigned Integer (UInt16) |

Request

This command is reading the contents of output configuration registers

to the slave device with address 01.

01 03 0040 0008 45D8

01: The Slave Address (01 hex = address 1)

03: The Function Code 3 (read Holding Registers)

0040: The Data Address of the first register requested.

 (0040 hex = 64)

0008: The total number of registers requested. (read 8 registers each holding Unsigned Int16 values. Analog Output device has 5 outputs and uses 5 registers)

45D8: The CRC (cyclic redundancy check) for error checking.

Response

01 03 10 0001 0001 004B 0000 0001 0001 0001 0001 EA3D

01: The Slave Address (01hex = address 1)

03: The Function Code 3 (read Holding Registers)

10: The number of data bytes to follow (8 registers x 2 bytes each = 16 bytes)

0001 : The contents of register 40041

0001 : The contents of register 40042

004B : The contents of register 40043

0000 : The contents of register 40044

0001 : The contents of register 40045

0001 : The contents of register 40046 (not used for Analog Output Device)

0001 : The contents of register 40047 (not used for Analog Output Device)

0001 : The contents of register 40048 (not used for Analog Output Device)

EA3D : The CRC (cyclic redundancy check).

For Example, for output 3, value is set to : Hexadecimal 004B which is 75 Decimal

(Analog Output Value – 4.0) * (1000.0 / 16.0)) = 75

Analog Output Value = 5,2mA

D. Write Analog Output Values with Preset Single Register (FC=06)

HUR Series Analog Output Modbus RTU Remote I/O Devices also has following registers that can be altered to set Analog Value to Outputs

Analog Value can be between 0 to 1000 so if for example user wants to set

- Output Value 20mA, user must write to relevant register: 1000

- Output Value 12mA, user must write to relevant register: 500

- Output Value 4mA, user must write to relevant register: 0

Analog value to set can be calculated with following formula

registerValueToSet = Math.Round((analogValueNeeded – 4.0) * (1000.0 / 16.0))

Register Number	Definition	Explanation	Modbus Address (Decimal)	Modbus Address (Hexadecimal)	Data Type
1	Output 1	A value between 0 and 1000 can be written to set Analog Output 1	1	0x01	Unsigned Integer (UInt16)
2	Output 2	A value between 0 and 1000 can be written to set Analog Output 2	2	0x02	Unsigned Integer (UInt16)

3	Output 3	A value between 0 and 1000 can be written to set Analog Output 3	3	0x03	Unsigned Integer (UInt16)
4	Output 4	A value between 0 and 1000 can be written to set Analog Output 4	4	0x04	Unsigned Integer (UInt16)
5	Output 5	A value between 0 and 1000 can be written to set Analog Output 5	5	0x05	Unsigned Integer (UInt16)
6	Output 6	A value between 0 and 1000 can be written to set Analog Output 6	6	0x06	Unsigned Integer (UInt16)
7	Output 7	A value between 0 and 1000 can be written to set Analog Output 7	7	0x07	Unsigned Integer (UInt16)
8	Output 8	A value between 0 and 1000 can be written to set Analog Output 8	8	0x08	Unsigned Integer (UInt16)

<u>Request</u>

This command is writing the contents of Analog Output register # 40002

to the slave device with address 01.

01 06 0001 028D 190F

01: The Slave Address (01 hex = address 1)

06: The Function Code 6 (Preset Single Register)

0001: The Data Address of the register.

   (0001 hex = 1 , + 40001 offset = register #40002)

028D: The value to write (Set Analog Output 2)

190F: The CRC (cyclic redundancy check) for error checking.

<u>Response</u>

The normal response is an echo of the query, returned after the register contents have been written.

01 06 0001 028D 190F

01: The Slave Address (01 hex = address 1)

06: The Function Code 6 (Preset Single Register)

0001: The Data Address of the register.

028D: The value to write (Analog Output 2 is set)

190F: The CRC (cyclic redundancy check) for error checking.

In this example Analog Output is wanted to be set 14,45mA and the value to be set in register is calculated with following formula

registerValueToSet = Math.Round((14,45 – 4.0) * (1000.0 / 16.0)) = 653

Hexadecimal 028D is 653 Decimal

E. Write Device Parameter and Register Values with Preset Single Register (FC=06)

HUR Series Analog Output Modbus RTU Remote I/O Devices has following settings that can be altered:

Register Number	Definition	Explanation	Modbus Address (Decimal)	Modbus Address (Hexadecimal)	Data Type
1	Modbus Device Address	HUR Series Remote I/O Device Address for Communication. Default Address is 0x01	128	0x80	Unsigned Integer (UInt16)

2	Save Data Before Auto Restart Option	HUR Series Modbus RTU Remote I/O Device restart itself in an automated manner to keep stability. Duration for each restart is 24 hours. This option is to save Output Values before restart and apply it after successful auto restart. It can be either Enabled (0x01) or Disabled (0x00) Default Value is 0x01: Enabled	129	0x81	Unsigned Integer (UInt16)
3	Use Custom Output Values on Power On	HUR Series Modbus RTU Remote I/O Device can accept user to set output values for next Power On. It is like keeping a constant configuration, so that Users can alter register values of outputs and when the device is Powered On, outputs will be in action based on configuration. User must also set the relevant registers after Enabling this option. It can be either Enabled (0x01) or Disabled (0x00) Default Value is 0x01: Disabled	130	0x82	Unsigned Integer (UInt16)

This command is writing the contents of device parameter register # 40130

to the slave device with address 01.

01 06 0082 0001 E822

01: The Slave Address (01 hex = address 1)

06: The Function Code 6 (Preset Single Register)

0082: The Data Address of the register.

     (0082 hex = 130)

0001: The value to write (Enable option 3 (Use Custom Output Values on Power On))

E822: The CRC (cyclic redundancy check) for error checking.

Response

The normal response is an echo of the query, returned after the register contents have been written.

01 06 0082 0001 E822

01: The Slave Address (01 hex = address 1)

06: The Function Code 6 (Preset Single Register)

0082: The Data Address of the register.

0001: The value written (Option 3 (Use Custom Output Values on Power On) Enabled)

E822: The CRC (cyclic redundancy check) for error checking.

HUR Series Analog Output Modbus RTU Remote I/O Devices also has following registers that can be altered and used if option 3 in settings part is Enabled

Register Number	Definition	Explanation	Modbus Address (Decimal)	Modbus Address (Hexadecimal)	Data Type

1	Output 1	Custom Output Value on Power On for Output 1 if option 3 (Use Custom Output Values on Power On) is Enabled	65	0x41	Unsigned Integer (UInt16)
2	Output 2	Custom Output Value on Power On for Output 1 if option 2 (Use Custom Output Values on Power On) is Enabled	66	0x42	Unsigned Integer (UInt16)
3	Output 3	Custom Output Value on Power On for Output 3 if option 3 (Use Custom Output Values on Power On) is Enabled	67	0x43	Unsigned Integer (UInt16)
4	Output 4	Custom Output Value on Power On for Output 4 if option 3 (Use Custom Output Values on Power On) is Enabled	68	0x44	Unsigned Integer (UInt16)
5	Output 5	Custom Output Value on Power On for Output 5 if option 3 (Use Custom Output Values on Power On) is Enabled	69	0x45	Unsigned Integer (UInt16)

Request

This command is writing the contents of device parameter register # 40043

to the slave device with address 01.

01 06 0042 004B 69E9

01: The Slave Address (01 hex = address 1)

06: The Function Code 6 (Preset Single Register)

0042: The Data Address of the register.

   (0042 hex = 66 , + 40001 offset = register #40043)

004B: The value to write (Set Register 3 for Analog Output 3)

683D: The CRC (cyclic redundancy check) for error checking.

Response

The normal response is an echo of the query, returned after the register contents have been written.

01 06 0042 004B 69E9

01: The Slave Address (01 hex = address 1)

06: The Function Code 6 (Preset Single Register)

0042: The Data Address of the register.

004B: The value to write (Register 3 for Analog Output 3 is Set)

683D: The CRC (cyclic redundancy check) for error checking.

In this example Analog Output is wanted to be set 5,2mA and the value to be set in register is calculated with following formula

registerValueToSet = Math.Round((5,2 – 4.0) * (1000.0 / 16.0)) = 75

Hexadecimal 004B is 75 Decimal

7.5 ZTerminal Software

ZTerminal software can be used to read all parameters of LKM devices, alter parameters that are allowed to change and read all registers for all meters connected to LKM devices. This is unoffical software for LKM series of devices and it is an implementation of Modbus commands only.

It supports both Modbus RTU and Modbus TCP (LKMs connected behind CKL series Modbus TCP to RTU gateway for example) communication.
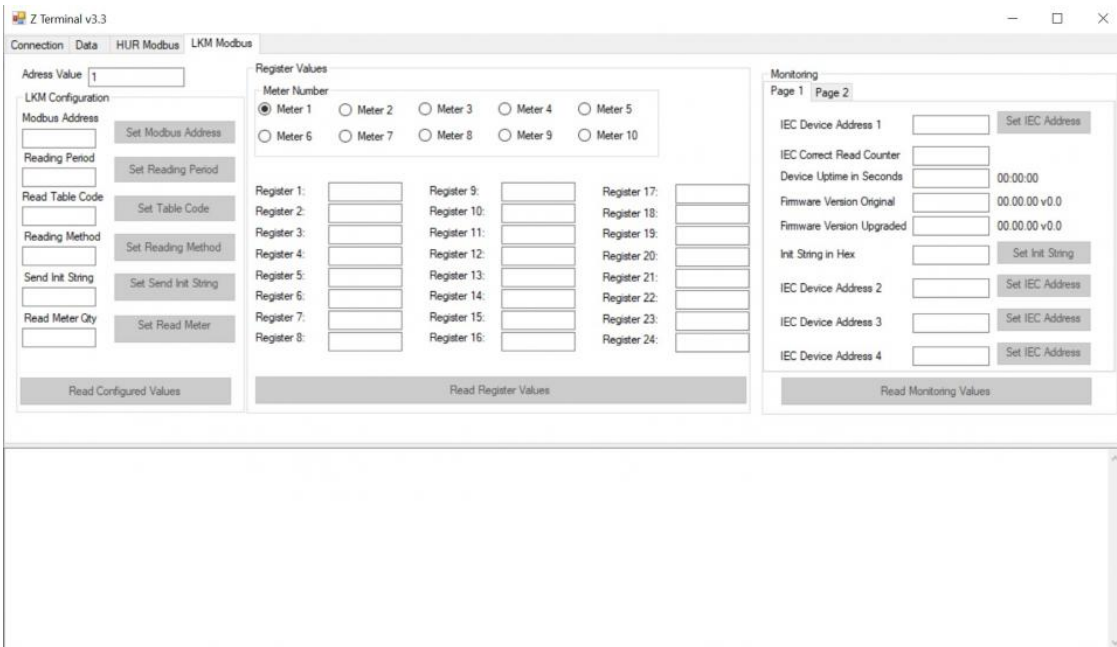
8. Firmware Upgrade

HUR Series Modbus RTU Remote I/O Devices has capability to upgrade firmware from serial line. This way the user can get latest updates for device operation and also user may also ask for custom changes. Here are some examples:

- Firmware upgrade for specific Modbus Register for query

- Firmware upgrade to disable switches and work only in one mode

- Firmware upgrade to put any feature that user needs

Firmware upgrade procedure need specific firmware file prepared by our company and the firmware upgrade software abcZ software also developed by our company.
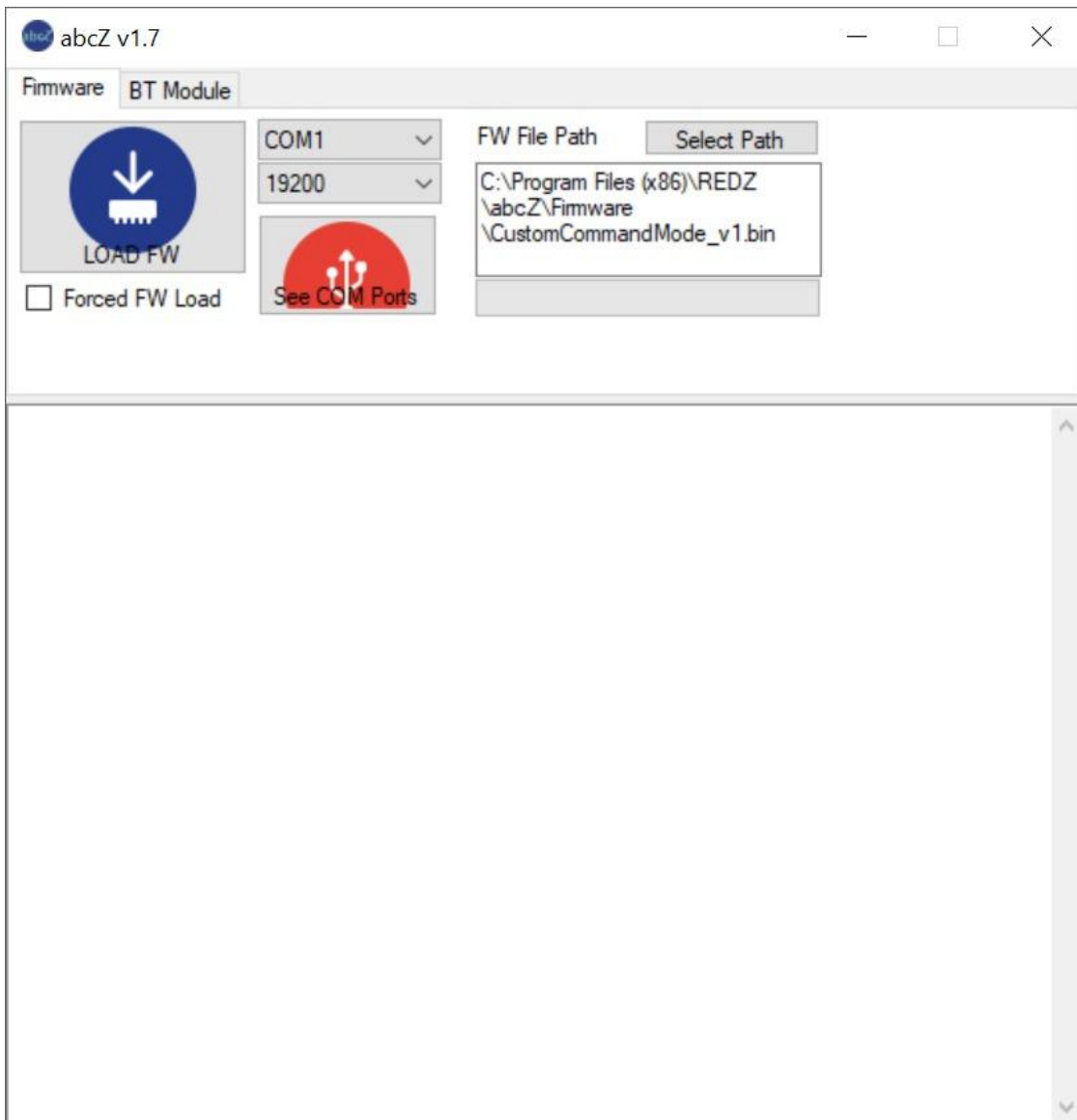
In order to use the software the specific firmware must be selected. After selecting the firmware path by clicking "Select Path" button the firmware can be loaded to device. The device has protection time window 10 seconds after the powered up so the process must be started within 10 seconds after the device powered up.

User can select the correct COM port and click "LOAD FW" button. The software will show the percentage of process visually by process bar in software. The process will take less than a minute and the device will be ready to use with new firmware after an automatic restart.

If somehow the firmware upgrade process is interrupted and upload file has failed, the device will lose firmware and stay in bootloader mode. In that case user can try upgrading the firmware again and this time should mark the "Forced FW Load" check box.

9. Ordering Information

HUR118: 8 Channels 5-275V AC-DC, 100mA Digital Optocoupler Output Modbus RTU Remote IO Device, 1 x RS485, 5-48V (max. 60V) DC Power Input

HUR128: 8 Channels Digital 5Amps 250VAC/30VDC Relay Output Modbus RTU Remote IO Device, 1 x RS485, 5-48V (max. 60V) DC Power Input

HUR218: 8 Channels 5-275V AC-DC, 100mA Digital Optocoupler Output Modbus RTU Remote IO Device, 1 x RS485, 100 - 240V AC (120 – 370V DC), 50Hz to 60Hz AC Power Input

HUR228: 8 Channels Digital 5Amps 250VAC/30VDC Relay Output Modbus RTU Remote IO Device, 1 x RS485, 100 - 240V AC (120 – 370V DC), 50Hz to 60Hz AC Power Input

HUR318: 8 Channels 12-275 AC-DC, 60mA Digital Optocoupler Input Modbus RTU Remote IO Device, 1 x RS485, 5-48V (max. 60V) DC Power Input

HUR418: 8 Channels 12-275 AC-DC, 60mA Digital Optocoupler Input Modbus RTU Remote IO Device, 1 x RS485, 100 - 240V AC (120 – 370V DC), 50Hz to 60Hz AC Power Input

HUR518: 8 Channels 0-10V and 0-20mA Selectable Analog Input Modbus RTU Remote IO Device, 1 x RS485, 5-48V (max. 60V) DC Power Input

HUR555: 5 Channels 4-20mA Analog Output Modbus RTU Remote IO Device, 1 x RS485, 5-48V (max. 60V) DC Power Input

HUR618: 8 Channels 0-10V and 0-20mA Selectable Analog Input Modbus RTU Remote IO Device, 1 x RS485, 100 - 240V AC (120 – 370V DC), 50Hz to 60Hz AC Power Input

HUR655: 5 Channels 4-20mA Analog Output Modbus RTU Remote IO Device, 1 x RS485, 100 - 240V AC (120 – 370V DC), 50Hz to 60Hz AC Power Input

10. Product Selection

Model	5-48V (max. 60V) DC Power input	90 – 265V AC (100 – 370V DC), 47Hz to 63Hz AC Power Input	1 x RS485 port	8 Channel 5-275V AC-DC, 100mA Digital Optocoupler Output	8 Channel Digital 5Amp. Relay Output	8 Channel 12-275 AC-DC, 60mA Digital Optocoupler Input	8 Channel 0-10V and 0-20mA Selectable Analog Input	5 Channel 4-20mA Analog Output
HUR118	X		X	X				
HUR128	X		X		X			
HUR218		X	X	X				
HUR228		X	X		X			
HUR318	X		X			X		
HUR418		X	X			X		
HUR518	X		X				X	
HUR555	X		X					X
HUR618		X	X				X	
HUR655		X	X					X