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MODBUS PROTOCOL

QUATROSENSE ENVIRONMENTAL LTD.
5935 OTTAWA STREET, PO BOX 749 RICHMOND, ONTARIO CANADA K0A 2Z0
PHONE: (613) 838-4005 FAX: (613) 838-4018
Web: www.QELsafety.com Email: QEL@QELsafety.com

1. MODBUS Protocol

1.1 Serial Transmission Mode

- ModBus RTU Slave Mode
- Baud rate: 1200 to 57.6K, selectable from [Menu]-->[System Setting]-->[Baud Rate]
- Byte parity: Odd, Even or None parity, selectable in [Menu]-->[System Setting]-->[Protocol]-->[ModBus]
- Data format: One start bit, 8 data bit, (one parity bit), one stop bit, LSB first.
- Frame Check: CRC check.

1.2 Function Code

- **#03 Read Holding Registers**

Function: Read inputs and outputs statuses and readings, such as

- Sensor readings and statuses
- Analog output current (mA x 10)
- Relay / Buzzer Statuses

Attribute: Read Only.
Broadcast is not supported.

Query:

Slave Address:	xx (Check Address in [Menu]-->[System Setting]-->[Address])
Function code:	03
Starting addr. Hi:	000
Starting addr. Lo:	xxx (00 to 03)
No. of points Hi:	000
No. of points Lo:	xxx (01 to 04)
CRC check:	xxxxH

Example: to read all holding registers (Address: 0x01)

Query: [001] [003] [000] [000] [000] [004] [068] [009] in unsigned decimal.

Holding Register Address Table

Modbus	Name	Description
40001	Transmitter Status and Gas Reading Decimal	Transmitter Status in High 8 bits, Reading Decimal in Low 8 bits Status Byte Definition: Byte=0: Normal b0=1: Alarm: At least one relay/buzzer is actuated. b1=1: Fault Others: N/A Decimal Byte Definition: Note: the reading without decimal is in 40002 0: The actual reading is Reading / 1 1: The actual reading is Reading / 10 2: The actual reading is Reading / 100 3: The actual reading is Reading / 1000 Others: N/A
40002	Gas Reading without Decimal	The Gas Reading is 16 bits signed integer. The Actual Reading of the sensor should be divided by its Decimal Position, see 40001

40003	Analog Output mA reading X 10
	And
	Relay / Buzzer Status
		Analog Out 10X mA value in High 8 bits,
		Relay / Buzzer Status in Low 8 bits
		
		10X mA Value Byte Definition:
		0 – 255: Analog Output Current Value (mA) X 10
		Example:
		If (Byte) = 200, the Analog Output value is 20.0 mA.
		If (Byte) = 41, the Analog Output value is 4.1 mA.
		If (Byte) = 20, the Analog Output value is 2.0 mA.
		
		Relay / Buzzer Status Byte Definition:
		bit = 1: ON, bit = 0: OFF
		b0: Relay 1 Status.
		b1: Relay 2 Status.
		b2: Relay 3 Status.
		b3: N/A
		b4: Buzzer 1 Status.
		b5: Buzzer 2 Status.
		b6: Buzzer 3 Status.
		b7: N/A
		
		Note: If a relay is disabled, its status bit will always be OFF.

40004	Temperature Reading	If the Sensor Board is equipped with Temperature Sensor, it shows as below, otherwise, it shows 0xFFFF 10X Temperature Reading in High 8 bits and Low 8 bits. Temperature Decimal would always be 1. Examples: If the register is 251, that means the temperature is 25.1C If the register is –100, that means the temperature is –10.0C The unit is Celsius.

- **#05 Write Single Coil**

Function: is used to write a single output to either ON or OFF

- Relay1 to Relay 3: Address 0 to Address 2
- Buzzer1 to Buzzer3: Address 4 to Address 6

Attribute: Write Only.
Broadcast is not supported.

The requested ON/OFF state is specified by a constant in the request data field. A value of FF 00 hex requests the output to be ON. A value of 00 00 requests it to be OFF. All other values are illegal and will not affect the output.

The Request PDU specifies the address of the coil to be forced. Coils are addressed starting at zero. Therefore coil numbered 1 is addressed as 0. The requested ON/OFF state is specified by a constant in the Coil Value field. A value of 0XFF00 requests the coil to be ON. A value of 0X0000 requests the coil to be off. All other values are illegal and will not affect the coil.

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

Note: The function will override the Transmitter Relay/Buzzer state. The forced state will remain valid until the manually reset of output is performed by pressing and hold Key [ESC] for 3 seconds.

Query:

Slave Address:	xx
	(Check Address in [Menu]-->[System Setting]-->[Address])
Function code:	05
Output addr. Hi:	000
Output addr. Lo:	xxx (000 to 006)
Output Value Hi:	255 or 000
Output Value Lo:	000
CRC check:	xxxxH

Response:

Slave Address:	xx (Address)
Function code:	05
Output addr. Hi:	000
Output addr. Lo:	xxx (000 to 006)
Output Value Hi:	255 or 000
Output Value Lo:	000
CRC check:	xxxxH

- #17(11H) Report Slave ID

Function:

Return a description and specification of the transmitter present at the address.

Broadcast is not supported.

Query:

Slave Addr.:	xxH	
	(Check Address in [Menu]-->[System Setting]-->[Address])	
Function code:	11H	
CRC check:	xxxxH	

Response:

Slave addr.:	xxH	
Function code:	11H	Command
Byte count:	22H	34 Bytes
Software Version:	(2 Bytes)	major version first
Transmitter Serial Number	(2 Bytes)	high byte first
Gas Type Name [5]	(5 Bytes)	Gas Type Name
Unit Name [3]	(3 Bytes)	Unit Name
Sensor Running days	(2 Bytes)	Running Days
Days since last CAL	(2 Bytes)	How many days since last CAL
Relay1-3 Enabled	(1 Bytes)	b0=1 Relay1 Enable b0=0 Relay1 Disabled b1=1 Relay2 Enable b1=0 Relay2 Disabled b2=1 Relay3 Enable b3=0 Relay3 Disabled
Relay1 Action On	(2 Bytes)	Number without decimal
Relay1 Action Off	(2 Bytes)	Number without decimal
Relay2 Action On	(2 Bytes)	Number without decimal
Relay2 Action Off	(2 Bytes)	Number without decimal
Relay3 Action On	(2 Bytes)	Number without decimal
Relay3 Action Off	(2 Bytes)	Number without decimal
Concentration at 4mA	(2 Bytes)	Conc@4mA without decimal
Concentration at 20mA	(2 Bytes)	Conc@20mA without decimal
Global Decimal	(1 Byte)	Same as low 8 bits in 40001 register
CRC check:	xxxxH	