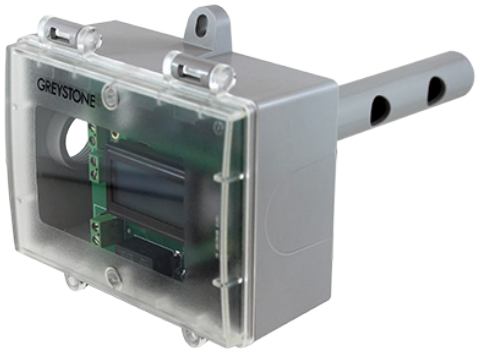
GREYSTONE
ENERGY SYSTEMS INC

VOC SERIES

Air Quality Transmitter
Setup Guide for Modbus Communication



Modbus Address	Typical Offset	Units	Data Type	Access	Description	Notes (All 16 bit Integers)	Register Value
40001	+0	VOC Index	Word	Read	VOC Index/TVOC ppb	0-500 VOC Index/0-1000ppb	0x0000 to 0x01F4 (0 to 500 VOC Index)/0x0000 to 0x03E8 (0 to 1000ppb)
40002	+1	%RH	Word	Read	RH sensor value	0-100%RH, resolution 0.1%RH	0x0000 to 0x3E8 (0.0 to 100.0%RH mulitplier = 10)
40003	+2	C/F	Word	Read	Temperature sensor value	0 to 50C, 32 to 122F	0x0000 to 0x01F4, corresponding to 0.0 to 50.0 °C (multiplier = 10) 0x0140 to 0x04C4, corresponding to 32.0 to 122.0 °F (multiplier = 10)
40004	+3		Word	Read	Relay Status	0 = Inactive, 1 = Active	0x0000 (Inactive) or 0x0001 (Active)
40005	+4		Word	Read	Override Status	0 = Inactive, 1 = Active	0x0000 (Inactive) or 0x0001 (Active)
40006	+5		Word	Read	Wireless Connect Status	0 =Unconnected, 1 =Connected	0x0000 (Disabled) or 0x0001 (Enabled)
40007	+6	VOC Index/ TVOC ppb	Word	Read/Write	VOC Units	0 = Index, 1 = ppb, default 0	0x0000 (Index) or 0x0001 (ppb)
40008	+7	C/F	Word	Read/Write	Temperature Units	0 = °C, 1 = °F, default 0	0x0000 (C) or 0x0001 (F)
40009	+8	C/F	Word	Read/Write	Temperature offset	-5 to 5 Δ°C, Resolution = 0.1 Δ°C ,defaults 0 Δ°C. -10 to 10 Δ°F, Resolution = 0.1 Δ°F, defaults 0 Δ°F	0xFFCE to 0x0032, corresponding to -5.0 to 5.0 °C (multiplier = 10) 0xFF9C to 0x0064, corresponding to -10.0 to 10.0 °F (multiplier = 10)
40010	+9	%RH	Word	Read/Write	RH offset	+/- 10%RH, 1%RH resolution,defaults 0 %	0xFFF6 to 0X000A (-10 to 10 %RH)
40011	+10		Word	Read/Write	Relay Assignment	1 = VOC ,2 = RH, 3 = Temperature,defaults 1	0x0001 (VOC) or 0x0002(RH) or 0x003(T)
40012	+11	VOC Index TVOC %RH Temperature	Word	Read/Write	Relay setpoint	Setpoint to activate Relay, VOC Index, range 100-500, resolution 10, defaults 200. TVOC, range 100-1000ppb, resolution 10 ppb, defaults 200ppb. RH range 20 to 90%RH 1%RH,defaults 70%RH. Temperature 5 to 40 °C, Resolution = 1 °C ,defaults 26C. 40 to100 °F, Resolution =1 °F,defaults 79F	0x0064 to 0x01F4 (100 to 500 VOC Index), 0x0064 to 0x03E8 (100 to 1000 TVOC) 0x0014 to 0X005A (20 to 90 %RH) 0x0005 to 0x0028 (5 to 40 °C) ,or 0x0028 to 0x0064 (40 to100 °F).
40013	+12	%RH (Temperature)	Word	Read/Write	Relay Hysterisis	Hysterisis for relay activation, VOC Index, range 10-50, resolution 1,defaults 20. TVOC, 10-50ppb, resolution 1ppb,defaults 20. RH, range 5 to 20%RH, resolution 1%,default 10%. T, range 1 to 5 C or 2-10F, resolution 1 C/F, defaults 2C/4F.	0x000A to 0x0032(10 to 50 VOC Index) 0x000A to 0x0032 (10 to 50ppb TVOC) 0x0005 to 0x0014 (5 to 20%RH) 0x0001 to 0x0005 (1 to 5 C) or 0x0002 to 0x000A (2 to 10F)
40014	+13	Seconds	Word	Read/Write	Relay On Time	Minimum on time when relay activated, default 0 seconds, resolution 1 second, range 255 seconds , default 15 seconds	0x0000 to 0x0005 (0 to 255 seconds)
40015	+14		Word	Read/Write	Relay Test	0 = Inactive, 1 = Active, default 0	0x0000 (Inactive) or 0x0001 (Active). Customer must set Inactive after Test
40016	+15		Word	Read/Write	Set Override	0 = Inactive, 1 = Active, default 0	0x0000 (Inactive) or 0x0001 (Active).
40017	+16		Word	Read/Write	Set New TVOC REF	0 = Inactive, 1 = Active, default 0	0x0000 (Inactive) or 0x0001 (Active).
40018	+17		Word	Read/Write	LCD Backlight	1 =AUTO, 2 = OFF, 3=ON, default 1	0x0001 (AUTO) or 0x0002OFF) or 0x0003(ON)
40019	+18		Word	Read/Write	LCD Format	1 =VOC, 2=RH, 3=T,4=VOC+RH+T, defaults=1	0x0001 (VOC) or 0x0002 (RH) or 0x0003(T) or 0x0004(VOC+RH+T)
40020	+19		Word	Read/Write	Wireless Enable	0 = Disable, 1 = Enable, defaults=0	0x0000 (Disable) or 0x0001(Enable)

RTU Message Format

Modbus Framing	8 bit binary
Data Bits	start bits --- 1, data bits --- 8, parity bits --- none,odd or even, stop bits --- 1 or 2
Baud Rate	9600, 19200, 38400, 57600, 76800 or 115200
Duplex	Half duplex
Error Checking	Cyclical Redundancy Check (CRC)
	CRC-16 — polynomial x16+x15+x2+x0 0x8005, or reversed version 0xA001, or CRC-CITT---polynomial x16+x12+x5+x0 0x1021 or reversed version 0x8408
Latency	More than 3.5 characters --- minimum, 50,100,150,200,250,300 or 350mS

RTU Framing Support and Bit Sequences

Start -1-2-3-4-5-6-7-8- Stop	
Start -1-2-3-4-5-6-7-8- Stop-stop	
Start -1-2-3-4-5-6-7-8- Odd-stop	
Start -1-2-3-4-5-6-7-8- Even-stop	

RTU Function Codes

0x03 --- Read holding registers

Query

Slave address (0x01 to 0xFF)	Function code (0x03)	Starting address MSB	Starting address LSB	Quantity of registers MSB	Quantity of registers LSB	CRC LSB	CRC MSB

* Starting address = 0x0000 to 0xFFFF, Quantity of registers = 0x0000 to 0x007D

Response

Slave address (0x01 to 0xFF)	Function code (0x03)	Byte count 2N	Register value MSB	Register value LSB	…	CRC LSB	CRC MSB

* N= Quantity of registers

0x06 --- Write single register

Query

Slave address (0x01 to 0xFF)	Function code 0x06	Register address MSB	Register address LSB	Register value MSB	Register value LSB	CRC LSB	CRC MSB

Response

Slave address (0x01 to 0xFF)	Function code 0x06	Register address MSB	Register address LSB	Register value MSB	Register value LSB	CRC LSB	CRC MSB

* Register address = 0x0000 to 0xFFFF, Registers value = 0x0000 to 0xFFFF

Exception response

Slave address	Function	Exception code	CRC	CRC
(0x01 to 0xFF)	code + 0x80	0x01, 0x02 or 0x03	LSB	MSB

* An exception response is only returned if the CRC is correct
  Exception code 01 --- illegal function, 02 --- illegal address, 03 --- illegal data value

Note that the registers may be read individually or multiple registers may be read at the same time by changing the query as shown below.

To read several registers with one query…

0x03 --- Read ALL REGISTERS

Query

Slave address							
(0x01 to 0xFF)	0x03	0x00	0x00 (Note 1)	0x00	0x05 (Note2)	CRC LSB	CRC MSB

Response

Slave address							
(0x01 to 0xFF)	0x03	0x0A (Note 3)	Register value MSB	Register value LSB	. . .	CRC LSB	CRC MSB

Note 1: The starting address (A) may be 0x0000 to 0x00A. The read multiple feature will read all registers from the starting address forward.
If the starting address is 0x0000 then registers 40001 to 40011 can be read. If the starting address is 0x0008 then registers 40009 to 40011 can be read.

Note 2: The quantity of registers (N) may be 0x0001 to 0x000B, but must be limited to11 – A. If the starting address (A) is set to 0x0000 then N may be 0x0001 to 0x000B. If the starting address is set to 0x0008 then N may be 0x0001 to 0x0003.

Note 3: The byte count (B) will always be 2N. If the quantity of registers (N) is 0x0001 then B will be 0x02. If N is 0x0005 then B will be 0x0A.