TotalSense AI31 BACnet Protocol User Guide

Contents

TotalSense™

TotalSense AI31 BACnet Protocol

Product Information

Product Specifications:

- **Model Numbers:** AI31, AI33, AI35, AI24, AI32, AI34, AV60, AV61, AV62, AV63, AV64, AV65
- **Inversion Options:** 0 = Not Inverted, 1 = Inverted
- **AQI (Air Quality Index) Categories:** CO2, VOC, PM, CO, O3
- **AQI Quality Levels:** Poor quality, Good quality
- **Temperature Range:** AQI Temp Range Low – AQI Temp Range High
- **Humidity Range:** Low window threshold for good humidity quality High window threshold for good humidity quality

Product Usage Instructions

Air Quality Monitoring:

1. Use the device to monitor AQI levels for CO2, VOC, PM, CO, and O3.
2. Note the thresholds where each air quality category transitions from Poor to Good quality.

Temperature and Humidity Monitoring:

1. Check the temperature range displayed on the device for optimal comfort.
2. Monitor the humidity levels within the specified thresholds for good quality.

Inversion Settings:

1. Select the desired inversion option (0 = Not Inverted, 1 = Inverted) based on your preference.

Frequently Asked Questions (FAQ):

- **Q: How do I know when air quality is considered poor or good?**
  A: The device will display the AQI levels for different pollutants and indicate whether it falls under Poor quality or Good quality based on the specified thresholds.
- **Q: What should I do if the temperature or humidity levels are outside the recommended range?**
  A: Take necessary actions to adjust the temperature or humidity levels to fall within the specified thresholds for good quality.

154-0043-0F

Rev.	Release Date	**By**	Description of Change	ECR
0A		NAK	Initial Release	—
OB	9/23/2021	NJS	Adding system config points	—
oc	6/7/2022	NJS	Updates for engineering Cl release	—
OD	9/21/2022	NJS	Updates for CO and 03 release	—
OE	3/8/2023	NJS	Adding PB over cornms	—
OF	1/8/2024	NJS	Updates for new feature release	—

See Also:

152-0401
TotalSense Installation Instructions

154-0042
TotalSense Display Navigation Guide

154-0044
TotalSense Modbus Protocol Guide

Protocol Implementation Conformance Statement

- Date 5/13/2021
- Vendor Name Senva Sensors
- Product Name Total Sense Air Quality Sensor
- Product Model Number AQ2W-XXXXXX (See catalog for model numbering)
- Firmware Revision VSBHP 14.10
- Application Software Version 1.2.x
- BACnet Protocol Revision 14
- Product Description Low Voltage Air Quality Sensor
- BACnet Standardized Device Profile BACnet Application Specific Controller (B-ASC)
- List of BACnet Interoperability DS-RP-8, DS-RPM-8, DS-WP-8,
    - Building Blocks Supported DM-DDB-8, DM-DOB-8 DM-DCC-8, DM-RD-8
- Segmentation Capability No Support
- Standard Object Types Supported See the following. Optional implementations are marked.
- Data Link Layer Options MS/TP Master
- Device Address Binding No Support
- Networking Options No Support
- Character Sets Supported ISO 10646 (UTF-8)
- Communications Gateway No Support
- Network Security Options Non-Secure Device

Configuration

Congratulations on installing your new Senva BACnet TotalSense Series indoor air quality monitor! The BACnet Protocol Guide assumes the first stage of installation is complete, with the Total Sense connected to your local RS485 network and powered.

See “Total Sense Installation Manual” for setup.

Device information can be configured or referenced using the below table.

Property	Min/Max	Default	Read	Functionality
OBJECT_IDENTIFIER (DEVICE INSTANCE)	0/4194302	655xxx	R/W	Set from factory to 655xxx where xxx is the last 3 digits of the serial number of the device.
OBJECT_NAME	N/A	Device Name	R/W	The device allocates 64 bytes for string values.
DESCRIPTION	N/A	Device Description	R/W	The device allocates 64 bytes for string values.
LOCATION	N/A	Device Location	R/W	The device allocates 64 bytes for string values.
PROFILIE_NAME	N/A	665-Device-AQ2	read only	
MODEL_NAME	N/A	Varies	read-only	Set from the factory to complete part number.
VENDOR_NAME	N/A	Senva Inc.	read-only	
APPLICATION_SOFTARE_VERSION	N/A	Varies	read-only	Set from the factory.
FIRMWARE_REVISION	N/A	VSBHP 14.10	read-only	
MAX_MASTER	0/127	127	R/W	
VENDOR_IDENTI FIER	665	665	read-only	
PROTOCOL_ VERSION	1	1	read-only	
PROTOCOL_REVISION	14	14	read only	

Trading

Register	Description	Min/Max	Units	Read	Functionality
All	Temperature	-40.0 I 122.0	°F/C	read-only	Read current temperature. Units depend on the setting in AV2.

AI2	Relative humidity	0.0 I 100.0	%RH	read-only	Read current relative humidity in.
AI3	CO2	0 I 10000	PPM	read-only	Read current CO2 concentration in PPM .
AI4	TVOCug/m3	0 I 10000	µg/m3	read-only	Read current TVOC reading in µg/m3. T his value is compensated for ambient te mperature and barometric pressure.
AIS	TVOCPPB	0 I 10000	PPB	read-only	Read current TVOC reading in PPB. Thi s value is compensated for ambient tem perature and barometric pressure and a ssumes an average molecular weight of 46.069 g/mol for conversion, which is based on Ethanol. To adjust this value, see AV8 to adjust the scaling factor.
AI6	PM 1.0ug/m3	0 I 1000.0	µg/m3	read-only	Read the current concentration of particl es sized 0.3-1.0 µg/m3.
AI?	PM2.5ug/m3	0 I 1000.0	µg/m3	read-only	Read the current concentration of particl es sized 0.3-2.5 µg/m3.
AI8	PM4.0ug/m3	0 I 1000.0	µg/m3	read-only	Read the current concentration of particl es sized 0.3-4.0 µg/m3.
AI9	PM 10.0 ug/m3	0 I 1000.0	µg/m3	read-only	Read the current concentration of particl es sized 0.3-10.0 µg/m3.
AI10	Air quality	0 = Good 1 = Fair 2 = Poor	no units	read-only	Read current air quality status. See the “ Air Quality Thresholds” section for more information.
AII 1	Slider display	-40.0 I 122.0	°F/C	read-only	Read the current setpoint slider position. Minimum and maximum values for scaling can be set in AV9 and AV10 r espectively. Units depend on the setting in Av2.

AI12	Occupancy	0= Unoccupied 1 = Occupied	no units	read-only	Read the current status of the PIR occupancy sensor. This value will stay occupied after a motion event for the period specified in AVI 2.
AI13	Ambient light	0 I 100	foot candles	read-only	Read current ambient light value in foot candles.
AI14	Relay contacts state	0 = OPEN 1 = CLOSED	no units	read-only	Read the current state of the setpoint relay. Relay settings can be adjusted in AV I 5- AV20.
AI15	Dewpoint	-40.0 I 122.0	°F/C	read-only	Read current dew point temperature. Units depend on the setting in AV2.
AI16	Pressure	0.00 I 35.44	inHg	read-only	Read current barometric pressure in inHg. This reading is only available on units that include either CO2 or VOE sensors.
AI25	PM0.5 Particle Count	0/1000.0	#/cm^3	read-only	Read Current counts for particle sizes 0.3 to 0.5.
AI26	PM 1.0 Particle Count	0/1000.0	#/cm^3	read-only	Read Current counts for particle sizes 0.3 to 1.0.
AI27	PM2.5 Particle Count	0/1000.0	#/cm^3	read-only	Read Current counts for particle sizes 0.3 to 2.5.
AI28	PM4.0 Particle Count	0/1000.0	#/cm^3	read-only	Read Current counts for particle sizes 0.3 to 4.0.
AI29	PM 10.0 Particle Count	0/1000.0	#/cm^3	Read-only	Read Current counts for particle sizes 0.3 to 10.0.
AI30	PM Avg Particle Size	0/10.00	um	Read-only	Read the Current average size of the particle that the device has measured.
AI31	CO Reading	0/2000	ppm	Read-only	Read the Current CO readings

AI33	03 Reading	0/5000	ppb	Read-only	Read the Current O3(ozone) readings
AI35	User BTN Active State	0/1	No units	Read-only	0 = No button activity since the timeout period. 1= Button was pressed within the timeout period.

Diagnostics

Register	Description	Min/Max	Read	Functionality
All 7	System status	0 l 255	read-only	0x01 = EEPROM hardware fault (Consult factory) 0x02 = EEPROM data corruption (Consult factory) 0x04 = EEPROM write error (Consult factory) 0x08 = Device is currently using factory defaults (Consult factory) 0xl 0 = Sensor error (see individual sensor status for more info). **Balded** statuses will trigger this error.
AI18	Temp sensor status	0 l 255	read-only	**0x01** = Sensor hardware fault (Consult factory) **0x02** = Sensor Data error (Consult factory)
AI19	RH sensor status	0 l 255	read-only	**0x01** = Sensor hardware fault (Consult factory) **0x02** = Sensor Data error (Consult factory)
AI20	CO2 sensor status	0 l 255	read-only	**0x01** = Sensor hardware fault (Consult factory) **0x02** = Sensor Data error (Consult factory) 0x04 = Sensor not ready (Consult factory) 0x40 = Temperature compensation not applied (No action necessary. The default value of 25°C is used for temp compensation). 0x80 = Pressure compensation not applied (No action necessary. A default value of 25°C is used for pressure compensation.

AI21	TVOCsensor status	0 I 255	read-only	**0x01** = Sensor hardware (I2C) fault (Consult factory) **0x02** = Sensor data error **0x04** = Sensor other hardware error **0x08** = Sensor not ready (training) 0xl 0 = Temperature compensation not applied 0x20 = Humidity compensation not applied
AI22	PM sensor status	0 I 255	read-only	**0x01** = Sensor communication error (Consult factory) **0x02** = Sensor Data Error (Consult factory) 0x04 = Sensor not ready (Consult factory) 0x08 = Sensor fan speed warning (Consult factory) 0xl 0 = Sensor fan failure (Consult factory) 0x20 = Sensor laser failure (Consult factory)
AI23	Pressure sensor status	0 I 255	read-only	**0x01** = Sensor hardware fault (Consult factory) **0x02** = Sensor Data error (Consult factory) 0x04 = Sensor not ready (Consult factory)
AI24	PIO Output Power	0.0/100.0%	read-only	Read the current output percentage of the PID output.
AI32	CO Status	0/255	R	**0x01** = Sensor communication error (Consult factory) **0x02** = Sensor Data Error (Consult factory) 0x04 = Sensor Error 0x08 = Sensor not ready (Consult factory) 0xl 0 = Sensor End of Life 0x20 = Calibration Expired 0x40 = Temperature compensation not applied

AI34	03 Status	0/255	R	**0x01** = Sensor communication error (Consult factory) **0x02** = Sensor Data Error (Consult factory) 0x04 = Sensor Error 0x08 = Sensor not ready (Consult factory) 0xl 0 = Temperature compensation not applied 0x02 = Humidity compensation not applied

Settings

Register	Description	Min/Max	Units	Default Value	Read	Functionality
AV1	Temp Offset	-9/9	OF	0	R/W	Adjust Treading by up to 9°F (or 5° C).
AV2	Temp Unit	0=F l=C	No units	0	R/W	Select whether the display shows degrees Fahrenheit or Celsius. Thi s will also determine the scale of th e reading in All.
AV3	RH Offset	-5.0/5.0	%RH	0	R/W	Adjust RH reading by up to 5%.
AV4	CO2 Offset	-250/250	PPM	0	R/W	Offset CO2 reading by ±250 PPM.
AVS	CO2 auto cal en able	0=disabled l=e nabled	None	1	R/W	Enable or disable the ABC function for CO2 sensor calibration. It is not recommended to disable this unles s you are using a dual-channel CO 2 element.
AV6	CO2 Autocal Ba seline	400 / 1499	PPM	400	R/W	This sets the baseline value for the automatic baseline calibration. Thi s should correspond to expected “ unoccupied” levels of CO2.
AV7	CO2 Autocal Pe riod	1 / 15	Days	14	R/W	This sets the period for which ABC will calculate its unoccupied level a nd calibrate.
AV8	TVOCscale	0.000 l 10.000	No units	1.000	R/W	This value can be used to adjust th e TVOC reading. The standard rea dings are based on an Ethanol equ ivalent. See “TVOC Molecular Wei ghts” section for more information.
AV9	Slider display mi n	-40.0 l 122.0	°F/C	50	R/W	The value is shown when the slide r is at the lowest position for displa y purposes only. This will not affect the slider’s resistive output. This wi ll also set the minimum value for th e All 1 reading.

AV10	Slider display max	-40.0 I 122.0	°F/C	95	R/W	The value is shown when the slider is at the highest position for display purposes only. This will not affect the slider’s resistive output. This will also set the maximum value for the All 1 reading.

AV11	PIR Motion event sensitivity	10 / 100	No units	80	R/W	Sensor sensitivity can be adjusted from 0-100. The default of 80 achieves the specified distance and degree. If nuisance triggers occur or a further sensing distance is required, this value can be decreased and increased accordingly. See the TotalSense Installation Manual for a visual representation of this sensitivity value.
AV12	PIR Occupied delay	1 / 120	Minutes	10	R/W	This is the number of minutes the occupancy state will remain active after each motion event is detected. This applies to the “occupancy” BACnet and Mod bus point as well as the output relay state if set to PIR in AV15.
AV13	PM clean interval	0 I 8760	hours	168	R/W	Timed automatic clean cycle of PM element. To disable auto-clean, set to 0.
AV14	PM command	0/2	no units	0	R/W	Write 1 to execute the fan manual clean operation Write 2 to execute the PM sensor reset
AV15	Relay source	0=None 1=(02 2=Humidity 3= Temp 4=TVOC µg/m^3 S=PM 6=Occupancy ?=Air Quality 8 =(0 9 = Ozone	no units	0	R/W	Which measurement will activate the setpoint relay?
AV16	Relay polarity	0=N.O. 1 =N.C.	no units	0	R/W	An N.O. (normally open) relay will be in the open state until it is activated, i.e., the turn-on threshold is met, at which time it will close. An N.C. (normally closed) relay will be in the closed state until it is activated, at which time it will open.

						Based on the full-scale range of the selected sen sor, set the value above which the relay will activ ate. For example, if CO2 is selected, its full availa ble range is 0-10,000 PPM, so a setpoint of 800 PPM would
						correspond to an 8.00% threshold setting. For te mperature, the full range is -40 to 122°F, so a set point of 70°F would correspond to a threshold val ue of 68%. Use this equation to determine the thr eshold setting for a temp in °F: (T+40)/162*100. This setting is ignored for PIR and G/F source
						selections. The display will show the calculated v alue as you adjust this setting. The below shows the values that are set by default when each sour ce is selected as well as the calculated value for each.
AV17	Relay on t hreshold	0.00 I 100. 00	**percen t**	**varies**	**R/W**	

Sour ce	Ra nge	Defa ult	Calcu lated	Defa ult	Calcu lated
Sele ction		Turn-on	Turn-on	Turn-off	Turn-off
		Thre shold	value	Thre shold	value
CO2	0-	8.0%	800 PPM	7.0%	700 P PM
	10, 000				
	PP M				
RH	0-	60%	60% RH	55%	55% RH
	100 %				
	RH				
Tem p*	-40 -	74%	80°F	73%	78°F
	122 °F				
TVO C	0-	4.0%	400	3.5%	350
	100 00		µg/m 3		µg/m 3
	µg/ m3				

						co	0-200 PPM	50%	l00PPM	40%	80PPM	
						Ozone	0-500 PPM	20%	l00PPM	16%	80PPM	
AV18	Relay off threshold	0.00 l 100.00	**percent**	Varies	**R/W**	Based on the full scale range of the selected sensor, set the value below which the relay will de-activate. For example, to deactivate the relay when the CO2 setting reaches 790, set this threshold value to 7.90%. This value must be set lower than the relay on the threshold.						
AV19	Relay min on time	1 / 240	**seconds**	**60**	**R/W**	When the relay activates, it will not deactivate until this time has lapsed, regardless of the turn-off setting. The relay will deactivate only when this time has expired AND the turn-off threshold is met.						

AV20	Relay min off time	1 / 240	seconds	60	R/W	When the relay de-activates, it will not activate again until this time has lapsed, regardless of the turn-on setting. The relay will re-activate only when this time has expired AND the turn-on threshold is met.
AV21	Display PM size	0 = 0.3-1.0 1 = 0.3-2.5 2 = 0.3-4.0 3 = 0.3-10.0	Micro-meters	1	R/W	Select which particulate size to show on display units.

AV22	Display center	0 = None 1 = Temperature 2 = Humidity 3 =CO2 4 = Air Quality 5 =TVOC µg/m^3 6 =TVOC ppb 7= PM 8 = Temp Setpoint 9=CO 10=03	None	4	R/W	Choose the value to show in the center of the OLEO display (Display models only). The below is an example of the Air Quality" setting. If PM is selected, the particle size displayed will depend on the setting in AV21. 
AV23	Display upper left	0 = None 1 = Relay Icon	None	0	R/W	Choose whether to show the relay state icon on the top left of the OLEO display (Display models only).
AV24	Display upper right	0 = None 1 = Temperature 2 = Humidity 3 =CO2 5 = TVOC µg/m^3 6 =TVOC ppb 7= PM 8 = Temp Setpoint 9=CO 10=03	None	1 or 0	R/W	Choose the value to show in the upper right of the OLEO display (Display models only). The default depends on whether the temperature element is included.
AV25	Display lower left	0 = None 1 = Temperature 2 = Humidity 3 =CO2 5 = TVOC µg/m^3 6 =TVOC ppb 7= PM 8 = Temp Setpoint 9=CO 10=03	None	2 or 0	R/W	Choose the value to show in the lower left of the OLEO display (Display models only). The default depends on whether the humidity element is included.

AV26	Display lower right	0 = None 1 = Temperature 2 = Humidity 3 =CO2 5 =TVOC µg/m^3 6 =TVOC ppb 7 =PM 8 = Temp Setpoint 9=CO 10 =03	None	3 or 0	R/W	Choose the value to show in the lower right of the OLEO display (Display models only). The default depends on whether the CO2 element is included.
AV27	AQRing brightness	0 I 100	no units	100	R/W	Adjust value to increase or decrease brightness of AQ Ring (on AQ Ring devices only).
AV28	Good-Fair	0 I 100	no units	70	R/W	Adjust this value to change the threshold below which the display or AQ Ring will show a “fair” rating.
AV29	Fair-Poor	0 I 100	no units	40	R/W	Adjust this value to change the threshold at or below which the display or AQ Ring will show a “Poor” rating.
AV30	VOCMode	0/1	No units	0	R/W	0 = Normal operation mode 1 = Training mode (48 hours)
AV31	Factory reset	1234 *	no units	0		Write value 1234 to this register to set all customer-accessible values to factory defaults. The device will reboot after the factory restore has been completed.
AV32	Protocol	0 = Modbus 1 = BACnet	no units		Read-only	Read from device DIP switches. See the installation Manual for details.
AV33	MAC address	0 I 127	no units		Read-only	Read from device DIP switches. See the installation Manual for details.

AV34	Baud rate	0 = 9600 1 = 19200 2 = 38400 3 = 57600 4 = 76800 5 = 115200	no units		Read -only	Read from device DIP switches. See the installation Manual for details .
AV35	Data/Parity/Stop	0 = 8N1 1 = 8N2 2 =801 3 = 8E1	no units		Read -only	Read from device DIP switches. See the installation Manual for details .
AV55	Display Lock	0 = Disabled 1 = Enabled	No units	0	R/W	Choose to lock the settings Menu. This will override the menu lock setting in the device GUI display settings and the device will remain locked until this setting is changed through comms.

AV56	PIR Display Wake-Up	0 = Disabled 1 = Enabled	No units	0	R/W	Will use the PIR motion sensor to wake up the device display when a motion event is detected
AV57	Screensaver Timeout	1/120	minutes	1	R/W	Sets the time in minutes the screen will stay active until the screensaver turns on
AV60	CO Calibration Expiration	0/365	days	365	Read Only	A count down in days until the CO sensor needs calibration.
AV61	CO Sensor End-of-Life	0/1825	days	1825	Read Only	A countdown in days of the CO sensor's total lifetime.
AV62	Ozone Calibration expiration	0/365	Days	0	Read-only	Shows several days left on the Ozone calibration.
AV63	BTN State Hold Time	1/600	Seconds	10	R/W	Number of seconds that the button state is active after the button is pressed.
AV64	Ozone Sensor end-of-life	0/1825	Days	1825	Read-only	Number of days until the Ozone sensor is at the end of its life.
AV65	Temp Setpoint	-40.0/122.0	F/C	72	Read-only	Setpoint is used when the slider is not equipped.

Analog Output

Register	Description	Min/Max	Units	Read	Functionality
AV36	Analog Source	0 = None 1 =CO2 2 = Humidity 3 = Temperature 4=VOC S=PM 6 = Slider Temp 7 = PIO-Temp 8 = PIO-CO2 9 = PIO-Slider Te mp 10=CO 11 = Ozone	None	R/W	Sets the source of the analog output c hannel.
AV37	Analog V min	0/10	Volts	R/W	This value corresponds to the lowest p oint on an analog scale. For a 0-10V si gnal, set to 0V. For a 2-10V signal, set to 2V.
AV38	Analog V max	0/10	Volts	R/W	This value corresponds to the highest point on an analog scale. For a 0-10V signal, set to 10V. For a 0-SV signal, set to SV.
AV39	Analog mA min	0/20	mA	R/W	This value corresponds to the lowest p oint on an analog scale. For a 4-20mA signal, set to 4mA. For a 0- 20mA signal, set to 0mA.
AV40	Analog mA max	0/20	mA	R/W	This value corresponds to the highest point on an analog scale. For a 0-20m A or 4-20mA signal, set to 20mA.

PID Setting

Register	Description	Min/Max	Units	Read	Functionality
AV41	PID CO2 setpoint	0/10000	ppm	R/W	Sets the CO2 setpoint for the PID-controlled analog output.
AV42	PIDTemp Set point	-40/122	F/C	R/W	Sets the Temperature set point for the PID-controlled analog output.
AV43	PID Kp	-100 /100	None	R/W	Sets the Proportional gain PID coefficient .
AV44	PID Ki	0/100	None	R/W	Sets the Integral gain PID coefficient.
AV45	PID Kd	0/100	None	R/W	Sets the Derivative gain PID coefficient.
AV46	PID Invert	0 = Not Inverted 1 = Inverted	None	R/W	This setting will invert the overall error signal (R – SP instead of (SP – R).
AV66	AQI PID Setpoint	0/100	%	R/W	Can use this to control a PID loop based on the calculated air quality index.

Air Quality Thresholds

If Air Quality is selected, the device will monitor each CO2, 1VOC, PM, RH, and Temp sensor present and will display accordingly. The device will calculate an average air quality based on up to 5 sensors and display good, fair, or poor accordingly. The device will come populated with the Senva recommended Good-Fair-Poor thresholds, but they can be changed with the following points, or in the device menu.

Register	Description	Min/Max	Units	Default Values	Read	Functionality
AV67	AQI CO2 Poor quality	0/10000	PPM	2000	R/W	Threshold where CO2 quality becomes Poor
AV68	AQI CO2 Good quality	0/10000	PPM	800	R/W	Threshold where CO2 quality becomes Good
AV69	AQI VOC Poor quality	0/32000	Ug/m3	3000	R/W	Threshold where VOC quality becomes Poor
AV70	AQI VOC Good quality	0/32000	Ug/m3	300	R/W	Threshold where VOC quality becomes Good
AV71	AQI PM Poor quality	0/1000	Ug/m3	55	R/W	Threshold where PM quality becomes Poor
AV72	AQI PM Good quality	0/1000	Ug/m3	12	R/W	Threshold where PM quality becomes Good
AV73	AQI CO Poor quality	0/200	PPM	25	R/W	Threshold where CO quality becomes Poor
AV74	AQI CO Good quality	0/200	PPM	0	R/W	Threshold where CO quality becomes Good
AV75	AQI O3 Poor quality	0/5000	PPB	100	R/W	Threshold where Ozone quality becomes Poor
AV76	AQI O3 Good quality	0/5000	PPB	0	R/W	Threshold where Ozone quality becomes Good
AV77	AQI Temp Range Low	-40.0/122.0	F/C	64	R/W	Low window threshold for good temperature quality
AV78	AQI CO Good quality	-40.0/122.0	F/C	79	R/W	High window threshold for good temperature quality
AV79	AQI Temp Range Low	0/100	%RH	30	R/W	Low window threshold for good humidity quality
AV80	AQI CO Good quality	0/100	%RH	60	R/W	High window threshold for good humidity quality

The average air quality is calculated as follows for the sensors that have been enabled (see table on page 19 to enable and disable each senor):

1. Each reading is rated according to the above thresholds and given an air quality rating. For each sensor, a good rating is given 90%, fair is given 60% and poor is given 0% air quality.
2. The average of all sensors' air quality is calculated.
3. The average air quality is assigned based on the following thresholds. These thresholds can be adjusted in AV28 Good-fair and AV29 fair-poor.
    - Good ≥ 75
    - 55 < Fair< 75

- Poor ≤ 55

Register	Description	Min/Max	Units	Read	Functionality
AVS0	AQ Enable Temp	0 = Disabled 1 = Enabled	None	R/W	These settings are used to enable or disable a sensor being used for the Air Quality calculation. For a sensor to be enabled it must be installed on the device. All sensors will be shipped with present elements enabled in the Air Quality calculation.
AV51	AQ Enable Humidity	0 = Disabled 1 = Enabled	None	R/W	
AV52	AQ Enable CO2	0 = Disabled 1 = Enabled	None	R/W	
AV53	AQ Enable PM	0 = Disabled 1 = Enabled	None	R/W	
AV54	AQ Enable voe	0 = Disabled 1 = Enabled	None	R/W	
AV58	AQ Enable CO	0 = Disabled 1 = Enabled	None	R/W Intl 6	
AV59	AQ Enable Ozone	0 = Disabled 1 = Enabled	None	R/W Intl 6	

VOC Molecular Weights

- Senva's TVOC sensor uses an Ethanol reading to determine a raw TVOC value. Additionally, conversion from g/m3 uses the molecular weight of Ethanol. To scale based on a different gas baseline, choose the appropriate gas from the list below and enter the scale factor in AV8.
- Please note that the sensor is measuring TOTAL VOCs, so adjusting the scale factor will not necessarily result in a gas-specific reading unless, in special cases, that is the only expected VOC present in the area. It is recommended to use the 1.0 scale factor in most cases. The RESET standard suggests calculating TVOC based on the molecular weight of isobutylene (scale factor: 1.218).

Data Source: http://aqt-vru.com/emissions/complete-list-of-vocs/.

Contamination	Name	Molecular Weight	Scale factor
ACETYLENE	ACETYLENE	26.04	0.565
FORMALDEHYDE	FORMAL	30.03	0.652
METHANOL	MEOH	32.04	0.695
PROPANE	PROPANE	44.1	0.957
ETHANOL	ETOH	46.07	1.000
DIMETHYL ETHER	ME-O-ME	46.07	1.000
METHYL CHLORIDE	CH3-CL	50.49	1.096
1,3-BUTADIENE	13-BUTDE	54.09	1.174
ISOBUTENE	ISOBUTEN	56.11	1.218
N-BUTANE	N-C4	58.12	1.262
ISOBUTANE	2-ME-C3	58.12	1.262
ACETIC ACID	ACETACID	60.05	1.303
ISOPROPYL ALCOHOL	I-C3-OH	60.1	1.305
ETHYLENE GLYCOL	ET-GLYCL	62.07	1.347
ISOPRENE	ISOPRENE	68.12	1.479
BUTANAL	1C4RCHO	72.11	1.565
N-PENTANE	N-C5	72.15	1.566
ISOPENTANE	2-ME-C4	72.15	1.566
HYDROXY ACETONE	HORACE	74.08	1.608
ISOBUTYL ALCOHOL	I-C4-OH	74.12	1.609
BENZENE	BENZENE	78.11	1.695
TOLUENE	TOLUENE	92.14	2.000
M-XYLENE	M-XYLENE	106.17	2.305
O-XYLENE	O-XYLENE	106.17	2.305
P-XYLENE	P-XYLENE	106.17	2.305
TERPENE	TERPENE	136.24	2.957

Documents / Resources

	TotalSense AI31 BACnet Protocol [pdf] User Guide AI31 BACnet Protocol, AI31, BACnet Protocol, Protocol

References

- tny.sh/AQ2DisplayGuide
- tny.sh/AQ2Modbus
- tny.sh/AQ2install
- User Manual