

AquiStar® Turbo (SDI-12 & Modbus®)

INTERFACE SPECIFICATION / 1/9/2015 / 9B1360r2

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Specifications

Power supply voltage: 9.0 – 16.0VDC

Default SDI-12 Address: 0

SDI-12 Command Nomenclature

a= Sensor address

{crc} = SDI-12 compatible 3-character CRC

<cr> = ASCII carriage return character

<lf> = ASCII line feed character

highlighted values indicate variable data

SDI-12 Commands

Setup Commands

Name	Command	Response
Sensor Identification	a!	a13 INWUSA ATurb2.2sssssssss<cr><lf> <i>Note: 2.2 will change to reflect current firmware revision, sssssssss = device serial #</i>
Acknowledge Active	a!	a<cr><lf>
Address Query	?!	a<cr><lf>
Start Verification	aV!	a0000<cr><lf>
Change Address	aAb!	b<cr><lf> Change address from a to b

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Measurement Commands

Request Measurement Name	Command	Response
Request measurement: • temperature • turbidity	aM!	atttn<cr><lf> "n" values available after "ttt" seconds Sample: a0022<cr><lf>
Read results	aD0!	aValue1Value2<cr><lf> Value1 = temperature Value2 = turbidity Sample: +24.2142+458.73<cr><lf >
Request measurement: • temperature	aM1!	atttn<cr><lf> "n" values available after "ttt" seconds Sample: a0021<cr><lf>
Read results	aD0!	aValue1<cr><lf> Value1 = temperature Sample: a+24.2142<cr><lf>
Request measurement: • turbidity	aM2!	atttn<cr><lf> "n" values available after "ttt" seconds Sample: a0021<cr><lf>
Read results	aD0!	aValue1<cr><lf> Value1 = turbidity Sample: a+458.73<cr><lf>

Request Measurement with CRC

Name	Command	Response
Request measurement: • temperature • turbidity	aMC!	atttn<cr><lf> "n" values available after "ttt" seconds Sample: a0022<cr><lf>
Read results	aD0!	aValue1Value2{crc}<cr><lf> Value1 = temperature Value2 = turbidity Sample: a+24.2142+458.73{crc}<cr><lf >
Request measurement: • temperature	aMC1!	atttn<cr><lf> "n" values available after "ttt" seconds Sample: a0021<cr><lf>
Read results	aD0!	aValue1{crc}<cr><lf> Value1 = temperature Sample: a+24.2142{crc}<cr><lf>
Request measurement: • turbidity	aMC2!	atttn<cr><lf> "n" values available after "ttt" seconds Sample: a0021<cr><lf>
Read results	aD0!	aValue1{crc}<cr><lf> Value1 = turbidity Sample: a+458.73{crc}<cr><lf>

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Concurrent Measurement

Name	Command	Response
Request measurement: • temperature • turbidity	aC!	atttnn<cr><lf> "nn" values available after "ttt" seconds Sample: a0022<cr><lf>
Read results	aD0!	aValue1Value2<cr><lf> Value1 = temperature Value2 = turbidity Sample: a+24.2142+458.73<cr><lf >
Request measurement: • temperature	aC1!	atttnn<cr><lf> "nn" values available after "ttt" seconds Sample: a0021<cr><lf>
Read results	aD0!	aValue1<cr><lf> Value1 = temperature Sample: a+24.2142{<cr><lf>
Request measurement: • turbidity	aC2!	atttnn<cr><lf> "nn" values available after "ttt" seconds Sample: a0021<cr><lf>
Read results	aD0!	aValue1<cr><lf> Value1 = turbidity Sample: a+458.73{<cr><lf>

Concurrent Measurement with CRC

Name	Command	Response
Request measurement: • temperature • turbidity	aCC!	atttnn<cr><lf> "nn" values available after "ttt" seconds Sample: a0022<cr><lf>
Read results	aD0!	aValue1Value2Value3Value4{crc}<cr><lf> Value1 = temperature Value2 = turbidity Sample: a+24.2142+458.73{crc}<cr><lf >
Request measurement: • temperature	aCC1!	atttnn<cr><lf> "nn" values available after "ttt" seconds Sample: a0021<cr><lf>
Read results	aD0!	aValue1Value2Value3Value4{crc}<cr><lf> Value1 = temperature Sample: a+24.2142{crc}<cr><lf>
Request measurement: • turbidity	aCC1!	atttnn<cr><lf> "nn" values available after "ttt" seconds Sample: a0021<cr><lf>
Read results	aD0!	aValue1Value2Value3Value4{crc}<cr><lf> Value1 = turbidity Sample: a+458.73{crc}<cr><lf>

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Modbus Register Definitions

Parameter data

Read measurements using Modbus function 03 – Read Holding Registers. Readings are located in two registers each, starting at address 62592. (INW Smart Sensor register addressing is zero based, i.e., starts at zero. If your equipment uses one based addressing, you will need to add one to the register address.

Modbus parameter data is returned as 32-bit IEEE floating point values, high word first, also referred to as big-endian, float inverse, or float AB CD. Each value is 32 bits in length, and therefore occupies two Modbus registers. As a result, the parameter registers must be read as pairs.

Modbus Register	Description
62592	Temperature
62594	Turbidity

Power On Function

In order to save power, the power to the sensing probe on the Turbo is normally off, even when the Turbo sensor itself is powered. The sensing probe requires a warm-up or stabilization time before returning valid readings. The sensing probe is turned on when a reading is requested or when a Power On command is written to the Turbo.

There is a “power on” register on the Turbo (register 62720 or 0xF500). When a positive value “n” is written to this register, the power is turned on to the sensing probe and remains on for n/4 seconds. When a reading is requested, the timer is reset and the sensing element remains on for another n/4 seconds. To force the power off immediately after a reading, for power savings, write a zero to the register. If the power to the entire Turbo sensor is turned off, this value defaults to 48 (or 12 seconds).

The recommended procedure to ensure proper warm-up/stabilization and to conserve power is:

- Write Power On value of 48 (48/4 = 12 seconds)
 - Power turns on
 - Starts sampling about two times per second
- Wait 10 seconds then request a reading
 - Returns most recent sample
 - Resets Power On value to 48 (48/4 = 12 seconds)
- Write Power On value of 0 (zero)
 - Turns power off
 - Retains last reading

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If You Cannot Write to the Power On Register

If you are reading your sensor using a meter or other device that cannot write the Power On value but simply takes readings on a specified schedule, be sure to set the polling interval to less than 12 seconds. This will ensure that the sensing probe is always powered up and readings should be fresh and stable. Note that the first reading when you turn on the Turbo will be old but will refresh within a second or two.

(Note: If you are recording sessions, reading with Aqua4Plus, or using SDI-12, you do not need to be concerned with the stabilization period. It is automatically taken care of in these situations. You only need to be concerned when using your own device to take Modbus readings.)

Sensor configuration/control

Modbus registers are provided for the following configuration and control functions.

Modbus Register	Description
62976=a	Set sensor Modbus address = a (Write Only)
64544=b	Set Modbus baud rate according to b (Write Only) b=0:38400 b=1:19200 b=2:9600

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