

Soil Temp. Humi. EC Sensor

JW-S3S(Z3) SDI-12 Protocol



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1. Product Introduction

The product adopts micro-power circuit design and follows SDI-12 protocol.

JW-S3S(Z3) Soil temperature and moisture EC sensor is based on the capacitive frequency domain measurement method. By measuring the soil apparent dielectric constant, the soil volume moisture content is calculated. The heat sensitive element inside the hollow probe measures the soil temperature. Soil moisture and temperature were measured at the same time. It's a two-in-one sensor.

BGT-SEC Soil temperature humidity and EC sensor adds an impedance measurement circuit to measure the impedance between the electrodes to convert the soil volume conductivity ECb. Three parameters of soil moisture, temperature and conductivity were measured simultaneously. It's a three-in-one sensor.

The output of JW-S3S(Z3) is compatible with American DECAGON 5TM SDI-12 output data format. The output of JW-S3S(Z3) is compatible with American DECAGON 5TE SDI-12 output data format.

Features: Micro power consumption, static standby current is only 20uA (when powered by 12V).

2. Technical Parameter

- ※ Working voltage : 5.7V-24V
- ※ Quiescent current : <20uA (when the power supply is less than 12V)
- ※ Working current : average < 4mA, instantaneous maximum is 20mA (within 0.1 s)
- ※ Response Time : < 1 s
- ※ Measured stability time : 2 s
- ※ Protection level : IP68
- ※ Working temperature range : -40℃ ~ 80℃
- ※ Cable length: 5m (standard type, the length can be customized, the maximum is 50m)

3. Table of Technical Parameters

Technical Indexes	Apparent dielectric constant (ϵ_a)	Soil moisture (VWC)	Temperature (℃)	ECb(bulk) (ds/m)
Measuring Range	1.0-80.0	0.0-1.0 m3/m3	-40.0℃-80.0℃	0-20.000
Accuracy	$\pm 1 \epsilon$ (<40) 15%(40-80)	± 0.03 m3/m3(3%VWC) (0%-50%)	$\pm 0.5^\circ\text{C}$	10% (0 to 7 dS/m)
Resolution	0.1	0.001 m3/m3 (0%-50%)	0.1	0.01 dS/m (0 - 7 dS/m), 0.05 dS/m (7- 23 dS/m)

Note: Mineral soil volume water content (VWC) : obtained by Topp equation:

$$\text{VWC} = 4.3 \times 10^{-6} \epsilon_a^3 - 5.5 \times 10^{-4} \epsilon_a^2 + 2.92 \times 10^{-2} \epsilon_a - 5.3 \times 10^{-2}$$

4. SDI protocol specification(V1.3)

4.1 Wiring Interface specification:

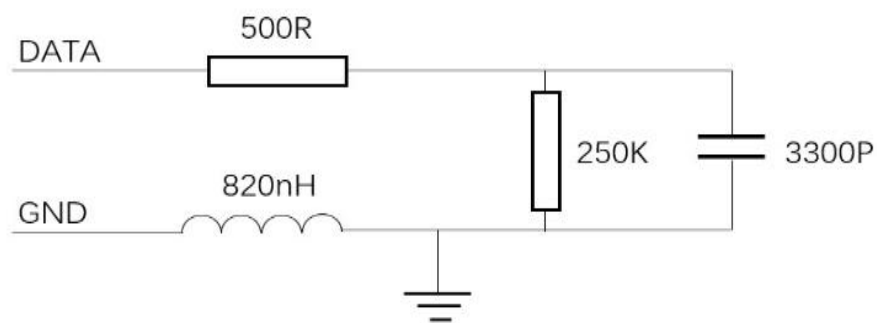
three-core sheathed wire:

Red: VCC, Black: GND, Yellow: Signal

Or 3.5mm stereo plug. Check below please



4.2 Interface equivalent circuit



4.3 Communication baud rate:

Table 1 SDI-12 communication configuration	
Baud Rate	1200
Start Bits	1
Data Bits	7 (LSB first)
Parity Bits	1 (even)
Stop Bits	1
Logic	Inverted (active low)

4.4 SDI-12 timing

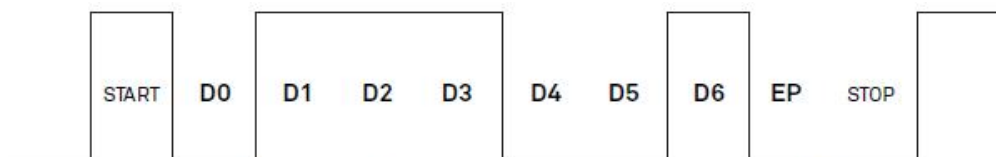
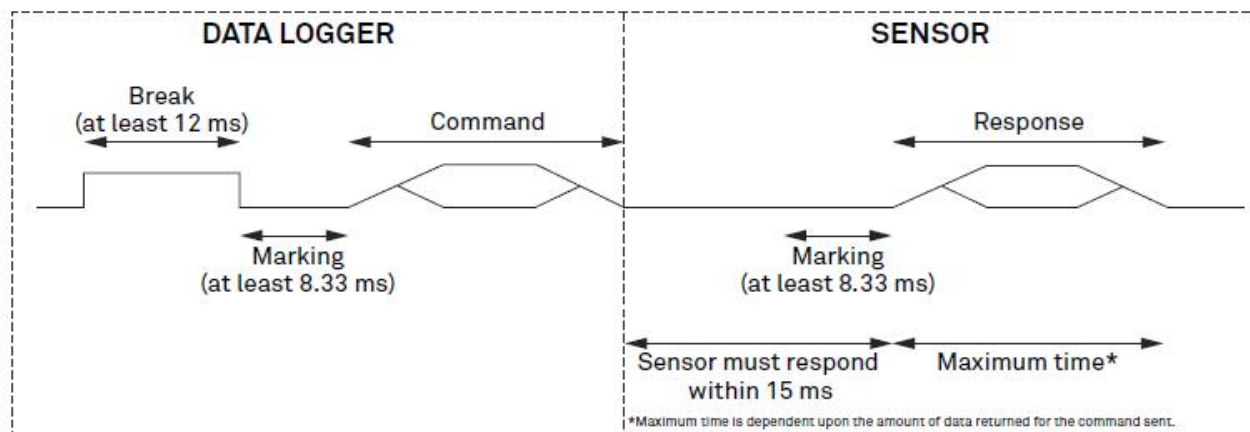


Figure 4 Example SDI-12 transmission of the character 1 (0x31)



4.5 Instruction list

Name	Order	Reply
Interrup ,arouse	Continuous 12ms vacancy	Nothing
Send identification code	a !	a13 QIFENG 5TM 400xxxxxx<CR><LF>
Change address	aAb!	b<CR><LF>
Address request	?!	a<CR><LF>
Start measurement	aM !	a0013<CR><LF>
Start measuring and request the CRC	aMC !	a0013<CR><LF>
Send data	aD0 !	TM5: a+DK+0±Temp<CR><LF> Or a+DK+0±Temp<CRC><CR><LF> TE5: a+DK+EC±Temp<CR><LF> Ora+DK+EC±Temp<CRC><CR><LF>
Start and send measurment	aC !	a00103<CR><LF>
Start and send measurement and request CRC	aCC !	a00103<CR><LF>

The first byte of all commands and replies is usually device address. The last byte of the command is " !", the last two bytes is <CR><LF> (0X0D,0X0A), that is "Enter" and "Newline" symbol of ASCII code.

If you want to know the detailed information of SDI-12 protocol, Please refer to
SDI-12_version1_3 January 28, 2016