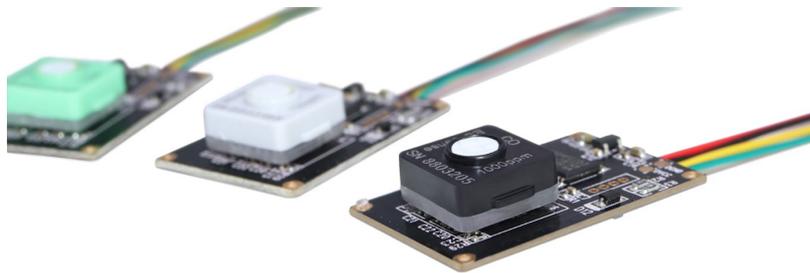


TB600 Series Gas Detection Module Manual



1. Product Overview

The TB600 gas detection module is used together with a EC Sense solid polymer ES1 gas sensor, which has the smallest volume of electrochemistry solution in the world. The ES1 sensors can detect toxic & harmful gaseous elements in air, and achieve accurate monitoring of air pollution gases. The UART digital signal output interface from the TB600 module will ease significantly the use and calibration of the ES1 sensor.

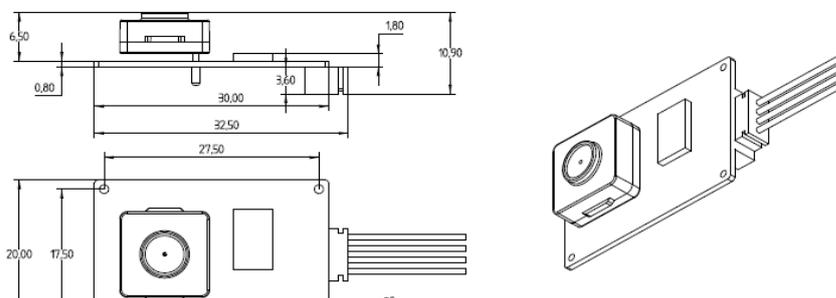
The TB600 series gas detection module includes 6 series for detecting of H₂, CO, H₂S, HCHO, TVOC gas and air quality. It is widely used in industrial & commercial applications; for instance in industrial safety monitoring within oil & gas, chemistry, metallurgy & energy production.

Other applications include environmental air quality monitoring field such as air pollution assessment, toxic and harmful gas emissions.

2. Products Features

- ★ High precision, long lifetime, low temperature resistance
- ★ Fast response, quick zero recovery, sensor functionality test when starting up, no warm-up time
- ★ UART Digital signal output
- ★ Durable and reliable of solid polymer electrochemical sensors
- ★ Excellent accuracy, repeatability & linearity
- ★ Excellent long-term stability
- ★ Immune towards electromagnetic interference
- ★ Fixed mounting hole, easy installation

3. Product appearance and structure



4. Principle

The solid polymer electrochemical sensing technology is a revolutionary innovation within electrochemical detection technology field. The principle is based on the of electrochemical gas detection, which is used to detect gases that can be chemically decomposed.



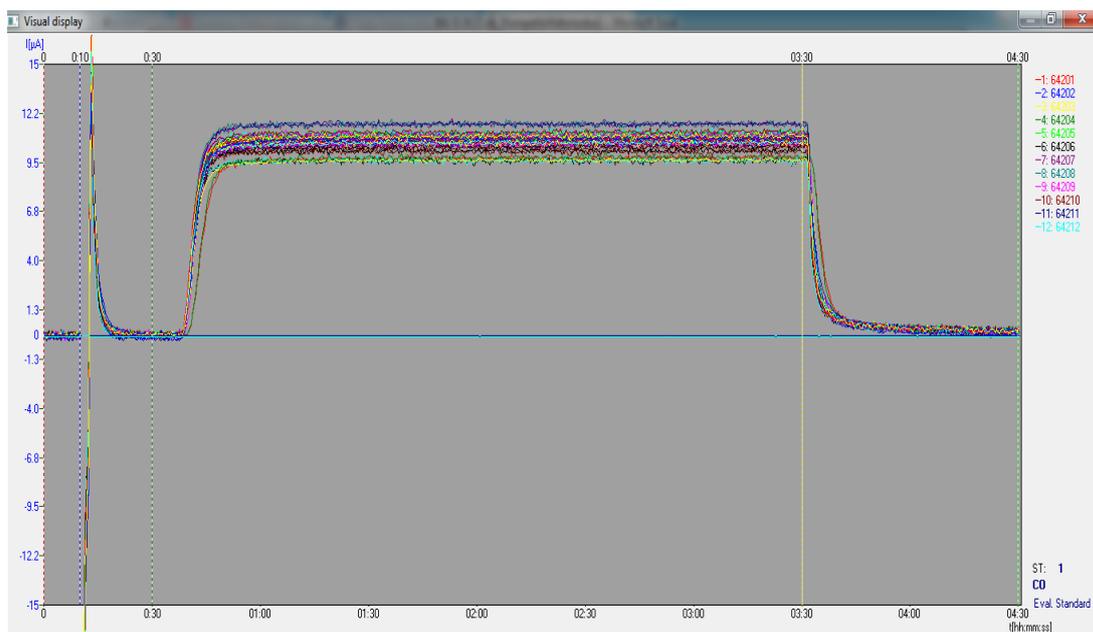
The sensor consists of 3 electrodes in contact with the solid polymer electrolyte. The electrodes are typically large surface area noble metals and other matrix materials. The electrode/electrolyte/air system, together with the diffusing gas into the working electrode, generates electrical charges in the system.

The gas is either oxidized or reduced in the reaction with the electrode. The electrochemical reaction generate the electricity flowing through the external circuit



The TB600 conditions and amplifies the small-current signal from the sensor. The outer circuit maintains the voltage across the sensor and the voltage of a two-electrode reverse reference sensor, an opposite reaction is produced at the reverse electrode, as the working electrode is oxidized while the opposite electrode is reduced. The solid polymer sensor output signal is a linear proportional to the gas concentration, and the linear output of a solid polymer sensor is one of many advantages over others technical sensor principles. Other sensors need to be linearized calibration before output. A linear output sensor can detect low concentration gas accurately, and is easy to calibrate (only zero point and one target point is needed for the calibration). Once the solid polymer electrochemical sensor is calibrated, the signal output is stable over time.

Typical response curve of solid polymer sensor



5. Specification

Warm-up time	<30s
Response time	<30s
Output signal	3.3V level UART digital signal (See below for communication protocol)
	Interface definition: VCC- red, GND- black, RX- yellow, TX- green, Baud rate: 9600, data bits: 8 bits, stop point: 1 bit.
Get data command	For the convenience of user testing, factory acquiesced preset the initiative to upload, interval 1s upload a concentration value. Gas concentration value = high gas concentration *256+ low gas concentration See details 《cable connection and communication protocol》
Working voltage	4.5-5.5V DC
Working current	5V DC @ 5mA
Energy consumption	25mW @ 5V DC
Accuracy	±5% FS
Repeatability	±1% FS
Working temperature	-20~55°C
Optimum working temperature	25°C
Operating humidity	10%-95% RH.
Optimum working humidity	50%RH.
Work stress	barometric pressure ±10%
Circuit board size	30 X 20X10.9mm (with sensor)
Circuit board size	30 X 20X4.5mm (without sensor)
Cable definition	5V (4.5-5.5V) : VCC (Red cable) ; GND: GND (Black cable) ; RX: RX (Yellow cable) ; TX: TX (Green cable)
Weight	3.1g

Order information list:

Product description	Product code	Meas. range	Resolution
Air quality detection module	TB600-WQ-IAQ-10	0-10ppm	0.01ppm
Air quality detection module	TB600-WQ-IAQ-200	0-200ppm	0.1ppm
Air quality detection module	TB600-WQ-IAQ-1000	0-1000ppm	0.1ppm
H2S detection module	TB600-WQ-H2S-100	0-100ppm	0.1ppm
H2 detection module	TB600-WQ-H2-1000	0-1000ppm	0.1ppm
H2 detection module	TB600-WQ-H2-4% vol	0.01-4%vol	0.01%vol
TVOC detection module	TB600-WQ-TVOC-10	0-10ppm	0.01ppm
TVOC detection module	TB600-WQ-TVOC-200	0-200ppm	0.1ppm
TVOC detection module	TB600-WQ-TVOC-1000	0-1000ppm	0.1ppm
CO detection module	TB600-WQ-CO-1000	0-1000ppm	0.1ppm

6.Communication protocol

6.1 User Communication Protocol

6.1.1 General Settings

The sensor module uses serial communication, and the communication configuration parameters are as follows:

Baud rate	9600
data bits	8 Bits
Stop bit	1 Bit
parity bit	None

6.1.2 Communication command

Communication both of automation upload and question and answer mode, Factory acquiesced automation upload, interval 1s send concentration value.

0	1	2	3	4	5	6	7	8
Start bit	comma	High gas concentration (ug/m3)	Low gas concentration (ug/m3)	Full range high	Full range low	High gas concentration (ppb)	Low gas concentration (ppb)	proof test value
0xFF	0x86	0x00	0x2A	0x00	0x00	0x00	0x20	0x30

The command line format as follow:

Gas concentration value = high gas concentration *256+ low gas concentration;

(The high and low concentration should be converted from hexadecimal to decimal before being substituted into this formula)

Switch to question and answer mode, the command line format is as follows:

0	1	2	3	4	5	6	7	8
start bit	retain	Switch command	answer	retain	retain	retain	retain	proof test value
0xFF	0x01	0x78	0x41	0x00	0x00	0x00	0x00	0x46

Switch to active upload and the command line format is as follows:

0	1	2	3	4	6	7	8
start bit	retain	Switch command	answer	retain	retain	retain	proof test value
0xFF	0x01	0x78	0x40	0x00	0x00	0x00	0x47

The read gas concentration format is as follows:

0	1	2	3	4	5	6	7	8
start bit	retain	Switch command	answer	retain	retain	retain	retain	proof test value
0xFF	0x01	0x86	0x00	0x00	0x00	0x00	0x00	0x79

The sensor return value format is as follows:

0	1	2	3	4	5	6	7	8
Start bit	command	High gas concentration (ug/m3)	Low gas concentration(ug/m3)	Full range high	Full range low	High gas concentration(ppb)	Low gas concentration (ppb)	proof test value
0xFF	0x86	0x00	0x2A	0x00	0x00	0x00	0x20	0x30

Gas concentration value = high gas concentration *256+ low gas concentration

(The high and low concentration should be converted from hexadecimal to decimal before being substituted into this formula)

6.2 Get module information instruction

Gets sensor type, maximum range, unit, unit decimal number instruction: 0xD1

returned value:

0	1	2	3	4	5	6	7	8
Sensor style	Maximum range high	Maximum range low	unit	retain	retain	retain	Data decimal (bit[4]~bit[7]) Data sign (bit[0]~bit[3])	parity bit
0x17	0x00	0xC8	0x02	0x00	0x00	0x00	0x01	0x1E

- check sum calculator

* functional description: summation check (Take to send、Receiving agreement 1\2\3\4\5\6\7 and opposite of +1)

* Function description: The number of elements in the group 1- the second last element is added and then inverted +1 (The number of elements must be more than 2)

unsigned char FucChecksum(unsigned char *i, unsigned char ln)

```

{
unsigned char j, tempq=0;

i+=1;

for(j=0; j<(ln-2); j++)

{

tempq+=*i;

i++;

}

tempq=(~tempq)+1;

return(tempq);

}

```

7.Package List

No.	Items	Unit	Quantity	Remark
1	Gas detection module	set	1	
2	Cable	pcs	1	

8.Maintenance

8.1 General operating instructions

- Do not drop sensor and board and do subject the sensor and board to any large shock or vibration
- Do not replace the electrical components trying to repair a broken circuit board
- Do not subject sensor and board to sudden heat changes
- Avoid using and storing the gas detection module (including sensor) in dusty areas
- Do not use chemicals, cleaning agents or concentrated detergents to clean the gas detection module

8.2 Fault analysis

Question	Possible reason	Solution
No reaction to gas	1) Sensor film is dirty or clogged 2) Sensor failure	1) Replace the sensor or try to blow the sensor clean 2) Replace the sensor
No signal output	1) The output wiring is not connected correctly 2) The power supply is broken 3) The power cable connection is not good	1) Reconnect the output cable 2) Measure the voltage value of the power supply 3) Reconnect the power cord
The output value is over or less than 0 in the absence of the measured gas	1) Zero drift 2) Temperature deviations are causing zero deviation 3) Interference gas in the site environment	Pass nitrogen and test if the output is correct. If not, correct the zero point
The output value constantly fluctuates and cannot be stabilized.	1) The condition of the cable is not good 2) High frequency interference 3) High voltage interference	1) Check cable 2) Move the module to another environment and observe whether the output value is stable

9.Storage and transportation

9.1 The product should be stored at a temperature of 0°C~40°C, relative humidity: ≤ 85%, well ventilated, no harmful gases in the room, and cannot be stored with chemicals, acids, alkalis and other substances.

9.2 There is no request to the way of transportation, but severe vibration and shock should be avoided during transportation and to avoid direct rain and snow. The packing box must not be inverted or inverted during transportation.

10.After-sales service

10.1 Service principle: The product warranty is 12 months. During the warranty period, the supplier will repair and replace the parts damaged by quality for free!

We are here for you. Addresses and Contacts.

Headquarter Switzerland:

Angst+Pfister Sensors and Power AG
Thurgauerstrasse 66
CH-8050 Zurich
Phone +41 44 877 35 00
sensorsandpower@angst-pfister.com

Office Germany:

Angst+Pfister Sensors and Power Deutschland GmbH
Edisonstraße 16
D-85716 Unterschleißheim
Phone +49 89 374 288 87 00
sensorsandpower.de@angst-pfister.com

Scan here and get an overview of personal contacts!



sensorsandpower.angst-pfister.com
