



4-20mA Smart Gas Sensor Module

TB420-ES1

Datasheet



» Overview

Easy solution for gas detection instruments and systems

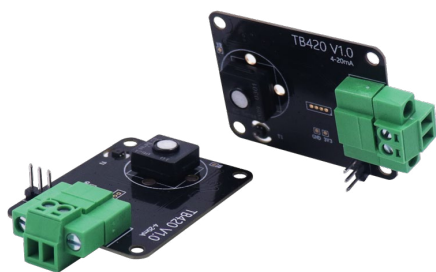
The TB420 Gas Sensor Module is an intelligent two wire 4-20mA digital gas sensor module from EC Sense, which utilizes a smart microprocess with high-reliability solid polymer electrochemical gas sensing technology and intelligent algorithm caculation. The TB420 Module is a smart solution, with temperature and humidity combined in one sensor module, for industrial safety applications.

The TB420 Gas Sensor Module is suitable for indoor and outdoor environments. It detects gas, temperature and humidity and easily receives all of the data simultaneously. The changing state of gas is closely related to temperature and humidity, for which this combination of EC Sense's Gas Sensor Module provides a professional solution.

The intelligent Gas Sensor Module provides a self-test which evaluates the sensor performance without a gas measurement. It is therefore an excellent solution for smart home and IoT applications. The data is put out through the output signal, which makes it easy and convenient to identify the right time to perform maintenance and replacement.

Each TB420 Sensor Module has been professionally calibrated with the gas. It can be instantly used without prior warm-up time and the calibration information is stored in the flash chip. There is a calibration software from EC Sense in case a recalibration should be performed or the 4-20mA output signal is to be corrected.

The TB420 Gas Sensor Module effectively shortens gas instrument development time, reduces cost and risk in new product development, saves production time, avoids complex gas calibration steps and ensures high reliability and accuracy. The standard 4-20mA two-wire module facilitates quick instrument and system setup or connection to display, DCS, PLC and other systems.



» Key Features

- ☞ 4-20mA standard two-wire output, 24V DC. power supply
- ☞ Detects single gas + temperature and humidity simultaneously
- ☞ Pre-calibration with sensor performance and life-testing output
- ☞ Fast signal stability time at power on
- ☞ Suitable for indoor and outdoor environments, sensor can work in -40 to 55 °C
- ☞ Response time is fast and has a stable zero point without drift, anti-electromagnetic interference ability
- ☞ Long lifetime gas sensor, anti-poisoning
- ☞ Integrated safety protection enables use in potentially explosive environments
- ☞ Electronic circuit boards have a dust and corrosion resistant coating
- ☞ Small size
- ☞ RoHS approved

» Applications

- ☞ Industrial gas safety monitoring
- ☞ Industrial process gas monitoring
- ☞ Air Exchange System and Air Purifier
- ☞ Food storage insecticide monitoring
- ☞ Wastewater treatment, garbage disposal, biogas safety monitoring
- ☞ Medical & Health Care
- ☞ Semiconductor gas purification monitoring
- ☞ Transformer failure and power chamber environment monitoring
- ☞ Warehouse logistics environment monitoring

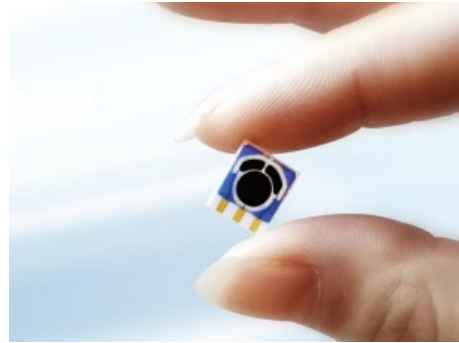


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» Principle

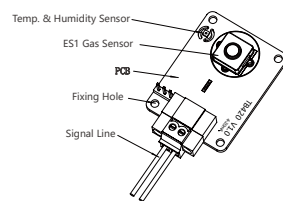
TB420 Sensor Module is a durable product. It converts the original small current signals of the gas sensors into standard 4-20mA outputs through a digital circuit. It is also possible to convert an external resistor to a 40-200 mV voltage output.

The Sensor Module uses the Solid Polymer Electrochemical Sensing Technology. It employs a three-electrode arrangement - the working, the counter and the reference electrodes - in which concentration measurements can be performed continuously and the sensor operates at a fixed potential. The gas of interest (target gas) diffuses through a diffusion barrier, like a capillary, into the cell to the working electrode, where an electrochemical reaction takes place. There are oxidation and reduction reactions. The current flowing through the cell is direct proportional to the concentration of the target gas. A reference electrode keeps the potential constant together with a potentiostat.

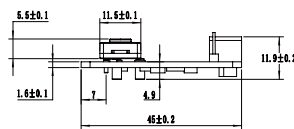


» Mechanical Drawing

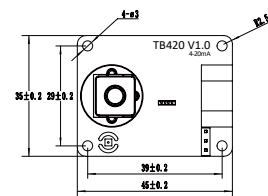
TB420-ES1 Gas Sensor Module



Product Schematic

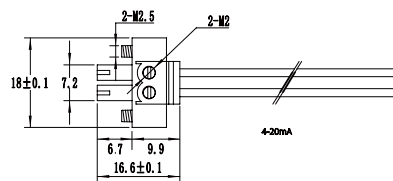


Side View

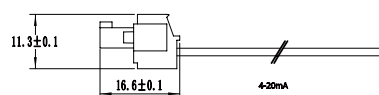


Top View

4-20mA Connector



Product Schematic



Side View

» Technology Specifications

Gas Sensor Specifications

Principle	Solid Polymer Electrochemical Sensing Technology
Accuracy	± 5 % Full scale
Repeatability	< 2%
Linearity	Linear
Long-Term Drift	< 1% / month
Expected Lifetime	> 3 years

Temperature & Relative Humidity Sensor Specification

Parameter	Range	Resolution	Accuracy	Repeatability	Response Time	Long-Term Drift
Temperature	-40 to 85°C	0.01°C	± 0.2°C	0.1°C	< 5s to 30s @ t63%	< 0.02°C /year
Humidity	0-100% RH	0.01% RH	± 2% RH	0.1% RH	8s @ t63%	< 0.25% RH/year

Electrical Specifications

Output Signal	4-20mA two-wires
Fault Output	3.5mA Fault Signal: Sensor signal weak 3mA Fault Signal: Sensor failure or sensor disconnection
Supply Voltage	9 to 24V DC, 24V DC recommended
Supply Current	3 to 22mA
Power Consumption	< 0.6W
Maximum Loop Resistance	< 500R @ 24V DC
Protection	Reverse polarity protection

Environment Specifications

Operating Temperature	Sensor can work from -40 to +55°C
Operating Humidity	15-95% RH. non-condensing
Operating Pressure	Atmospheric pressure ± 10%
Storage Temperature	0 to 20°C

Mechanical Specifications

Size (Including Gas Sensor)	45 x 35 x 11.9mm
Size (Without Gas Sensor)	45 x 35 x 11.9mm
Weight (Including Gas Sensor)	7.8g
Weight (Without Gas Sensor)	7.1g
Warranty	12 months
Package	ESDBAG Size: 120 x 150mm

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» Order Information

Product	Gas Formula	Partnumber	Range	Resolution	Response Time
Smart SMELL Sensor Module	SMELL	TB420-ES1-SMELL-5ppm	0-5ppm	0.01ppm	< 3s (T90 < 30s) ①
		TB420-ES1-SMELL-200ppm	0-200ppm	0.1ppm	< 3s (T90 < 30s)
Smart Nitrogen Dioxide Sensor Module	NO ₂	TB420-ES1-NO ₂ -5ppm	0-5ppm	0.01ppm	< 3s (T90 < 80s) ①
		TB420-ES1-NO ₂ -100ppm	0-100ppm	0.1ppm	< 3s (T90 < 30s)
Smart Sulfur Dioxide Sensor Module	SO ₂	TB420-ES1-SO ₂ -100ppm	0-100ppm	0.1ppm	< 3s (T90 < 30s)
Smart Chlorine Sensor Module	Cl ₂	TB420-ES1-Cl ₂ -100ppm	0-100ppm	0.1ppm	< 3s (T90 < 30s)
Smart Ethylene Oxide Sensor Module	ETO	TB420-ES1-ETO-10ppm	0-10ppm	0.01ppm	< 3s (T90 < 30s) ①
		TB420-ES1-ETO-200ppm	0-200ppm	0.1ppm	< 3s (T90 < 30s)
		TB420-ES1-ETO-1000ppm	0-1000ppm	1ppm	< 3s (T90 < 30s)
Smart Phosphine Sensor Module	PH ₃	TB420-ES1-PH ₃ -5ppm	0-5ppm	0.01ppm	< 3s (T90 < 80s) ①
		TB420-ES1-PH ₃ -100ppm	0-100ppm	0.1ppm	< 3s (T90 < 80s)
		TB420-ES1-PH ₃ -2000ppm	0-2000ppm	1ppm	< 3s (T90 < 80s)
Smart Formaldehyde Sensor Module	HCHO	TB420-ES1-HCHO-5ppm	0-5ppm	0.01ppm	< 3s (T90 < 80s) ①
		TB420-ES1-HCHO-100ppm	0-100ppm	0.1ppm	< 3s (T90 < 60s)
Smart Methyl Mercaptan Sensor Module	CH ₄ S	TB420-ES1-CH ₄ S-10ppm	0-10ppm	0.01ppm	< 3s (T90 < 80s)
		TB420-ES1-CH ₄ S-100ppm	0-100ppm	0.1ppm	< 3s (T90 < 80s)
		TB420-ES1-CH ₄ S-5000ppm	0-5000ppm	10ppm	< 3s (T90 < 80s)
Smart Ethylene Sensor Module	C ₂ H ₄	TB420-ES1-C ₂ H ₄ -10ppm	0-10ppm	0.01ppm	< 3s (T90 < 80s) ①
		TB420-ES1-C ₂ H ₄ -200ppm	0-200ppm	0.1ppm	< 3s (T90 < 80s)
Smart Hydrogen Cyanide Sensor Module	HCN	TB420-ES1-HCN-50ppm	0-50ppm	0.1ppm	< 3s (T90 < 80s) ①
Smart Arsenide Sensor Module	AsH ₃	TB420-ES1-AsH ₃ -5ppm	0-5ppm	0.01ppm	< 3s (T90 < 80s) ①
Smart Silane Sensor Module	SiH ₄	TB420-ES1-SiH ₄ -10ppm	0-10ppm	0.01ppm	< 3s (T90 < 80s) ①
Smart Borane Sensor Module	B ₂ H ₆	TB420-ES1-B ₂ H ₆ -5ppm	0-5ppm	0.01ppm	< 3s (T90 < 80s) ①
Smart Germane Gas Module	GeH ₄	TB420-ES1-GeH ₄ -5ppm	0-5ppm	0.01ppm	< 3s (T90 < 80s) ①

Note: 1) If there is a gas or range not to be found in the above list please contact us.

2) With ①: the T90 response time calculate from the gas reach sensor.

Disclaimer

The EC Sense performance data stated above is based on data obtained under test conditions using the EC Sense gas distribution system and AQS test software. In the interest of continuous product improvement, EC Sense reserves the right to change design features and specifications without notice. We are not responsible for any loss, injury or damage caused by this. EC Sense assumes no responsibility for any indirect loss, injury or damage resulting from the use of this document, the information contained therein or any omissions or errors herein. This document does not constitute an offer to sell. The data it contains are for informational purposes only and cannot be considered a guarantee. Any use of the given data must be evaluated and determined by the user to comply with federal, state and local laws and regulations. All specifications outlined are subject to change without notice.

 Warning

EC Sense sensors are designed for use in a variety of environmental conditions. However, due to the principles and characteristics of solid polymer electrochemical sensors and to ensure normal use, users must strictly follow this article during storage, assembly and operation of the module. General-purpose PCB circuit board application methods and illegal applications / violation of the application will not be covered by the warranty. Although our products are highly reliable, we recommend checking the module's response to the target gas prior to utilization to ensure on-site use. At the end of the products service life, please do not discard any electronics in the domestic waste, instead follow the local governments electronic waste recycling regulations for disposal.



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