EC Sense
Easy Gas Sensors

4-20 mA
Smart Gas Sensor Module
TB420-ES4
Datasheet

❱❱ Overview

Easy solution for gas detection instruments and systems

The TB420 Gas Sensor Module is an intelligent two wire 4-20 mA digital gas sensor module, which utilizes a smart microprocessor with high-reliability solid polymer electrochemical gas sensing technology and intelligent algorithm calculation. The TB420 is designed to comply with the relevant standards for gas safety monitoring in the industrial application.

The intelligent Gas Sensor Module provides a self-test which evaluates the sensor performance without a gas measurement. Therefore, it is the perfect solution for smart home and IoT applications. The data is put out through the output signal, which makes it easy and convenient to determine 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 is required or the 4-20 mA output signalneeds to be corrected.

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

❱❱ Key Features

☞ 4-20 mA standard two-wire output, 24V DC power supply

☞ Detects single gas

☞ Pre-calibration, with sensor performance and lifetime self-test output

☞ Fast signal stability time at power on

☞ Suitable for indoor and outdoor environments, sensor can work in -40 ℃ to +55 ℃

☞ Fast response time and stable zero point without drift, anti-electromagnetic interference ability

☞ Long lifetime, anti-poisoning

☞ Integrated safety protection enables use in potentially explosive environments

☞ Electronic circuit boards have a dust and corrosion resistant coating

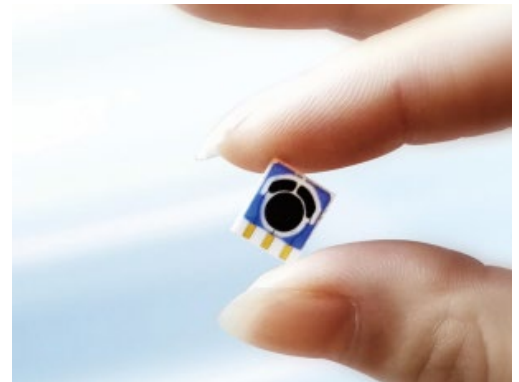☞ Small size

☞ Intrinsic safety, RoHS approved

❱❱ Applications

☞ Industrial Gas Safety Monitoring

☞ Industrial Process Gas Monitoring

☞ Gas Leakage Monitoring

☞ Gas Battery Fire Safety Monitoring

☞ Gas Vehicle Safety Monitoring

☞ Gas Warehouse Logistics Environment Monitoring

☞ Transformer Failure and Power Chamber Environment Monitoring

☞ Data Center Gas Monitoring
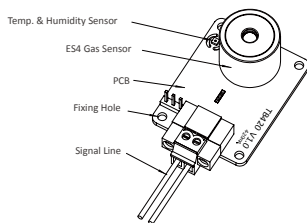
☞ Medical & Health Care

❯❯ Principle

The TB420 Sensor Module is a durable product. It converts the original small current signals of the gas sensors into standard 4-20 mA 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.
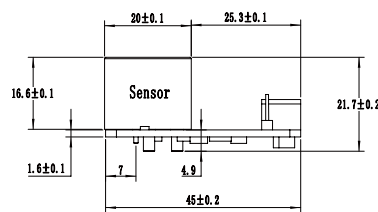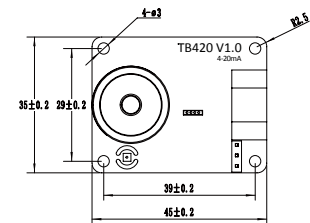
❯❯ Mechanical Drawing (Unit: mm)
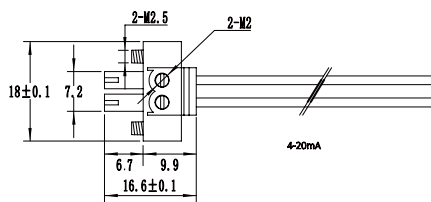
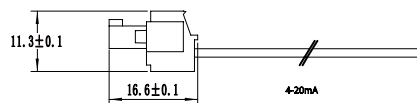TB420-ES4 Gas Sensor Module

Product Schematic

Side View

Top View

4-20 mA Connector

Product Schematic

Side View

≫ Technology Specifications

Gas Sensor Specifications

Principle	Solid Polymer Electrochemical Sensing Technology
Accuracy	± 5 % (Measurement Value)
Repeatability	< 2 %
Linearity	Linear
Long-Term Drift	< 5 %/years
Expected Lifetime	> 5 years

Electrical Specifications

Output Signal	4-20 mA two-wires
Sensor Lifetime Self-Test	The TB420 module starts the self-test after being switched on for 30 seconds, the test lasts 20 seconds and the module continuously emits a signal of 3.8 mA. Once the test is complete, the module returns to the normal measuring state.
Fault Output	3.5 mA Fault Signal: Sensor signal weak
	3 mA Fault Signal: Sensor failure or sensor disconnection
Supply Voltage	9 to 24V DC, 24V DC recommended
Supply Current	3 to 22 mA
Power Consumption	< 0.6 W
Maximum Loop Resistance	< 500 R @ 24V DC
Protection	Reverse polarity protection

Environment Specifications

Operating Temperature	-40 ℃ to +55 ℃
Operating Humidity	15 - 95 % RH. non-condensing
Operating Pressure	Atmospheric pressure ± 10 %
Storage Temperature	0 ℃ to 20 ℃

Mechanical Specifications

Size (Including Gas Sensor)	45 x 35 x 21.7 mm
Size (Without Gas Sensor)	45 x 35 x 11.9 mm
Weight (Including Gas Sensor)	11.8 g
Weight (Without Gas Sensor)	7.1 g
Warranty	12 months
Package	ESDBAG Size: 120 x 150 mm

Certification

Ex ia IIC Ga Intrinsic safety (certificated Temperature T6 -40 ℃ to + 55 ℃)

RoHS Directive 2011/65/EU with amendment (EU)2015/863

» Order Information

Product	Gas Formula	Partnumber	Range	Resolution	Response Time
Smart Arsine Sensor Module	AsH_3	04-TB420-ES4-AsH_3-1-01	0-1 ppm	0.001 ppm	< 3 s (T90 < 80 s)
Smart Diborane Sensor Module	B_2H_6	04-TB420-ES4-B_2H_6-1-01	0-1 ppm	0.001 ppm	< 3 s (T90 < 80 s)
Smart Methyl Mercaptan Sensor Module	CH_4S	04-TB420-ES4-CH_4S-10-01	0-10 ppm	0.001 ppm	< 3 s (T90 < 80 s)
		04-TB420-ES4-CH_4S-100-01	0-100 ppm	0.01 ppm	< 3 s (T90 < 80 s)
		04-TB420-ES4-CH_4S-5000-01	0-5000 ppm	0.1 ppm	< 3 s (T90 < 80 s)
Smart Chlorine Sensor Module	Cl_2	04-TB420-ES4-Cl_2-100-01	0-100 ppm	0.01 ppm	< 3 s (T90 < 30 s)
Smart Carbon Monoxide Sensor Module	CO	04-TB420-ES4-CO-10-01	0-10 ppm	0.001 ppm	< 3 s (T90 < 80 s)
		04-TB420-ES4-CO-100-01	0-100 ppm	0.01 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-CO-1000-01	0-1000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-CO-2%-01	0-2% vol.	0.001% vol.	< 3 s (T90 < 30 s)
Smart Ethylene Oxide Sensor Module	ETO (C_2H_4O)	04-TB420-ES4-ETO-10-01	0-10 ppm	0.001 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-ETO-200-01	0-200 ppm	0.1 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-ETO-1000-01	0-1000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
Smart Germane Gas Module	GeH_4	04-TB420-ES4-GeH_4-5-01	0-5 ppm	0.01 ppm	< 3 s (T90 < 80 s)
Smart Hydrogen Sensor Module	H_2	04-TB420-ES4-H_2-1000-01	0-1000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-H_2-5000-01	0-5000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-H_2-5%-01	0-5% vol.	0.001% vol.	< 35 s (T90 < 90 s)
Smart Hydrogen Sulfide Sensor Module	H_2S	04-TB420-ES4-H_2S-5-01	0-5 ppm	0.001 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-H_2S-10-01	0-10 ppm	0.001 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-H_2S-100-01	0-100 ppm	0.01 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-H_2S-1000-01	0-1000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-H_2S-5000-01	0-5000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
Smart Formaldehyde Sensor Module	HCHO	04-TB420-ES4-HCHO-5-01	0-5 ppm	0.001 ppm	< 3 s (T90 < 80 s)
		04-TB420-ES4-HCHO-100-01	0-100 ppm	0.01 ppm	< 3 s (T90 < 60 s)
Smar Hydrogen Cyanide Sensor Module	HCN	04-TB420-ES4-HCN-50-01	0-50 ppm	0.01 ppm	< 3 s (T90 < 30 s)
Smart Ammonia Sensor Module	NH_3	04-TB420-ES4-NH_3-10-01	0-10 ppm	0.001 ppm	< 3 s
		04-TB420-ES4-NH_3-100-01	0-100 ppm	0.01 ppm	< 3 s
Smart Nitrogen Dioxide Sensor Module	NO_2	04-TB420-ES4-NO_2-5-02	0-5 ppm	0.001 ppm	< 3 s (T90 < 80 s)
		04-TB420-ES4-NO_2-50-01	0-50 ppm	0.01 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-NO_2-100-01	0-100 ppm	0.01 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-NO_2-1000-01	0-1000 ppm	0.01 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-NO_2-2000-01	0-2000 ppm	0.01 ppm	< 3 s (T90 < 30 s)
Smart Oxygen Sensor Module	O_2	04-TB420-ES4-O_2-25%-01	0-25% vol.	0.01% vol.	< 3 s (T90 < 30 s)
Smart Ozone Sensor Module	O_3	04-TB420-ES4-O_3-5-01	0-5 ppm	0.001 ppm	< 3 s (T90 < 80 s)
		04-TB420-ES4-O_3-50-01	0-50 ppm	0.01 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-O_3-100-01	0-100 ppm	0.01 ppm	< 3 s (T90 < 30 s)

» Order Information

Product	Gas Formula	Partnumber	Range	Resolution	Response Time
Smart Phosphine Sensor Module	PH_3	04-TB420-ES4-PH$_3$-5-01	0-5 ppm	0.001 ppm	< 3 s (T90 < 80 s)
		04-TB420-ES4-PH$_3$-20-01	0-20 ppm	0.01 ppm	< 3 s (T90 < 80 s)
		04-TB420-ES4-PH$_3$-100-01	0-100 ppm	0.01 ppm	< 3 s (T90 < 80 s)
		04-TB420-ES4-PH$_3$-2000-01	0-2000 ppm	0.1 ppm	< 3 s (T90 < 80 s)
Smart Silane Sensor Module	SiH_4	04-TB420-ES4-SiH$_4$-10-01	0-10 ppm	0.001 ppm	< 3 s (T90 < 80 s)
Smart Odor Sensor Module	SMELL	04-TB420-ES4-SMELL-5-01	0-5 ppm	0.001 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-SMELL-10-01	0-10 ppm	0.001 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-SMELL-200-01	0-200 ppm	0.1 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-SMELL-500-01	0-500 ppm	0.1 ppm	< 3 s (T90 < 30 s)
Smart Sulfur Dioxide Sensor Module	SO_2	04-TB420-ES4-SO$_2$-5-01	0-5 ppm	0.001 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-SO$_2$-50-01	0-50 ppm	0.01 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-SO$_2$-100-01	0-100 ppm	0.01 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-SO$_2$-1000-01	0-1000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-SO$_2$-2000-01	0-2000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
Smart Volatile Organic Compounds Sensor Module	TVOC	04-TB420-ES4-TVOC-10-01	0-10 ppm	0.001 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-TVOC-200-01	0-200 ppm	0.1 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-TVOC-1000-01	0-1000 ppm	0.1 ppm	< 3 s (T90 < 30 s)
		04-TB420-ES4-TVOC-2000-01	0-2000 ppm	0.1 ppm	< 3 s (T90 < 30 s)

Disclaimer

⚠ 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 or 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.

EC Sense
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