25VS
Flammable vapor sensor

http://waterheatertimer.org/How-to-troubleshoot-gas-water-heater.html#FVIR

Chemi-resistive flammable vapor sensor

Therm-O-Disc's 25VS chemi-resistive flammable vapor sensor was custom designed for the Water Heater Industry Joint Research and Development Consortium to meet Flammable Vapor Ignition Resistance (FVIR) requirements of ANSI Z21.94/CSA 6.31 standard.

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Flammable vapor sensor capability

The 25VS is a silicone-based sensor that detects the presence of a specific concentration of flammable vapors released during a typical gasoline spill. The sensor is required to detect flammable vapors in less than a minute after a spill enabling the gas valve control module to prevent the supply of gas and burner ignition. It is a passive device that requires no power and continually senses for vapors. Additionally, the sensor's compatible signal can be readily adapted as an input by any electronic control device using standard technology.

The 25VS offers long life, in some cases up to 15 years, and good sensitivity to most gasoline components within a wide operating temperature range of 0°C to 65°C. In addition to being certified by the Canadian Standards Association (CSA) to ANSI Z21.94/CSA 6.31 the sensor meets all other Water Heater Industry Consortium member requirements.

Agency ratings

Base Resistance @ 25°C	7 to 25 KΩ
Standard	ANSI Z21.94 / CSA 6.31
Detected Gas(s)	Gasoline vapor
Trip Point	50 kΩ
Operating Temperature Range	0˚C to 65˚C (32˚F to 150˚F)
Storage Temperature	-40˚C to 80˚C (-40˚F to 176˚F)
Voltage	5 VDC
Humidity	10% to 90% RH

General description and priciple of operation

The 25VS sensor is comprised of three primary components: a sensor film, an insert-molded base, and a molded cover. The sensor film (a proprietary mixture of silicone and carbon) is deposited on the insert-molded base and shielded from the environment with a thermoplastic cover ultrasonically welded to the base. The custom designed silicone system provides a robust foundation and support structure for the carbon. The carbon, which acts as a conductor, is dispersed throughout the silicone such that, in the absence of gasoline vapor, the carbon particles are in solid electrical contact. When the silicone encounters gasoline vapor, it expands, pulling some of the carbon particles apart, increasing the resistance of the sensor. The magnitude of resistance increase is dependent upon the gasoline vapor concentration; higher concentrations cause increased expansion of the silicone film, which results in a higher sensor resistance and vice versa.

Unique benefits

The Therm-O-Disc 25VS flammable vapor sensor yields several unique benefits when compared with other vapor sensing technologies. Unlike active sensors that typically utilize metal-oxide or infrared technologies, the 25VS does not require an external power source to detect flammable vapors, only the amount of power used by the customer's control circuit to read the sensor's resistance. This feature provides design flexibility and contributes to the efficient operation of the water heater control circuit to which it is connected.

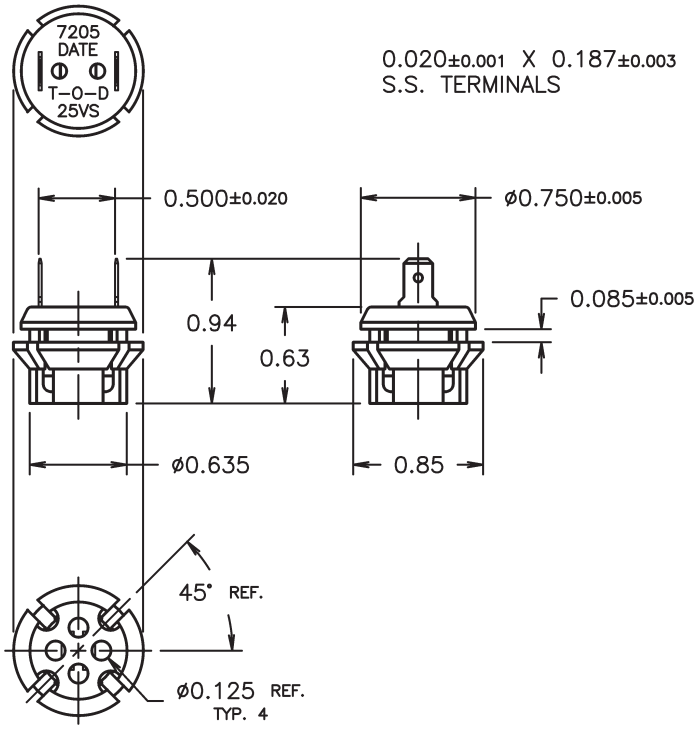
Design considerations

The 25VS was designed to accommodate a normal range of ambient conditions and is relatively insensitive to vapors from most household cleaners. However, 25VS is moderately sensitive to ambient temperature, as such resistance does increase with temperature, and users must consider this characteristic in their FVIR system designs to reduce the potential for false positive signals.

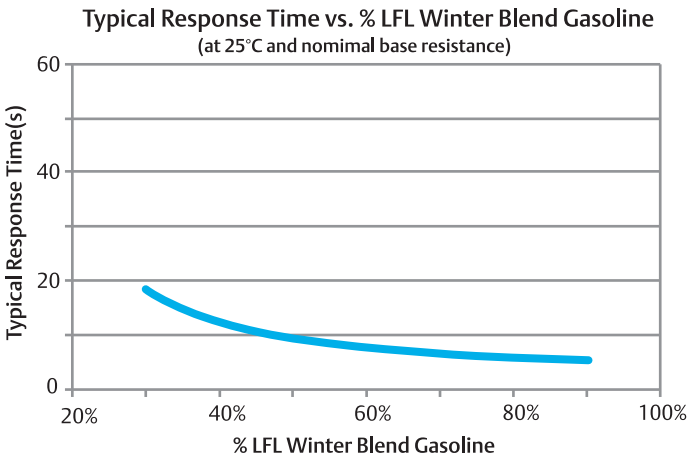
"One-shot" use

Generally, the sensor will reset after a limited exposure to flammable vapor. However, Therm-O-Disc cannot validate the sensor's response to flammable vapors after an initial flammable vapor exposure in the field. Therefore, the sensor must be replaced after an exposure to flammable vapor.

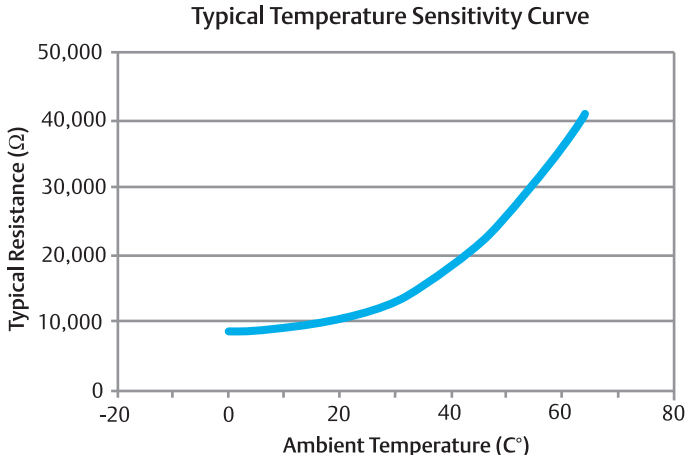
Dimensions



Response vs. gasoline concentration



Ambient temperature sensitivity



NOTE:
Curves do not represent guaranteed performance but typical response under carefully controlled laboratory conditions.

Definition of terms

False Positive Signals (Nuisance Trip) – Sensor reaches the trip resistance with no flammable vapors present.

LFL (Lower Flammability Limit) – The lowest flammable vapor concentration in air that is ignitable at standard conditions

Response Time – The time required for the sensor to reach 50 kΩ once it has been exposed to a flammable vapor concentration of 50% LFL for Winter Blend Gasoline

Trip Point – The resistance above which the sensor indicates exposure to flammable vapor.

Winter Blend Gasoline – Automotive gasoline with a Reid Vapor Pressure (RVP) of not less than 13.0 psi

Important notice

The scope of the technical and application information included in this article is necessarily limited. Operating environments and conditions can materially affect the operating results of Therm-O-Disc products. Users must determine the suitability of any Therm-O-Disc component for their specific application, including the level of reliability required, and are solely responsible for the function of the end-use product.

Therm-O-Disc does not warrant 25VS sensor against false positive signals (nuisance trip).

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