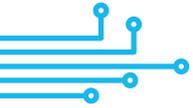




# SGX

## SENSORTECH

An Amphenol Company



TRDU5

# Li-ion Battery Thermal Runaway Detection Datasheet

**TRDU5** is a Battery Failure Detection sensor that measures H<sub>2</sub>, CO, NH<sub>3</sub>, Pressure, Temperature and Humidity level when different battery leakage occur.

The module has to be placed in the battery enclosure allowing to detect a failure mode.

**TRDU5** is a solution to allow Battery Management System (BMS) monitor the safe operation of the battery and send an **earlier signal** during a thermal runaway warning to give time to passengers to leave the vehicle safely.



*Quality, Safety, Responsibility*

# Functional specifications

## Features

- Automotive product
- Fast response time (< 1 s)
- MEMS sensor technology for H<sub>2</sub>, CO and NH<sub>3</sub>
- Absolute pressure sensor inside
- High sensitivities to gases H<sub>2</sub>, CO, NH<sub>3</sub> and Hydrocarbons
- Measurement redundancy (gases, pressure, temperature, humidity)
- LIN 2.1 output
- Thermal Runaway Trigger Signal can be setup
- Standard 3 pins connector
- Watertight housing IP6K7

## Principle

There are different failure mode during the battery life time that could occur. To prevent any injury to the passengers, one solution is to send an alarm as soon as possible to the passenger to leave the car when there is any leakage detection.

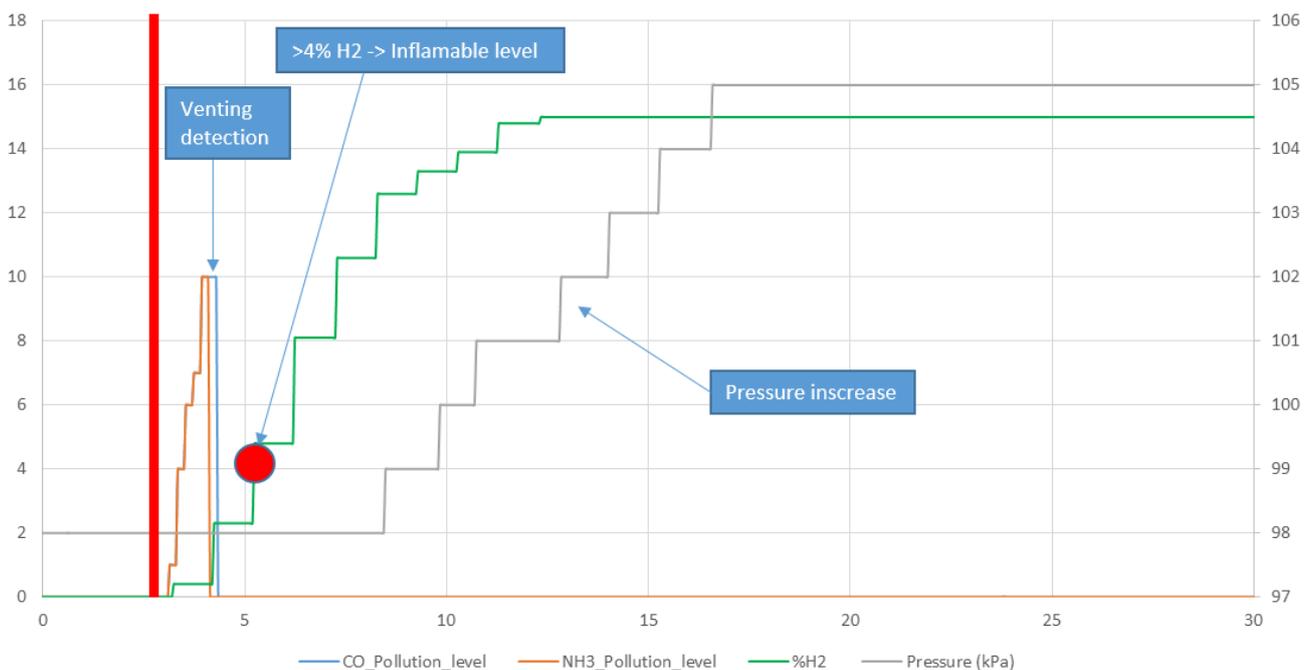
Our sensors are able to detect different gases, pressure change and environmental changes during a thermal runaway. All the failure mode are cover and earlier than any other single sensor element.

The TRDU5 product is giving to the customer different strategy and robustness to catch up all the cases for a quick reaction.

See below one failure mode example:



Thermal Runaway example



## Main technical characteristics

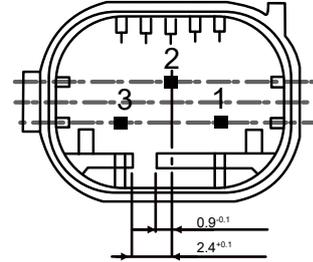
Temperature and humidity range	0~95% RH -40°C to +85°C
Temperature storage	-40°C to 120°C
IP level	IP6K7
Fixing	Bayonet Delphi clip (optional)
Connector	3pins connector ref : AMP 967642-1 Coding B
External dimensions	39mm x 35mm x 27 mm
Weight	< 15 g
Power supply operating range	9 to 15V
Power consumption	<80 mA at 12V
Output signal	LIN 2.1 / 19'200 Bds
H2 detection	Can detect at least up to 10% in air (Inflammability level >4%) ± 0.4 vol.% in air H2 ≤4% ± 10% in air H2 ≥4% At 23 °C
CO detection	Pollution level 0 to 10 (venting phase reach the level 10)
NH3 detection	Pollution level from 0 to 10 (venting phase reach the level 10)
Pressure	Range: 20 to 250kPa Resolution: 0.0329kPa Accuracy: ± 2.3kPa between 20 and 250kPa max allowed 300kPa burst 750kPa
Internal Temperature	Range: -40/+85°C Resolution: 1°C Accuracy: ±3%
Internal Humidity	Range: 0 to 100% Resolution: 0.0019% Accuracy: ± 3% RH (max), 0–80% RH
Response time (T80)	< 60ms
Start-up time	< 400ms
Lifetime	Minimum 10 years Minimum 13'000h

# TRDU5

# Interface and integration

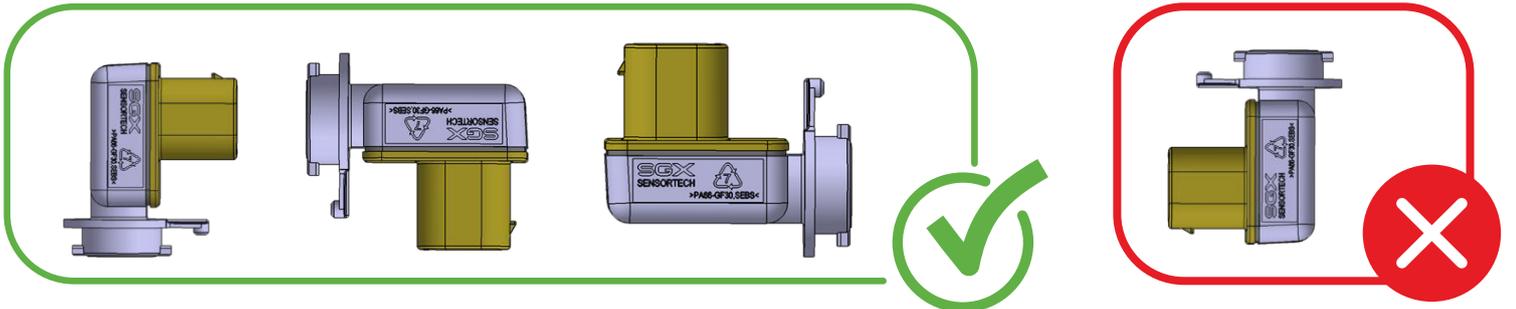
## Principle

Connector type	AMP 967642-1 Coding B
Communication	LIN 2.1 / ID 0x16
Pinout	Pin1: Vbat Pin2: GND Pin3: LIN

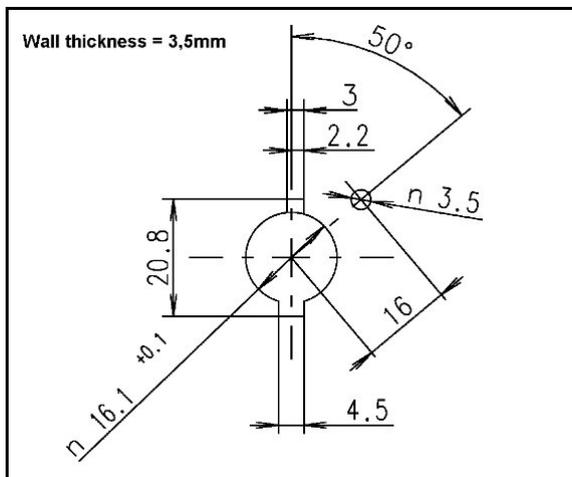


## Recommendation for integration

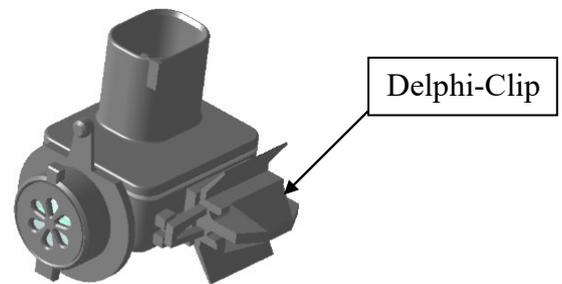
The sensor must be exposed to measure the air from the **battery pack only**. Preferably, the filtering membrane included in the module should be facing downward. If this is not possible, it should be vertical, but should never be facing upward, to prevent accumulation of dirt, water.



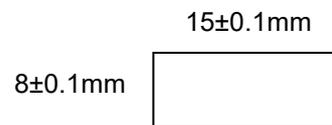
Bayonet fixing, mating with following interface:



Optional, the sensor can be mounted with a standard Delphi-clip.



Recommended hole for Delphi-Clip



Sheet Metal Thickness (Max) 0.8 – 2.8mm

## LIN interface

Below is the description of the frame of the sensor, its ID is 0x16 and its DLC is 8 bytes.

frame 8 bytes		0	1	2	3	4	5	6	7
startbit	byte\bit								
0	0	Pressure							
8	1								
16	2	Temperature							
24	3	Hydrogen							
32	4	Level CO sensor				Level NH3 sensor			
40	5	voltage							
48	6	Humidity							
56	7								

16 bits signals format is little endian (LSB, MSB)

### Description of the signals:

Name	Description	Readings	Measurement data	Unit	Comments
Pressure	absolute pressure	43601	925,31	mBar	(readings/65535)x1000 +260
Temperature	Temperature from NTC	105	45	°C	readings - 60
Hydrogen	Hydrgen value	21	2,1	%	readings x 0.1
Level CO sensor	Level based on the CO sensor	2	2	level	
Level NH3 sensor	Level based on the NH3 sensor	2	2	level	
Humidity	internal humidity	12618	18,07	%	(readings*125/63536)-6
internal voltage	voltage	123	12,3	V	readings x 0.1

Pressure, Hydrogen and CO/NH3 levels are the outputs of the sensor.

Internal voltage is for diagnosis purpose.

Temperature and humidity are for internal use.

Levels of CO and NH3 are representative of an increase, 0 means no change, 10 means a huge increase

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SGX Europe Sp. z o.o. sensors are designed to operate in a wide range of harsh environments and conditions. However, it is important that exposure to high concentrations of solvent vapours is to be avoided, both during storage, fitting into instruments and operation. When using sensors on printed circuit boards (PCBs), degreasing agents should be used prior to the sensor being fitted. SGX Europe Sp. z o.o. makes every effort to ensure the reliability of its products. Where life safety is a performance requirement of the product, we recommend that all sensors and instruments using these sensors are checked for response to gas before use.

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