

HYDROGEN H₂ GAS MEASURING SYSTEM

1. THE TECHNOLOGY

The Hydrogen H₂ gas measuring system contains a new type of solid electrolyte sensor to specifically determine volumes of between 100ppm to 40,000ppm (4% volume) of Hydrogen in ambient air.

In principle, the sensor works like an electrochemical cell. A solid electrolyte, however, takes the place of a liquid one. For this reason, the measuring system operates over a temperature range of -20° C to +60° C and a relative humidity of 5 to 95% RH.

At the three-phase boundary of the measuring electrode, the Hydrogen splits into protons and electrons. The resulting current flow is proportional to the Hydrogen concentration. Since this reaction takes place at room temperature, the heating systems for classic solid electrolyte sensors are not required.

It contains no moving parts. Silicone, Halogen and sulphuric compounds do not impair its functioning. In addition, it is neither cross-sensitive to HC, H₂S, NO, NO₂, CO nor CO₂. The housing is aluminium, designed for intrinsic safety, and is suitable for wall mounting.

The sensor has a fast response and a long service life of approximately 40,000 operating hours. The intelligent electronics process the measured values, output the measuring signal, monitor the functioning of the system and report any faults. The system requires a 12V or 24 V dc power supply.



Hydrogen H₂ Gas Measuring System in aluminium housing

Range: 100-40,000ppm H₂
Part no: 2112B24420



HYDROGEN H2 GAS MEASURING SYSTEM

2. WHY A SPECIFIC MEASURING SYSTEM FOR H2?

Since Hydrogen is easy to store and transport, it is deemed the energy store of the future; electrolyzers decompose water into Oxygen and Hydrogen using an electric current that has been generated in an environmentally friendly manner. The resulting Hydrogen stores the energy required to generate it and releases it again later in a reaction with Oxygen to make water, either in the form of electrical energy in a fuel cell or as heat or driving power in combustion.

One problem with this process is the highly explosive nature of Hydrogen. Whereas Methane forms an explosive mixture with air in a concentration of between 5 and 15% volume, in the case of Hydrogen concentrations, the corresponding range is between 4 and 75.6%. Since Hydrogen is extremely light and volatile, this problem is not critical in the open air but it certainly is in enclosed spaces such as cellars, garages and vehicle passenger compartments where even small leaks could lead to the formation of explosive mixtures. For this reason, it is essential to monitor Hydrogen concentration in such places at all times.

3. THE INNOVATION

Sensors previously available on the market have disadvantages. Semiconductor sensor and pellistors are cross-sensitive to flammable gases and vapours such as methane and benzene, while electrochemical liquid electrolyte sensors have limited service life and are susceptible to climate fluctuations.

The Hydrogen specific measuring system uses a new sensor which combines many advantages: it is specific for Hydrogen, has a long service life of more than five years, responds quickly, consumes very little power and has a linear measuring range.

4. DESIGN OF THE SYSTEM

The solid electrolyte sensor is mounted in aluminium housing, designed for intrinsic safety.



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SPECIFICATION

Sensor

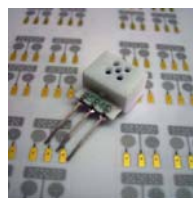
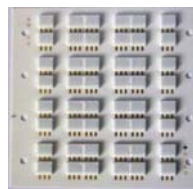
Sensor Type:	Solid electrochemical Hydrogen H ₂ sensor
Construction:	5 Pin Sensor inclusive of memory
Temperature range:	-20° C to +60° C
Humidity range:	5 to 95% RF, non-condensing
Measuring range:	100 – 40,000 ppm H ₂
Lowest measuring range:	100 ppm
T 90:	Typically 10 seconds at 20°C
Sensor current:	Typically 0.5 – 5nA / ppm H ₂
Response time with gas:	Typically 0.1 sec
Dimensions:	20 mm by 13.5 mm excluding pins
Cross Sensitivity:	See sensor datasheet



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Electronics

Voltage Supply:	12Vdc version or 24Vdc version +/- 10%
Current consumption:	Typically 65 mA
Temperature range:	-20°C to + 80°C
Temperature compensation:	-25°C to + 85°C
Alarm relays 1:	Gas high potential free contact C, NC
Alarm relays 2:	Fault for hard- and software. Potential free contact C, NC.
Status LED:	Double function LED: Normal operating - GREEN High gas - RED
Sensor test:	Life – test
Current output:	4-20mA
Voltage at current output:	Minimum 12 Vdc, maximum 32 Vdc
Electrical protection:	Short circuit proof
Chamber:	Plastic Dimensions: width 56mm x depth 90mm x height 47mm
Weight:	Approx. 300grams
Part no:	2112B24420
Options available:	Sensor only or transmitter with sensor available as separate items. Please ask Euro-Gas for details



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Description of functions

Sensor failure / Sensor Defect

The sensor signals a defect if the recorded sensor tension is longer than an adjustable time (1-255 seconds) or if the sensor is damaged mechanically or it fails (specification 5 seconds).

Excess temperature

The signal for excess temperature is set at a value under -25°C or above $+85^{\circ}\text{C}$.

Data disturbance

The data disturbance signal is set if the conveyance of EEPROM data to the processor shows an error. The relay fault triggers and the contact is potential free.

Gas alarm

The gas alarm signal is activated by the processor, directly on the relay and when the adjusted threshold is exceeded. The contact is potential free.

Life test

The life test is a direct functional test of the sensor. A specific tension signal is sent by the processor and will generate a voltage signal directly to the anode on the sensor. The resulting signal has an amplitude height that conveys information about the quality condition of the sensor. If the intended height of amplitude is not reached, then the hardware fault is activated. In this case, the sensor must be exchanged.



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EEprom Processor Statuscontrol

Bits in Sensor status:

Bit 7: Hardware Error/	1 = General hardware fault
Bit 6: Kom Error/	1 = Data fault CAN
Bit 5: Flash Error/	1 = EEprom fault (CRC/Program code)
Bit 4: Sensor Error/	1 = Sensor casualty / Sensor defect
Bit 3: Over Tmp/	1 = Over temperature
Bit 2: Analog Error/	1 = Analogue output fault
Bit 1: Cal. Mode/	0 = Normal operation / 1 = Calibration operation
Bit 0: Com Mode/	1 = Communications mode for permanent operation

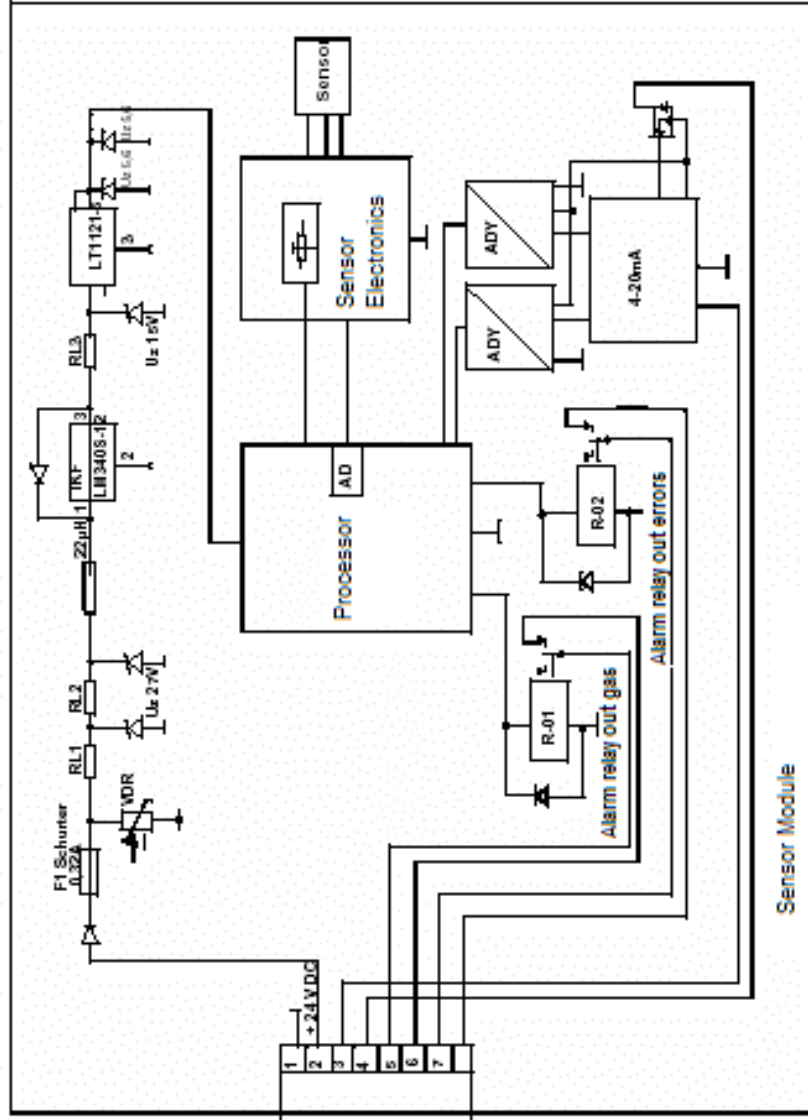
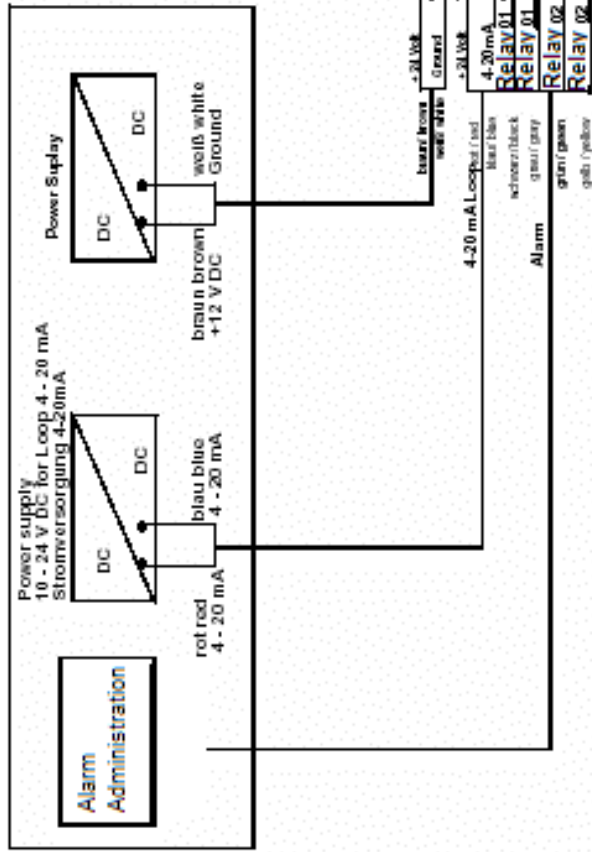
The sensor and electronics are developed according to the following guidelines;

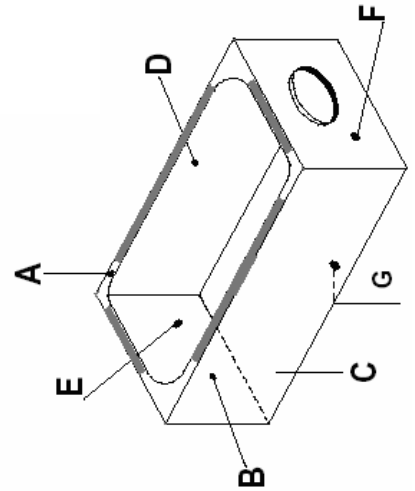
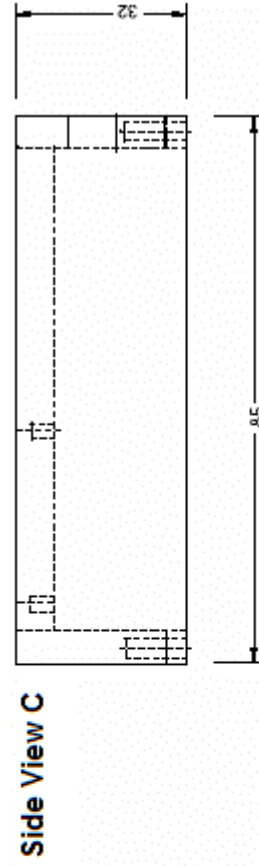
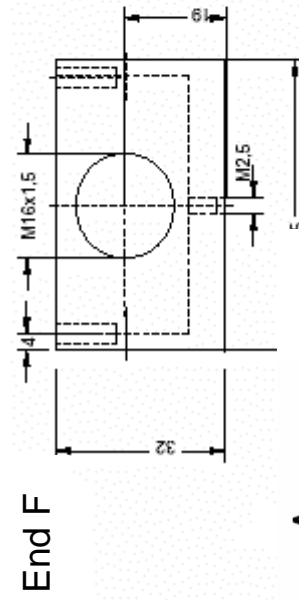
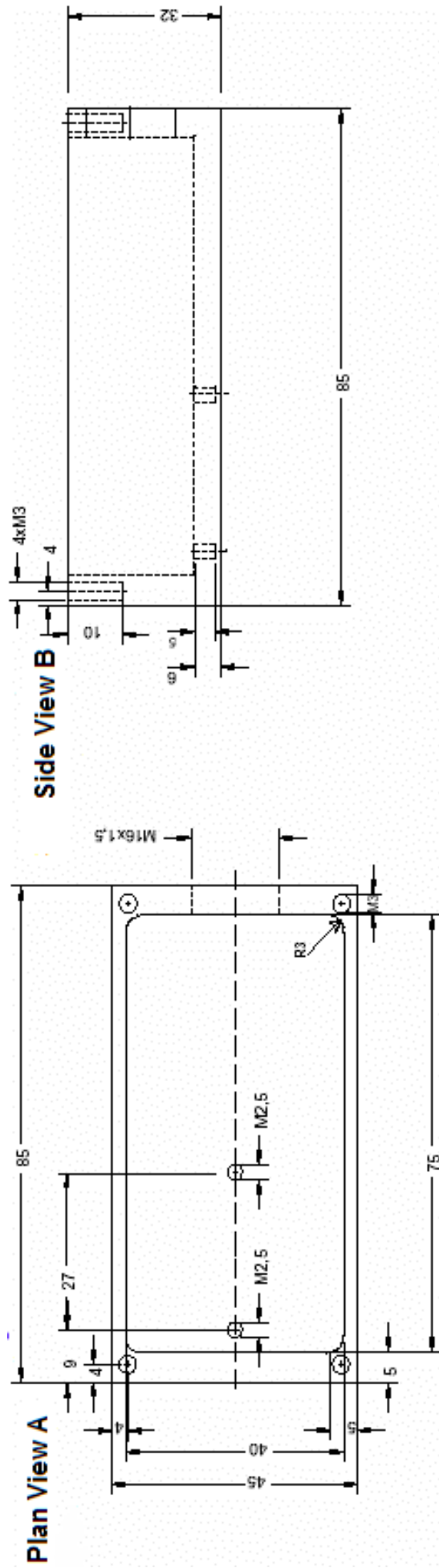
- EN 60079-0:2009 general request
- EN 610079-11:2007 intrinsically safe
- EN 60079-18:2004

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Main functions of 4-20mA Circuitry





Sensor Housing Dimensions

