H2 KEY SAFETY FEATURES SUMMARY

- **Hydrogen production is in real time, no storage of hydrogen is needed for H2 operation.**
- **Sensors are present to detect hydrogen leakage and if any leak is detected the system stops immediately.**
- **Block valves are installed in different stages to prevent the back flow of hydrogen.**
- **All the process variables are manipulated by an AI Control Algorithm, which is an integral part of the safety and security system.**
- **Upgraded tighter fittings and seals in all equipment that hydrogen passes through to prevent leakage and the introduction of new injectors and/or nozzles. Threaded fittings (Swagelok/Autoclave) till 1”**
- **Alloy steel piping & all Metallurgy consistent to prevent Hydrogen embrittlement at the welded joints.**
- **CO2 / Nitrogen shall be used as a purge gas in the system before the generation of Hydrogen or feeding Hydrogen to the DG set.**
- **Site supervisor ensures correct ventilation of the space to eliminate the need for a flare.**
- **No lighters or any welding operations shall be allowed until a complete inspection is performed.**
- **Dismantling of the hardware shall follow safety and operational procedures.**

H2 SAFETY/SECURITY SYSTEM OVERVIEW

The **H2** thermoplasma hydrogen generator system has a peripheral detector hydrogen detector and thermoplasma injection unit. In the event of hydrogen leakage, the detector above the thermoplasma injector units inhibits hydrogen synthesis in the internal combustion chamber.

Hydrogen gas detectors are installed to alarm and activate shutdown if hydrogen leakage is detected.

The sensors are installed in places that are most likely to accumulate hydrogen in case of leakage.

The sensors are installed above the height of the hydrogen system.

The detectors are set to alarm at 1% hydrogen concentration (25% lower flammability limit) and shut down the system at 2% hydrogen concentration (50% lower flammability limit).

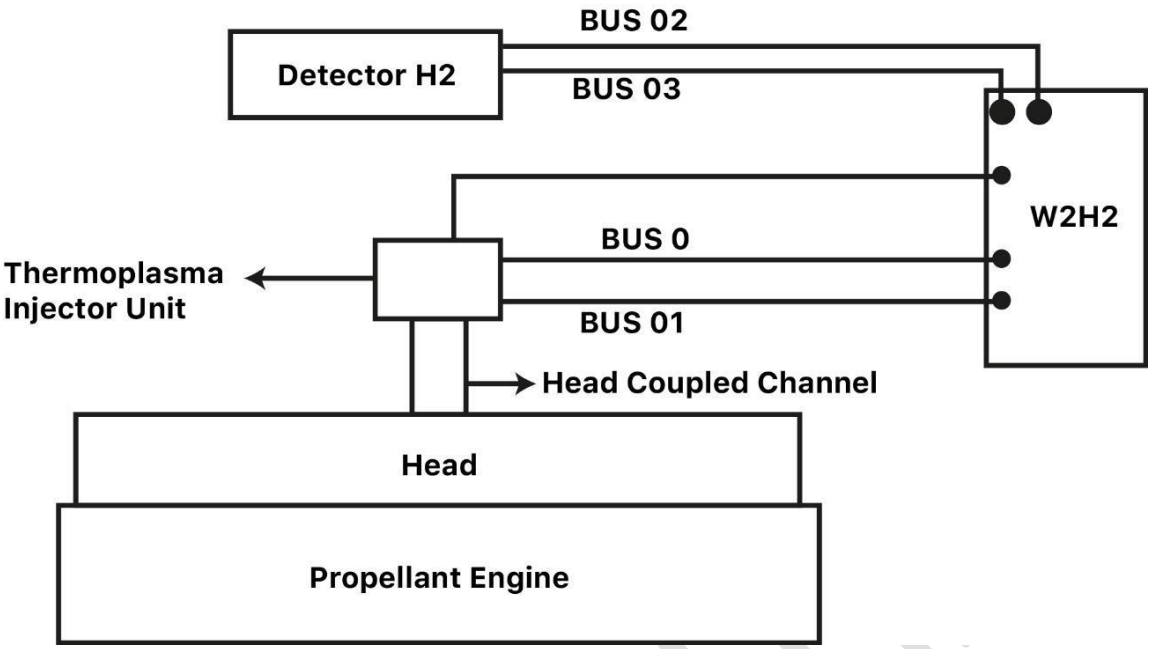
DETECTOR MODEL USED IN H2:

SMART 3G-D3 PN: S3594H2

COMMENTS:

The **H2** System does not use hydrogen stored in cylinders or pressurized hydrogen line, but provides hydrogen from water on demand.

Diagram analysis below:



The synthesis and combustion of hydrogen in the combustion chamber of diesel generator converted to hydrogen generator provides maximum safety.

The hydraulic line (water flow) is directed to the level peripherals (stages) and then forwarded to the thermoplasma injector unit. Unstable water enters the thermoplasma unit for level four process.

Magnetic, resonance, quantum, and fusion phenomena in the thermoplasma unit that contribute to the synthesis of injected hydrogen through the thermoplasma injector unit in the internal combustion chamber.

The synthesis occurs in the ultra-high temperature thermoplasma injection unit with the assistance of the previous stages of **H2**.

HYDRAULIC CIRCUIT PIPING FOR WATER:

Austenitic stainless steel tubing (300 series) for conducting water to the mentioned peripherals.

WATER CONDUCTION PIPE FAULT DETECTION:

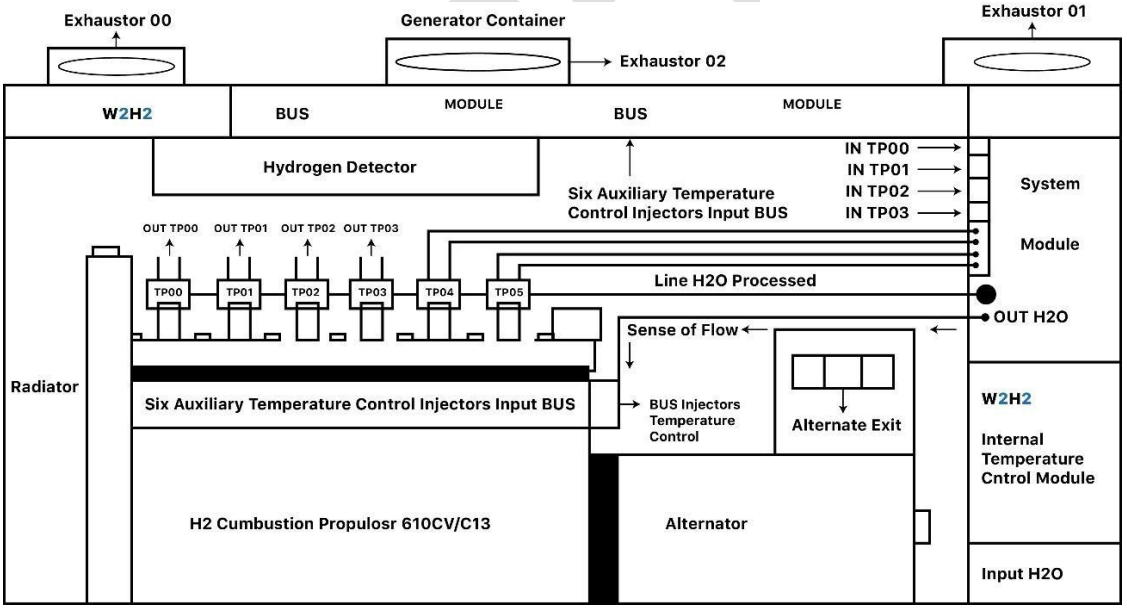
Vibrations or a set of vectors that may cause pipe fatigue may disrupt the flow of water to the molecular decomposition peripherals. Each peripheral is monitored by the host system and compares the results with fixed parameters.

Parameter offsets, in this case above pressure, are processed and unacceptable variations allow **H2** to lock out by interrupting the synthesis of hydrogen from water.

H2 SYSTEM SAFETY SENSOR ARRANGEMENT:

01- Pressure sensor in the thermoplasma circuit water supply line;

02- Sensor (H2 Detector) with superior spatial arrangement above the thermoplasma injection units with diagram below:

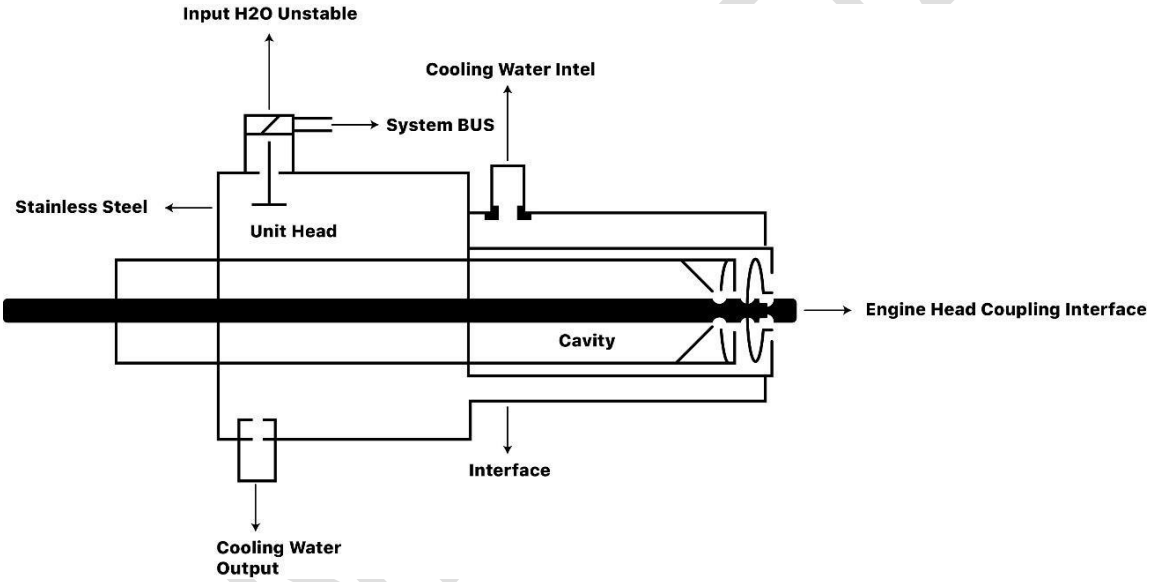


Upon a failure of the hydrogen synthesis process, **H2** inhibits hydrogen water processing and enables exhaust fans by eliminating flammable atmosphere.

The algorithm, SOIAH2_01 Artificial Intelligence Operating System, utilizes flammable atmosphere operating lockout routines, ie waterline or thermoplasma head leaks enable **H2** System lockout with faulty peripheral information.

The mechanical digital assistant (ADM) has routines for processing duplicate hardware, ie the higher cost of duplicate hardware allows it to proceed without paralyzing the operation of the hardware generator force water for hydrogen, but peripheral duplication should be considered in each business model.

EXTERNAL DIAGRAM OF THERMOPLASMA INJECTION UNIT:



The cylindrical interface is connected to the internal combustion engine head.

Through this interface occurs the synthesis and injection of hydrogen and oxygen inside the combustion chamber.

Between the thermoplasma injection unit block and cavity, another coupling interface occurs, that is, the block head and cavity assembly. The block head (thermoplasma injector unit divided into two blocks, ie, management block and cylindrical block (terminal synthesis) which constitute a monoblock termed thermoplasma injector unit.

In the interface block head and cylinder block may in the long run or other environment variables allow hydrogen leakage. Rare variations in this interface bridge are detected

by hydrogen detectors that report the SOIAH2_01 of the **H2** system inhibiting hydrogen synthesis at all stages that contribute to the molecular decomposition effect of water.

The probability of hydrogen leakage mentioned in the head block and cavity block interface is negligible in low operating time thermoplasma injection units, but due to the characteristic expansion of the metals and their coefficients of dilation and sealing adhesive between blocks, high usage time, Vibrations and other environment variables are possible hydrogen leakage at this point.

Four-year platform tests, **IVECO MODEL C13** (cursor 13.0), no anomalies or vanishing point detected at this interface main head block and cylinder block cavity, but dedicated application computational trials consider the events mentioned above.

H2 SYSTEM SECURITY CONSIDERATIONS:

The **H2** SYSTEM is directed to the step-by-demand decomposition process, ie the process is modulated according to the amount of hydrogen required in the load (Industry). The amount of hydrogen produced is determent by the **H2** System being informed of the desired power in kW and the algorithm performs the mathematical treatment of synthesis operations on demand, amount of water per hour.

Internal dissipation, rotation, torque, monitoring through hydrogen detectors analyzing possible hydrogen leakage, amount of hydrogen in startup, ramp, developed thermal energy. in-chamber and internal dissipation control through combustion chamber sensor, thermoplasma injector unit temperature, optical water conditions, magnetic compensator system compensation allowing for a great alternative breakthrough in synthesis and viable hydrogen combustion in internal combustion engines.

The **H2** architecture is driven with modifiers for application on hydrogen generators by displacing the combustion engine by alternating stage fuel cells and inverters. The hydrogen cell on demand architecture will utilize the fuel cell combustion engine space with modified **H2** / Modified technology that incorporates the on-demand synthesis process:

H2 / Modified >> fuel cell >> hydrogen and oxygen separator >> reverse dc / ca.