H2scan®

Advanced Hydrogen Sensing

OPERATION MANUAL

HY-ALERTA®

5320 Intrinsically Safe Hydrogen Monitor

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IMPORTANT NOTICES

Read and understand this operation manual before installing or using the unit. If this equipment is used in a manner not specified by H2scan, the warranty may be void. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

⚠ WARNING

If the product seems defective, DO NOT attempt to repair it. Immediately send the product back to H2scan for repairs.

LIMITATION OF LIABILITY - seller shall under no circumstances be liable for any incidental, consequential, special, punitive, or other damages, including, but not limited to, loss of business or profit, promotional or manufacturing expenses, injury to reputation, or loss of customer, based on any alleged negligence, breach of warranty, strict liability, breach of contract, or any other legal theory arising out of the use, misuse, purchase, sale or possession of its goods or its performance of this contract to the extent that such liability extends seller's obligations beyond the price paid by buyer to seller for the item on which such claim is based. Seller advises buyer to perform acceptable tests on all hardware prior to deployment and to perform maintenance as described in the seller's instruction guide. Under no circumstances shall the equipment provided hereunder be used in a manner where it is the sole protective system for facilities, equipment, and personnel safety; the equipment is intended for use in conjunction with other appropriate protective systems.

LIMITED WARRANTY

H2scan Limited Warranty: Each HY-ALERTA 5320 Hydrogen Safety Monitor ("Product") will conform, as to all substantial operational features, to the Product specifications set forth in this Manual and will be free of defects which substantially affect such Product's performance for three-year from the ship date for such Product.

Must Provide Notice of Defect: If you have a Product that you believe is defective, you must notify H2scan in writing, within the warranty period of your claim regarding any such defect.

Return Product to H2scan for Repair, Replacement or Credit: The customer is responsible for shipping and handling costs. If the Product is found defective by H2scan, H2scan's sole obligation under this warranty is to either (i) repair the Product, (ii) replace the Product, or (iii) issue a credit for the purchase price for such Product, the remedy to be determined by H2scan on a case-by-case basis. A valid RMA number must be assigned by H2scan and clearly marked on the package when the unit is returned.

Voided Warranty: H2scan's three-year Limited Warranty is void for any of the following:

- **Unauthorized repair work performed at the customer's location or conducted by anyone other than H2scan's factory trained technicians.**
- **Equipment or parts that have been tampered with, misused, neglected, mishandled, improperly adjusted, or modified in any way without the written consent of H2scan.**
- **Equipment or parts that have been damaged due to shipping, misuse, accidents, mishandling, neglect, or problems with electrical power sources.**
- **Repair work performed during the warranty period does not prolong the warranty period past the original period.**
- **System operation in incorrect or inappropriate environments.**
- **Usage that is not in accordance with system guidelines or an operator's failure to follow manual instructions.**

Limitation of Warranty: THE ABOVE IS A LIMITED WARRANTY AS IT IS THE ONLY WARRANTY MADE BY H2SCAN. H2SCAN MAKES NO OTHER WARRANTY EXPRESS OR IMPLIED AND EXPRESSLY EXCLUDES ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. YOUR SOLE REMEDY HEREUNDER IS REPAIR OR REPLACEMENT OF THE PRODUCT OR A CREDIT FOR THE PURCHASE PRICE FOR SUCH PRODUCT, THE PARTICULAR REMEDY TO BE DETERMINED BY H2SCAN ON A CASE-BY-CASE BASIS. H2SCAN SHALL HAVE NO LIABILITY WITH RESPECT TO ITS OBLIGATIONS UNDER THIS AGREEMENT FOR CONSEQUENTIAL, EXEMPLARY, OR INCIDENTAL DAMAGES, EVEN IF IT HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. THE STATED EXPRESS WARRANTY IS IN LIEU OF ALL LIABILITIES OR OBLIGATIONS OF H2SCAN FOR DAMAGES ARISING OUT OF OR IN CONNECTION WITH THE DELIVERY, USE OR PERFORMANCE OF THE PRODUCTS.

Symbol	Meaning
	CE marking according to the current applicable directive.
	According to its marking, the device is certified for hazardous areas.
	Safety instructions that must always be followed: The respective data must be noted and/or the safety-related instructions contained in the operating instructions must be followed for devices with this symbol!

1. INTRODUCTION

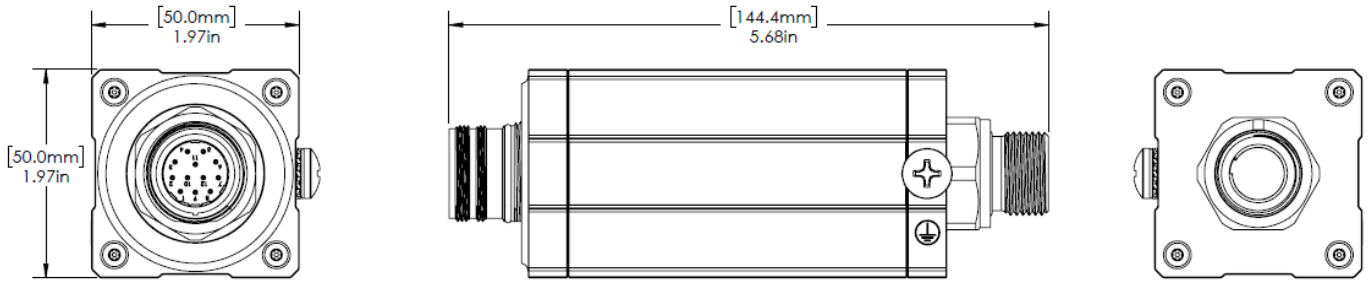
The HY-ALERTA 5320 Series Intrinsically Safe Hydrogen Safety Monitor measures hydrogen concentration in ambient air or room environments using H2scan's patented solid-state sensing technology. It provides real-time, hydrogen-specific measurement without cross-sensitivities to hydrocarbons, CO2, or inert gases.

Using H2scan's patented solid-state, non-consumable, hydrogen-specific sensing element as well as patented algorithms and a robust design, the monitor reports accurate hydrogen readings through a digital interface — without periodic calibration. If used in normal operation following the guidelines in this manual, expect the measurement algorithm to maintain its stated accuracy over the life of the device.

The HY-ALERTA 5320 is designed for area or room hydrogen detection, mounted to a wall or ceiling.

Figure 1: HY-ALERTA 5320 Hydrogen Safety Monitor Dimensions

2. PRE-INSTALLATION REQUIREMENTS



2.1 CABLING AND WIRING

The H2scan cable shipped with your product has been specially designed and manufactured to the requirements of intrinsic safety. The H2scan cable assembly is available in lengths of 5, 10, 20, or 30 m. For cable assembly pinout and wiring information refer to 3.2 Electrical Connection, Figure 2.

2.2 INTERFACE BARRIERS

When operated in a hazardous area, the HY-ALERTA 5320 Hydrogen Safety Monitor must be connected to Ex i certified barriers located in a non-hazardous area using the H2scan-supplied cable. The maximum length of cable for intrinsically safe operation is 30 m.

CAUTION

This equipment shall only be powered by a limited energy electric circuit in accordance with CAN/CSA C22.2 No. 61010-1-12 and ANSI/UL 61010-1, or Class 2 as defined in the Canadian Electrical Code C22.1, Section 16-200 and/or National Electrical Code (NFPA 70), article 725.121, when installed in non-hazardous areas.

The following barriers are recommended to use with the HY-ALERTA 5320 Hydrogen Safety Monitor for an Intrinsically Safe implementation (refer to individual manufacturer's data sheets for proper connection and operation):

Intrinsically Safe Power Barrier: R. STAHL, INC. Ex I Power Supply, P/N 9143/10-156-160-10s

Intrinsically Safe Serial Interface Barrier (RS-485): R. STAHL, INC. Fieldbus Isolating Repeater, P/N 9185/11-35-10s

Intrinsically Safe Analog Output Barrier (4–20 mA): R. STAHL, INC. Transmitter Supply Unit, Ex i Field Circuit, P/N 9160/13-11-11s

Intrinsically Safe Digital Output Barrier: R. STAHL, INC. Switching Repeater, Ex i Field Circuit, P/N 9170/21-11-11s

2.2.1 Power Supply

Each HY-ALERTA 5320 Hydrogen Safety Monitor incorporates an internal voltage regulator for operation in harsh electrical conditions. An external DC power source is required to energize the monitor for operation. As required for intrinsic safety, power must be limited in the hazardous area using an Ex i certified barrier that meets the Safety Interface Parameters in Appendix B.

DC power is electrically isolated from the metal enclosure of this device.

The metal enclosure of this device shall be connected to the earth safety ground as described in Appendix B.

2.2.2 RS-485 Communication

HY-ALERTA 5320 Hydrogen Safety Monitor offer digital communication using Modbus over a three-wire, half-duplex RS-485 interface that is galvanically isolated. Fail-safe resistors and a 120 Ohm termination resistor are installed in the monitor. As required for intrinsic safety, power transferred through these signals must be limited in the hazardous area using an Ex i certified barrier that meets the Safety Interface Parameters in Appendix B.

2.2.3 Analog Output

The HY-ALERTA 5320 Hydrogen Safety Monitor offer a 4–20 mA analog output that is powered by an external voltage source. The output current has the following properties:

- 0 mA indicates the device is disconnected or not powered
- 3.5 mA indicates an error condition
- 4–20 mA indicates the hydrogen measurement from 0-5%
- 22 mA indicates the device is warming up and not ready

As required for intrinsic safety, power transferred through these signals must be limited in the hazardous area using an Ex i certified barrier that meets the Safety Interface Parameters in Appendix B.

2.2.4 Digital Output

The HY-ALERTA 5320 Hydrogen Safety Monitor offer two digital outputs that share a common reference. These digital outputs are electrically isolated from the other electrical systems. They can be independently configured via Modbus to indicate high levels of hydrogen or a fault condition with the device. Typically, DOUT-1 is configured for hydrogen alarm and DOUT-2 is configured to indicate fault conditions.

The digital outputs have “open-collector” logic, which is analogous to a normally open relay. That is, when deactivated, current will not flow from DOUT to DOUT-REF. When activated, current will flow from DOUT to DOUT-REF.

When using a digital output as a hydrogen threshold alarm while the hydrogen measurement is below the alarm threshold, the digital output will be in a deactivated state and will not allow current to flow from DOUT to DOUT-REF. As soon as the hydrogen measurement exceeds the threshold, the digital output activates and allows current to flow.

When using a digital output to detect faults while no fault is detected, the digital output is activated and allows current to flow from DOUT to DOUT-REF. When a fault occurs, the digital output deactivates and stops current from flowing.

As required for intrinsic safety, power transferred through these signals must be limited in the hazardous area using an Ex i certified barrier that meets the Safety Interface Parameters in Appendix B.

3. INSTALLATION

CAUTION

Keeping the cap in place until installation. Avoid damage to the safety monitor assembly during handling by ensuring nothing comes in contact with the sensor end of the device.

3.1 MECHANICAL

The sensor continuously measures hydrogen in ambient air; no gas plumbing or process connection is required. The HY-ALERTA 5320 Safety Monitor is enclosed in a rugged, IP66-rated housing suitable for wall or ceiling installation. The sensing face must remain exposed to the environment for accurate readings.

⚠ WARNING

Mounting the monitor such that the sensor cavity accumulates condensed liquids will damage the sensor and void the warranty.

3.2 ELECTRICAL CONNECTION

Electrical connection to the HY-ALERTA 5320 Hydrogen Safety Monitor is achieved through a single connector using an H2scan cable assembly.

Make all electrical connections to associated equipment (barriers and power supply) before connecting cable to the monitor. The cable includes four separate circuits (DC Power, RS-485, Analog Output, Digital Outputs). Wires within each circuit have unique colors however, the same color wire is used in different circuits. To ensure proper connection it is important to check continuity from connector pin to wired connection. The following figure identifies the cable pinout, and wire colors. Use the following check list to complete wiring:

1. Route cable from monitor to associated equipment, confirm sufficient length.
2. Dress flying leads as needed to route wires to terminals, any unused wires/circuits must be secured, isolated and apply an insulated wire cap or heat-shrink tubing.
3. Connect two wires to the Intrinsically Safe Power Barrier, confirm polarity.
4. Connect three wires to the Intrinsically Safe Serial Interface Barrier (RS-485), confirm polarity of signal wires, connect RS485-GND to the ground reference.
5. Connect two wires to the Intrinsically Safe Analog Output Barrier (4–20 mA), confirm polarity of signal wires.
6. Connect three wires to the Intrinsically Safe Digital Output Barrier with a jumper between (-) terminals to DOUT-REF wire, confirm polarity of connections.
7. Check continuity of all connections to the respective pins at the connector.

Attach connector to the monitor before energizing the system. The connector must be fully engaged and hand tightened.

PIN CONFIGURATION AND FUNCTION DESCRIPTIONS			
NO.	MNEMNIC	FUNCTION	WIRE COLOR
1	VDC	Positive Supply Voltage.	BROWN
2	VDC_GND	Ground Reference for Supply Voltage. This pin must be connected to 0V with respect to VDC.	WHITE
3	NIC	Not Internally Connected. This pin is not connected to the internal circuity.	-
4	RS485-A	RS-485 Noninverting Driver Output/Receiver Input.	BLUE
5	RS485-B	RS-485 Inverting Driver Output/Receiver Input.	BLACK
6	AOUT+	Analog Output Current.	BLUE
7	AOUT-	Analog Output Return.	GREY
8	DOUT-1	Digital Output 1 (Open Collector).	GREEN
9	DOUT-2	Digital Output 2 (Open Collector).	WHITE
10	NIC	Not Internally Connected. This pin is not connected to the internal circuity.	-
11	RS485-GND	RS-485 Ground Reference.	GREY
12	DOUT-REF	Ground Reference for Digital Outputs 1-2.	YELLOW

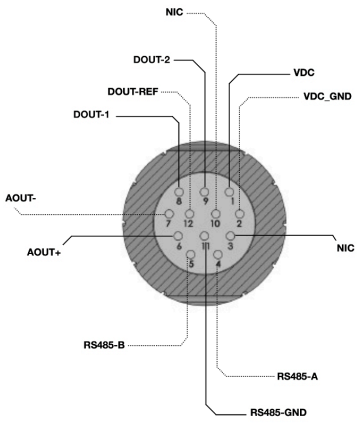


Figure 2: H2scan Cable Pinout and Wire Colors

NOTE: The connector to the HY-ALERTA 5320 Hydrogen Safety Monitor **must be fully engaged and hand-tightened to ensure the IP66 rating.**

3.3 EARTH GROUND CONNECTION

The metal enclosure of this device shall be connected to the earth ground through the earth ground connection described in Appendix B.

4. COMMISSIONING

NOTE: If operating at a pressure other than 1.0 ATA, the hydrogen reading must be compensated by performing a two-point field calibration or by dividing the hydrogen reading by the known pressure in ATA. See 4.2 for two-point field calibration instructions.

4.1 STARTUP

Power on the monitor and it will execute a startup sequence and is able to begin reporting hydrogen after approximately 90 seconds. During this period, the monitor will:

- Perform a power on system self-test
- Restore configuration settings from non-volatile memory

If using Modbus, the default communication settings are:

- RS-485, half-duplex, 19200 baud, 8 data bits, 2 stop bits, no parity
- Default Modbus ID is 1

The Modbus status register 111 bit 15 will indicate Ready when the first valid hydrogen measurement is available. After the startup sequence completes, measurement data will be available in the Modbus registers.

If an error is reported, turn off power to the monitor and check the electrical connections and power supply voltage before restoring power. If the error persists, contact H2scan customer service at hello@h2scan.com.

4.2 FIELD CALIBRATION PROCEDURE

- Recommended to use the 105920-KIT Gen5-IS Calibration Adapter
- Minimum exposure per calibration gas: 90 minutes
- Recommended gases: 1% and 2% H_2 in air

- Flow rate: 1.0 ± 0.2 SLPM
- Abort command: write '1' to register 133

NOTE: Calibration is not necessary under normal operating conditions. This procedure is provided in the event the customer procedure requires a calibration to be performed.

NOTE: The exposure time per gas is a minimum of 90 minutes per exposure. Exposures shorter than 90 minutes can generate erroneous calibration data.

NOTE: The calibration can be aborted at any time (See: 4.2.1).

Table 4: Two-Point Field Calibration Registers

Register	Parameter	Function	Data Type	Data Range	Access
126	Calibration Gas 1, ppm H_2	High word	32-bit binary number	0–1,000,000	R/W
127		Low word			
128	Calibration Complete/ Date	High byte: Month Low byte: Day	32-bit binary value		R/W
129		Year			
130	Calibration Gas 2, ppm H_2	High word	32-bit binary number	0–1,000,000	R/W
131		Low word			
132	Field Cal start command	Gas exposure duration (minutes)	16-bit binary number	90–1440	W
133	Field Cal abort command	Abort Field Cal or clear data	8-bit binary number	1: abort 2: clear	W
134	Field Cal get status command	High byte: Status Low byte: Error code	16-bit binary number	Tables 5 and 6	R
135	Gas start command	Gas 1 or 2 started	8-bit binary number	1: gas 1 2: gas 2	W

Read the status and error codes from register 134 after each write to the field calibration registers.

Upon calibration initiation, the status code should read '1' (in-progress).

The error code should read '0' (no errors detected) after register write until the procedure is completed. Upon completion, the status code should read '0' (success) and the error code should read '0' (no errors detected). Refer to 4.2.5 if an unexpected code appears.

1. Attach the calibration adapter.
2. Initiate calibration by writing the duration per gas exposure in minutes to register 132. The minimum time is 90 minutes per gas. Longer exposure times are preferable, up to 1440 minutes.
3. Apply the first gas to the unit at 1 SLPM.
4. If necessary, adjust the gas pressure at the monitor to match the intended operating pressure.
5. Indicate the first gas is flowing by writing '1' to register 135.
6. Wait the exposure time.
7. Write the first gas concentration in ppm to registers 126, 127. To convert percentage to ppm, multiply percentage value by 10,000.
8. Apply the second gas at 1 SLPM.

9. Ensure the gas pressure at the monitor has not changed, making any necessary adjustments.
10. Indicate the second gas is flowing by writing '2' to register 135.
11. Wait the exposure time.
12. Write the second gas concentration in ppm to registers 130, 131.
13. Finish the field calibration with the current date by writing to registers 128, 129.
14. The unit will automatically reboot.
15. After reboot and warmup apply a known concentration to confirm accurate field calibration.

4.2.1 Abort Field Calibration

To abort a field calibration while in progress, either power cycle the unit or write '1' to register 133.

4.2.2 Calibration Status and Errors

Check Register 134 for calibration status and errors.

Table 5: Field Calibration Status

Code	Definition
0	The calibration was completed successfully.
1	The calibration process is ongoing.
2	The calibration failed due to errors.
3	The calibration was canceled by the user.
4	The calibration has been removed and factory settings restored.
5	The most recent command was not executed. See the error code for more details.

Table 6: Field Calibration Errors

Code	Definition	Resolution
0	No errors detected.	N/A
2	Field calibration already in-progress.	Abort in-progress field calibration. See 4.2.1.
3	The entered gas exposure time is outside the limits.	Ensure the time was entered in minutes and within the limits of the product (minimum of 90 minutes).
4	Internal problem with the unit.	Power cycle and try again. Contact H2scan if the error persists.
5	This code is used for diagnostic purposes only.	N/A
7	Entered gas concentration is outside limit.	Ensure the gas concentration is entered in ppm and within the range of the product model.
8	Command to start Gas 2 received before Gas 1 completed.	
10	Calibration could not complete based on measured data.	Retry the calibration. Contact H2scan if the error persists.

Code	Definition	Resolution
12	Calculated gain and/or offset are outside limits.	Confirm the gas was flowing and the concentrations entered in ppm and match the respective gases.
13	A step was skipped in the calibration process.	Restart the calibration, following the steps detailed above.
14	The gas exposure was not completed.	Retry the command once the full exposure time has elapsed. If an incorrect gas exposure time was entered, abort the field calibration and start over.

Once the calibration is complete, maintain operating pressure and do not adjust the pressure regulation to ensure the normal operating conditions match the field calibration conditions as closely as possible.

5. OPERATION

NOTE: Hydrogen measurement is performed in ambient air. During normal operation, the monitor reports readings via RS-485, 4–20 mA, or digital alarm outputs.

NOTE: For optimal long-term stability, the unit should remain powered continuously. Frequent power cycling (<2 hours on-time) may reduce accuracy.

5.1 MONITORING

5.1.1 RS-485

During normal operation, poll the HY-ALERTA 5320 Hydrogen Safety Monitor measurements through the RS-485 interface periodically for a measurement reading. The time between readings can be from one second to several hours or days depending on user requirements. Each reading should include the following Modbus holding registers.

- Status Register (111 bits 15 and 12): Bit 15 indicates the hydrogen measurement is available. Bit 12 indicates an error.
- Error Status Registers (112,113): Indicates which error is detected. These registers are active when register 111 bit 12 is high.
- Hydrogen Registers (0,1): Provides the hydrogen ppm values. Programming note: The high word (0) must be read to enable the low word (1) value to be available.

NOTE: Regarding Hydrogen Registers (0,1), to convert ppm to %, divide ppm reading by 10,000.

5.1.2 Analog Output

The hydrogen measurement can be monitored using the analog output. See 2.2.3 for details.

5.1.3 Digital Output

Two isolated digital outputs can be used as alerts to signal high levels of hydrogen as well as fault conditions within the electronics. See 2.2.4 for electrical information. For configuration details, consult the Modbus Register Map, which is available as a separate document.

5.2 ERROR/EXCEPTION HANDLING

The HY-ALERTA 5320 Hydrogen Safety Monitor are designed for continuous operation and will attempt to automatically recover from intermittent problems due to insufficient power, excessive electrical noise, or excessive internal temperature.

An internal algorithm maintains long-term measurement accuracy without periodic field calibrations. For this

algorithm to run properly, the monitors must be powered on continuously. If the monitor is powered on only for durations less than two hours, the algorithm will not function properly and the monitor accuracy may not meet the product specifications.

If the sensor element is damaged and unable to operate, the HY-ALERTA 5320 Hydrogen Safety Monitor will shut down the measurement system and continue responding to Modbus for error reporting. This error will be reported via register 111 bit 12 with details specified in register 112,113. This type of error typically indicates a hardware fault that can only be repaired at H2scan. Power cycle the unit to attempt recovery. If the error condition persists, contact H2scan for repair at help@h2scan.com.

5.3 ENVIRONMENTAL CONDITIONS

- Pressure: The HY-ALERTA 5320 is designed and calibrated at sea level. Reference the datasheet for acceptable conditions. Refer to 4.2 when the HY-ALERTA 5320 is operating at a pressure other than 1.01 Bar Absolute.
- Condensation: Condensing moisture accumulation will damage the sensing element. Ensure any moisture is non-condensing. Atmosphere may be up to 95% relative humidity and non-condensing.

APPENDIX A: SPECIFICATIONS

Monitor performance specifications are absolute and valid for a dry environment an ambient temperature of 25 °C, and 1 ATA gas pressure, and are affected by errors in the calibration gases. Accuracy and repeatability are defined as ± the values listed. For other operating pressures, see Table A.2

While the monitors can operate in gas containing no hydrogen, measurement performance specifications are valid only when the monitor is exposed to gas containing hydrogen above the Lower Detection Limit shown in Table A.1

Table A.1: Product Table

Model	H_2 Range	Lower Detection Limit (LDL)	Response Time* (sec)	Accuracy and Repeatability
5320	0–5% H_2	0.4% H_2	< 60	0.3% H_2 (Absolute Error)

*For the model 5320, the response time is the time until the measured H_2 exceeds 1% when transitioning from air to 3% H_2/Air.

Table A.2: Operating Conditions

Parameter	Value			Units
	Minimum	Nominal	Maximum	
Environment – Ambient				
Pressure Certified, Hazardous Location CSA*	0.95	1	1.1	Bar Absolute
Humidity	0		95%	RH (non-condensing)
Operating Temperature	-40		70	°C
Storage Temperature	-40		105	°C
Ingress Protection	IP66			

Parameter	Value			Units
	Minimum	Nominal	Maximum	
Altitude*	0–2000 m above sea level			
Mechanical				
Vibration	ISTA 6-FEDEX-A TEST			
Shock	ISTA 6-FEDEX-A TEST			
Weight	1.65 lbs (748.43 g)			
Electrical				
Voltage Input Certified, Hazardous Location CSA (C1D1)	10		15.6	VDC
Voltage Input Certified, Ordinary Location (C1D2)	18		30	VDC
Power Consumption			2	W
Digital Output			10 40 200	VDC mA mW
Analog Output	3.5	4–20	24	mA
RS-485	Modbus RTU (three-wire)			

*Operating at pressures above or below 1 ATA will affect the measurement accuracy.

This equipment is capable of withstanding Overvoltage Category: II. (IEC/EN/UL/CSA 61010-1)

Pollution Degree 2: Normally only nonconductive pollution occurs. Temporary conductivity caused by condensation is to be expected. Ex. “Equipment is suitable for Laboratories, Test stations, or Office environment.” (IEC/EN/UL/CSA 61010-1)

APPENDIX B: CSA COMPLIANCE & CERTIFICATIONS

CD90000240: CSA COMPLIANCE & CERTIFICATIONS

B.1 GENERAL (SECTION APPLIES TO ALL MODELS)

B.1.1 SCOPE

Intrinsically safe (Ex) Zone 0 Hazardous locations – See Entity Parameters

Class I Div 2 or Ordinary locations (Non Hazardous locations) : Electrical Rating 18VDC to 30VDC (24VDC nominal), 2W max.

B.1.2 ENVIRONMENTAL CONDITIONS

- Specification of the Pollution Degree: 2.
- Specification of the Overvoltage Category: II.
- Specification for the maximum use altitude: 2000 m above sea level.

B.1.3 GROUNDING

The external housing shall be grounded in the end application per this diagram:

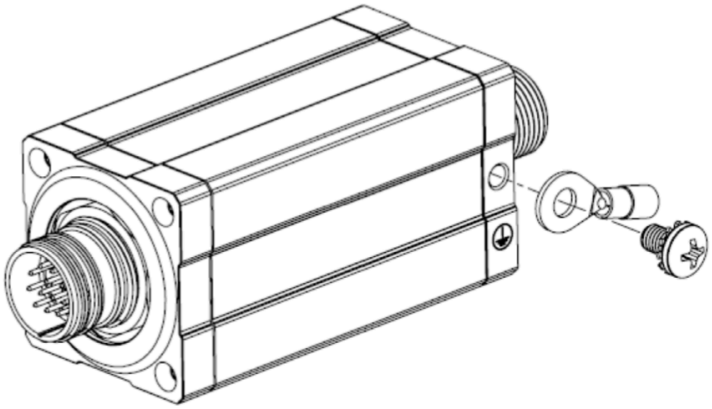


Figure 1: Earth Ground Connection

A grounding screw with an integrated external-tooth lock washer is provided with the HY-OPTIMA Hydrogen Analyzer assembly. This screw shall be used to attach a grounding lug and equivalent grounding method compliant with the standards associated with this product.

Grounding Screw Specifications:

- Size: M6 X 10mm, 18-8 Stainless Steel
- Minimum Torque: 8.7N-m (77.0 in-lbs.)

Grounding Wire Specifications:

- Minimum Grounding Conductor Size: 14 AWG Copper Wire (or equivalent as tested per UL 467)
- Use UL/CSA Listed or Recognized Wire

All of the above grounding requirements may be exempted when the following conditions are met:

- There is no insulation or coating on the mating threads of the process gas connection; and
- The process equipment is grounded according to the local electrical code

B.1.4 CERTIFICATE NUMBERS

- IECEx CSA 24.0040X
- CSANe 24ATEX1173X
- CSA24CA80204834X

B.1.5 SYMBOLS

Symbols related to safety which are used on this equipment:

- ISO 3864 Symbol B.3.1 ⚠ or ISO 7000 symbol 0434 ⚠ (triangle with exclamation point) with a statement that the manual must be consulted in all cases where this symbol is marked, in order to find out the nature of the potential HAZARDS and any actions which have to be taken to avoid them.

Symbol	Reference	Description
	ISO 7000-0434B (2004-01)	Caution

Exterior protective earth, for installer:

Symbol	Reference	Description
	IEC 60417-5019 (2006-08)	Protective Conductor Terminal

B.1.6 STANDARDS

This equipment has been evaluated and tested in accordance with:

Standard	Description
CAN/CSA C22.2 No. 94.2:20 ANSI/UL 50E-2020 Third Edition	Enclosures for Electrical Equipment, Environmental Considerations
CAN/CSA C22.2 No. 61010-1-12 + UPD1:2015, UPD2:2016, AMD 1 – 18 ANSI/UL 61010-1-2018 Third Edition	Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements
IEC 60079-0:2017 EN ISO 60079-0:2018 CAN/CSA C22.2 No. 60079-0:19 ANSI/UL 60079-0-2020 Seventh Edition	Explosive atmospheres – Part 0: Equipment – General requirements
IEC 60079-11:2011 EN 60079-11:2012 CAN/CSA C22.2 No. 60079-11:14 (R2018) ANSI/UL 60079-11-2018 Sixth Edition	Explosive atmospheres – Part 11: Equipment protection by intrinsic safety “i”
IEC 60529 CSA C22.2 No 60529: 05	Degrees of Protection provided by enclosures (IP Code)

B.2 CLASS I ZONE 0 AEx ia (H_2) Ga (SECTION APPLIES TO ONLY MODELS 53XY CLASS I, ZONE 0 AND 5846 CLASS I, ZONE 0)

B.2.1 CONDITIONS OF USE

1. The equipment is Certified for process pressure from 80 kPa (0.8 bar) to 110 kPa (1.1 bar). Process temperature: -40°C to +70°C.
2. The mating connector at the input shall provide an ingress protection level equivalent to the equipment, minimum of IP 66 or Type 4X.
3. If the equipment is used in a manner not specified in this installation manual, the protection provided by the equipment may be impaired.
4. The safety of any system incorporating the equipment is the responsibility of the assembler of the system.
5. The external housing shall be grounded in the end application per the manual.
6. The equipment has not been assessed as a combustible gas detector and shall not be used as a safety device.
7. The equipment shall be protected from direct mechanical impact or friction in the end application. Refer to installation manual.

B.2.2 SAFETY INTERFACE PARAMETERS

Supply:

Ui = 15.6 V; Ii = 160 mA, Pi = 2 W; Ci = 10 nF; Li = 36.11 µH	[no cable]
Ui = 15.6 V; Ii = 160 mA, Pi = 2 W; Ci = 22 nF; Li = 169 µH	[with 30m cable]*

RS485 Interface:

Ui = 6 V; Ii = 160 mA, Pi = 150 mW; Ci = 7.5 µF; Li = 1 µH	[no cable]
Ui = 6 V; Ii = 160 mA, Pi = 150 mW; Ci = 7.8 µF; Li = 133 µH	[with 30m cable]*
Uo = 6.52 V; Io = 330 mA, Po = 537 mW; Co = 3.5 µF; Lo = 163.25 µH	[no cable]
Uo = 6.52 V; Io = 330 mA, Po = 537 mW; Co = 3.4 µF; Lo = 30.25 µH	[with 30m cable]*

Analog Outputs:

Ui = 28 V; Ii = 100 mA, Pi = 750 mW; Ci = 69 nF; Li = 1 µH	[no cable]
Ui = 28 V; Ii = 100 mA, Pi = 750 mW; Ci = 81 nF; Li = 133 µH	[with 30m cable]

Digital Outputs:

Ui = 10 V; Ii = 40 mA, Pi = 200 mW; Ci = 10 nF; Li = 1 µH	[no cable]
Ui = 10 V; Ii = 40 mA, Pi = 200 mW; Ci = 34 nF; Li = 133 µH	[with 30m cable]*

A 50% reduction in cable length may apply in end application.

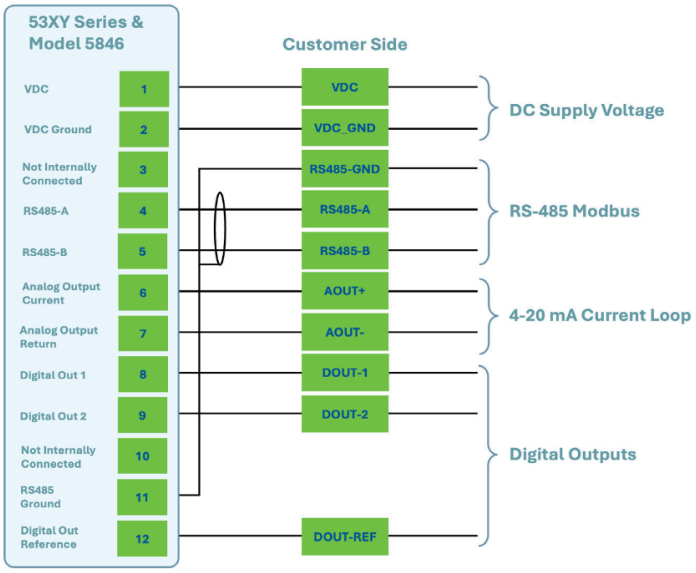


Figure 2: Typical Wiring Diagram

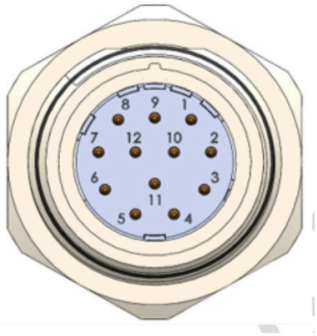


Figure 3: Connector Pin-Out

B.2.3 RECOMMENDED BARRIERS

When operated in a hazardous area, the Analyzer must be connected to appropriately certified barriers located in a non-hazardous area using H2scan specified cables. The following barriers are recommended to use with this device for an Intrinsically Safe implementation (refer to individual manufacturer's data sheets for proper connection and operation):

- **Intrinsically Safe Power Barrier**: R. STAHL, INC. Ex I Power Supply, P/N 9143/10-156-160-10s
- **Intrinsically Safe Serial Interface Barrier (RS485)**: R. STAHL, INC. Fieldbus Isolating Repeater, P/N 9185/11-35-10s
- **Intrinsically Safe Analog Output Barrier (4 mA to 20 mA)**: R. STAHL, INC. Transmitter Supply Unit, Ex i Field Circuit, P/N 9160/13-11-11s
- **Intrinsically Safe Digital Output Barrier**: R. STAHL, INC. Switching Repeater, Ex i Field Circuit, P/N 9170/21-11-11s

⚠ CAUTION

This equipment shall only be powered by a limited energy electric circuit in accordance with CAN/CSA C22.2 No. 61010-1-12 and ANSI/UL 61010-1, or Class 2 as defined in the Canadian Electrical Code C22.1, Section 16-200 and/or National Electrical Code (NFPA 70), article 725.121, when installed in non-hazardous locations.

B.2.4 CABLES

Only use cables specified by H2scan with this Analyzer. The maximum length of cable for intrinsically safe operation is 30 m. Cable connector is designed to be hand tighten to provide a seal.

B.3 CLASS I DIV 2 (H_2) (SECTION APPLIES TO ONLY MODELS 5846 CLASS I, DIV 2)

B.3.1 CONDITIONS OF USE

1. The equipment is Certified for process pressure from 80 kPa (0.8 bar) to 110 kPa (1.1 bar). Process temperature: -40°C to +70°C.
2. The mating connector at the input shall provide an ingress protection level equivalent to the equipment, minimum of IP 66 or Type 4X.
3. The equipment shall be wired per an acceptable method for Division 2 per the Canadian Electrical Code C22.1, Section 18 and/or National Electrical Code (NFPA 70), Article 501.
4. The external housing shall be grounded in the end application per the manual. If used in ordinary locations, this equipment shall only be powered by a limited energy electric circuit in accordance with CAN/CSA C22.2 No. 61010-1-12 and ANSI/UL 61010-1, or Class 2 as defined in the Canadian Electrical Code C22.1, Section 16-200 and/or National Electrical Code (NFPA 70), article 725.121.
5. If the equipment is used in a manner not specified in this installation manual, the protection provided by the equipment may be impaired.
6. The safety of any system incorporating the equipment is the responsibility of the assembler of the system.
7. The equipment has not been assessed as a combustible gas detector and shall not be used as a safety device.

B.4 PRODUCT MARKINGS

B.4.1 53XY CLASS I ZONE 0 AEx ia (H_2) Ga

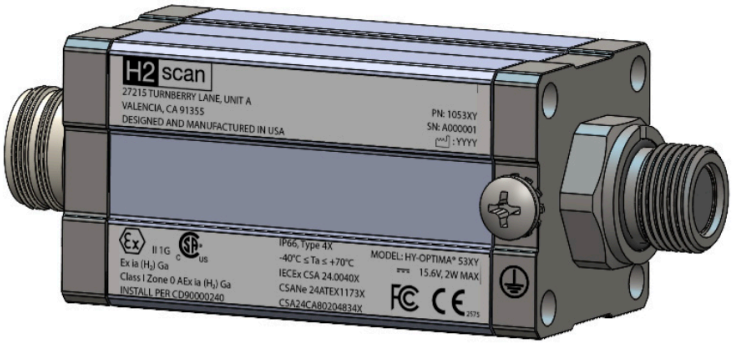


Figure 4: Product Marking

Figure 5: 53XY Product Marking - Upper

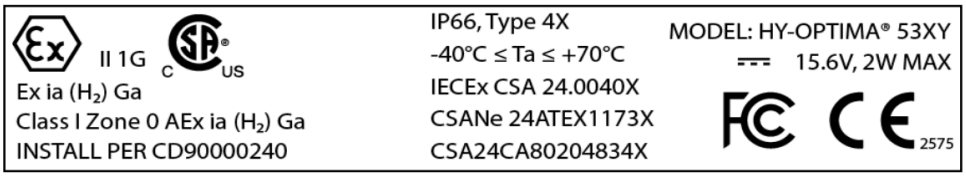


Figure 6: 53XY Zone 0 Product Marking - Lower

B.4.2 5846 CLASS I ZONE 0 AEx ia (H_2) Ga

Figure 7: Model 5846 Product Marking - Upper

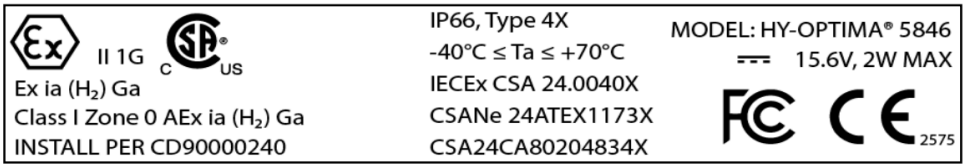


Figure 8: Model 5846 Zone 0 Product Marking - Lower

B.4.3 5846 CLASS I DIV 2 (H_2)

Figure 9: Model 5846 Product Marking - Upper

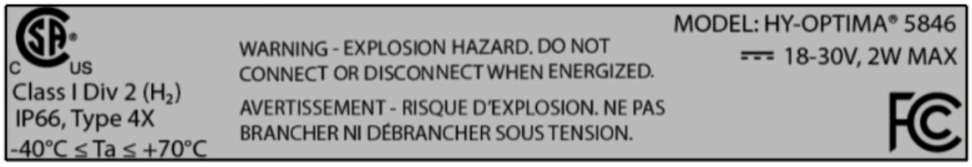


Figure 10: Model 5846 Class I Div 2 Product Marking - Lower

APPENDIX C: OTHER STANDARDS

Beyond the scope of CSA certification, this equipment is in compliance with the following standards:

- IEC 60068-2-2 & EN 50155 Section 13.4.4
- IEC 60068-2-11 & DIN EN ISO 12944
- IEC 60068-2-6 table C.2
- IEC 60068-2-64 paragraph A.2, category no. 2
- IEC 60068-2-27
- FCC Part 15
- IC, RSS-Gen and RSS-210
- AS/NZS 4268

APPENDIX D: TROUBLESHOOTING

1. Verify the monitor is reporting H_2.
   - Check all connections.
   - Power cycle the monitor.
2. Verify the pressure and flow are stable.
3. Check the stability of the monitor output.
   - Expose the monitor to a calibration gas (not exceeding 5% H_2) overnight while recording the H_2 reading.
   - If the monitor does not stabilize, contact H2scan for support.
4. Evaluate whether the monitor has been exposed to substances that may have damaged it.

NOTE: Exposure to liquids, acids, bases, or levels of H_2S or CO that exceed the product limits will damage the monitor.

NOTE: Exposure to H_2 partial pressures that exceed the product limits will damage the monitor.

APPENDIX E: KEY INTRINSIC SAFETY ENTITY PARAMETERS

Below are the formal definitions of Ui, Ii, Pi, Ci, and Li in accordance with IEC/EN/UL 60079-11 (Intrinsically Safe Equipment, “i” and “ia/ib/ic” protection concepts). These parameters are used to evaluate the entity concept, ensuring that an intrinsically safe apparatus and its associated apparatus remain safe when interconnected.

Ui (Vmax) - Maximum Input Voltage

The maximum input voltage that the intrinsically safe device can safely withstand under normal and fault conditions without becoming a source of ignition.

Ii (Imax) - Maximum Input Current

The maximum allowable input current that can be supplied to the intrinsically safe device without compromising intrinsic safety.

Pi (Pmax) - Maximum Input Power

The maximum permissible input power the IS device can receive without generating enough heat or sparks to ignite a hazardous atmosphere.

Ci - Internal Capacitance of the Equipment

The capacitance present within the IS device that contributes to stored energy.

Li - Internal Inductance of the Equipment

The inductance present within the IS device that contributes to energy storage in magnetic fields.

Parameter	Meaning	Purpose
Ui	Max input voltage	Ensures supply cannot over-energize device
Ii	Max input current	Limits current supplied into IS circuit
Pi	Max input power	Prevents overheating or ignition-capable power
Ci	Internal Capacitance	Ensures stored capacitive energy is below ignition limit
Li	Internal Inductance	Ensures stored inductive energy is below ignition limit