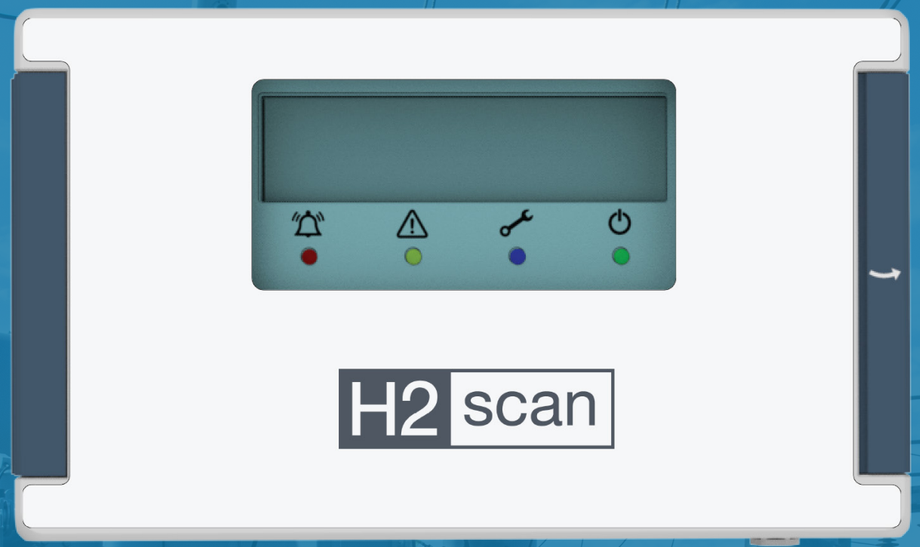
H2scan®

Advanced Hydrogen Sensing



MODBUS REGISTER MAP

GSAO-2

Control Hub

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IMPORTANT NOTICES

Read and understand this operation manual before installing or using the unit.

Use of this equipment in a manner not specified by H2scan may void the warranty.

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 GSAO-2 Control Hub ("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 36 months 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 36-Month Limited Warranty is void for any of the following:

- Unauthorized repair work of the GSAO-2 Control Hub 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 EXPRESSED 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.

GRIDSCAN® Hydrogen Monitor #1					
Register	Parameter	Function	Data Type	Data Range	Access
0	Hydrogen, ppm H_2	High word	32-bit binary number	0–20,000,000	R
1		Low word			
8	Liquid Temp	x100 scale; 100 offset (T=V/100-100)	16-bit binary number	-100–+200	R
13	Rate of Change, ppm H_2 per Day	High word	32-bit binary number	-20,000,000 to 20,000,000 +20,000,000 offset	R
14		Low word			
15	Rate of Change, ppm H_2 per Week	High word	32-bit binary number	-20,000,000 to 20,000,000 +20,000,000 offset	R
16		Low word			
17	Rate of Change, ppm H_2 per Week	High word	32-bit binary number	-20,000,000 to 20,000,000 +20,000,000 offset	R
18		Low word			
22	Moisture, %RH	x10 scale	16-bit binary number	0–100	R
23	Pressure Gauge, ATM	x1000 scale	16-bit binary number	0–2041	R
24	Moisture, ppm	x1 scale	16-bit binary number	0–10000	R
31–40	Model Number	Set in the factory	ASCII String	19 characters + NULL char (20 bytes)	R
41–50	Serial Number	Set in the factory	ASCII String	19 characters + NULL char (20 bytes)	R
81	Manufacturing Date	High byte: Month Low byte: Day	32-bit binary value		R
82		Year			
83	Factory Calibration Date	High byte: Month Low byte: Day	32-bit binary value		R
84		Year			
87	Dissolved Gas Calibration Date	High byte: Month Low byte: Day	32-bit binary value		R
88		Year			
89-98	Firmware Revision		ASCII String	19 characters + NULL char (20 bytes)	R
111	Status		16-bit binary flags	For reference definitions, see GRIDSCAN® Modbus Register Map	R
112	Error Status	High word	32-bit binary flags	For reference definitions, see GRIDSCAN® Modbus Register Map	R
113		Low word			

GRIDSCAN® Hydrogen Monitor #2					
Register	Parameter	Function	Data Type	Data Range	Access
256	Hydrogen, ppm H_2	High word	32-bit binary number	0–20,000,000	R
257		Low word			
264	Liquid Temp	x100 scale; 100 offset (T=V/100-100)	16-bit binary number	-100–+200	R
269	Rate of Change, ppm H_2 per Day	High word	32-bit binary number	-20,000,000 to 20,000,000 +20,000,000 offset	R
270		Low word			
271	Rate of Change, ppm H_2 per Week	High word	32-bit binary number	-20,000,000 to 20,000,000 +20,000,000 offset	R
272		Low word			
273	Rate of Change, ppm H_2 per Month	High word	32-bit binary number	-20,000,000 to 20,000,000 +20,000,000 offset	R
274		Low word			
278	Moisture, %RH	x10 scale	16-bit binary number	0–100	R
279	Pressure Gauge, ATM	x1000 scale	16-bit binary number	0–2041	R
280	Moisture, ppm	x1 scale	16-bit binary number	0–10000	R
287–296	Model Number	Set in the factory	ASCII String	19 characters + NULL char (20 bytes)	R
297–306	Serial Number	Set in the factory	ASCII String	19 characters + NULL char (20 bytes)	R
337	Manufacturing Date	High byte: Month Low byte: Day	32-bit binary number		R
338		Year			
339	Factory Calibration Date	High byte: Month Low byte: Day	32-bit binary number		R
340		Year			
343	Dissolved Gas Calibration Date	High byte: Month Low byte: Day	32-bit binary number		R
344		Year			
345-354	Firmware Revision		ASCII String	19 characters + NULL char (20 bytes)	R
367	Status		16-bit binary flags	For reference definitions, see GRIDSCAN® Modbus Register Map	R
368	Error Status	High word	32-bit binary flags	For reference definitions, see GRIDSCAN® Modbus Register Map	R
369		Low word			

GSAO-2 Control Hub					
Register	Parameter	Function	Data Type	Data Range	Access
1002	Modbus Version		16-bit binary number	Modbus version is set to “2”	R
1003–1004	Uptime Since Restart (seconds)	High word	32-bit binary number		R
		Low word			
1005	Real-Time Clock Date/Time	High byte: Month Low byte: Day	16-bit binary number	For reference definitions, see GRIDSCAN® Modbus Register Map	R
1006		Year	16-bit binary number		R
1007		High byte: Hour Low byte: Minute	16-bit binary number		R
1008		Seconds in Milliseconds (uint16_t, big endian)	16-bit binary number		R
1009	GSAO-2 Status	GSAO-2 status results including reboot reason and current GSAO-2 state	16-bit binary number	0x#001 POST 0x#002 STARTUP = 2; 0x#003 RUN = 3; 0x#004 CONFIGURATION = 4; 0x#005 SERVICE = 5; 0x#006 FIRMWARE_UPDATE = 6; 0x#007 DATA_DOWNLOAD = 7; 0x#010 SYSTEM_FAULT = 8; 0x0### ResetReason_PowerOn, 0x1### ResetReason_Software, 0x2### ResetReason_LowPower, 0x3### ResetReason_Watchdog, 0x4### ResetReason_Button, 0x5### ResetReason_BrownOut, 0xF### ResetReason_Unknown,	R
1012	Relay Status	Relay status bitmap	16-bit binary number	0x0000 = None active 0x0001 = Relay #1 active 0x0002 = Relay #2 active 0x0004 = Relay #3 active 0x0008 = Relay #4 active	R

Register	Parameter	Function	Data Type	Data Range	Access
1052	AIN 1 Config		16-bit binary number	XXXX YYYY 0ZZZ 000E Sensor Type: XXXX = 0000 Disabled = 0001 H2 = 0100 Temperature = 0101 Moisture = 0110 Pressure = 1000 Current = 1001 Custom Units: YYYY = 0000 Disabled = 0001 PPM = 0010 Celsius = 0011 %RS = 0100 kPa = 0101 PSI = 0110 ATM = 0111 mV = 1000 mA = 1001 A = 1010 CST Input Range: ZZZ = 000 N/A = 001 0-5 V = 010 1-5 V = 011 4-20 mA Enabled: E = 0 Disabled = 1 Enabled	R
1053	AIN 1 Analog Value	High word	32-bit scaled integer	x1000 scale 0-5V and 1-5V reported in V 4-20 mA reported in mA	R
1054		Low word			
1055	AIN 1 Sensor Value	High word	32-bit scaled integer	x1000 scale Range: -99,999 to 99,999 (-99.999 to 99.999 for Pressure (PSI))	R
1056		Low word			

Register	Parameter	Function	Data Type	Data Range	Access
1057	AIN 2 Cfg		16-bit binary number	XXXX YYYY 0ZZZ 000E Sensor Type: XXXX = 0000 Disabled = 0001 H2 = 0100 Temperature = 0101 Moisture = 0110 Pressure = 1000 Current = 1001 Custom Units: YYYY = 0000 Disabled = 0001 PPM = 0010 Celsius = 0011 %RS = 0100 kPa = 0101 PSI = 0110 ATM = 0111 mV = 1000 mA = 1001 A = 1010 CST Input Range: ZZZ = 000 N/A = 001 0-5 V = 010 1-5 V = 011 4-20 mA Enabled: E = 0 Disabled = 1 Enabled	R
1058	AIN 2 Analog Value	High word	32-bit scaled integer	x1000 scale 0-5V and 1-5V reported in V 4-20 mA reported in mA	R
1059		Low word			
1060	AIN 2 Sensor Value	High word	32-bit scaled integer	x1000 scale Range: -99,999 to 99,999 (-99.999 to 99.999 for Pressure (PSI))	R
1061		Low word			

Register	Parameter	Function	Data Type	Data Range	Access
1064	AOUT 1 Cfg		16-bit number	XXXX YYYY 0ZZZ 000E Sensor Type: XXXX = 0000 Disabled = 0001 H2 = 0010 Lqd Temp = 0100 Temperature = 0101 Moisture = 0110 Pressure = 1000 Current = 1001 Custom Units: YYYY = 0000 Disabled = 0001 PPM = 0010 Celsius = 0011 %RS = 0101 PSI = 0110 ATM = 0111 mV = 1000 mA = 1001 A = 1010 CST Input Range: ZZZ = 000 N/A = 001 0.1 - 5 V = 010 1-5 V = 011 4-20 mA Enabled: E = 0 Disabled = 1 Enabled	R
1065	AOUT 1 Sensor Value	high word	32-bit scaled integer	x1000 scale Range: -99,999 to 99,999 (-99.999 to 99.999 for Pressure (PSI))	R
1066		low word			
1067	AOUT 1 Analog Value	high word	32-bit scaled integer	x1000 scale 0.1-5V and 1-5V reported in V 4-20 mA reported in mA	R
1068		low word			

Register	Parameter	Function	Data Type	Data Range	Access
1069	AOUT 2 Cfg		16 bit binary number	XXXX YYYY 0ZZZ 000E Sensor Type: XXXX = 0000 Disabled = 0001 H2 = 0010 Lqd Temp = 0100 Temperature = 0101 Moisture = 0110 Pressure = 1000 Current = 1001 Custom Units: YYYY = 0000 Disabled = 0001 PPM = 0010 Celsius = 0011 %RS = 0101 PSI = 0110 ATM = 0111 mV = 1000 mA = 1001 A = 1010 CST Input Range: ZZZ = 000 N/A = 001 0.1 - 5 V = 010 1-5 V = 011 4-20 mA Enabled: E = 0 Disabled = 1 Enabled	R
1070	AOUT 2 Sensor Value	high word	32-bit scaled integer	x1000 scale Range: -99,999 to 99,999 (-99.999 to 99.999 for Pressure (PSI))	R
1071		low word			
1072	AOUT 2 Analog Value	high word	32-bit scaled integer	x1000 scale 0.1-5V and 1-5V reported in V 4-20 mA reported in mA	R
1073		low word			

Register	Parameter	Function	Data Type	Data Range	Access
1075	Sensor Modbus Parity/Stop Bit	Sensor Modbus comms parameters	16-bit number	T000 00XX Terminated: T = 8 Terminated T = 0 Not Terminated Data Bits, Parity, Stop Bits: XX = 1 = 8N1 2 = 8N2 3 = 8E1 4 = 8E2 5 = 8O1 6 = 8O2	R
1076	Sensor Modbus Baud rate	Sensor comms speed	16-bit number	0x0001 = 9600 0x0003 = 19200	R
1077	GRIDSCAN® 1 Device ID	MB Address of GRIDSCAN® 1	16-bit number	1–247	R
1078	GRIDSCAN® 1 Status	State of this GRIDSCAN® 1	16-bit number	1 = Not Ready (H_2 not ready) 2 = Ready (H_2 ready) 3 = Lost Communication 6 = Not Found (configured, not found) 8 = Fault State 9 = Not Configured	R
1081	GRIDSCAN® 2 Device ID	MB Address of GRIDSCAN® 2	16-bit number	1–247	R
1082	GRIDSCAN® 2 Status	State of this GRIDSCAN® 2	16-bit number	1 = Not Ready (H_2 not ready) 2 = Ready (H_2 ready) 3 = Lost Communication 6 = Not Found (configured, not found) 8 = Fault State 9 = Not Configured	R
1086	SCADA Modbus ID	MB Address of GSAO-2	16-bit number	1–247	R
1087	SCADA Modbus Parity/Stop Bit	SCADA Modbus comms parameters	16-bit number	T000 00XX Terminated: T = 8 Terminated T = 0 Not Terminated Data Bits, Parity, Stop Bits: XX = 1 = 8N1 2 = 8N2 3 = 8E1 4 = 8E2 5 = 8O1 6 = 8O2	R
1088	SCADA Modbus Baud rate	SCADA/Host port comms speed	16-bit number	0x0001 = 9600 0x0003 = 19200	R
1090–1099	Model Number		ASCII String	19 characters + NULL char (20 bytes)	R

Register	Parameter	Function	Data Type	Data Range	Access
1100–1109	Serial Number		ASCII String	19 characters + NULL char (20 bytes)	R
1110–1119	Firmware Revision	GSAO-2 Firmware Identification	ASCII String	19 characters + NULL char (20 bytes)	R
1122	GRIDSCAN® Input 1, Cfg	Current Status: GRIDSCAN® Model, Calibration Type (Liquid) 0000 if cfg is not valid	16-bit binary number	00XY: GRIDSCAN® Model: X = 0 Unknown = 1 GS5000 = 2 GS6000 Calibration Type: Y = 0 Unknown = 2 Liquid	R
1156	GRIDSCAN® Input 2, Cfg	Current Status: GRIDSCAN® Model, Calibration Type (Liquid) 0000 if cfg is not valid	16-bit binary number	00XY: Input Type: X = 0 Unknown = 1 GS5000 = 2 GS6000 Calibration Type: Y = 0 Unknown = 2 Liquid	R

Register	Parameter	Function	Data Type	Data Range	Access
1210	AOUT 3 Cfg		16 bit binary number	XXXX YYYY 0ZZZ 000E Sensor Type: XXXX = 0000 Disabled = 0001 H2 = 0010 Lqd Temp = 0100 Temperature = 0101 Moisture = 0110 Pressure = 1000 Current = 1001 Custom Units: YYYY = 0000 Disabled = 0001 PPM = 0010 Celsius = 0011 %RS = 0100 kPa = 0101 PSI = 0110 ATM = 0111 mV = 1000 mA = 1001 A = 1010 CST Input Range: ZZZ = 000 N/A = 001 0.1 - 5 V = 010 1-5 V = 011 4-20 mA Enabled: E = 0 Disabled = 1 Enabled	R
1211	AOUT 3 Sensor Value	high word	32-bit scaled integer	x1000 scale Range: -99,999 to 99,999 (-99.999 to 99.999 for Pressure (PSI))	R
1212		low word			
1213	AOUT 3 Analog Value	high word	32-bit scaled integer	x1000 scale 0.1-5V and 1-5V reported in V 4-20 mA reported in mA	R
1214		low word			

Register	Parameter	Function	Data Type	Data Range	Access
1215	AOUT 4 Cfg		16 bit binary number	XXXX YYYY 0ZZZ 000E Sensor Type: XXXX = 0000 Disabled = 0001 H2 = 0010 Lqd Temp = 0100 Temperature = 0101 Moisture = 0110 Pressure = 1000 Current = 1001 Custom Units: YYYY = 0000 Disabled = 0001 PPM = 0010 Celsius = 0011 %RS = 0100 kPa = 0101 PSI = 0110 ATM = 0111 mV = 1000 mA = 1001 A = 1010 CST Input Range: ZZZ = 000 N/A = 001 0.1 - 5 V = 010 1-5 V = 011 4-20 mA Enabled: E = 0 Disabled = 1 Enabled	R
1216	AOUT 4 Sensor Value	high word	32-bit scaled integer	x1000 scale Range: -99,999 to 99,999 (-99.999 to 99.999 for Pressure (PSI))	R
1217		low word			
1218	AOUT 4 Analog Value	high word	32-bit scaled integer	x1000 scale 0.1-5V and 1-5V reported in V 4-20 mA reported in mA	R
1219		low word			