



FEATURES

- pH, REDOX / ORP MEASUREMENT (-1.000 V TO +1.000 V), 0.03% FS ERROR
- MULTIPLE SOURCES FOR pH TEMPERATURE COMPENSATION, PROGRAMMABLE
- DISSOLVED OXYGEN, mV (-10 TO +100 mV) MEASUREMENT, 0.03% FS ERROR
- THE mV INPUT ACCEPTS 11 TYPES OF THERMOCOUPLES, PROGRAMMABLE
- BUILT-IN COLD JUNCTION COMPENSATION, 0.2 °C ERROR
- 4-20 mA MEASUREMENT, 0.03% FS ERROR
- Pt1000 RTD ALPHA = 0.00385 MEASUREMENT FROM -50 °C TO +300 °C, WITH 0.2 °C ERROR
- RS485 MODBUS RTU, FULLY COMPLIANT, FULLY PROGRAMMABLE
- 1/8 LOAD, ALLOWING UP TO 247 DEVICES ON THE NETWORK
- WEIGHT: 186 g (6.6 oz)

APPLICATIONS

- WATER TREATMENT
- COOLING TOWERS
- WATER TOWERS
- LABORATORY MEASUREMENTS
- SCADA
- PROCESS CONTROL
- INDUSTRIAL AUTOMATION



1. DESCRIPTION

GpH140 is a low power transmitter for pH, REDOX / ORP, dissolved oxygen, mV, 11 types of thermocouples, Pt1000 RTD and a general purpose 4-20 mA loop power signal with a RS485 MODBUS RTU communication port and high accuracy. It represents 1/8 load allowing up to 247 devices connected to the same network. pH, pH signal voltage, dissolved oxygen concentration, dissolved oxygen signal voltage, the 4-20 mA current, its scaled value, all temperatures and many other variables can be read many times a second or written at any time. The temperature compensation for the pH signal can be programmed to many sources or disabled.

There is a built in cold junction compensation for thermocouples measurement with high accuracy.

The pH input can also be used for measuring a general purpose signal in the range of -1000.0 to +1000.0 mV. It has extremely high input impedance.

Using high quality materials and our proprietary circuits and algorithms ensures high accuracy, reliability, flexibility and long time without service.



2. ABSOLUTE MAXIMUM RATINGS *

Ambient temperature	-30 °C to +80 °C
Power supply voltage	40 V DC
pH input voltage	200 V DC, negative or positive
mV input voltage	60 V DC, negative or positive
Pt1000 RTD input	60 V DC, negative or positive
4-20 mA input	45 mA DC

* **NOTE: Stresses above those ratings may cause permanent damage to the device.**

3. CHARACTERISTICS

Parameter	Conditions	Min	Typical	Max	Units
Power supply voltage	-30 °C to +80 °C, NOTE 1	8.5		36	V DC
pH / REDOX / ORP input					
Input impedance	0 to 100 Hz	1.00E+12			ohm
Range		-1.0000		1.0000	V DC
Resolution, voltage	From -1.0000 to + 1.0000 V DC		100		uV
Resolution, pH scaled	0.00 to 14.00		0.01		
Error	25 °C		0.03		% FS
mV, thermocouples Input					
Input resistance	DC voltage		1		Mohm
Resolution	-10.00 to +100.00 mV		10		uV
Error	25 °C		0.03		% FS
Cold Junction Compensation					
Resolution	-30 °C to +80 °C		0.1		°C
Error	-30 °C to +80 °C		0.2	0.4	°C
4-20 mA Input					
Resolution			1		uA
Error	25 °C		0.03		% FS
Pt1000 RTD input					
Resolution	Alpha = 0.00385, from -50 °C to +300 °C		0.1		°C
Error	Alpha = 0.00385, from -50 °C to +300 °C		0.2	0.4	°C
Communication port	Two-wire RS485, MODBUS RTU, 1/8 load				

Note 1: 4-20 mA input loop power uses the power supply voltage. Make sure the voltage you use is high enough for the 4-20 mA loop to work properly

4. INPUTS

4.1. 4-20 mA input is always present. It is two wire loop power. It is a general purpose input that can be used for accurate measurement of temperature, level, flow rate and any other standard 4-20 mA loop power signal. The current in uA and a scaled programmable value are provided for reading at any time. If this input is a temperature it can be used to compensate the pH measurement, if a pH input is present.



4.2. Pt1000 RTD input is always present. It can be used to connect to a Pt1000 RTD built-in a pH probe or for a general purpose accurate temperature measurement. Its temperature can be read at any time and also used to compensate a pH reading. The RTD must be Pt1000 with alpha 0.00385.

The connection is two wires, so the wires must be as short and as thick as possible.

4.3. The cold junction temperature is always present. It can be read at any time, used to accurately compensate one or two thermocouples connected to a mV input, or used to compensate a pH measurement.

4.4. mV input. GpH140 transmitter can be ordered with one, two or no mV input. This input can be used to accurately measure a general purpose mV signal, dissolved oxygen and many other sensors. It can be programmed at any time to accurately measure 11 types of thermocouples and this temperature then can be used to compensate a pH measurement.

4.5. pH input. GpH140 can be ordered with one, two or no pH inputs. This input is a special design for accurate pH and REDOX / ORP measurement but it can also be used for accurate general purpose voltage measurement. The input voltage and the pH number are both provided for reading. This input has multiple sources for temperature compensation, programmable. If REDOX / ORP are measured there will be no temperature compensation.

5. PROGRAMMING AND COMMUNICATION

GpH140 has a two wire RS485 MODBUS RTU communication port. All programming is available through this port. It can be connected to a lap top or a PC through a USB to RS485 converter or to a PLC through RS232 to RS485 converter.

The settings are:

- The baud rate is 9600 or 19 200, programmable. Default is 19 200.
- The character is 8 bit
- The parity is none, odd or even, programmable. Default is even.
- Stop bits are 1 or 2, not programmable. MODBUS standard requires 1 stop bit with odd or even parity and 2 stop bits with no parity.
- No handshaking.
- **There is a 120 ohm 0.5W termination resistor built-in. It can be connected and used if the jumper behind the RS485 terminals on the board is shorted.**

MODBUS address is programmable from 1 to 247. Default is 1.

The protocol for communication is MODBUS RTU. Functions 0x03 (read holding registers), 0x04 (read input registers) and 0x06 (write single register) are implemented. GpH140 handles exceptions 1, 2 and 3.

Here are the registers used:

<i>Register address</i>	<i>Register Type</i>	<i>Read/Write</i>	<i>Description</i>	<i>Format</i>
19	Input	R	4 to 20 mA current, in uA 0 to 20 000	7456 = 7.456 mA
20	Input	R	Input 2 voltage 10 uV resolution if mV 100 uV resolution if pH	1538 = 15.38 mV -2345 = -234.5 mV
21	Input	R	Input 1 voltage 10 uV resolution if mV 100 uV resolution if pH	-774 = -7.74 mV 3983 = 398.3 mV
22	Input	R	4 to 20 mA input, scaled	
23	Input	R	Input 2 scaled	



24	Input	R	Input 1 scaled 0.01 resolution if pH	755 = 7.55
25	Input	R	Cold Junction Temperature 0.1 °C resolution	346 = 34.6 °C
26	Input	R	Pt1000 RTD Temperature 0.1 °C resolution	-115 = -11.5 °C
27	Input	R	Input 1 Temperature, if mV and if programmed for a thermocouple 0.1 °C resolution	5216 = 521.6 °C
28	Input	R	Input 2 Temperature, if mV and if programmed for a thermocouple 0.1 °C resolution	-445 = -44.5 °C
1000	Holding	R/W	Low value for 4 to 20 mA input	Default is 0
1001	Holding	R/W	High value for 4 to 20 mA input	Default is 10000
1002	Holding	R/W	Current for low value, in uA 3800 to 20500 = 3.8 to 20.5 mA	4567 = 4.567 mA Default is 4000 = 4.000 mA
1003	Holding	R/W	Current for high value, in uA 3800 to 20500 = 3.8 to 20.5 mA	19774 = 19.774 mA Default is 20000 = 20.000 mA
1004	Holding	R/W	Low value for input 2	
1005	Holding	R/W	High value for input 2	
1006	Holding	R/W	Voltage for input 2 low value in 10 uV steps, if mV in 100 uV steps, if pH -1000 to +10000 = -10.00 to +100.00 mV, for mV -10000 to + 10000 = -1000.0 to +1000.0 mV, for pH	38 = 0.38 mV 4053 = 405.3 mV Default is 000 = 0.00 mV Default is 4141 = 414.1 mV
1007	Holding	R/W	Voltage for input 2 high value in 10 uV steps, if mV in 100 uV steps, if pH -1000 to +10000 = -10.00 to +100.00 mV, for mV -10000 to + 10000 = -1000.0 to +1000.0 mV, for pH	4143 = 41.43 mV -2345 = -234.5 mV Default is 4000 = 40.00 mV Default is -4141 = -414.1 mV
1008	Holding	R/W	Low value for input 1	
1009	Holding	R/W	High value for input 1	
1010	Holding	R/W	Voltage for input 1 high value in 10 uV steps, if mV in 100 uV steps, if pH -1000 to +10000 = -10.00 to +100.00 mV, for mV -10000 to + 10000 = -1000.0 to +1000.0 mV, for pH	4143 = 41.43 mV -2345 = -234.5 mV Default is 4000 = 40.00 mV Default is -4141 = -414.1 mV
1011	Holding	R/W	Voltage for input 2 high value in 10 uV steps, if mV in 100 uV steps, if pH -1000 to +10000 = -10.00 to +100.00 mV, for mV -10000 to + 10000 = -1000.0 to +1000.0 mV, for pH	4143 = 41.43 mV -2345 = -234.5 mV Default is 4000 = 40.00 mV Default is -4141 = -414.1 mV
1053	Holding	W	Baud Rate: 0 = 19 200, 1 = 9 600, NOTE 1	default is 0 = 19 200
1054	Holding	W	Parity: 0 = even, 1 = odd, 2 = none, NOTE 1	default is 0 = even
1055	Holding	R/W	Input 1 type, if mV, NOTE 2 0 - 11	Default is 0 = mV
1056	Holding	R/W	Input 2 type, if mV, NOTE 2 0 - 11	Default is 0 = mV
1057	Holding	R/W	Input 1 temperature compensation source, if pH 0 – 5, NOTE 3	Default is 0 = manual
1058	Holding	R/W	Input 2 temperature compensation source, if pH 0 – 5, NOTE 3	Default is 0 = manual



1059	Holding	R/W	Manual temperature in 0.1 °C steps	Default is 250 = 25.0 °C
1200	Holding	W	MODBUS address , 1 to 247	default is 1

NOTE 1: When changing the baud rate, the MODBUS address or the parity, GpH140 will first do the change and then reply to the master with the new setting already in effect.

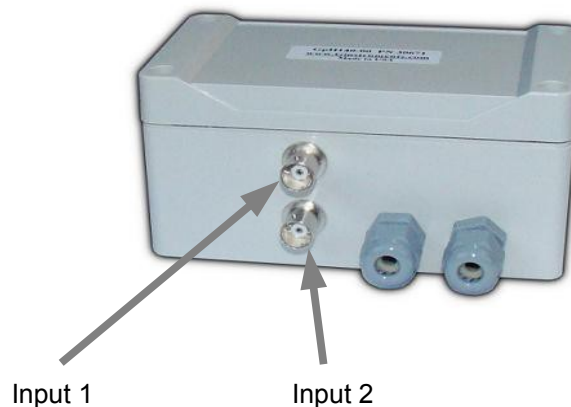
NOTE 2: This setting is valid only if the input is for mV, not for pH
 0 = -10 do +100 mV
 1 = thermocouple B, NIST Monograph 175, IEC 584
 2 = thermocouple C, W5Re/W26Re, type W5, ASTM E 988-96
 3 = thermocouple E, NIST Monograph 175, IEC 584
 4 = thermocouple J, NIST Monograph 175, IEC 584
 5 = thermocouple K, NIST Monograph 175, IEC 584
 6 = thermocouple L, DIN 43710
 7 = thermocouple N, NIST Monograph 175, IEC 584
 8 = thermocouple R, NIST Monograph 175, IEC 584
 9 = thermocouple S, NIST Monograph 175, IEC 584
 10 = thermocouple T, NIST Monograph 175, IEC 584
 11 = thermocouple U, DIN 43710

NOTE 3: This setting is valid only if the input is for pH, not for mV
 0 = manual temperature is used for temperature compensation of the pH input signal.
To disable the temperature compensation keep the manual temperature at 25.0 °C
 1 = cold junction temperature
 2 = Pt1000 RTD
 3 = thermocouple at input 1, if present and programmed
 4 = thermocouple at input 2, if present and programmed
 5 = scaled value of 4-20 mA input. Must be in °C with 0.1 °C resolution. Example: 346 = 34.6 °C

6. APPLICATION

6.1. ELECTRICAL

- There are options for a BNC or terminals inside for Input 1 and Input 2.
- RTD input is always on two terminals inside, two wires connection.
Keep the wires as short and as thick as possible.
- 4-20 mA input is always on two terminals inside.
- Two terminals for RS485 communication port inside, A(D+) and B(D-).
There is a jumper behind the terminals for connecting a 120 ohm 0.5W termination resistor.
- Two terminals for the power inside, DC voltage from 8.5 to 40 VDC

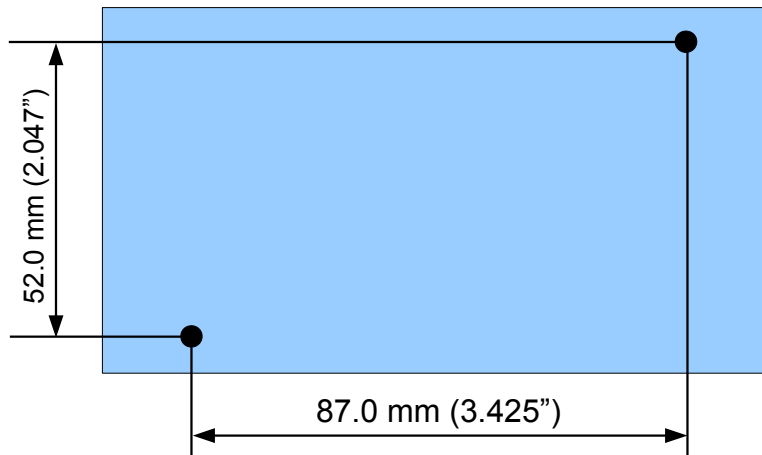


The inputs, RS485 port and the power are not isolated from each other. If you need to use RS485 ground, use the power ground.

NOTE: If the application allows we strongly recommend earth grounding the negative of the power supply.

6.2. MECHANICAL

Mounting GpH140 on a wall requires an area of 120 x 65 mm (4.73 x 2.56 inch) and two screws:



NOTE: The cable grips and the cables need additional space.

7. ORDERING

For ordering please use the following G Instruments part numbers:

	Description	G Instruments PN
GpH140-11 Input 1 = pH Input 2 = pH	Input 1 is BNC, Input 2 is BNC	30672
	Input 1 is BNC, Input 2 is terminals	30674
	Input 1 is terminals, Input 2 is BNC	30675
	Input 1 is terminals, Input 2 is terminals	30676
GpH140-12 Input 1 = pH Input 2 = mV	Input 1 is BNC, Input 2 is BNC	30671
	Input 1 is BNC, Input 2 is terminals	30677
	Input 1 is terminals, Input 2 is BNC	30678
	Input 1 is terminals, Input 2 is terminals	30679
GpH140-22 Input 1 = mV Input 2 = mV	Input 1 is BNC, Input 2 is BNC	30673
	Input 1 is BNC, Input 2 is terminals	30680
	Input 1 is terminals, Input 2 is BNC	30681
	Input 1 is terminals, Input 2 is terminals	30682



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