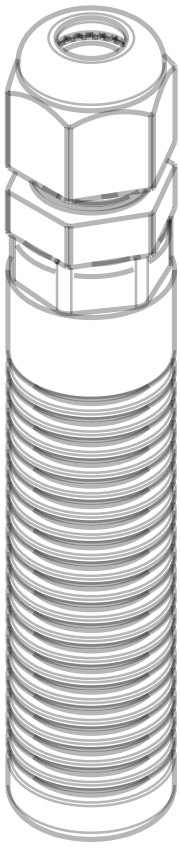
HydroTemp

Submersible Water Temperature Sensor

User Manual

v1.2.3



Starting Point

Thank you for purchasing the Geolux HydroTemp submersible water temperature sensor! We have put together the experience of our engineers, the domain knowledge of our customers, the enthusiasm of our team, and the manufacturing excellence to deliver this product to you.

You may freely rely on our field-proven technology. The use of top-quality components and advanced signal processing algorithms ensures that the Geolux HydroTemp submersible water temperature sensor can be used in various applications and environments.

We have created this User Manual to assist you in setting up and using the Geolux instrument.

Should there be any questions left unanswered, please feel free to contact us directly:

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1 Introduction

The Geolux HydroTemp submersible water temperature sensor enables accurate water temperature measurements. The water temperature sensor responds to Modbus requests via the RS-485 data line and can be used to measure water temperatures ranging from -20 °C to 70 °C with an accuracy of 0.1 °C and a resolution of 0.01 °C. The sensor can be used individually to measure the temperature at a single depth, or multiple sensors can be connected to measure temperatures at various depths. It is possible to connect up to 16 sensors in the multi-depth configuration with costumizable distance between the sensors.

2 Electrical Characteristics

The electrical characteristics of the Geolux HydroTemp submersible water temperature sensor are given in Table 1.

Table 1. Electrical Characteristics

Parameter	MIN	TYP	MAX	Unit
Communication interface RS-485 interface speed		 9600		 bps
Temperature sensor Measurement range Accuracy	 -20	 0.1	 +70	 °C °C
Power supply voltage	9.0	12.0	27.0	V
Power Operational mode		 15		 mW
Operational temperature range	-40		+85	°C
Ingress Protection rating	IP68			
Mechanical		ϕ16.5 x 90		mm

3 Cable Pin-Out

The HydroTemp submersible water temperature sensor is supplied with an open end cable consisting of 5 wires coded with different colors. Table 2 gives a detailed description of each wire.

Table 2. Cable Pin-Out

Pin No.	Wire Color		Pin Name	Pin Description
1	White		+Vin	The power supply for the HydroTemp submersible water temperature sensor is provided on this pin. The power supply voltage must be in range of 9 VDC to 27 VDC, and the power supply must be able to provide at least 0.65 W.
2	Brown		GND	This pin should be connected to the ground (negative) pole of the power supply.
3	Blue		SDI-12	SDI-12 communication interface
4	Orange		RS-485 - D+	RS-485 data transmitter/receiver high signal.
5	Orange/White		RS-485 - D-	RS-485 data transmitter/receiver low signal

3.1. Serial RS-485 Interface

Serial RS-485 interface is implemented as standard industrial half-duplex communication interface. The communication interface is internally short-circuit and overvoltage protected. Depending on the receiving device, the interface can be used with only two wires (D+ orange wire & D- orange/white wire) while in some cases the ground connection (signal GND brown wire) is also required. For more details please consult receiver specification.

The most common communication protocol used with RS-485 interface is Modbus-RTU, but other protocols are also available on request. Detailed description of communication protocols is given in chapter 6 of this user manual.

4 Installing the HydroTemp Sensor

In order to measure the water temperature the Geolux HydroTemp water temperature sensor must be immersed in the water. The sensor can be installed at depths up to 150 metres. It is possible to connect up to 16 sensors in the multi-depth configuration with costumizable distance between the sensors. The distance between the sensors in the multi-depth configuration must be in the range of 0.5 m and 5 m.

5 Data Interface

The Geolux HydroTemp submersible water temperature sensor responds to Modbus requests over the RS-485 data line. The temperature measurements are not reported automatically, but are instead reported only after being requested by the master device (data logger unit).

5.1. Serial RS-485 Interface

Serial RS-485 interface is used for connecting multiple instruments to a single data logger. The HydroTemp water temperature sensor supports Modbus protocol over RS-485 bus. A detailed description of the protocol is given in chapter 6 of this user manual.

Default communication parameters are:

Bitrate:	9600 bps
Data bits:	8
Stop bits:	1
Parity:	None
Device ID:	20

6 Data Protocols

Geolux HydroTemp water temperature sensor supports the following data protocols:

- Request-response protocol (Modbus) on RS-485 interface that allows multiple units to be used on a single RS-485 bus

6.1. Modbus Protocol (RS-485)

The unit responds to Modbus requests over RS-485 data line. 9600 bps, ID 20, 1 stop bit, no parity, 8 data bits configuration is used.

Modbus registers that are accessed by Modbus protocol are 16-bit (2-byte) registers. Any number of registers can be read or written to over Modbus.

Modbus is a request-response protocol where a master (such as data logger) sends out requests, and slave devices (such as the HydroTemp water temperature sensor) respond. The request and response format, with examples is given in Tables 3-6.

In each request, the master can either ask the slave to retrieve the value of one or more registers, or the master can set the value of one or more registers. Each register holds one 16-bit value.

Table 3. Master Request Format

Name	Address	Fun	Data Start Address		Register Count		CRC16	
Length	1 byte	1 byte	2 bytes (H,L)		2 bytes (H,L)		2 bytes (L,H)	
Example	0x01	0x03	0x00	0x00	0x00	0x01	0x84	0x0A

Table 4. Request Example

Name	Content	Detail
Address	0x01	Slave address (Sensor id)
Function	0x03	Read holding register
Data start address	0x00	The address of the first register to read minus one (HIGH)
	0x00	The address of the first register to read minus one (LOW)
Number of regs	0x00	High
	0x01	Low (read only 1 register)
CRC16	0x84	CRC Low
	0x0A	CRC High

Table 5. Slave (sensor) Response Format

Name	Address	Fun	Byte Count	Data		CRC16	
Length	1 byte	1 byte	1 byte	2 bytes(H,L)		2 bytes(L,H)	
Example	0x01	0x03	0x02	0x01	0x79	0x84	0X0A

Table 6. Response Example

Name	Content	Detail
Address	0x01	Slave address (Sensor id)
Function	0x03	Read holding register
Data length	0x02	Data length is 2 bytes
Data	0x00	Data high byte
	0x01	Data low byte, means ID is 1
CRC16	0x79	CRC Low
	0x84	CRC High

Since the Geolux HydroTemp submersible water temperature sensor requires no configuration, all the registers used for reporting temperature are read-only.

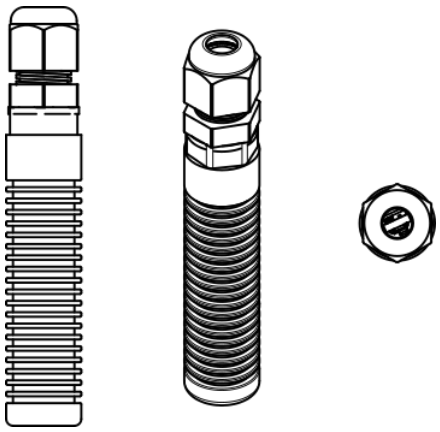
Table 7 defines the data returned by the instrument when the master requests that the register is read. In Table 7, field *Fun* corresponds to Modbus function codes, i.e. 0x03 – *Read holding register.*

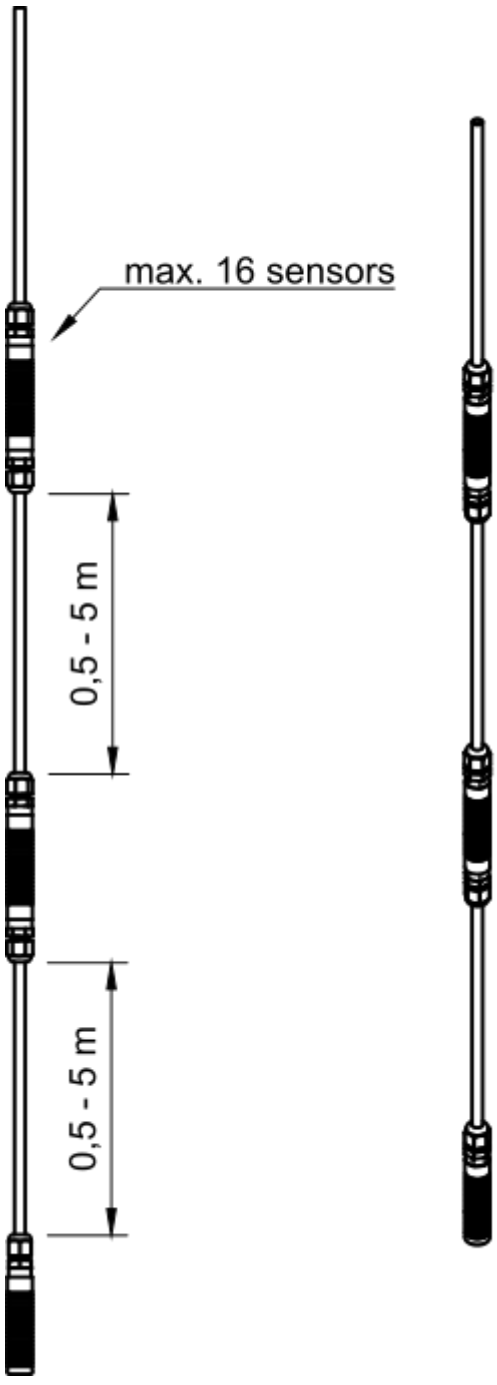
All measurements are reported as value * 10.

Table 7. Retrieving Data from the Sensor

Fun	Register Address	Data Length	Data Range	Details
0x03	0x0001	2 bytes	-128 – 127	Read water temperature (value * 10)

7 Appendix A - Mechanical Assembly





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