D-Opto Shutter

Operation Manual

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1. Overview

The D-Opto Shutter is a mechanical shutter system designed to be fitted to the Zebra-Tech D-Opto optical dissolved oxygen probe.

The D-Opto Shutter attaches to the side of the D-Opto probe. Between measurements, the sensor window is covered by the Shutter disc. By covering the sensor window, the incidence of bio-fouling and other deposits from settling and developing is reduced. The shutter incorporates a copper stud, which further discourages the growth of bio-fouling due to the toxic nature of copper.

When a measurement is required, the shutter disc is rotated away from the sensor window, allowing a representative sample of water to come into contact with the D-Opto sensor window. After the measurement has been made, the shutter closes over the sensor window.

The D-Opto Shutter can be controlled simply by the same data logger that records the output signal from the D-Opto, provided it has a spare programmable control port. If the data logger control port is set low, the Shutter closes; when the control port is set high, the shutter opens.

The Shutter features a supervisory microprocessor, which constantly monitors the position of the shutter arm, protecting both the D-Opto and the Shutter in the event that debris becomes trapped between the D-Opto and the Shutter.

The Shutter has been designed to operate with minimal power consumption, making it ideal for long term remote deployments with a finite battery supply.

Features

Your D-Opto Shutter offers the following features:

- Easy to install and simple to operate
- Low power consumption for long term deployments
- Microprocessor that detects and responds to trapped debris, protecting both the D-Opto and the Shutter from damage

2. D-Opto Shutter Specifications

Specifications

Power Supply	8 to 13 volts DC
Power Consumption	Quiescent 0.04mA. Opening and closing: 80mA, 120MA peak
Shutter Pad	EDPM disc, copper central stud
Wiper Shaft	5 bearing stack, with quad-ring seal
Depth Rating	30m as standard
Cable	EPDM jacketed cable between the wiper and interface panel

TABLE 1: D-OPTO SHUTTER SPECIFICATIONS

Options

The following additional options are also available with your D-Opto Shutter:

Extended Depth Rating	100 meters
Cable	Additional cable between the Shutter and interface panel
Reverse Control Port Logic	High to close, low to open

TABLE 2: D-OPTO SHUTTER OPTIONAL EXTRAS

3. Installation

!	NOTE! The D-Opto Shutter should always be disconnected from the power supply when adjustments are being made. If the shutter opens of closes unexpectedly, it can cause injury.

The D-Opto is mounted in a clamp that is attached to the Shutter (Photo 1). No modifications to the D-Opto are required.

PHOTO 1: D-OPTO SHUTTER CLOSED

The shutter arm is factory set to the correct position. The Shutter automatically controls the closing pressure of the shutter disc on the optical window.

The D-Opto Shutter cable is supplied pre-terminated with a connector that simply plugs into the interface panel (Photo 2).

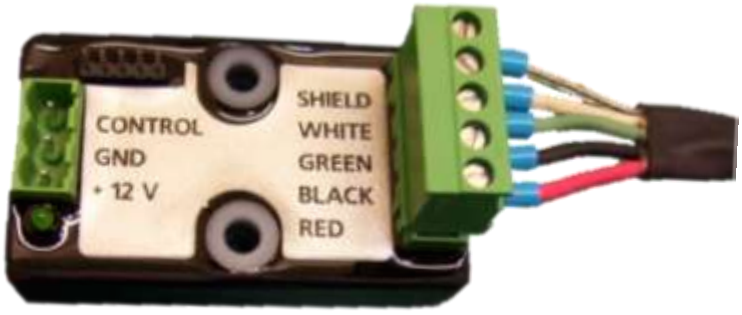

PHOTO 2: D-OPTO SHUTTER INTERFACE PANEL

The interface panel is connected to a 12 volt power supply (+12 volt terminal), and power ground (Gnd terminal). The control port on the data logger is connected to the 'Control' terminal.

It is intended that the data logger control port will be low (0 volts) to close the shutter, and high (5 volts) to open the shutter. However, the Shutter will operate with control voltages ranging from 2.5 volts to supply voltage, relative to ground.

The interface panel is very rugged; however it should be mounted inside a weather-proof housing.

4. Operating the D-Opto Shutter

When a 12 volt supply is connected to the D-Opto Shutter, the shutter will firstly close. The shutter will remain closed until the control port is driven high by the attached data logger. The shutter will then open (Photo 3). The shutter will remain open until the control port goes low.

The control input in the interface panel incorporates a 1k series resistor and a voltage clamp. The control voltage can be as high as the main supply voltage. A switch can be simply wired between the voltage supply and control line for bench testing purposes. The control line has an internal 10k pull down resistor.

PHOTO 3: D-OPTO SHUTTER OPEN

The interface panel features an LED. This will flash every 10 seconds. The number of flashes indicates the operating status of the D-Opto Shutter.

LED Blink Sequence	Description
1	Shutter closed
2	Shutter open
2	Shutter jammed
4	Power-up rest

TABLE 3: SHUTTER INTERFACE PANEL LED BLINK SEQUENCE

The data logger should be programmed so that a time delay occurs between the shutter opening and a measurement from the D-Opto being made. The duration of this delay will depend on local conditions, such as water flow. Around 30 second is a good starting point.

During deployment

The D-Opto Shutter incorporates various features for coping with inadvertent field conditions.

1) As the shutter closes, the drive motor is run in a low torque mode to prevent damage, if an object is trapped between the shutter disc and the D-Opto.
2) The on-board microprocessor detects if the shutter is obstructed, or becomes obstructed whilst opening or closing. If it is, the motor is shut down. It will subsequently make 3 retries, each with a 10 second interval. If the shutter is still jammed, then no further attempts are made for a 10 minute period, after which 3 retries are attempted again. This cycle is repeated until the obstruction is cleared.
3) The position of the shutter is monitored regularly; if it has been shifted, then the motor will move the shutter back to the intended position.
4) The shutter arm can be manually rotated without causing any damage.

5. Further Assistance

For further assistance with this or any other **Zebra-Tech** product, please contact:

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For up to date information about the D-Opto and other Zebra-Tech products, please visit the **Zebra-Tech Ltd** website at: http://www.zebra-tech.co.nz

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