DFS31 - Instructions

High Speed

How To Specify

1. Select Sensor: DFS31 High Speed Digital Fiber Optic Sensor
2. Select Light Source: R = Red I = Infrared
3. Select Connection: Blank = 6ft cable (1.8m) C = 4-pin M8 connector

Example:

DFS31 R C
Light Source Connection

Features:

- Ultra High-speed: 2µs, 8µs, 50µs, or 200µs configurable
- 2µs repeatability
- Good immunity to high frequency florescent lighting
- Intuitive percentage diagnostic OLED display
- Attractive 10mm wide housing
- Low power & wide operating voltage
- Advanced remote programming
- Five AUTOSET modes
- Programmable output/input configurations
- CE Approved

WIDE VARIETY OF FIBERS
Visit www.ttco.com for full listing.

AUTOSET (●)
Push to perform AUTOSET.

THRESHOLD/VALUE ADJUST ROCKER (▼▲)
1. Manually adjusts the threshold. +/-
2. Alters programming parameters. +/-
   Hold to scroll for numeric values.

MODE (■)
1. Tap to display sensor status screen.
2. Tap again to access parameters.

CONNECTION
4-Pin M8 connector or built-in cable.

FIBER RELEASE CLAMP
Locks fibers in place.

OUTPUT LEDS
1. Illuminates solid when output is ON.
2. Flashes when output is overloaded.

ADVANCED DIAGNOSTIC OLED DISPLAY
See next page for complete listing.

INPUT FUNCTION LIGHT RING
Illuminates when input is activated.
Note: Only available on connector models.

Quick Start

The Digital Fiber Optic Sensor is designed to provide reliable detection using fiber optic light guides. Sensor is adjusted by a single push of a button; there is no guess work on the part of the operator. The sensor default settings* (Light State) will work for most applications.

Follow the three step procedure below:

1. Establish one of the following conditions:
   - Beam Make/Proximity - Reflect light off object.
   - Beam Break - Remove object from light beam path.

2. Tap AUTOSET (●) button:
   Pressing the AUTOSET button sets the sensors threshold to the desired level.

3. Verify setup on advanced diagnostic OLED display. If needed, the threshold can be altered by tapping up or down on the threshold adjust rocker.

Signal Level

Advanced Diagnostic OLED Display

* Note: Consult all default settings on page 6.
Programming

The DFS performance, AUTOSET function, output configuration, and other features can be tailored to your unique application. Follow the programming procedure contained in this section.

Tap **MODE (●)** to show status screen.

Status Screen shows a quick overview of sensor’s settings.

**AUTOSET Modes**

The sensor’s automatic threshold adjustment is controlled by the AUTOSET mode. Each AUTOSET mode sets the threshold differently. Select the mode that works best for your specific application. See details at the left.

**AUTOSET Percent**

For Light State (LS), and Dark State (DS), the offset percentage is adjustable. AUTOSET Percent determines threshold placement during AUTOSET. Placement is a percentage of received light beam intensity.

Note: Programming will time out after 60 seconds if no action is taken.
Tap and hold to exit status screen.
Using AUTOSET

The DFS threshold is set automatically by pressing the AUTOSET button. There are five different ways the sensor determines the threshold. The user first must determine which type of setup mode is appropriate for the application. The simplest and most common mode we recommend is Light State (LS) setup. It is used in both beam make and beam break sensing. When using this mode, the sensor will provide the best sensitivity to fine changes in light level or contrast. This is useful for small part detection and precise leading-edge triggering. Please consult our website at https://www.ttco.com/sensors/fundamentals or contact one of our worldwide distributors for application help. We look forward to providing any assistance you may need.

Note: OLED display will provide intuitive visual feedback during autosetting. Paying close attention to the display is important.

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Light State (Default)

Place object to be detected in the worst-case light-state condition and press the AUTOSET button. The threshold will be set 20%(default) below the received light-beam intensity. The threshold can be altered by tapping up or down on the threshold adjust rocker (see Figure 1).

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Dark State

Place object to be detected in the worst-case dark-state condition and press the AUTOSET button. The threshold will be set 20%(default) above the received light-beam intensity. The threshold can be altered by tapping up or down on the threshold adjust rocker (see Figure 2).

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Midpoint

Place object to be detected in position at which you want the threshold to be set and press the AUTOSET button. The threshold can be altered by tapping up or down on the threshold adjust rocker (see Figure 3).

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Two-Point

Place object to be detected in the light-state condition and press the AUTOSET button. Then remove or place the object in the dark-state condition and press the AUTOSET button again. The threshold will be set between the two light-beam intensities. The threshold can be altered by tapping up or down on the threshold adjust rocker (see Figure 4).

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Dynamic

Press the AUTOSET button to start the Dynamic AUTOSET. Now move the object through the beam at least once and press the AUTOSET button again to complete the Dynamic AUTOSET. The threshold is set between the highest and lowest received light levels caused by the object being passed through. The threshold can be altered by tapping up or down on the threshold adjust rocker (see Figure 5).
**Detect Mode**
Sensor output activates or deactivated when received light intensity is over the threshold. *Not available when input function is set to Remote Dark On.

- **Light On (LO):** Output activates when received light intensity is over the threshold.
- **Dark On (DO):** Output deactivates when received light intensity is over the threshold.

**Response Time**
Select which mode that best fits the performance need of your application. Sensor speed, and stability are optimized for best performance.

- **Response Time:** 2μs Fastest speed
- **Response Time:** 8μs
- **Response Time:** 50μs
- **Response Time:** 200μs Higher stability

**Hysteresis**
To avoid false triggers for example due to object vibration. Adjusts the span between the operate point and the release point of the sensor output. Low hysteresis increases sensitivity and high hysteresis increases sensing stability.

- **Hysteresis:** Low (H0): Reduced hysteresis for increased sensitivity.
- **Hysteresis:** Standard (H1): Automatic adjustment depending on signal level.
- **Hysteresis:** High (H2): Increased hysteresis for increased stability.

**Timer/Counter Function #:**
Choose from eight modes pre-configured timer/counter control functions. Each one represents a function such as on-delay, off-delay, etc. Once a function is selected, adjustable parameters of that function appear such as delay time.

**Timer Duration**
Adjust
- **On Delay:** 0.1 - 9.9, 10 - 1000ms
  - Hold up or down to scroll.

**Counter**
Count:
- **Count:** 0001-9999
  - Hold up or down to scroll.
Output Mode
Output can be set one of three ways:

- **Push/Pull**: NPN and PNP transistor connected in a push/pull configuration.
- **PNP - Source**: PNP transistor open collector output.
- **NPN - Sink**: NPN transistor open collector output.

Input Functions
Input can be set one of six ways:

- **Remote Set**: An AUTOSET function is performed when input wire is transitioned from idle to active and returned. *Note: input wire can be used in addition to the AUTOSET button.*
- **Remote Command**: Sensor parameters can be adjusted via defined pulses. See chart on page 7.
- **Gate**: Sensing is gated. Detection is enabled when input is active.
- **Remote Dark On**: Detect Mode is determined by input state. Dark On mode is used when input is active.
- **Remote Lockout**: Remote lock of the AUTOSET, up and down adjust and most mode functions.
- **Disabled**: Deactivates input wire.

Two other input types are automatically selected when required by other settings:

- **Latch**: Latch is required by timer functions 5 & 6.
- **Interrogate**: Interrogate is required by timer functions 7 & 8.

Input Polarity
Select the active state of the input.

- **Active High**: Selects active High.
- **Active Low**: Selects active Low.

Display Orientation
Flips orientation 180 degrees.

- **Toggle Display Orientation**: 030.6 025.2
- **Toggle Display Orientation**: 90.030 2.928

Lock Mode
Locks buttons. *Note: input wire remains unlocked.*

- **Button Lock**: Enabled
  - **Disabled**: Adjustments made by anyone.
  - **Enabled**: Prevents unauthorized tampering.
  - To unlock, tap MODE to scroll through menu to Button Lock and select Disabled to unlock.
**Default Setting Chart**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>Default</th>
<th>Other options</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUTOSET MODE</td>
<td>Light-State</td>
<td>Dark-State, Midpoint, Two-point, Dynamic</td>
</tr>
<tr>
<td>AUTOSET PERCENT</td>
<td>20%</td>
<td>1% - 50%</td>
</tr>
<tr>
<td>DETECT MODE</td>
<td>Light On</td>
<td>Dark On</td>
</tr>
<tr>
<td>RESPONSE TIME</td>
<td>8µs</td>
<td>2µs, 50µs, 200µs</td>
</tr>
<tr>
<td>HYSTERESIS</td>
<td>Standard</td>
<td>Low, High</td>
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<tr>
<td>TIMER</td>
<td>Bypass</td>
<td>Timer 1-8</td>
</tr>
<tr>
<td>TIMER DURATION</td>
<td>1ms</td>
<td>0001 - 9999ms</td>
</tr>
<tr>
<td>OUTPUT MODE</td>
<td>Push/Pull</td>
<td>PNP - Source, NPN - Sink</td>
</tr>
<tr>
<td>INPUT FUNCTIONS</td>
<td>Disabled</td>
<td>Remote Set, Remote Command, Gate, Remote Dark On, Remote Lockout</td>
</tr>
<tr>
<td>ORIENTATION</td>
<td></td>
<td>Toggles display orientation 180 degrees.</td>
</tr>
<tr>
<td>LOCK MODE</td>
<td>Disabled</td>
<td>Enabled</td>
</tr>
</tbody>
</table>

**Factory Reset**

Hold down MODE (n) on power up, then tap up or down (▲▼). Sensor will return to all settings to factory default (see chart above).

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**Mounting on a DIN Rail**

1. Hook the DIN rail clip on the bottom of the sensor under the edge of the DIN rail.
2. Gently push and pivot the sensor onto the DIN rail, pressing until it snaps into place.

**Installing the Fibers**

1. Open the dust cover.
2. Move the fiber clamp forward to unlock it.
3. Insert the fiber(s) into the fiber port(s) until they stop.
4. Move the fiber clamp backward to secure the fiber(s).
5. Close the dust cover.
Remote Command Programming

In Remote Command Mode a limited set of options can be configured via the input wire. This is accomplished by sending a simple sequence of pulses on the white wire. For example, sending a sequence of two pulses followed by three pulse followed by two pulses selects dark on mode.

**Example of 2 - 3 - 3 pulse command**

Pulse width (P) is 40ms - 400ms.
The delay between sets of pulses (D) is 0.75 - 5 seconds.

Pulses are displayed while being received. Valid commands are executed immediately. Holding the input active will cancel a partial command.

**AUTOSET**

A single pulse command initiates an AUTOSET. A second single pulse command is required to complete Two-Point and Dynamic AUTOSETs.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Option</th>
<th>Icon</th>
<th>Pulse Sequence</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>AUTOSET</td>
<td></td>
<td></td>
<td>1</td>
<td>A single pulse initiates AUTOSET. An additional pulse command is required to complete AUTOSET for two-point and dynamic modes.</td>
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<tr>
<td>AUTOSET Mode</td>
<td>Light-State</td>
<td>LS</td>
<td>2 - 1 - 1</td>
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<td>Dark-State</td>
<td>DS</td>
<td>2 - 1 - 2</td>
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<tr>
<td></td>
<td>Midpoint</td>
<td>MP</td>
<td>2 - 1 - 3</td>
<td></td>
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<tr>
<td></td>
<td>Two-Point</td>
<td>2P</td>
<td>2 - 1 - 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dynamic Set</td>
<td>DY</td>
<td>2 - 1 - 5</td>
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<tr>
<td>AUTOSET Percent</td>
<td>1%</td>
<td>01%</td>
<td>2 - 2 - 1</td>
<td>Percentage will affect the next Light, Dark AUTOSET.</td>
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<tr>
<td></td>
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<td>02%</td>
<td>2 - 2 - 2</td>
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<td>50%</td>
<td>50%</td>
<td>2 - 2 - 6</td>
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<td>Detect Mode</td>
<td>Light On</td>
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<td>2 - 3 - 1</td>
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<td></td>
<td>Dark On</td>
<td>DO</td>
<td>2 - 3 - 2</td>
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<td>2µs</td>
<td>2</td>
<td>2 - 4 - 1</td>
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<td></td>
<td>High</td>
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<td>2 - 5 - 3</td>
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<td>On-Delay</td>
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<td>Off-Delay</td>
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<td>One-Shot</td>
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<td>Motion</td>
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<td>500µs</td>
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<td>1ms</td>
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<td></td>
<td>2ms</td>
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<td>5ms</td>
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<td>3 - 2 - 6</td>
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<td>10ms</td>
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<td>3 - 2 - 7</td>
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<td>Enabled</td>
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<td>4 - 1 - 2</td>
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<td>Display Mode</td>
<td>Standard</td>
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<td>Flipped</td>
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<td>4 - 2 - 4</td>
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</tr>
</tbody>
</table>
Specifications

SUPPLY VOLTAGE & CURRENT
- 8-30 Vdc
- 35mA @ 24Vdc, 55mA @ 12Vdc
- Reverse polarity protected
- Transient spike protected

OUTPUT
- Configurable NPN, PNP or Push-Pull
- 150mA output current
- Short circuit & transient spike protected
- Saturation voltage: < 0.3Vdc @ 10mA
  < 2Vdc @150mA

INPUT
- Transient spike protected
- Configurable function: Remote setting or commands, Gate, Dark-On, Lockout, and Latch Reset.

POWER-UP DELAY
- 300ms. No output pulse on power-up.

RESPONSE TIME (Dependent on Mode)
- 2µs - repeatability = 2µs
- 8µs - repeatability = 2µs
- 50µs - repeatability = 3µs
- 200µs - repeatability = 3µs

MAXIMUM RANGE
Opposed Mode (RED) (INFRARED)
- 2µs 3.50in (92mm) 11.25in (286mm)
- 8µs 5.00in (128mm) 19.50in (495mm)
- 50µs 7.00in (176mm) 28.50in (724mm)
- 200µs 7.50in (200mm) 45.00in (1143mm)
Proximity Mode (RED) (INFRARED)
- 2µs 5.00in (128mm) 7.00in (181mm)
- 8µs 6.00in (152mm) 8.50in (220mm)
- 50µs 6.50in (160mm) 10.00in (251mm)
- 200µs 7.00in (174mm) 12.50in (319mm)

Note: Opposed tests utilized: PF-Z-78TL (red); MDF-B-36T (infrared)
Proximity tests utilized: PFD-Z-78M64 (red); MDBF-E-36T (infrared)

LIGHT IMMUNITY
- High immunity to most ambient light, including high efficiency lighting.

COMBINABLE DUAL TIMERS
- On-Delay, Off-Delay, One-Shot, Motion
- Latching function
- Counters (counting range up to 9999)
- Timer range: 0.1 - 0.9ms, 1ms - 9,999ms

LED LIGHT SOURCE
- 4 element LED, Red = 660nm
- IR = 880nm (Use glass fibers with Ø2.2mm connection only).

DISPLAY
- 96 X 16 white dot matrix OLED
- Signal strength 0-100%

LED INDICATORS
- Output: Red LED, illuminates when output is ON. Flashes when output is overloaded.
- Connector: Red LED, illuminates when input wire is activated.

CONNECTIONS
- M8, 4-pin
- Attached cable: 4-wire 6ft (1.8m)

OPERATING TEMPERATURE
- 5°C to 55°C (41°F to 131°F) - Electrical.

HOUSING CONSTRUCTION
- Chemical resistant, high-impact polycarbonate

RATINGS & CERTIFICATIONS
- IP50
- CE
- UL pending

Dimensions

DFS31 Digital Fiber Optic Sensor

http://www.ttco.com • 800-237-0946 070-0669, Rev. 1

RoHS Compliant
Product subject to change without notice