

DFS31 - Instructions



High Speed

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

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
DFS High Speed Digital Fiber Optic Sensor
Light Source
Connection

Features

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 LEADS
1. Illuminates solid when output is ON.
2. Flashes when output is overloaded.

ADVANCED DIAGNOSTIC OLED DISPLAY
See next page for complete listing.

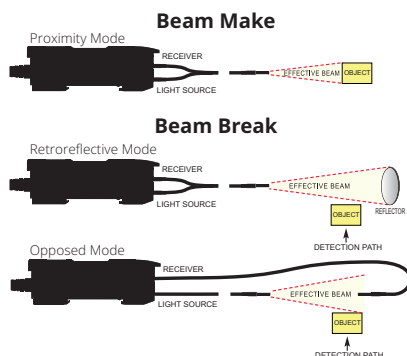
INPUT FUNCTION LIGHT RING
Illuminates when input is activated.
Note: Only available on connector models.

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:

* Note: Consult all default settings on page 6.

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




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

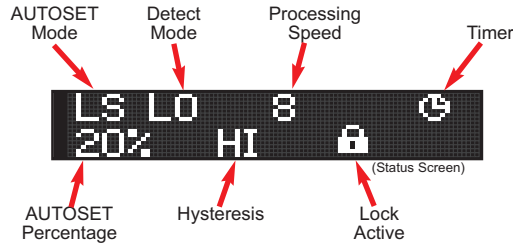
- Verify setup on advanced diagnostic OLED display. If needed, the threshold can be altered by tapping up or down on the threshold adjust rocker.



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.



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

- Tap **MODE** (■) again to access first parameter. Continue tapping to select desired parameter. Use the threshold/value **ADJUST ROCKER** (▼▲) to select or adjust a specific parameter.

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.

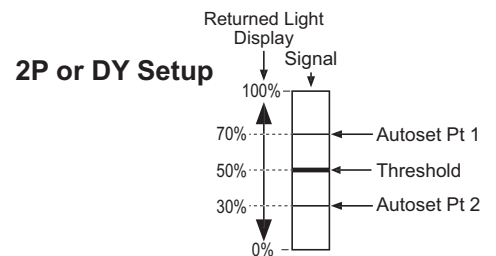
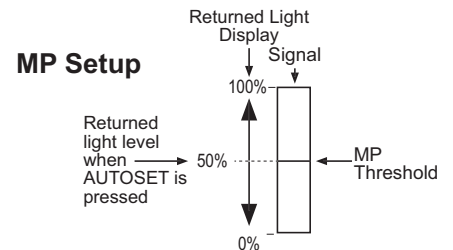
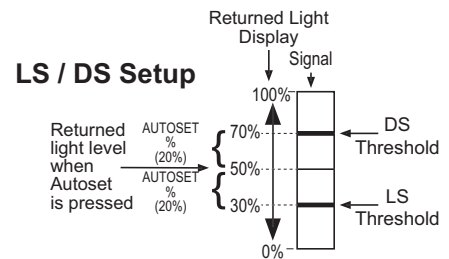
Select ▼▲	AUTOSET Mode: Light State LS	Light-State Set (LS): Sets threshold below received light beam intensity.
	AUTOSET Mode: Dark State DS	Dark-State Set (DS): Sets threshold above received light beam intensity.
	AUTOSET Mode: Midpoint MP	Midpoint Set (MP): Sets threshold at received light beam intensity.
	AUTOSET Mode: Two-Point 2P	Two-point Set (2P): Sets threshold between received light beam intensity two point.
	AUTOSET Mode: Dynamic DY	Dynamic Set (DY): Sets threshold between received light beam high and low intensity.

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.

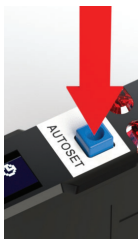
ADJUST 10% - 50% (Hold to scroll)

AUTOSET Pct:
20%



Using AUTASET

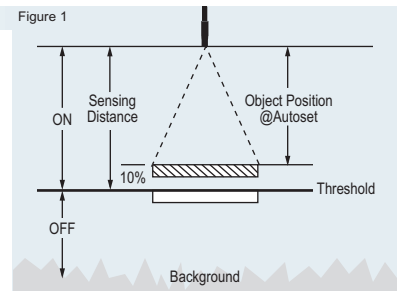
The DFS threshold is set automatically by pressing the **AUTASET** button. There are five different ways the sensor determines the threshold. The user first must determine which type of setup mode is appropriate for the application. The simplest and most common mode we recommend is Light State (LS) setup. 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.tco.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.

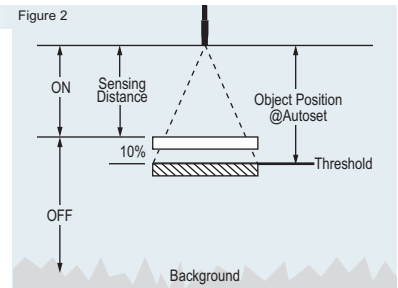
Light State (Default)

Place object to be detected in the worst-case light-state condition and press the **AUTASET** 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).



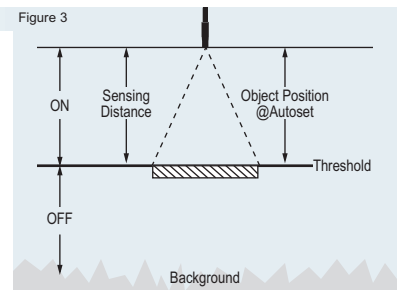
Dark State

Place object to be detected in the worst-case dark-state condition and press the **AUTASET** 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).



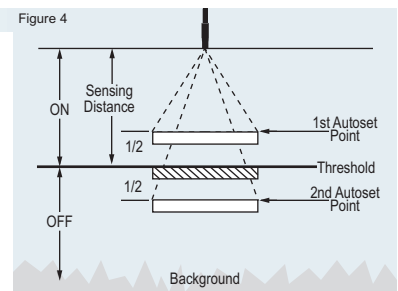
Midpoint

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



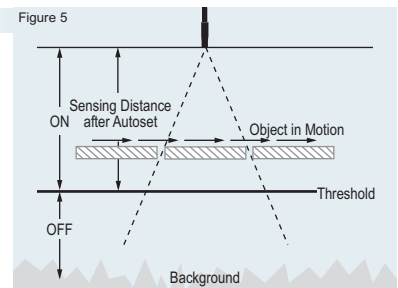
Two-Point

Place object to be detected in the light-state condition and press the **AUTASET** button. Then remove or place the object in the dark-state condition and press the **AUTASET** 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).



Dynamic

Press the **AUTASET** button to start the Dynamic **AUTASET**. Now move the object through the beam at least once and press the **AUTASET** button again to complete the Dynamic **AUTASET**. 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 deactivates when received light intensity is over the threshold. *Not available when input function is set to Remote Dark On.*

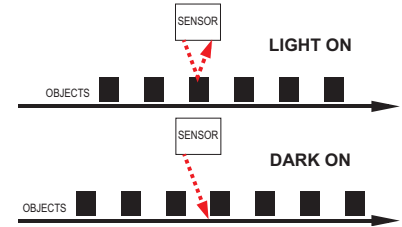


Detect Mode:
Light On LO

Detect Mode:
Dark On DO

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:
2 μ s

Response Time:
8 μ s

Response Time:
50 μ s

Response Time:
200 μ s

2 μ s Fastest speed

8 μ s

50 μ s

200 μ s Higher stability
Note: Highest ambient light rejection.

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

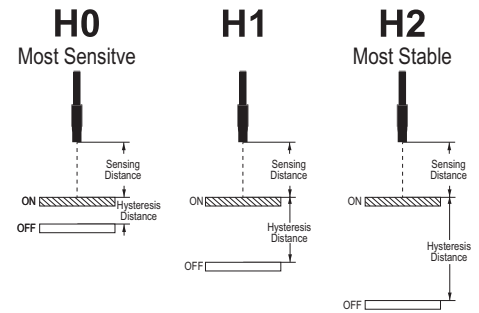
Hysteresis:
Standard H1

Hysteresis:
High H2

Low (H0): Reduced hysteresis for increased sensitivity.

Standard (H1): Automatic adjustment depending on signal level.

High (H2): Increased hysteresis for increased stability.



PRESS

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

On Delay:
10ms

0.1 - 9.9, 10 - 1000ms

Hold up or down to scroll.

Counter

Count:
0005

0001-9999

Hold up or down to scroll.

Select

00
Timer Func: 00
Bypass

Timer not used.

01
Timer Func: 01
On-Delay

"ON" Delay

02
Timer Func: 02
Off-Delay

"OFF" Delay Pulse Stretcher

03
Timer Func: 03
One-Shot

One-Shot

04
Timer Func: 04
Motion

Motion Detection

05
Timer Func: 05
Latch

Latching, Edge Triggered

06
Timer Func: 06
Count, Latch

Count, Latch

Latch occurs on Nth detection. For this example N = 5.

07
Timer Func: 07
Interrogate

Interrogate

08
Timer Func: 08
Interr, One-Shot

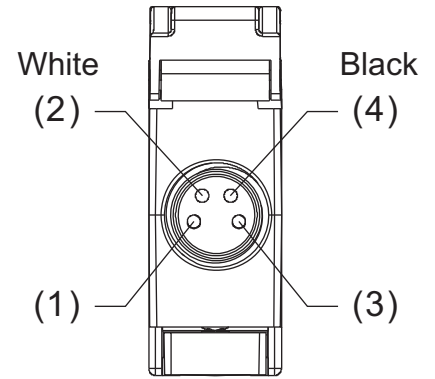
Interrogate, One-Shot

Output Mode

Output can be set one of three ways:

Select

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



Input Functions

Input can be set one of six ways:

Select

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

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

Input Function: Latch Reset*	Latch: Latch is required by timer functions 5 & 6.
Input Function: Interrogate*	Interrogate: Interrogate is required by timer functions 7 & 8.

Input Polarity

Select the active state of the input.

Select

Input Polarity: Active High	Active High: Selects active High.
Input Polarity: Active Low	Active Low: Selects active Low.

Display Orientation

Flips orientation 180 degrees..

Select

Toggle Display Orientation	→	030.6 025.2	→	
Toggle Display Orientation	→	9°020 2°920	→	

Display flips 180 degrees.

Lock Mode

Locks buttons. *Note: Input wire remains unlocked.*

Select

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

Sensor Locked

 Displayed when sensor is locked.

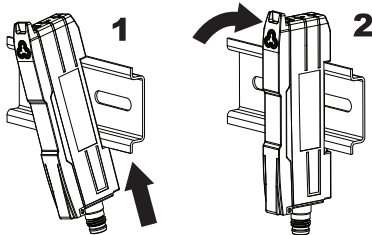
PARAMETER	Default	Default Setting Chart
AUTOSET MODE	Light-State	Other options: Dark-State, Midpoint, Two-point, Dynamic
AUTOSET PERCENT	20%	Other options: 1% - 50%
DETECT MODE	Light On	Other option: Dark On
RESPONSE TIME	8 μ s	Other options: 2 μ s, 50 μ s, 200 μ s
HYSTERESIS	Standard	Other options: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

Factory Reset

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

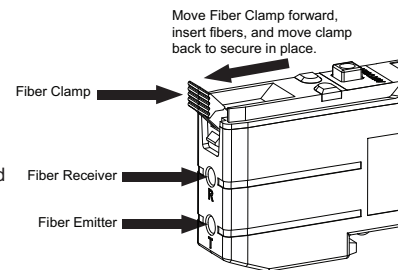
Mounting on a DIN Rail

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

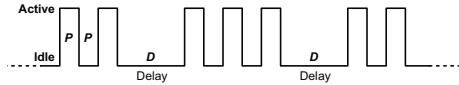
1. Open the dust cover.
2. Move the fiber clamp forward to unlock it.
3. Insert the fiber(s) into the fiber port(s) until they stop.
4. Move the fiber clamp backward to secure the fiber(s).
5. Close the dust cover.



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.

Setting	Option	Icon	Pulse Sequence	Notes
AUTOSET			1	A single pulse initiates AUTOSET. An additional pulse command is required to complete AUTOSET for two-point and dynamic modes.
AUTOSET Mode	Light-State	LS	2 - 1 - 1	
	Dark-State	DS	2 - 1 - 2	
	Midpoint	MP	2 - 1 - 3	
	Two-Point	2P	2 - 1 - 4	
	Dynamic Set	DY	2 - 1 - 5	
AUTOSET Percent	1%	01%	2 - 2 - 1	Percentage will affect the next Light, Dark AUTOSET.
	2%	02%	2 - 2 - 2	
	5%	05%	2 - 2 - 3	
	10%	10%	2 - 2 - 4	
	20%	20%	2 - 2 - 5	
	50%	50%	2 - 2 - 6	
Detect Mode	Light On	LO	2 - 3 - 1	
	Dark On	DO	2 - 3 - 2	
Response Time	2µs	2	2 - 4 - 1	
	8µs	8	2 - 4 - 2	
	50µs	50	2 - 4 - 3	
	200µs	200	2 - 4 - 4	
Hysteresis	Low	H0	2 - 5 - 1	
	Standard	H1	2 - 5 - 2	
	High	H2	2 - 5 - 3	
Timer Function	Bypass		3 - 1 - 1	
	On-Delay		3 - 1 - 2	
	Off-Delay		3 - 1 - 3	
	One-Shot		3 - 1 - 4	
	Motion		3 - 1 - 5	
Timer Duration	100µs		3 - 2 - 1	
	200µs		3 - 2 - 2	
	500µs		3 - 2 - 3	
	1ms		3 - 2 - 4	
	2ms		3 - 2 - 5	
	5ms		3 - 2 - 6	
	10ms		3 - 2 - 7	
Button Lock	Disabled		4 - 1 - 1	
	Enabled		4 - 1 - 2	
Display Mode	Standard		4 - 2 - 2	
	Flipped		4 - 2 - 4	

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)

- 2 μ s - repeatability = 2 μ s
- 8 μ s - repeatability = 2 μ s
- 50 μ s - repeatability = 3 μ s
- 200 μ s - repeatability = 3 μ s

MAXIMUM RANGE

- Opposed Mode (RED) (INFRARED)*
- 2 μ s 3.50in (92mm) 11.25in (286mm)
 - 8 μ s 5.00in (128mm) 19.50in (495mm)
 - 50 μ s 7.00in (176mm) 28.50in (724mm)
 - 200 μ s 7.50in (200mm) 45.00in (1143mm)
- Proximity Mode (RED) (INFRARED)*
- 2 μ s 5.00in (128mm) 7.00in (181mm)
 - 8 μ s 6.00in (152mm) 8.50in (220mm)
 - 50 μ s 6.50in (160mm) 10.00in (251mm)
 - 200 μ s 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 \varnothing 2.2mm 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



RoHS Compliant

Product subject to change without notice

Dimensions

DFS31 Digital Fiber Optic Sensor

