

DFS71 - Instructions

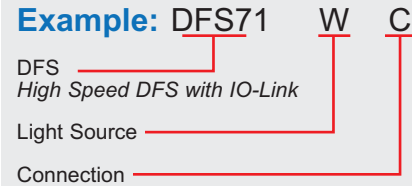


Features:

- IO-Link compatible (COM3)
- 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
- Configurable Q2 (Output/Remote set)
- Low power & wide operating voltage
- Five **AUTOSET** modes
- CE Approved

How To Specify

- 1. Select Sensor: DFS71**
High Speed DFS with IO-Link
- 2. Select Light Source:**
W = White
- 3. Select Connection:**
Blank = 6ft cable (1.8m)
C = 4-pin M8 connector



Features

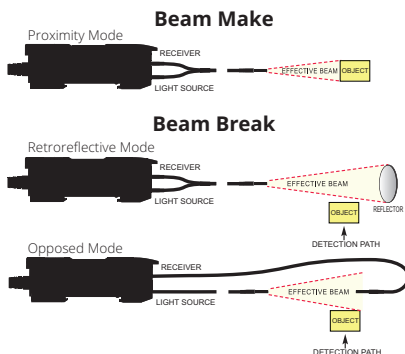
- WIDE VARIETY OF FIBERS**
Visit www.ttco.com for full listing.
- AUTOSET (●)**
Push to perform AUTOSET.
- THRESHOLD/VALUE ADJUST ROCKER (▼▲)**
 1. Manually adjusts the threshold. +/-
 2. Alters programming parameters. +/-
Hold to scroll for numeric values.
- MODE (■)**
 1. Tap to display sensor status screen.
 2. Tap again to access parameters.
- CONNECTION**
4-Pin M8 connector or built-in cable.
- FIBER RELEASE CLAMP**
Locks fibers in place.
- OUTPUT LEDS**
 1. Illuminates solid when output is ON.
 2. Flashes when output is overloaded.
- ADVANCED DIAGNOSTIC OLED DISPLAY**
See next page for complete listing.
- IO-LINK STATUS LIGHT RING**
Blinks out when IO-LINK 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:

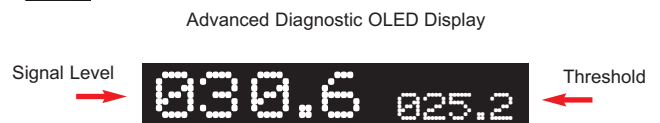
* Note: Consult all default settings on page 7.

- 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.

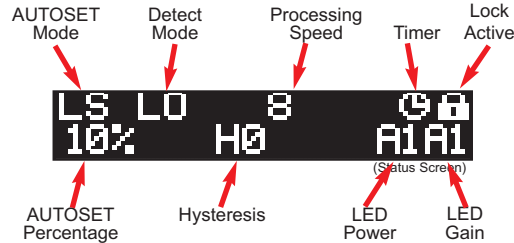
- Verify setup on advanced diagnostic OLED display. If needed, the threshold can be altered by tapping up or down on the threshold adjust rocker.



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.

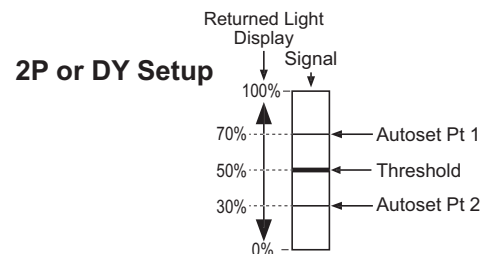
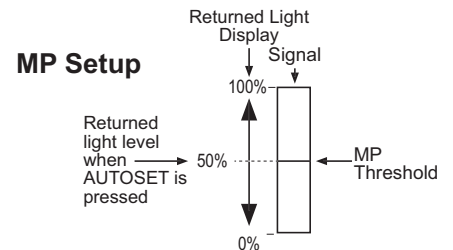
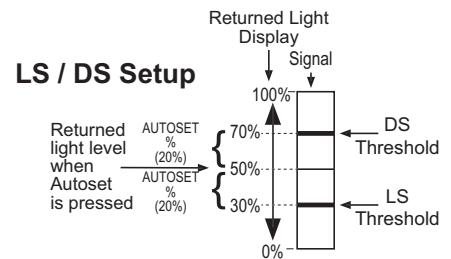
Select ▼▲	AUTOSET Mode: Light State LS	Light-State Set (LS): Sets threshold below received light beam intensity.
	AUTOSET Mode: Dark State DS	Dark-State Set (DS): Sets threshold above received light beam intensity.
	AUTOSET Mode: Midpoint MP	Midpoint Set (MP): Sets threshold at received light beam intensity.
	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.

For White Light Source
ADJUST 2% - 50% (Hold to scroll)

▲▼ AUTOSET Pct:
10%



Using AUTOSET

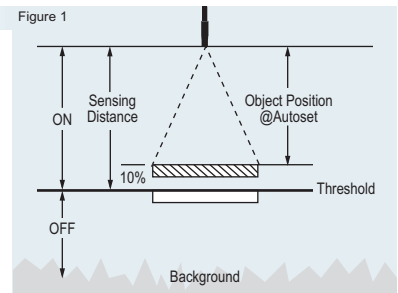
The DFS threshold is set automatically by pressing the **AUTOSET** button. There are five different ways the sensor determines the threshold. The user first must determine which type of setup mode is appropriate for the application. The simplest and most common mode we recommend is Light State (LS) setup.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

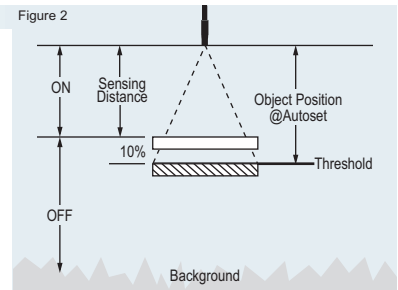
Light State (Default)

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



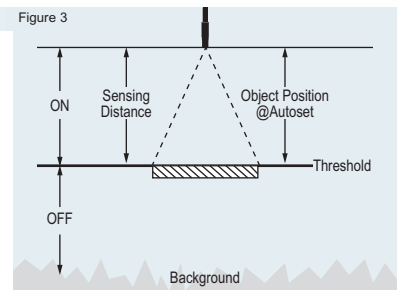
Dark State

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).



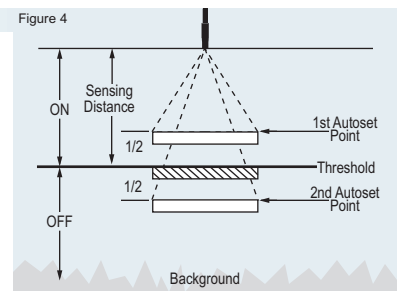
Midpoint

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).



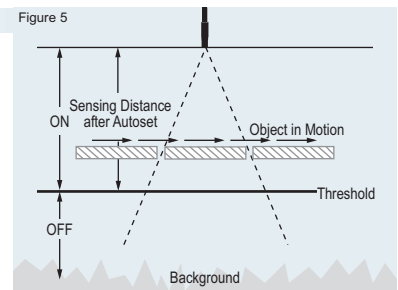
Two-Point

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).



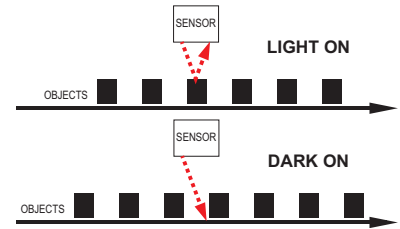
Dynamic

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.*



Select
▲
▼

Detect Mode:
Light/High On

Detect Mode:
Dark/Low On

Light/High On (LO): Output activates when received light intensity is over the threshold. *Note: In window mode (WN) output activates when received light intensity is inside the window thresholds.*

Dark/Low On (DO): Output deactivates when received light intensity is over the threshold. *Note: In window mode (WN) output activates when received light intensity is outside the window thresholds.*

■ Response Time

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

Select
▲
▼

Response Time:
2 us

Response Time:
8 us

Response Time:
50 us

Response Time:
200 us

2us Fastest speed

8us

50us

200us Higher stability
Note: Highest ambient light rejection.

■ LED Power

Select the desired power.

Select
▲
▼

LED Power:
Auto A1

Gain:
High Power P1

Gain:
Low Power P0

Auto (A0/A1): Automatically determined during AUTOSET. *Recommended for most applications.*

High Power (P1): Force the use of High Power mode.

Low Power (P0): Cuts emitter power to prevent saturation. (it's recommended to reduce gain first)

■ Gain

Select the desired gain.

Select
▲
▼

Gain:
Auto A1

Gain:
High Gain G1

Gain:
Low Gain G0

Auto (A0/A1): Automatically determined during AUTOSET. *Recommended for most applications.*

High Gain (G1): Force the use of High Gain mode.

Low Gain (G0): Cuts gain to prevent saturation.

■ 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.

Select
▲
▼

Hysteresis:
Low H0

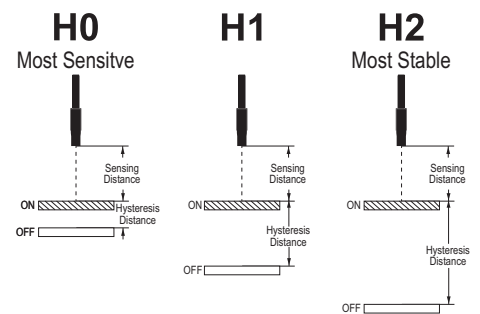
Hysteresis:
Standard H1

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 #:

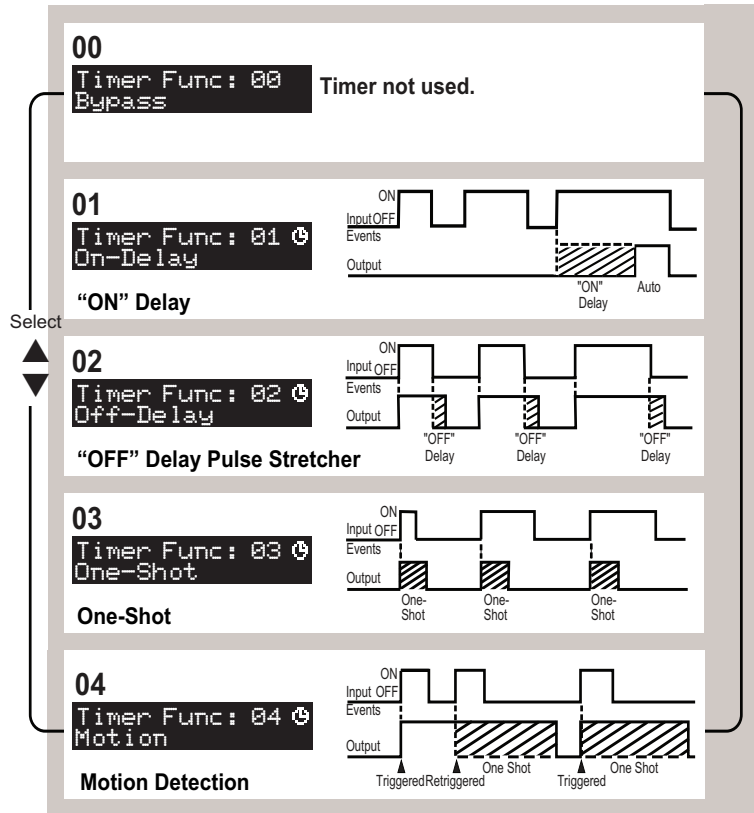
Choose from four modes pre-configured timer/counter control functions. Each one represents a function such as on-delay, off-delay, etc. Once a function is selected, adjustable parameters of that function appear such as delay time.

Timer Duration

ADJUST On Delay: 1.0ms

▲▼ **0.1 - 9999.9ms**

Hold up or down to scroll.



IO-Link Features and Options

AUTOSET (Teach) and Switch Point [SP]

For one point sets:

Selected the desired mode for [Single Value Teach Mode]:

- Light State Teach
- Dark State Teach
- Midpoint Teach

Then, use the [Teach SP1] command.

For two point sets:

Run the [Teach SP1] command with the first point in view.

Run the [Teach SP2] command with the second point in view.

Then, use the [Teach Apply] command.

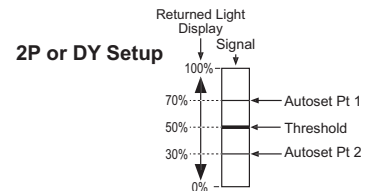
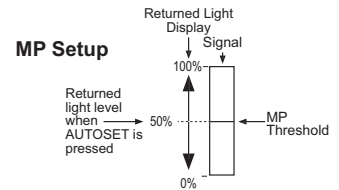
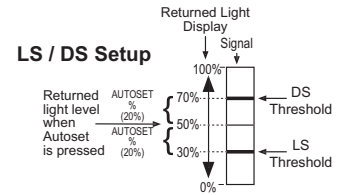
For a dynamic set:

Run the [Teach SP1 Start] command to begin.

Then, run the [Teach SP1 Stop] command to complete the set.



The AUTOSET (Teach) commands also set the sensor's switch point [SP], which can be adjusted by tapping the up and down buttons or manually adjusting via IO-Link.



LED Power and Gain:

We recommend leaving these on automatic unless directed otherwise and performing an AUTOSET for each new application/setup. The current automatically selected value is exposed via IO-Link to support recipe storage and recall.

Counter:

The sensor's switch count is readable and resettable via the [SSC1 Switch Counts Reset] command. The count is valid from 0-32000; a value of 32760 indicates an overflow.

Process Data:

In addition to the output status, you can select to transmit the [Signal Level] or [Switch Count].

You can also turn off the emitter via process data.

Lock:

The sensor can be locked and unlocked via the buttons or IO-Link to prevent accidental changes.

When locked, local button adjustments and AUTOSETs are not allowed.

Using IO-Link, you can also enable [Secured] mode, which prevents the buttons from being unlocked via the buttons.

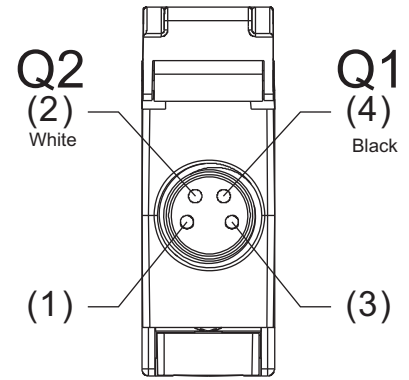
You can, however regain access to a secured sensor via a Factory Reset.

■ Q2 IO Function

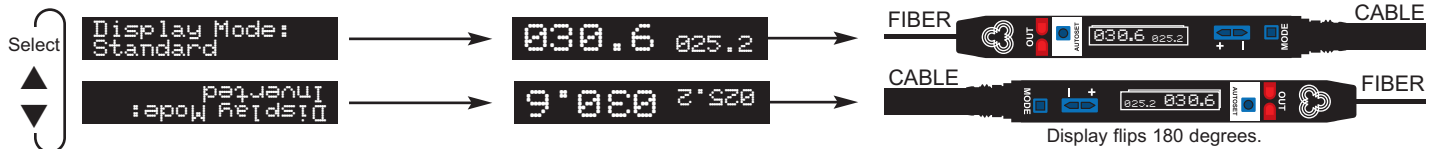
The Q2 (white wire) is configurable as an output, or as an remote set input.

The DFS71 Q2 pin is configurable.

Select ▲ ▼	Q2: Disabled	Disabled: To ignore unwanted signals.
	Q2: Output PNP - Source	PNP - Source: PNP transistor open collector output.
	Q2: Output NPN - Sink	NPN - Sink: NPN transistor open collector output.
	Q2: Output Push/Pull	Push/Pull: NPN and PNP transistor connected in a push/pull configuration.
	Q2: Remote Set Active High	Active High: Selects active High Remote Set.
	Q2: Remote Set Active Low	Active Low: Selects active Low Remote Set.
	Q2: Remote Lock Active High	Active High: Selects active High Remote Lock.
	Q2: Remote Lock Active Low	Active Low: Selects active Low Remote Lock.



■ Display Orientation Flips orientation 180 degrees..



■ Display

Select ▲ ▼	Display: Auto Off	Auto Off: Turns off display after 5 minutes.
	Display: Always On	Always On: Sensor status is continuously shown.

■ Lock Mode Buttons

Select ▲ ▼	Lock Mode: Read-Only	Read only: No changes are allowed when locked.
	Lock Mode: Allow Set	Allow Set: Allows only AUTOSET using the buttons when locked
	Lock Mode: Allow Set/Adjust	Allow Set: Allows only AUTOSET and manual threshold adjustments when locked

■ Settings Lock Locks sensor dependent on lock mode.

Select ▲ ▼	Settings: Unlocked	Unlocked: Adjustments can be made easily.
	Settings: Locked	Locked: Prevents unauthorized tampering. To unlock, tap MODE to scroll through menu to <i>Settings Lock</i> and select <i>Unlocked</i> to unlock.

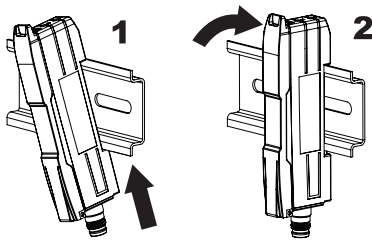
PARAMETER	Default	Default Setting Chart
AUTOSET MODE	Light-State	Other options: Dark-State, Midpoint, Two-point, Dynamic
AUTOSET PERCENT	10%	Other options: 2% - 50% for White
DETECT MODE	Light On	Other option: Dark On
RESPONSE TIME	8 μ s	Other options: 2 μ s, 50 μ s, 200 μ s
LED POWER	Auto	Other options: Low, High
LED GAIN	Auto	Other options: Low, High
HYSTERESIS	Low	Other options: Standard, High
TIMER	Bypass	Other options: Various
TIMER DURATION	1.0ms	Other options: 0.1ms - 9999.9ms
Q2 IO FUNCTION	Disabled	Other options: PNP, NPN, Push/Pull, Remote Set: Active High, Active Low, Remote Lock: Active High, Active Low
DISPLAY	Standard	Other options: Inverted
LOCK MODE BUTTONS	Read-Only	Other option: Allow Set, Allow Set/Adjust
SETTINGS LOCK	Unlocked	Other option: Locked

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).

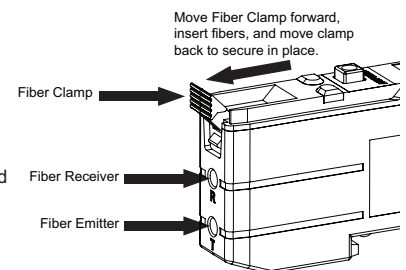
Mounting on a DIN Rail

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.



Specifications

SUPPLY VOLTAGE & CURRENT

- 8-30 Vdc
- 35ma @ 24Vdc, 55ma @ 12Vdc
- Reverse polarity protected
- Transient spike protected

OUTPUT / INPUT

- Q1 - Push/Pull
- Q2 - Configurable: PNP - Source, NPN - Sink, Push-Pull, Active High, or Active Low
- 150mA output current
- Short circuit & transient spike protected
- Saturation voltage: < 0.3Vdc @ 10mA < 2Vdc @150mA

POWER-UP DELAY

- 350ms. 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

IO-LINK

- Smart Sensor Profile: SSP 0
- Bitrate: COM3
- MinCycle Time: 1ms
- Process Data:
 - In: 4 bytes including output and measurement value
 - Out: 1 byte including emitter disable

IO-LINK ADJUSTABLE SWITCHING SENSOR SUPPORTING:

- Fast COM3 Communications
- 1ms Cycle Time

MAXIMUM RANGE

White Light Source

Opposed Mode (WHITE)

- 2 μ s 4.00in (102mm)
- 8 μ s 5.00in (127mm)
- 50 μ s 10.00in (254mm)
- 200 μ s 12.00in (305mm)

Proximity Mode (WHITE)

- 2 μ s 1.00in (25mm)
- 8 μ s 1.50in (38mm)
- 50 μ s 2.00in (51mm)
- 200 μ s 3.00in (76mm)

Note: Opposed tests utilized: PF-Z-78TL;

Proximity tests utilized: PFD-Z-78M64

LIGHT IMMUNITY

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

TIMER OPTIONS

- On-Delay, Off-Delay, One-Shot, Motion
- Timer range: 0.1 - 9999.9ms

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: Rear Green IO-Link status Indicator.

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

DFS71 Digital Fiber Optic Sensor

