S70 Analogue Output

Advanced sensor with dual digital displays
for use with plastic and glass fiber optic assemblies

For complete technical information about this product, including dimensions, accessories, and specifications, see *www.datalogic.com*.

1	Analogue and Discrete Output LEDs
2	CH1/CH2 Switch
3	RUN/PRG/ADJ Mode Switch
4	Lever Action Fiber Clamp
5	Red Signal Level
6	Green CH1 Analog Output Signal or CH2 Threshold
7	+/SET/- Navigation key

Figure 1

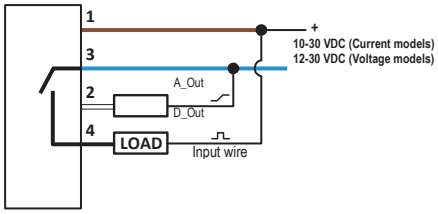
WARNING: Not to be used for personnel protection
Never use this device as a sensing device for personnel protection.
Doing so could lead to serious injury or death. This device does not include the self-checking redundant circuitry necessary to allow its use in personnel safety applications.
A sensor failure or malfunction can cause either an energized or de-energized sensor output condition.

Model	Sensing Beam Color	Reference Sensing Range[1]	Outputs	Connector
S70-5-E3-PV/NV	Visible Red	2250 mm	Voltage and PNP or NPN Discrete	4-pin, M8 Pico-style
S70-5-E3-PI/NI			Current and PNP or NPN Discrete	

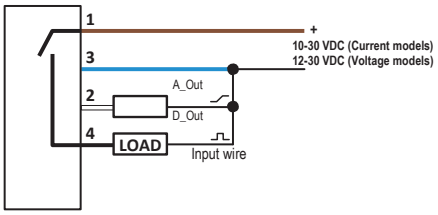
[1] **NOTE: Maximum sensing range in opposed mode at 12 ms response speed using 1mm diameter core plastic fiber.**

CONNECTIONS

NPN Version



PNP Version



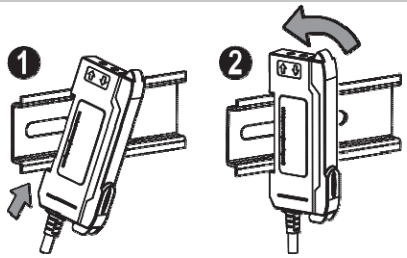
Key
1 = Brown
2 = White
3 = Blue
4 = Black

NOTE: Open lead wires must be connected to a terminal block.

MOUNTING INSTRUCTIONS

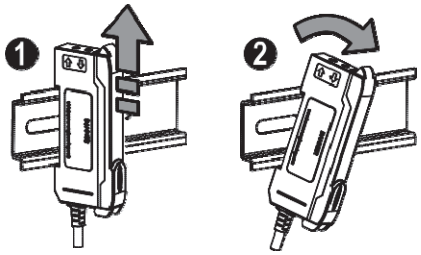
Mount on a DIN Rail

1. Hook the DIN rail clip on the bottom of the S70 over the edge of the DIN rail (1).
2. Push the S70 up on the DIN rail (1).
3. Pivot the S70 onto the DIN rail, pressing until it snaps into place (2).



Remove from a DIN rail

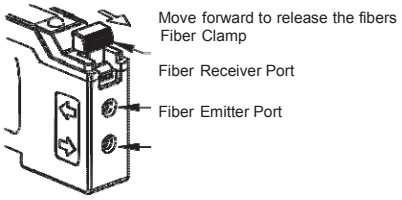
1. Push the S70 up on the DIN rail (1).
2. Pivot the S70 away from the DIN rail and remove it (2).



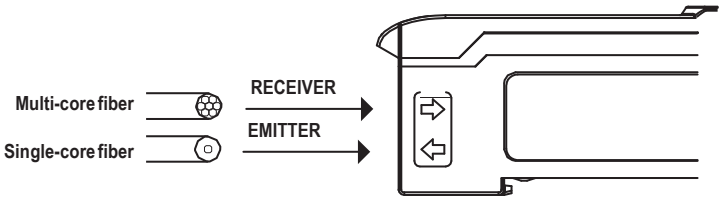
INSTALLING THE FIBERS

Follow these steps to install glass or plastic 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 lock the fiber(s).
5. Close the dust cover.



When connecting coaxial-type fiber assemblies to the amplifier, install the solid core fiber to the LED emitting port, and the multi-core fiber to the PD receiving port for most reliable detection.



TOP PANEL INTERFACE

Opening the dust cover provides access to the top panel interface. The top panel interface consists of the RUN/PRG/ADJ mode switch, LO/DO switch, +/SET/- Navigation key, dual red/green digital displays, and output LED.

RUN/PRG/ADJ Mode Switch

The RUN/PRG/ADJ mode switch puts the sensor in RUN, PRG (Program), or ADJ (Adjust) mode.
RUN mode allows the sensor to operate normally and prevents unintentional programming changes via the +/SET/- button. PRG mode allows the sensor to be programmed through the display driven programming menu (see **Program Mode** below).
ADJ mode allows the user to perform Expert TEACH/SET methods and Manual Adjust (see **Adjust Mode** below).

CH1/CH2 Switch

The CH1/CH2 switch selects which output's parameters can be accessed and changed in the interface of the display.

- CH1 selects the Analogue Output
- CH2 selects the Discrete Output

.

+/SET/- Navigation key

The +/SET/- Navigation key is a 3-way button. The +/- positions are engaged by rocking the button left/ right.
The SET position is engaged by clicking down the button while the rocker is in the middle position.
All three button positions are used during PRG mode to navigate the display driven programming menu.
During ADJ mode, SET is used to perform TEACH/SET methods and +/- are used to manually adjust the threshold(s). The Navigation key is disabled during RUN mode, except when using Window SET (see *Window SET).*

Red/Green Digital Displays

During RUN and ADJ mode, the Red display shows the signal level and the Green display shows the threshold.
During PRG mode, both displays are used to navigate the display driven programming menu.

Dual Output LED

The output LED provides a visible indication when the output is activated.

- 1 represents the Channel 1 analogue output. When on, it indicates that the signal is within the analogue range.
- 2 represents the Channel 2 discrete output. When on, it indicates that the output is conducting.

Teach / Set methods

For more information about how to perform TEACH/SET methods, see the www.datalogic.com.

Run Mode

Run mode allows the sensor to operate normally and prevents unintentional programming changes.

In CH1 RUN mode, the +/SET/- Navigation key is used to view the analogue endpoints and midpoint signal values.

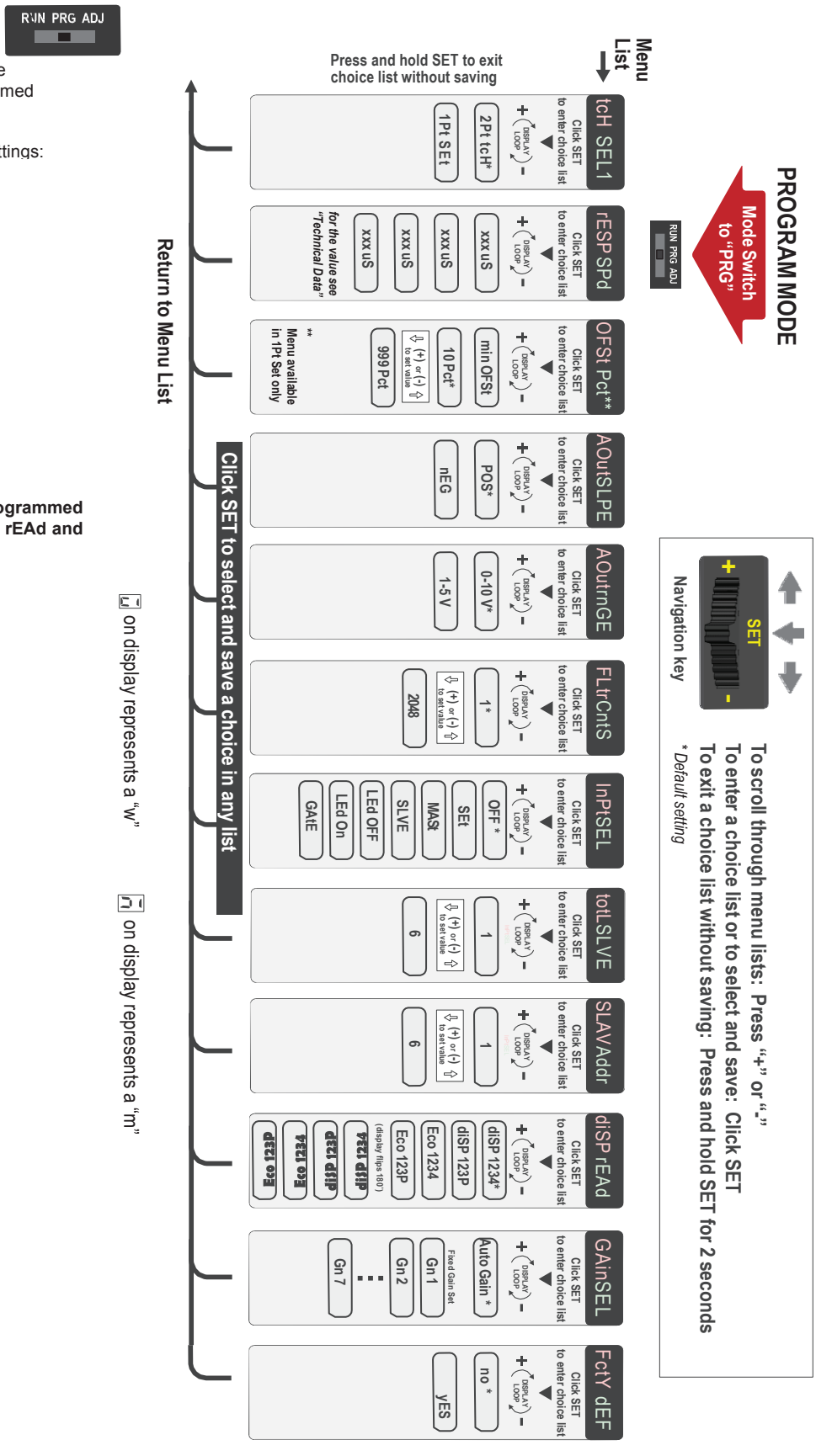
The +/SET/- Navigation key is disabled during CH2 RUN mode, except when using Window SET (see *Window SET*).

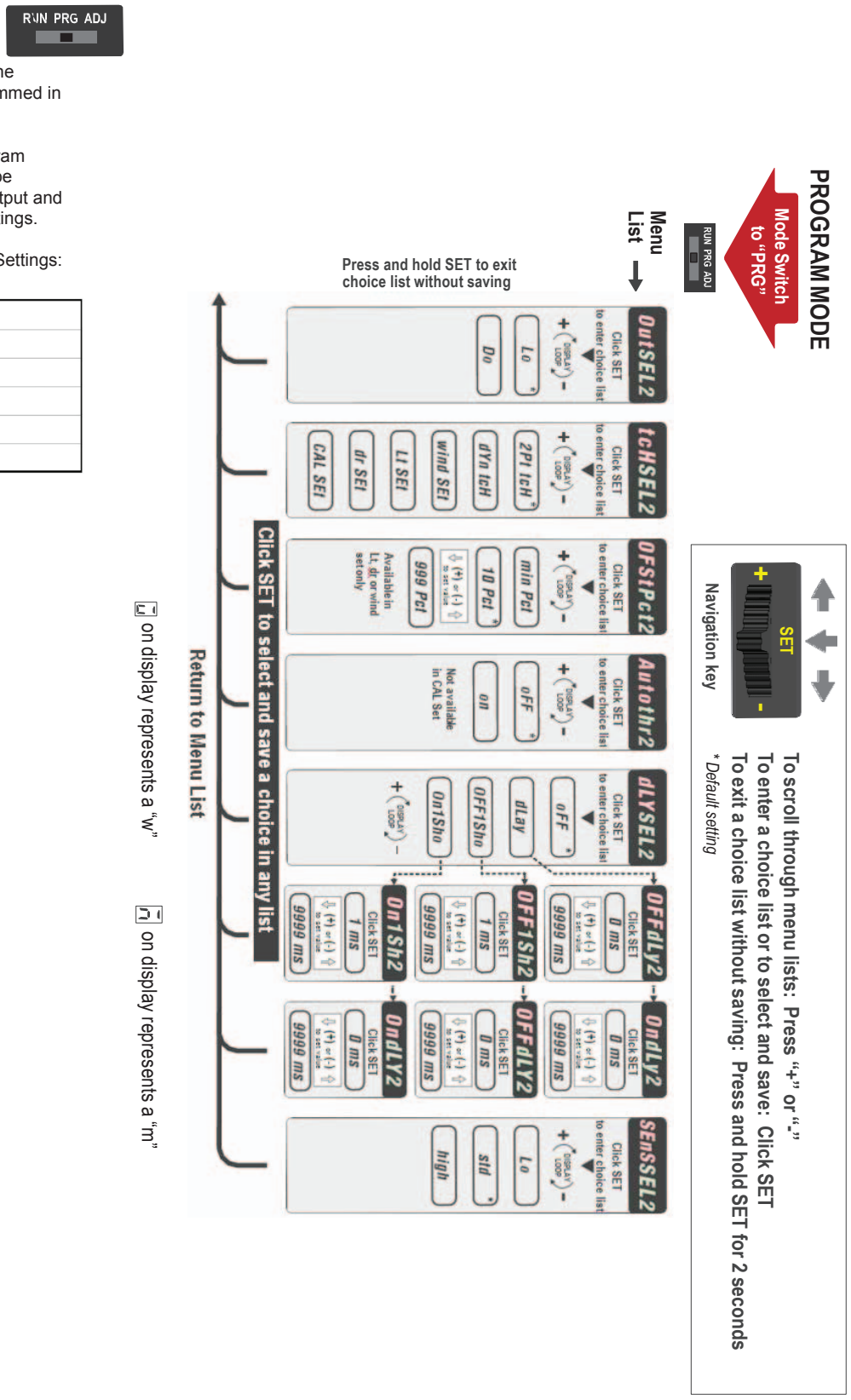
Channel 1 Analogue Menu
Program (PRG) mode allows the following settings to be programmed in the S70.

CH1 Analog Factory Default Settings:

tch SEL1	2-pt tch
rESP SPd	2 ms
OFSt Pct1	10 Pct
AOut SLPE	POS
AOut RnGE	1 to 5 V
FLtr CntS	1
diSP rEAd	diSP 1234
GAin SEL	6

NOTE: The CH1 settings programmed for rESP SPd, inPt SEL, diSP rEAd and GAin SEL also apply to CH2.





on display represents a "w"

on display represents a "m"

Channel 2 Discrete Menu

Program (PRG) mode allows the following settings to be programmed in the S70.

When CH2 is selected in Program mode, the settings below can be configured for CH2 discrete output and are independent from CH1 settings.

CH2 Discrete Factory Default Settings:

Out SEL2	LO
tch SEL2	2-pt tch
OFSt Pct2	10 pct
Auto thr2	oFF
dLY SEL2	oFF
SEnS SEL2	Std

ADJUST MODE

Sliding the RUN/PRG/ADJ mode switch to the ADJ position allows the user to perform Expert TEACH/SET methods and Manual Adjustment of the threshold and the midpoint or endpoints of the analogue output depending on whether a 1-point SET or 2-point TEACH was used.

NOTE: For threshold and analogue endpoints, when teaching CH2, the gain setting will be the same as the gain setting made during the CH1 teach. Reteaching CH1 may invalidate the previous CH2 teach.

TEACH Procedures

The instruction manual has detailed instructions for these TEACH modes:

CH1 Analogue	CH2 Discrete
Two-Point TEACH One-Point SET	Two-Point TEACH Dynamic TEACH Window SET Light SET Dark SET Calibration SET

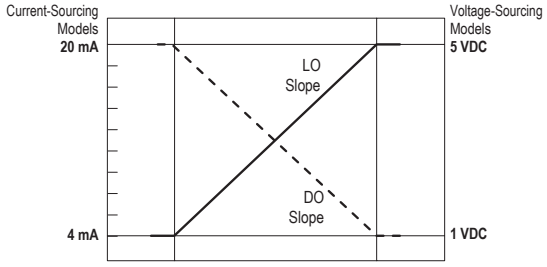
CH1 Analogue Output

- Two-Point TEACH

- Establishes defined endpoints for the analogue output range
- Analogue endpoints can be adjusted by using the "+" and "-" Navigation key (Manual Adjust)

Two-Point TEACH is used when two conditions can be presented statically to the sensor. The first taught condition is set to 1 V (4 mA), and the second taught condition to 5 V (20 mA). The order of the taught points determines the slope. If the first taught condition is darker, the slope will be positive. If the first taught condition is lighter, the slope will be negative. Reverse the slope of the analog output by changing the AOut SLPE menu setting.

NOTE: Depending on the application configuration and fibers used, the analogue function may or may not behave linearly. The received light intensity will be dictated by the inverse square properties of light.

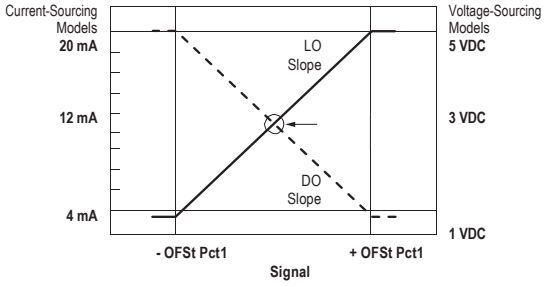


Two-Point TEACH (Light Operate shown)

- One-Point SET

- Defines the 3 V (12 mA) midpoint of the analogue output
- Analogue midpoint can be adjusted by using the "+" and "-" Navigation key (Manual Adjust)

A single sensing condition is presented, and the sensor positions the midpoint of its analogue range (3 V or 12 mA) exactly at the presented condition. The size of the window is determined by the OFSt Pct1 menu setting. The slope of the analogue output is determined by the AOut SLPE setting.



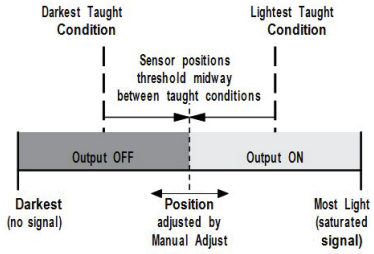
One-Point SET (Light Operate shown)

CH2 Discrete Output

- Two-Point TEACH

- Establishes a single switching threshold
- Threshold can be adjusted by using the "+" and "-" Navigation key (Manual Adjust)

Two-Point TEACH is used when two conditions can be presented statically to the sensor.
The sensor locates a single sensing threshold (the switch point) midway between the two taught conditions, with the Output ON condition on one side, and the Output OFF condition on the other.



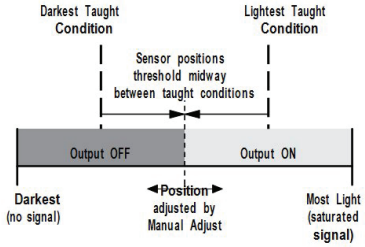
Two-Point TEACH (Light Operate shown)

Reverse the Output ON and OFF conditions by using the LO/DO (Light Operate/ Dark Operate) selection through the program interface for the dual output model.

- Dynamic TEACH

- Teaches on-the-fly
- Establishes a single switching threshold
- Threshold can be adjusted using "+" and "-" Navigation key (Manual Adjust)

Dynamic TEACH is best used when a machine or process may not be stopped for teaching. The sensor learns during actual sensing conditions, taking multiple samples of the light and dark conditions and automatically setting the threshold at the optimum level (see Fig.*3*).



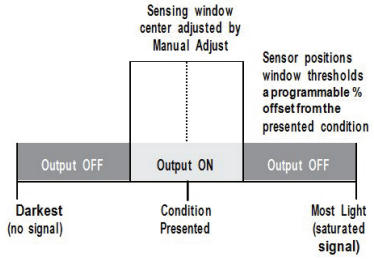
Dynamic TEACH (Light Operate shown)

Reverse the CH2 Output ON and OFF conditions by using the LO/DO (Light Operate/ Dark Operate) selection through the program interface.

- Window SET

- Sets window thresholds that extend a programmable % offset above and below the presented condition
- All other conditions (lighter or darker) cause the output to change state
- Sensing window center can be adjusted using "+" and "-" Navigation key (Manual Adjust)
- Recommended for applications where a product may not always appear in the same place, or when other signals may appear
- See Program Mode in the user's manual for programming the Offset Percent setting (to increase/decrease the window size)

A single sensing condition is presented, and the sensor positions window thresholds a programmable % offset above and below the presented condition. In LO mode, Window SET designates a sensing window with the Output ON condition inside the window, and the Output OFF conditions outside the window.



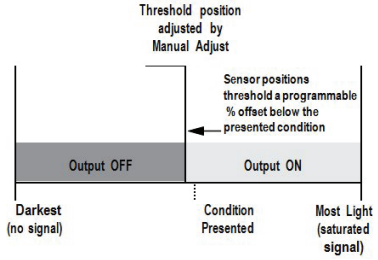
Window SET (Light Operate shown)

Reverse the Output ON and OFF conditions by using the LO/DO (Light Operate/ Dark Operate) selection through the program interface for the dual output model.

- Light SET

- Sets a threshold a programmable % offset below the presented condition
- Changes output state on any condition darker than the threshold condition
- Threshold can be adjusted using "+" and "-" Navigation key (Manual Adjust)
- Recommended for applications where only one condition is known, for example a stable light background with varying darker targets
- See *Program Mode* for programming the Offset Percent setting

A single sensing condition is presented, and the sensor positions a threshold a programmable % offset below the presented condition. When a condition darker than the threshold is sensed, the output either turns ON or OFF, depending on the LO/DO setting.



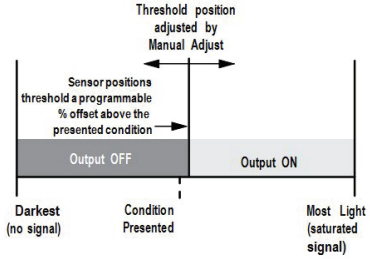
Light SET (Light Operate shown)

- Dark SET

- Sets a threshold a programmable % offset above the presented condition
- Any condition lighter than the threshold condition causes the output to change state
- Threshold can be adjusted using "+" and "-" Navigation key (Manual Adjust)
- Recommended for applications where only one condition is known, for example a stable dark background with varying lighter targets
- See *Program Mode* on page 5 for programming the Offset Percent setting

NOTE: Offset Percent MUST be programmed to Minimum Offset to accept conditions of no signal (0 counts).

A single sensing condition is presented, and the sensor positions a threshold a programmable % offset above the presented condition. When a condition lighter than the threshold is sensed, the output either turns ON or OFF, depending on the LO/DO setting.

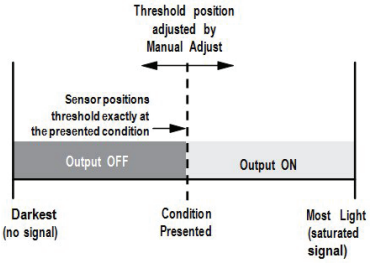


Dark SET (Light Operate shown)

- Calibration SET

- Sets a threshold exactly at the presented condition
- Threshold can be adjusted using "+" and "-" Navigation key (Manual Adjust)

A single sensing condition is presented, and the sensor positions a threshold exactly at the presented condition. When a condition lighter than the threshold is sensed, the output either turns ON or OFF, depending on the LO/DO setting.



Calibration SET (Light Operate shown)

TECHNICAL DATA

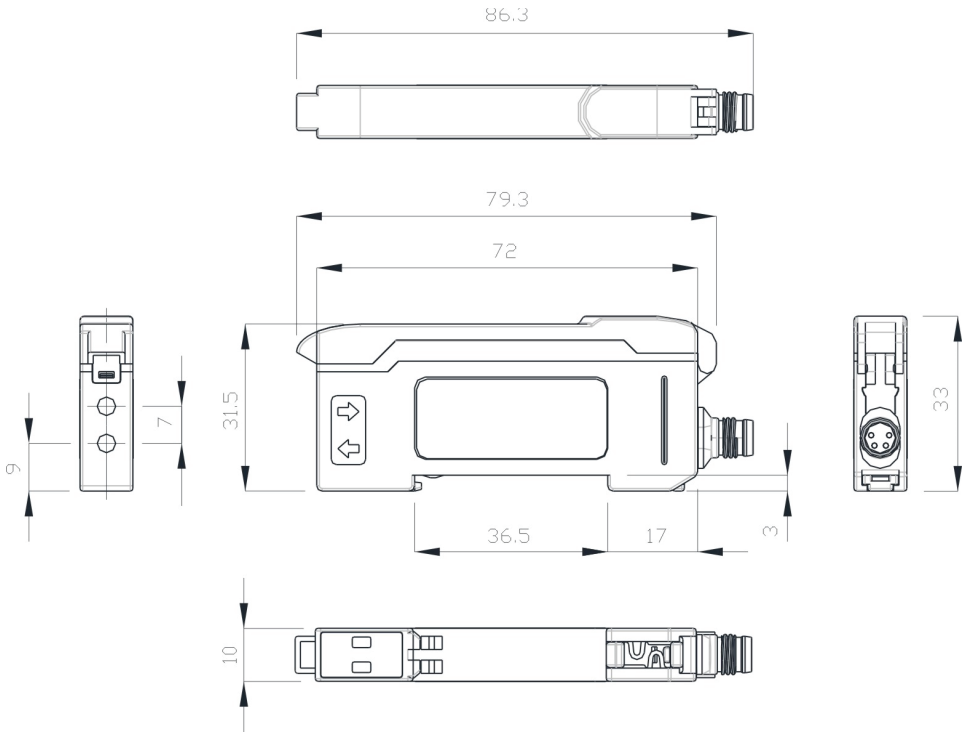
Sensing Beam:	Visible red, 635 nm
Supply Voltage:	**Voltage output models:** 12 to 30 VDC Class 2 (10% maximum ripple) **Current output models:** 10 to 30 VDC Class 2 (10% maximum ripple)
Power and Current Consumption (exclusive of load):	**Standard display mode:** 840 mW, Current consumption < 35 mA at 24 VDC **ECO display mode:** 672 mW, Current consumption < 28 mA at 24 VDC
Supply Protection Circuitry:	Protected against reverse polarity, overvoltage, and transient voltages
Delay at Power Up:	500 milliseconds max.; outputs do not conduct during this time
Output Configuration:	**Voltage Output Models:** 1 analogue voltage output (user configurable as 1 to 5 V or 0 to 10 V) with 1 current sinking (NPN) or 1 current sourcing (PNP) discrete output, depending on model. **Current Output Models:** 1 analogue current output (4 to 20 mA) with 1 current sinking (NPN) or 1 current sourcing (PNP) discrete output, depending on model
Discrete Output Rating:	100 mA maximum combined load—analogue plus discrete outputs (derate 1 mA per °C above 30 °C) **OFF-state leakage current:** < 5 µA at 30 VDC; **ON-state saturation voltage: NPN:** < 1.5 V; **PNP :** < 2 V
Analogue Output Recovery Time:	< 2× the selected response speed
Analogue Output Ripple Content (p-p):	< 0.5% of the full scale analogue output
Analogue Output Rating:	**Voltage Outputs:** 2.5 kOhm minimum load resistance **Current Outputs:** 1 kOhm maximum load resistance at 24 V; maximum load resistance = [(Vcc - 4)/.02] Ohms
Output Protection:	Protected against output short-circuit, continuous overload, transient over-voltages, and false pulse on power up
Construction:	Black ABS / Polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover
Environmental Rating:	IEC IP50, NEMA 1
Operating Temperature:	−10 °C … +55 °C
Storage Temperature:	−20 °C… +85 °C
Humidity:	50% at +50 °C maximum relative humidity (non- condensing)
Connections:	4-pin M8 connector

Response Speed and Features

Description	Response Speed	Repetition Period	Repeatability	Cross-Talk Avoidance	Energy Efficient Light Resistance	Maximum Range
High Speed	250 µs	50 µs	50 µs	No	No	900 mm
Fast	500 µs	50 µs	75 µs	Yes	No	1125 mm
Standard	1 ms	50 µs	90 µs	Yes	Yes	1125 mm
Long Range	4 ms	50 µs	90 µs	Yes	Yes	1462.5 mm
Extra Long Range	12 ms	50 µs	90 µs	Yes	Yes	2250 mm

NOTE: These values are valid for opposed mode sensing using a 1 mm diameter core plastic fiber.

OVERALL DIMENSIONS



Dimensions in mm

Datalogic S.r.l.
Via S. Vitalino 13 - 40012 Calderara di Reno - Italy
Tel: +39 051 3147011 - Fax: +39 051 3147205 - www.datalogic.com

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S70 Series

Advanced sensor with dual digital displays
for use with plastic and glass fiber optic assemblies

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Figure 1

1	Output LED
2	LO/DO Switch
3	RUN/PRG/ADJ Mode Switch
4	Lever Action Fiber Clamp
5	Red Signal Level
6	Green Threshold
7	+/SET/- Navigation key

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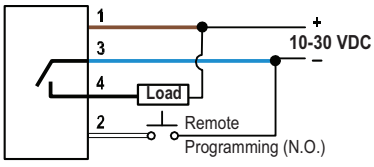
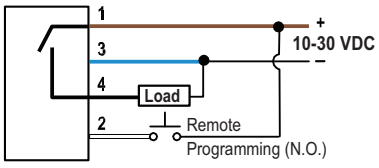
	Outputs	Connector[1]
S70-2-E1-N	Single NPN	2 m cable, 4-wire
S70-2-E1-P	Single PNP	
S70-5-E1-N	Single NPN	Integral M8 Pico QD connector, 4-pin
S70-5-E1-P	Single PNP	
S70-5-E1-PZ	Dual outputs, 1 push-pull IO-Link and 1 PNP (complementary outputs)	
S70-5-E2-N	Single NPN	Integral M8 Pico QD connector, 4-pin
S70-5-E2-P	Single PNP	

CONNECTIONS

NPN Version



PNP Version



Key
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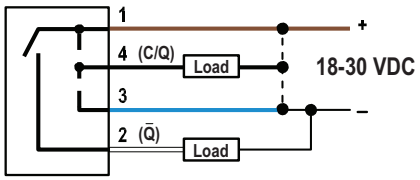
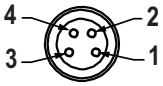
IO-Link Version



Pico



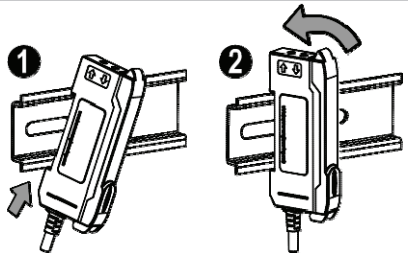
NOTE: Open lead wires must be connected to a terminal block.

1 A model with a QD connector requires a mating cordset.

MOUNTING INSTRUCTIONS

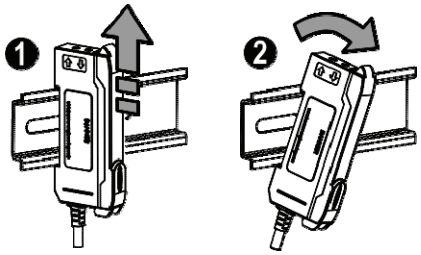
Mount on a DIN Rail

1. Hook the DIN rail clip on the bottom of the S70 over the edge of the DIN rail (1).
2. Push the S70 up on the DIN rail (1).
3. Pivot the S70 onto the DIN rail, pressing until it snaps into place (2).



Remove from a DIN rail

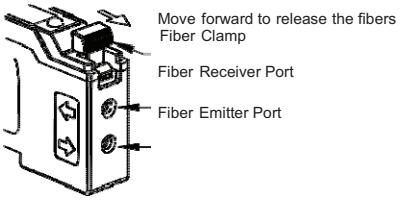
1. Push the S70 up on the DIN rail (1).
2. Pivot the S70 away from the DIN rail and remove it (2).



INSTALLING THE FIBERS

Follow these steps to install glass or plastic fibers.

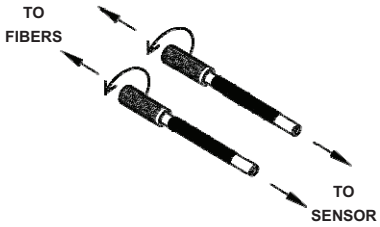
1. Open the dust cover.
2. Move the fiber clamp forward to unlock it.
3. Insert the fiber(s) into the fiber port(s) until they stop.
4. Move the fiber clamp backward to lock the fiber(s).
5. Close the dust cover.



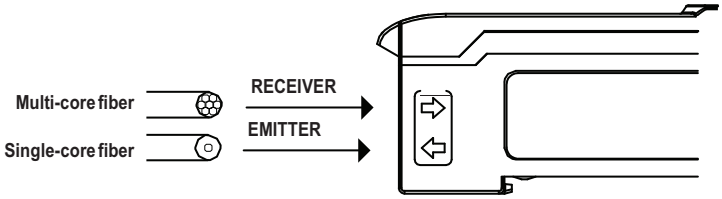
Fiber Adapters

NOTE: If a thin fiber with less than 2.2 mm outer diameter is used, install the fiber adapter provided with the fiber assembly to ensure a reliable fit in the fiber holder. Datalogic includes the adapters with all fiber assemblies.

Fiber Outer Diameter (mm)	Adapter Color
Ø 1.0	Black
Ø 1.3	Red
Ø 2.2	No adapter needed



When connecting coaxial-type fiber assemblies to the amplifier, install the solid core fiber to the LED emitting port, and the multi-core fiber to the PD receiving port for most reliable detection.



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The RUN/PRG/ADJ mode switch puts the sensor in RUN, PRG (Program), or ADJ (Adjust) mode.
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ADJ mode allows the user to perform Expert TEACH/SET methods and Manual Adjust (see **Adjust Mode** below).

LO/DO Switch

The LO/DO switch is used to select Light Operate or Dark Operate mode. In Light Operate mode, the output is ON when the sensing condition is above the threshold (for Window SET, the output is ON when the sensing condition is inside the window). In Dark Operate mode, the output is ON when the sensing condition is below the threshold (for Window SET, the output is ON when the sensing condition is outside the window).

+/SET/- Navigation key

The +/SET/- Navigation key is a 3-way button. The +/- positions are engaged by rocking the button left/right.
The SET position is engaged by clicking down the button while the rocker is in the middle position. All three button positions are used during PRG mode to navigate the display driven programming menu.
During ADJ mode, SET is used to perform TEACH/SET methods and +/- are used to manually adjust the threshold(s). The Navigation key is disabled during RUN mode, except when using Window SET, see *Window SET*.

Red/Green Digital Displays

During RUN and ADJ mode, the Red display shows the signal level and the Green display shows the threshold.
During PRG mode, both displays are used to navigate the display driven programming menu.

Output LED

The output LED provides a visible indication when the output is activated.

Remote Input / IO-Link

For more information about how to perform TEACH/SET methods, to program the sensor remotely, or to interface with the sensor via IO-Link, see the www.datalogic.com.

Run Mode

Run mode allows the sensor to operate normally and prevents unintentional programming changes.
The +/SET/- Navigation key is disabled during RUN mode, except when using Window SET, see *Window SET*.

Program Mode

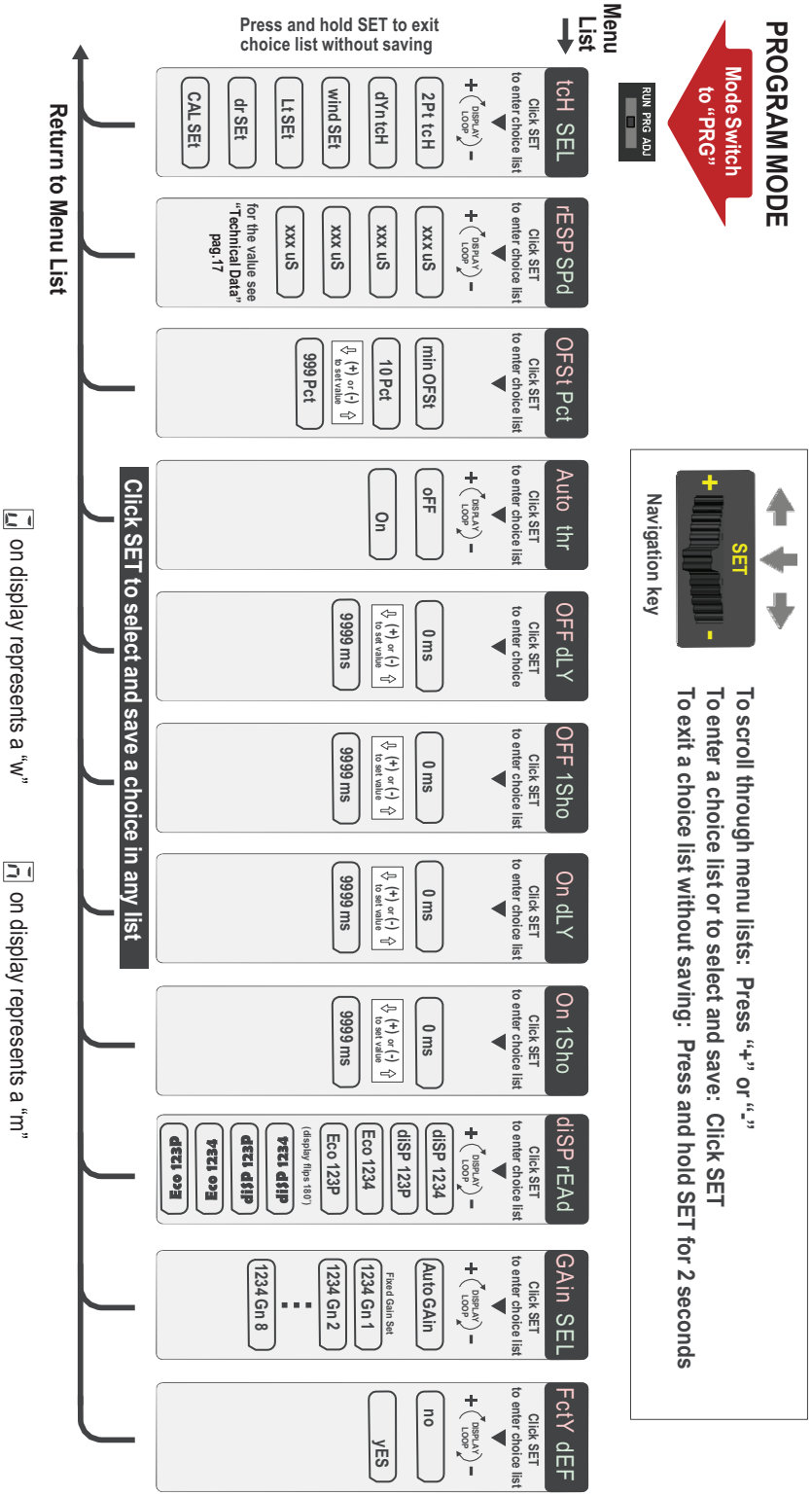
Program (PRG) mode allows the following settings to be programmed in the S70:

S70-E1 Factory Default Settings:

Setting	Factory Default
Threshold	2026
TEACH Selection	Two-Point TEACH
Response Speed	Standard: 500 µs
Offset Percent	10%
Auto Thresholds	OFF
OFF Delay	0 (Disabled)
OFF One-Shot	0 (Disabled)
ON Delay	0 (Disabled)
ON One-Shot	0 (Disabled)
Display Readout	Numeric, ECO disabled, Normal Orientation
Gain Selection	Auto Gain

S70-E2 Factory Default Settings:

Setting	Factory Default
Threshold	2011
TEACH Selection	Two-Point TEACH
Response Speed	Standard: 250 µs
Offset Percent	10%
Auto Thresholds	OFF
OFF Delay	0 (Disabled)
OFF One-Shot	0 (Disabled)
ON Delay	0 (Disabled)
ON One-Shot	0 (Disabled)
Display Readout	Numeric, ECO disabled, Normal Orientation
Gain Selection	Auto Gain



ADJUST MODE

Sliding the RUN/PRG/ADJ mode switch to the ADJ position allows the user to perform Expert TEACH/SET methods and Manual Adjustment of the threshold(s).

Two-Point TEACH

- Establishes a single switching threshold
- Threshold can be adjusted using "+" and "-" Navigation key (Manual Adjust)

Two-Point TEACH is used when two conditions can be presented statically to the sensor.
The sensor locates a single sensing threshold (the switch point) midway between the two taught conditions, with the Output ON condition on one side, and the Output OFF condition on the other (see Fig.2).

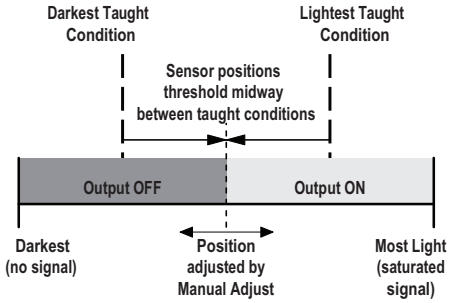


Figure 2. Two-Point TEACH (Light Operate shown)

The Output ON and OFF conditions can be reversed by using the LO/DO (Light Operate / Dark Operate) switch (see **LO/DO Switch** in *Top Panel Interface*).

Two-Point TEACH and Manual Adjust

Moves switching threshold value up or down to make adjustments

- Slide Mode switch to ADJ to enter Adjust mode
- Press "+" to increase; press "-" to decrease
  - GREEN display shows the switching threshold value
  - 2 seconds after adjustment, the GREEN display will flash 3 times to confirm
- Slide Mode switch to RUN to complete operation

> ***Remember:*** *Manual adjustments are disabled when Auto Thresholds are ON*

Follow these steps to perform a Two-Point TEACH:

> ***NOTE:*** *TEACH Selection must be programmed to* ***2Pt tcH*** *(see Program Mode)*

1. Enter Adjust mode.

Method	Action	Result
SET Button [2]	Set the Mode switch to ADJ. 	Display: Red - Signal Level; Green - Threshold 
Remote Input [3]	No action is required; sensor is ready for the Two-Point TEACH method	

[2] *SET Button: 0.04 seconds ≤ "Click" ≤ 0.8 seconds*
[3] *Remote Input: 0.04 seconds ≤ T ≤ 0.8 seconds*

2. Teach the first condition.

Method	Action	Result
SET Button	a. Present the first condition. b. Click the SET Navigation key 	Display: Flashes "**2Pt tch**" then holds on "**1234 2nd**"  
Remote Input	a. Present the first condition b. Single-pulse the remote input  **NOTE:** Negative pulse for NPN models, positive pulse for PNP models.	

3. Teach the second condition.

Method	Action	Result
SET Button	a. Present the second condition. b. Click the SET Navigation key. 	**TEACH Accepted** Displays alternate "**PASS**" and % Minimum Difference[4]; Sensor returns to Adjust mode  
Remote Input	a. Present the second condition. b. Single-pulse the remote input. 	**TEACH Not Accepted** Displays alternate "**FAIL**" and % Minimum Difference[4]; Sensor returns to Adjust mode  

4. Return to Run mode.

Method	Action	Result
SET Button	Move the Mode switch to RUN 	Display: Red - Signal Level; Green - Threshold 
Remote Input	No action is required; sensor returns to RUN mode automatically	

Dynamic TEACH

- Teaches on-the-fly
- Establishes a single switching threshold
- Threshold can be adjusted using "+" and "-" Navigation key (Manual Adjust)

Dynamic TEACH is best used when a machine or process may not be stopped for teaching. The sensor learns during actual sensing conditions, taking multiple samples of the light and dark conditions and automatically setting the threshold at the optimum level (see Fig.*3*).

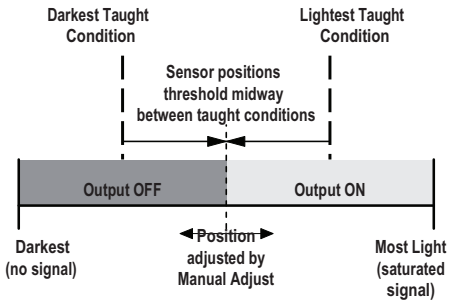


Figure 3. Dynamic TEACH (Light Operate shown)

The output ON and OFF conditions can be reversed using the LO/DO switch (see **LO/DO Switch** in *Top Panel Interface*).

4 See Troubleshooting on page 16 for more explanation of the % Minimum Difference displayed after the Two-Point TEACH method

Dynamic TEACH and Manual Adjust

Moves switching threshold value up or down to make adjustments

- Slide Mode switch to ADJ to enter Adjust mode
- Press "+" to increase; press "-" to decrease
  - GREEN display shows the switching threshold value
  - 2 seconds after adjustment, GREEN display will flash 3 times to confirm
- Slide Mode switch to RUN to complete operation

> ***Remember:*** *Manual adjustments are disabled when Auto Thresholds are ON*

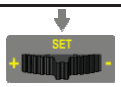
Follow these steps to perform a **Dynamic TEACH**:

> ***NOTE:*** *TEACH Selection must be programmed to* ***dYn tcH*** *(see Program Mode)*

1. Enter Adjust Mode.

Method	Action	Result
SET Button [5]	Set Mode switch to ADJ 	Display: Red - Signal Level; Green - Threshold 
Remote Input [6]	No action required; sensor is ready for Dynamic TEACH method	

2. Enter Dynamic TEACH.

Method	Action	Result
SET Button	Click the SET Navigation key 	Display: Flashes "**dYn tch**" then holds on "**1234 dYn**"
Remote Input	Single-pulse remote input 	 

3. Present ON and OFF Conditions.

Method	Action	Result
SET Button	Present ON and OFF conditions	Display: Red - Signal Level; Green - Threshold
Remote Input	Present ON and OFF conditions	

[5] *SET Button: 0.04 seconds ≤ "Click" ≤ 0.8 seconds*
[6] *Remote Input: 0.04 seconds ≤ T ≤ 0.8 seconds*

4. Exit Dynamic TEACH.

Method	Action	Result
SET Button	Click the SET Navigation key 	**TEACH Accepted** Displays alternate "**PASS**" with % Minimum Difference[7], Sensor returns to Adjust mode   **TEACH Not Accepted** Displays alternate "**FAIL**" with % Minimum Difference[7], Sensor returns to Adjust mode  
Remote Input	Single-pulse remote input 	

5. Return to RUN Mode.

Method	Action	Result
SET Button	Move Mode switch to RUN 	Display: Red - Signal Level; Green - Threshold 
Remote Input	No action required; sensor returns to RUN mode automatically	

Window SET

- Sets window thresholds that extend a programmable % offset above and below the presented condition
- All other conditions (lighter or darker) cause the output to change state
- Sensing window center can be adjusted using "+\" and "-" Navigation key (Manual Adjust)
- Recommended for applications where a product may not always appear in the same place, or when other signals may appear
- See Program Mode in the user's manual for programming the Offset Percent setting (to increase/decrease the window size)

A single sensing condition is presented, and the sensor positions window thresholds a programmable % offset above and below the presented condition. In LO mode, Window SET designates a sensing window with the Output ON condition inside the window, and the Output OFF conditions outside the window (see Fig.4).

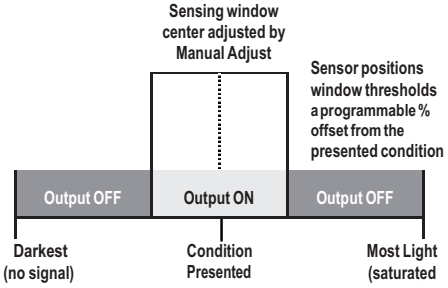


Figure 4. Window SET (Light Operate shown)

Output ON and OFF conditions can be reversed using the LO/DO switch (see **LO/DO Switch** in *Top Panel Interface*).

7 *See Troubleshooting on page 16 for more explanation of the % Minimum difference displayed after the Dynamic TEACH method.*

Window SET and Manual Adjust

Moves sensing window center value up or down to make adjustments

- Slide Mode switch to ADJ to enter Adjust mode
- Press "+" to increase; press "-" to decrease
  - GREEN display shows the sensing window center value
  - 2 seconds after adjustment, the GREEN display will flash 3 times to confirm
- Slide Mode switch to RUN to complete operation

> ***Remember:*** *Manual adjustments are disabled when Auto Thresholds are ON*

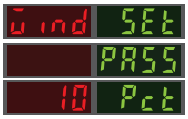
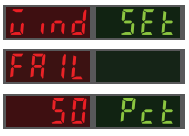
Follow these steps to perform a Window SET:

> ***Note:*** *TEACH Selection must be programmed to* ***wind SEt*** *(see Program Mode)*

1. Enter Adjust Mode

Method	Action	Result
SET Button [8]	Set Mode switch to ADJ 	Display: Red - Signal Level; Green - Threshold 
Remote Input [9]	No action required; sensor is ready for Window SET method	

2. SET Sensing Condition

Method	Action	Result
SET Button	• Present sensing condition • Click the SET Navigation key 	**Threshold Condition Accepted** Displays read "**wInd SEt**" then alternate "**PASS**" with % Offset[10]; Sensor returns to Adjust mode  **Threshold Condition Not Accepted** Displays read "**wInd SEt**" then alternate "**FAIL**" with minimum % Offset[10] for sensing condition; Sensor returns to Adjust mode 
Remote Input	• Present sensing condition • Single-pulse the remote input 	

1. Return to RUN Mode

Method	Action	Result
SET Button	Move Mode switch to Run 	Display: Red - Signal Level; Green - Window Center (see *Figure 5* for instructions on how to display upper and lower thresholds) 
Remote Input	No action required; sensor returns to Run mode automatically	

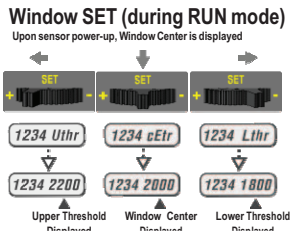


Figure 5. Upper and Lower Thresholds

[8] *SET Button: 0.04 seconds ≤ "Click" ≤ 0.8 seconds*
[9] *Remote Input: 0.04 seconds ≤ T ≤ 0.8 seconds*
[10] *See Troubleshooting on page 16 for more explanation of the % Offset displayed after the Window SET method.*

Light SET

- Sets a threshold a programmable % offset below the presented condition
- Changes output state on any condition darker than the threshold condition
- Threshold can be adjusted using "+" and "-" Navigation key (Manual Adjust)
- Recommended for applications where only one condition is known, for example a stable light background with varying darker targets
- See *Program Mode* for programming the Offset Percent setting

A single sensing condition is presented, and the sensor positions a threshold a programmable % offset below the presented condition. When a condition darker than the threshold is sensed, the output either turns ON or OFF, depending on the LO/DO switch setting (see **LO/DO Switch** in *Top Panel Interface*).

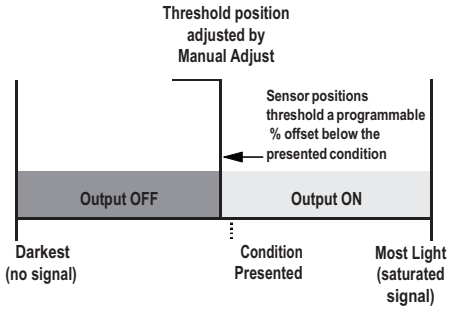


Figure 6. Light SET (Light Operate shown)

Light SET and Manual Adjust

Moves switching threshold value up or down to make adjustments

- Slide Mode switch to ADJ to enter Adjust mode
- Press "+" to increase; press "-" to decrease
  - GREEN display shows the switching threshold value
  - 2 seconds after adjustment, the GREEN display will flash 3 times to confirm
- Slide Mode switch to RUN to complete operation

> ***Remember:*** *Manual adjustments are disabled when Auto Thresholds are ON*

Follow these steps to perform a Light SET:

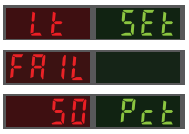
> ***Note:*** *TEACH Selection must be programmed to* ***Lt SEt*** *(see Program Mode)*

1. Enter Adjust Mode

Method	Action	Result
SET Button [11]	Set Mode switch to ADJ 	Display: Red - Signal Level; Green - Threshold 
Remote Input [12]	No action is required; sensor is ready for Light SET method	

[11] *SET Button: 0.04 seconds ≤ "Click" ≤ 0.8 seconds*
[12] *Remote Input: 0.04 seconds ≤ T ≤ 0.8 seconds*

2. SET Sensing Condition

Method	Action	Result
SET Button	• Present sensing condition • Click the SET Navigation key 	**Threshold Condition Accepted** Displays read "**Lt SEt**" then alternate "**PASS**" with % Offset[13]; Sensor returns to Adjust mode  **Threshold Condition Not Accepted** Displays read "**Lt SEt**" then alternate "**FAIL**" with minimum % Offset[13] for sensing condition; Sensor returns to Adjust mode 
Remote Input	• Present sensing condition • Single-pulse the remote input 	

3. Return to RUN Mode

Method	Action	Result
SET Button	Move Mode switch to RUN 	Display: Red - Signal Level; Green - Threshold 
Remote Input	No action required; sensor returns to RUN mode automatically	

Dark SET

- Sets a threshold a programmable % offset above the presented condition
- Any condition lighter than the threshold condition causes the output to change state
- Threshold can be adjusted using "+" and "-" Navigation key (Manual Adjust)
- Recommended for applications where only one condition is known, for example a stable dark background with varying lighter targets
- See *Program Mode* for programming the Offset Percent setting

> ***NOTE:*** *Offset Percent MUST be programmed to* ***Minimum Offset*** *to accept conditions of no signal (0 counts).*

A single sensing condition is presented, and the sensor positions a threshold a programmable % offset above the presented condition. When a condition lighter than the threshold is sensed, the output either turns ON or OFF, depending on the LO/DO switch setting (see **LO/DO Switch** in *Top Panel Interface*).

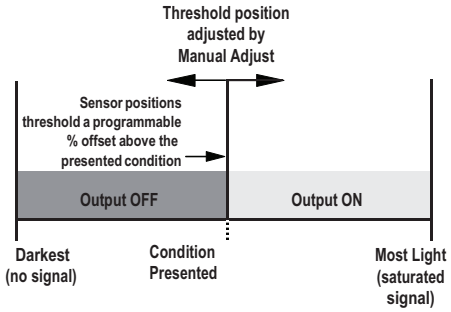


Figure 7. Dark SET (Light Operate shown)

[13] *See Troubleshooting for more explanation of the % Offset displayed after the Light SET method.*

Dark SET and Manual Adjust

Moves switching threshold value up or down to make adjustments

- Slide Mode switch to ADJ to enter Adjust mode
- Press "+" to increase; press "-" to decrease
  - ◦GREEN display shows the switching threshold value
  - ◦2 seconds after adjustment, the GREEN display will flash 3 times to confirm
- Slide Mode switch to RUN to complete operation

> ***Remember**: Manual adjustments are disabled when Auto Thresholds are ON*

Follow these steps to perform a Dark SET:

> ***Note:** TEACH Selection must be programmed to **dr SEt** (see Program Mode)*

1. Enter Adjust Mode.

Method	Action	Result
SET Button [14]	Set Mode switch to ADJ 	Display: Red - Signal Level; Green - Threshold 
Remote Input [15]	No action required; sensor is ready for Dark SET method	

2. SET Sensing Condition.

Method	Action	Result
SET Button	• Present sensing condition • Click the SET Navigation key 	**Threshold Condition Accepted** Displays read "**dr SEt**" then alternate "**PASS**" with % Offset[16]; Sensor returns to Adjust mode 
Remote Input	• Present sensing condition • Single-pulse the remote input 	**Threshold Condition Not Accepted** Displays read "**dr SEt**" then alternate "**FAIL**" with minimum % Offset[16] for sensing condition; Sensor returns to Adjust mode 

3. Return to RUN Mode.

Method	Action	Result
SET Button	Move Mode switch to RUN 	Display: Red - Signal Level; Green - Threshold 
Remote Input	No action required; sensor returns to RUN mode automatically	

[14] *SET Button: 0.04 seconds ≤ "Click" ≤ 0.8 seconds*
[15] *Remote Input: 0.04 seconds ≤ T ≤ 0.8 seconds*
[16] *See Troubleshooting on page 16 for more explanation of the % Offset displayed after the Dark SET method.*

Calibration SET

- Sets a threshold exactly at the presented condition
- Threshold can be adjusted using "+" and "-" Navigation key (Manual Adjust)

A single sensing condition is presented, and the sensor positions a threshold exactly at the presented condition. When a condition lighter than the threshold is sensed, the output either turns ON or OFF, depending on the LO/DO switch setting (see **LO/DO Switch** in *Top Panel Interface*).

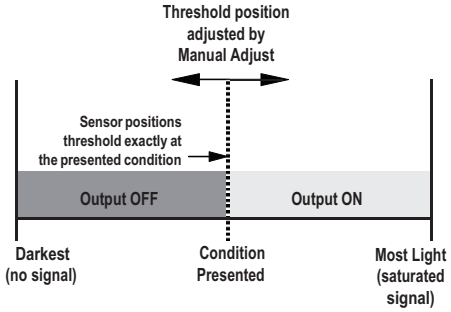


Figure 8. Calibration SET (Light Operate shown)

Calibration SET and Manual Adjust

Moves switching threshold value up or down to make adjustments

- Slide Mode switch to ADJ to enter Adjust mode
- Press "+" to increase; press "-" to decrease
  - GREEN display shows the switching threshold value
  - 2 seconds after adjustment, the GREEN display will flash 3 times to confirm
- Slide Mode switch to RUN to complete operation

> ***Remember**: Auto Thresholding is automatically disabled in Calibration SET*

Follow these steps to perform a Calibration SET:

> ***Note**: TEACH Selection must be programmed to **CAL SEt** (see Program Mode)*

1. Enter Adjust Mode

Method	Action	Result
SET Button [17]	• Set Mode switch to ADJ 	Display: Red - Signal Level; Green - Threshold 
Remote Input [18]	No action required; sensor is ready for Calibration SET method	

[17] *SET Button: 0.04 seconds ≤ "Click" ≤ 0.8 seconds*
[18] *Remote Input: 0.04 seconds ≤ T ≤ 0.8 seconds*

2. SET Sensing Condition

Method	Action	Result
SET Button	• Present sensing condition • Click the SET Navigation key 	**Threshold Condition Accepted** Displays read "**cAL SEt**" then flashes "**PASS**"; Sensor returns to Adjust mode  **Threshold Condition Unacceptable** Displays read "**cAL SEt**" then flashes "**FAIL**"; Sensor returns to Adjust mode 
Remote Input	• Present sensing condition • Single-pulse the remote input 	

1. Return to RUN Mode.

Method	Action	Result
SET Button	Move Mode switch to RUN 	Display: Red - Signal Level; Green - Threshold 
Remote Input	No action required; sensor returns to RUN mode automatically	

IO-Link Interface

IO-Link is a point-to-point communication link between a master device and sensor.
It can be used to automatically parameterize sensors and transmit process data.
For the latest IO-Link protocol and specifications, please visit the web site at *www.io-link.com*.

The IO-Link IODD package is available on the Datalogic Website at *www.datalogic.com*.

Troubleshooting

Manual Adjustments Disabled

Manual adjustments are disabled when Auto Thresholds are ON. If a manual adjustment is attempted while Auto Thresholds are ON, the Green display will flash 

Percent Minimum Difference after TEACH

The Two-Point and Dynamic TEACH methods will flash a % minimum difference on the displays after a PASS or FAIL.

Value	PASS/FAIL	Description
0 to 99%	FAIL	The difference of the taught conditions does not meet the required minimum
100 to 300%	PASS	The difference of the taught conditions just meets/exceeds the required minimum, minor sensing variables may affect sensing reliability
300 to 600%	PASS	The difference of the taught conditions sufficiently exceeds the required minimum, minor sensing variables will not affect sensing reliability
600% +	PASS	The difference of the taught conditions greatly exceeds the required minimum, very stable operation

Percent Offset after SET

The Window, Dark, and Light SET methods will flash a % offset on the displays after a PASS or FAIL.

SET Result	% Offset Meaning
PASS (with % Offset)	Displays the % offset used for the SET method
FAIL (with % Offset)	Displays the minimum required % offset necessary to PASS the SET method
FAIL (without % Offset)	Presented condition cannot be used for the SET method

Threshold Alert or Threshold Error

Severe contamination/changes in the taught condition can prevent the Auto Thresholds algorithm from optimizing the threshold(s).

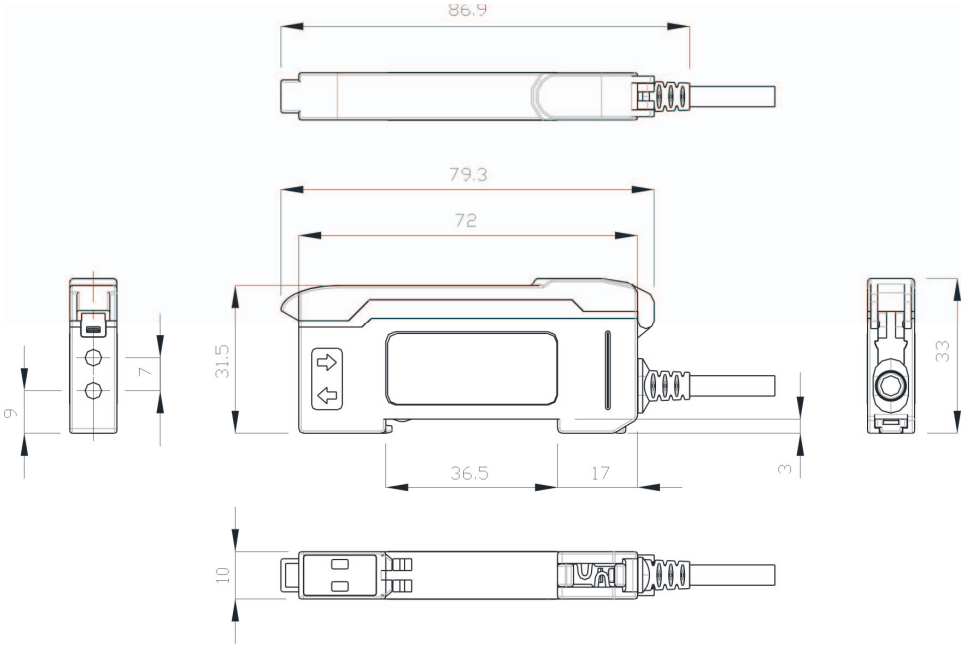
State	Display	Description	Corrective Action
Threshold Alert	Alternates  and	The threshold(s) cannot be optimized, but the sensor's output will still continue to function	Cleaning/correcting the sensing environment and/or a re-teach of the sensor is highly recommended
Threshold Error		The threshold(s) cannot be optimized, and the sensor's output will stop functioning	Cleaning/correcting the sensing environment and/or a re-teach of the sensor is required

TECHNICAL DATA

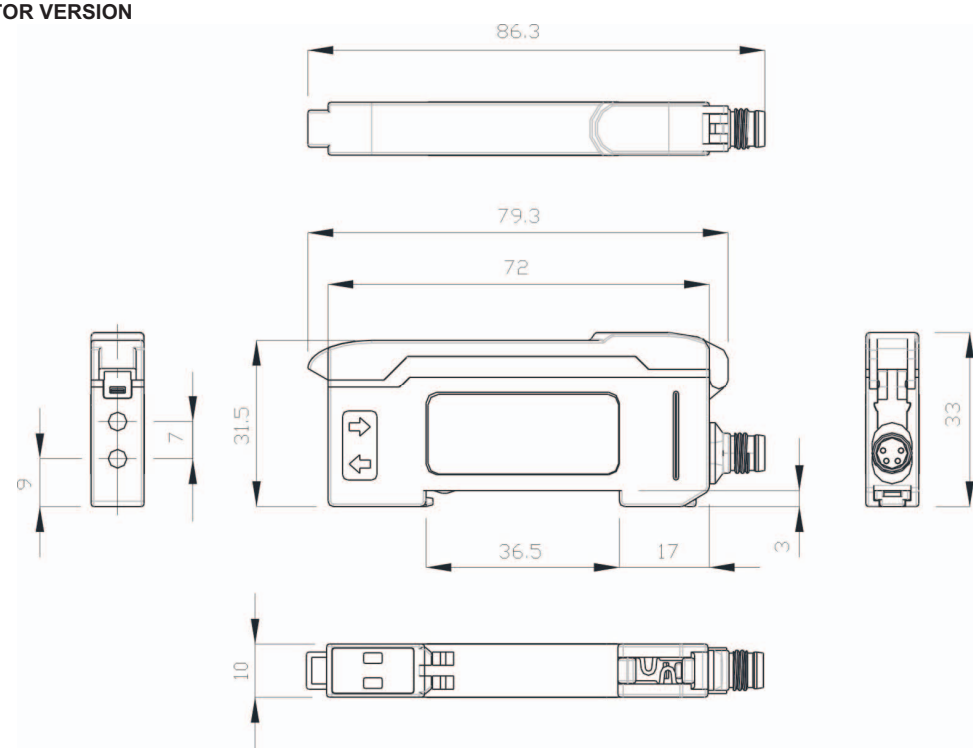
	S70-x-E1	S70-x-E2
Sensing Beam:	660 nm visible red	635 nm visible red
Supply Voltage:	**NPN/PNP models:** 10 … 30 VDC Class 2 (10% max ripple) **IO-Link models:** 18 … 30 V dc (10% max ripple)	
Power and Current Consumption (exclusive of load):	**Standard display mode:** 960 mW, Current consumption < 40 mA at 24 VDC **ECO display mode:** 720 mW, Current consumption < 30 mA at 24 VDC	
Supply Protection Circuitry:	Protected against reverse polarity, overvoltage, and transient voltages	
Delay at Power Up:	500 milliseconds max.; outputs do not conduct during this time	
Output Configuration:	**NPN/PNP models:** 1 current sinking (NPN) or 1 current sourcing (PNP) output, depending on model	
	IO-Link: 1 push-pull and 1 PNP (complementary outputs)	-
Output Rating:	100 mA max. load (derate 1 mA per °C above 30 °C) **OFF-state leakage current: NPN/PNP models:** < 5 µA at 30 VDC; **ON-state saturation voltage: NPN:** < 1.5 V; **PNP / IO-Link:** < 2 V	
	IO-Link: < 50 µA at 30 VDC	-
Output Protection:	Protected against output short-circuit, continuous overload, transient over-voltages, and false pulse on power up	
Output Response Time:	High Speed: 200 µs; Standard: 500 µs; Long Range: 2 ms; Extra Long Range: 5 ms	Super High Speed: 10 µs High Speed: 15 µs Fast: 50 µs Standard: 250 µs Medium Range: 500 µs Long Range: 1000 µs
Repeatability:	High Speed: 66 µs, Standard/Long Range: 100 µs Extra Long Range: 100 µs	Super High Speed: 5 µs High Speed: 5 µs Fast: 12 µs Standard: 50 µs Medium Range: 80 µs Long Range: 165 µs
Construction:	Black ABS / Polycarbonate alloy (UL94 V-0 rated) housing, clear polycarbonate cover	
Environmental Rating:	IEC IP50, NEMA 1	
Operating Temperature:	−10 °C … +55 °C	
Storage Temperature:	−20 °C… +85 °C	
Humidity:	90% at +60 °C maximum relative humidity (non- condensing)	
IO-Link Interface:	**Supports Smart Sensor Profile:** Yes **Baud Rate:** 38,400 bps (COM2) **Process Data Width:** 16 bits **IODD files:** Provide all programming options of top panel interface, plus additional functionality	
Certifications:	CE c UL us LISTED	
	IO-Link®	-

OVERALL DIMENSIONS

CABLE VERSION



CONNECTOR VERSION



Dimensions in mm

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