Installation Instructions
PHOTOSWITCH® Bulletin 45FVL Digital Self-Teaching Fiber Optic

IMPORTANT: SAVE THESE INSTRUCTIONS FOR FUTURE USE.



CE

Product Description

The 45FVL is a DIN rail mountable fiber optic photoelectric sensor with sophisticated detection, diagnostic and self-teach capabilities. Possible modes of sensing include transmitted beam, diffuse and retroreflective, allowing the 45FVL to be used in a variety of complex applications.

Summary of 45FVL Features

- **Self-teach capability**—Allows the 45FVL photoelectric sensor to determine an optimum sensitivity and hysteresis setting for a specific application.
- **Manual or automatic sensitivity adjustment.**
- **Back-Lit LCD Display.** Clearly displays various operating modes, functions and diagnostic information.
- **Visible red, green, white, or blue light source.**
- **Selectable 40ms off delay output timer.** "Pulse stretcher" useful in high speed applications when the output pulse must be lengthened to allow time for the machine logic to respond.
- **DIN rail mountable.** For installation convenience, a steel bracket is supplied for specific mounting requirements.
- **"Power Bus" option**. Interface which allows user to jumper power on several DIN rail mounted units to reduce unnecessary wiring.
- **Dual channel interference protection**. Prevents crosstalk between 2 sensors.
- **Short circuit protection.**
- **Reverse polarity protection.**
- **False pulse protection.**
- **Transient noise protection.**

The 45FVL photoelectric sensors are designed for use with plastic fiber optic cables up to 2.2mm diameter. An adaptor is supplied with the sensor for use with 1.25mm diameter plastic fiber optic cables. No tools are required to attach or remove fiber optic cables. Special glass fiber optic cables are also available.

Accessories

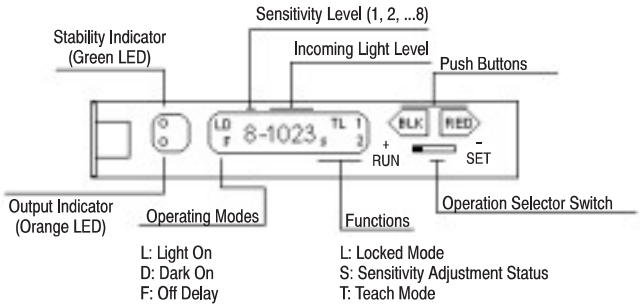
- Mounting Bracket : Quantity 1
- Instruction Manual : Quantity 1
- Fiber Adaptor : Quantity 1

General Specifications

Model					
	NPN Type	45FVL–2LG	45FVL–3LG	45FVL–6LG	45FVL–5LG
	PNP Type	45FVL–2LH	45FVL–3LH	45FVL–6LH	45FVL–5LH
Light Source		Red LED	Green LED	Blue LED	White LED
(Wave Length)		(660nm)	(565nm)	(470nm)	—
Power Supply		12 to 24V DC +/– 10% Ripple 10% or Less			
Range		Depends on Fiber			
Current Consumption		NPN Type: <39ma/PNP Type: <50ma			
Output Mode		Open Collector NPN Rated: 100ma @ 30V DC Max, <1V Residual PNP Rated: 100ma @ 30V DC Max, <2V Residual			
Operation Mode		Light On/Dark On Selectable			
Output Timer		Off delay/Nondelay Selectable Delay time: 40ms fixed			
Indicators		Orange LED = Output, Green LED = Power/Stability			
Response Time		Channel 1 = 600µs, Channel 2 = 700µs			
Interference Protection		Yes			
Short Circuit Protection		Yes			
Features		Power bus for easy wireless power distribution			
Material		Polycarbonate			
Wiring		Cable 2m (6.5ft) or 4-pin pico QD connector or Power Bus QD connector			
Operating Temperature		–25°C to +55°C (–13°F to 131°F)			
Operating Humidity		35% to 85% RH			
Operating Environment		NEMA 1, IP 40			
Vibration		10–55Hz			
Shock		50g			
Approvals		CE			

User Interface

The user interface contains a back lit LCD display, two adjustment buttons, operation selector switch, and LED indicators for configuring and viewing the sensor's operation and status. A more complete description of each item is described below.



Rockwell Automation

Allen-Bradley

Sensor Selection

Operating Voltage	Current Consumption	Output Characteristics			Response Time	LED	Catalog Number		
		Type	Max Load Current	Max Leakage Current			Cable	Pico	Power Bus (QD required)
12–24V DC +/– 10%	50ma or Less	PNP	Output: 100ma Stability: 50ma	0.5ma	600µs	Red	45FVL–2LHE–A2	45FVL–2LHE–P4	45FVL–2LHE–C4 ❶
						Green	45FVL–3LHE–A2	45FVL–3LHE–P4	45FVL–3LHE–C4 ❶
						Blue	45FVL–6LHE–A2	45FVL–6LHE–P4	45FVL–6LHE–C4 ❶
						White	45FVL–5LHE–A2	45FVL–5LHE–P4	45FVL–5LHE–C4 ❶
	39ma or Less	NPN				Red	45FVL–2LGE–A2	45FVL–2LGE–P4	45FVL–2LGE–C4 ❶
						Green	45FVL–3LGE–A2	45FVL–3LGE–P4	45FVL–3LGE–C4 ❶
						Blue	45FVL–6LGE–A2	45FVL–6LGE–P4	45FVL–6LGE–C4 ❶
						White	45FVL–5LGE–A2	45FVL–5LGE–P4	45FVL–5LGE–C4 ❶

❶ PowerBus master/3 conductor QD = 45F–A3C–A2. PowerBus slave/1 conductor QD = 45F–A1C–A2

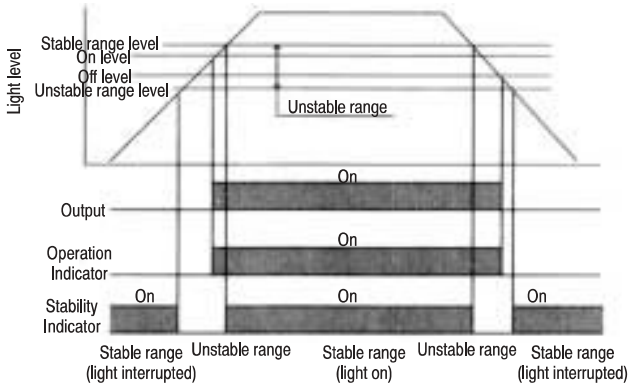
Output and Stability Indicators

Two LEDs (green and orange) indicate a variety of conditions to facilitate set-up and troubleshooting. The function of each is described in the table below. Relevant output and stability data are also shown.

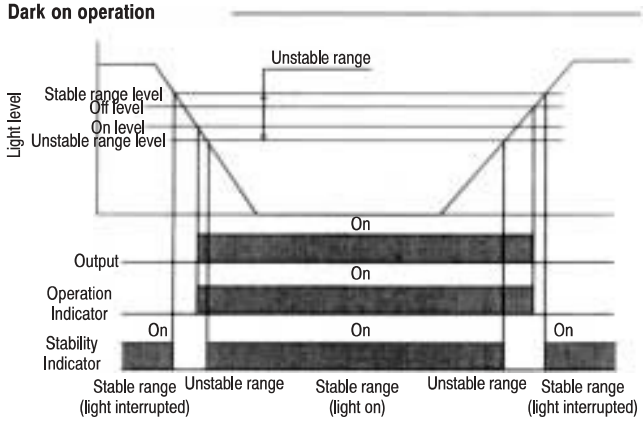
LED	State	Condition
Green	OFF ON	Unstable light signal Stable light signal
Orange	OFF ON	Output OFF Output ON

Operation Indicator and Stability Indicator

Light on operation

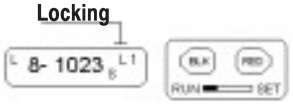


Dark on operation



Operation Selector Switch

When the selector switch is in the RUN position (see following example), the sensor will function normally, and all settings are locked from adjustment. The SET position unlocks the sensor's settings, allowing the user to either adjust the sensor manually, or use the self-teach functionality. When adjustments are complete, return the switch to the RUN position (settings become locked). If a manual sensitivity adjustment is required a user can unlock this setting by (quickly) switching from RUN to SET to RUN. The sensor will display a flashing "S" on the LCD display, and the user can now adjust the sensitivity setting. The sensor will automatically return to the locked condition 10 seconds after sensitivity adjustment is complete.



Two Adjustment Buttons

The red button is used to teach the sensor, change the frequency and to increase the sensitivity.

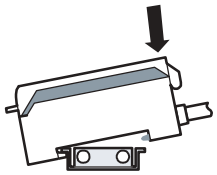
The black button is used to change the operating mode, indication mode and to decrease sensitivity.

Both buttons are inactive in the RUN mode.

Mounting the Sensor

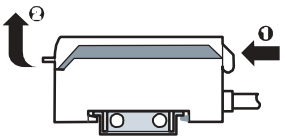
How to Attach Sensor to DIN Rail

Attach front hook of the photoelectric sensor onto rail (or Mounting bracket) and press rear end of sensor down until unit snaps into place.



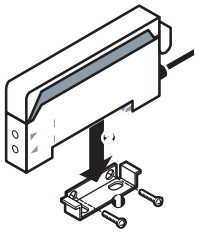
How to Detach Sensor from DIN Rail

Pushing the sensor unit forward, pull up on the front of the sensor until the front hook is detached. Remove sensor.



Side Mounting Sensor with Bracket

Fasten mounting bracket assembly using M3 screws. Tightening torque is 0.8Nm max. Attach front hook of the photoelectric sensor onto mounting bracket and press rear end of sensor down until unit snaps into place.

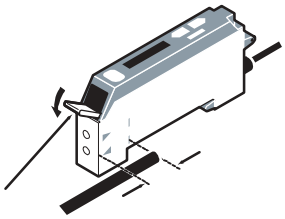


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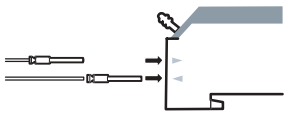
Installing the Fiber Optic Cables

- Push down the locking lever
- Insert fiber all the way
- Lift locking lever to lock fiber in place

Maximum fiber insertion length is 13mm

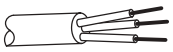
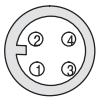


For installation of smaller fiber optic cables with jacket diameters of 0.05mm (1.25in) adaptors are provided for easy installation.

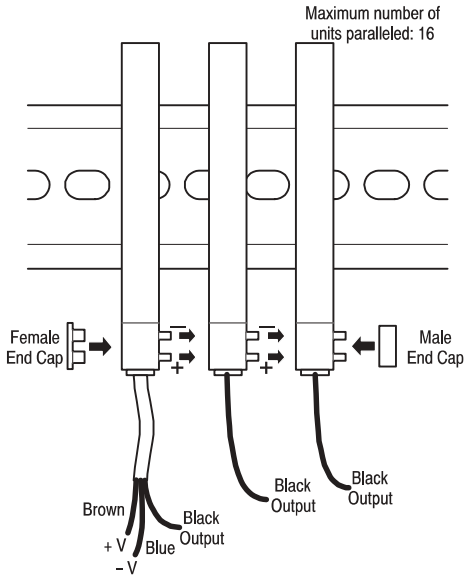


Wiring the Sensor

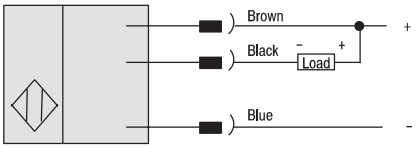
Choice of Power Bus, 2m (6.5ft) cable, or 4 pin pico QD connector are provided for wiring the 45FVL Series sensors. On the pico QD models Rockwell Automation/Allen-Bradley recommends the use of the 889 Series cordsets and patchcords (i.e., 889P–F4AB–2). Standard 2m (6.5ft) cable lengths are provided with flying leads for hard wiring. Hard wiring color coding and pin assignment for QD connectors are as specified below.

Designation	Lead Color 2m (6.5ft) Cable	Pin Assignment 4 Pin Pico QD
Termination		
V+	Brown	1
0V	Blue	3
Output	Black	4

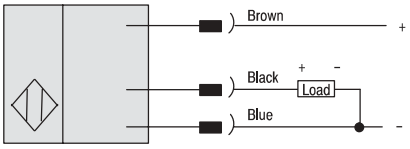
The **Power Bus** option utilizes PB quick disconnect cordsets which are prewired with up to four conductors. When ganging sensors with the Power Bus option a three conductor cordset is wired to one sensor to provide power to all ganged units. The remaining ganged units use a single conductor cordset for wiring an output. This option eliminates two conductors per ganged unit (see below).



NPN Output



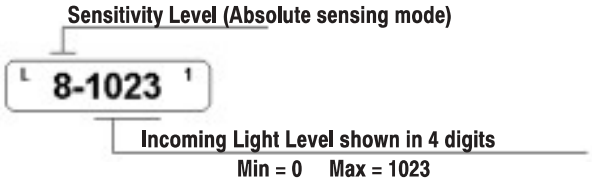
PNP Output



Configuring and Using the Sensor

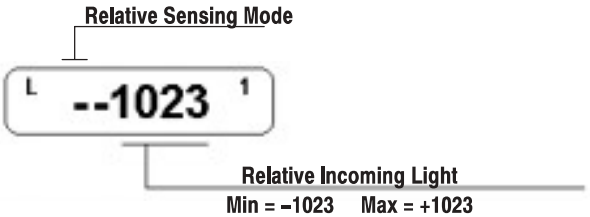
This section will run through the basics on how to operate your new 45FVL Series sensor. After connecting power, load, and fiber optic cables the next step is to choose one of two available options for your Display Mode: **Absolute Sensing Mode** or **Relative Sensing Mode.**

Absolute Sensing Mode measures the absolute value of a target's reflected light at that moment represented in a four-digit value ranging from 0 to 1023. Depending on the reflectivity of the target 1 of 8 sensitivity level settings (with 1023 bits of resolution) is automatically chosen by the sensor when target is taught. A "1," representing the lowest sensitivity level, would be displayed for a highly reflective target. A "8," representing the highest sensitivity, would be displayed for dull, less reflective targets (see following diagram).



Relative Sensing Mode monitors and displays the variation of light received relative to the standard value at which it was learned. In this mode the sensor measures and learns the level of light reflected from a target. However, this value is registered as "0" on the display when target is taught and all subsequent measurements are relative to that standard value +/– 1023 bits.

This mode is beneficial in applications to obtain the detailed light attenuation rate due to soil/damage on the fiber end. See diagram below.



Setting Indication Mode

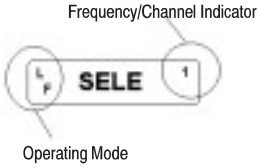
- Slide set switch to **SET.** Note flashing "T" on display.
- Pushing and releasing the **BLACK** button will change the display to alternately switch between **Absolute Sensing** or **Relative Sensing Mode** (see above).

- Choose desired mode and slide set switch to **RUN** (settings are now locked).

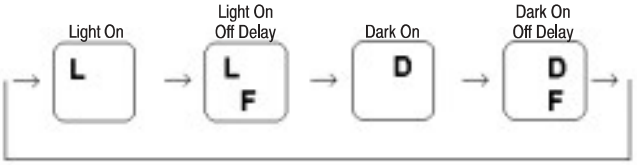
Setting Output Mode

Output Mode Options: Light On
Light On Off delay (40ms delay)
Dark On
Dark On Off delay (40ms delay)

- Slide switch to **SET** position
- Press and hold **BLACK** button for 3 seconds
- The display will show "**SELE**"



- Push the **BLACK** button until desired output is set



- Slide switch to **RUN**

Setting Interference Protection

- Slide switch to **SET** position
- Press and hold **BLACK** button for 3 seconds
- The display will show "**SELE**"
- Push the **RED** button to select Channel **1** or **2** for transmission frequency selection for prevention of interference between 2 sensors
- Set switch to **RUN**

Teaching the Sensor

Stationary Target

- Slide switch to **SET** (flashing "T")
- Push and release **RED** button without target present (Indicators flash to show standby status)
- Push and release **RED** button with target in position (Flashing indicators stop flashing)
- Slide switch to **RUN**
- Setting is complete

Moving Target

- Slide switch to **SET** (flashing "T")
- Push and hold **RED** button (Orange and Green LED flashing alternately)
- While holding down **RED** button pass target in front of sensor (LED flashing slows down)
- Release **RED** button when target finishes passing sensor
- Slide switch to **RUN**
- Setting is complete

Transmitted Beam Setting

- Set up opposing fibers
- Block light with target
- Slide switch to **SET** (flashing "T")
- Push **RED** button twice
- Slide switch to **RUN**
- Setting is complete

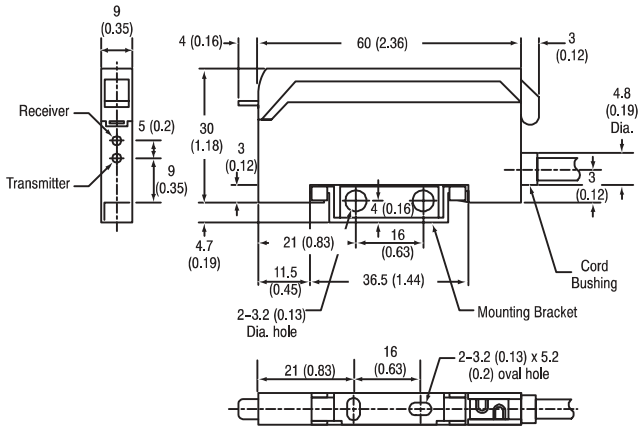
Sensitivity Adjustment (Absolute Sensing Mode)

- Quickly flip switch from **RUN** to **SET** to **RUN** ("s" flashes to show sensitivity adjustment status)
- Push **RED** button to decrease sensitivity
- Push **BLACK** button to increase sensitivity
- Unit automatically enters locked condition 10 seconds after completion of adjustment

Sensitivity Adjustment (Relative Sensing Mode)

- Quickly flip switch from **RUN** to **SET** to **RUN** ("s" flashes to show sensitivity adjustment status)
- Push **BLACK** button to decrease sensitivity
- Push **RED** button to increase sensitivity
- Unit automatically enters locked condition 10 seconds after completion of adjustment

Dimensions—mm (inches)



Replacement Parts

- Plastic Sensor Cover: PSC1
- Fiber Optic Cable (Diffuse/Retro): 99–94
- Fiber Optic Cable (Transmitted Beam): 99–90
- Pico QD Cordset: 889P–F4AB–2
- Power Bus QD Connectors:
  1 Conductor: 45F–A1C–A2
  3 Conductor: 45F–A3C–A2
- Power Bus End Caps:
  Male Cap: 45F–AMC
  Female Cap: 45F–AFC
- 1.25mm fiber optic adaptor: 61–6731

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