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

<table>
<thead>
<tr>
<th>Model</th>
<th>NPN Type 45FVL-2LG</th>
<th>PNP Type 45FVL-2LH</th>
<th>NPN Type 45FVL-3LG</th>
<th>PNP Type 45FVL-3LH</th>
<th>NPN Type 45FVL-6LG</th>
<th>PNP Type 45FVL-6LH</th>
<th>NPN Type 45FVL-5LG</th>
<th>PNP Type 45FVL-5LH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Source</td>
<td>Red LED</td>
<td>Green LED</td>
<td>Blue LED</td>
<td>White LED</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Wave Length)</td>
<td>(660nm)</td>
<td>(565nm)</td>
<td>(470nm)</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Supply</td>
<td>12 to 24V DC +/- 10% Ripple 10% or Less</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>Depends on Fiber</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Consumption</td>
<td>NPN Type: &lt;39ma/PNP Type: &lt;50ma</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Mode</td>
<td>Open Collector</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operation Mode</td>
<td>Light On/Dark On Selectable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Timer</td>
<td>Off delay/Non-delay Selectable</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indicators</td>
<td>Orange LED = Output, Green LED = Power/ Stability</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response Time</td>
<td>Channel 1 = 600µs, Channel 2 = 700µs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interference Protection</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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.
Sensor Selection

<table>
<thead>
<tr>
<th>Operating Voltage</th>
<th>Current Consumption</th>
<th>Output Characteristics</th>
<th>Response Time</th>
<th>LED</th>
<th>Catalog Number</th>
<th>Power Bus (QD required)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-24V DC</td>
<td>50ma or Less</td>
<td>PNP</td>
<td>0.5mA</td>
<td>Red</td>
<td>45FVL-2LHE-A2</td>
<td>45FVL-2LHE-P4</td>
</tr>
<tr>
<td>30mA or Less</td>
<td>NPN</td>
<td>Output: 100mA</td>
<td>600µs</td>
<td>Green</td>
<td>45FVL-3LHE-A2</td>
<td>45FVL-3LHE-P4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stability: 50mA</td>
<td></td>
<td>Blue</td>
<td>45FVL-6LHE-A2</td>
<td>45FVL-6LHE-P4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>White</td>
<td>45FVL-5LHE-A2</td>
<td>45FVL-5LHE-P4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>White</td>
<td>45FVL-3LGE-A2</td>
<td>45FVL-3LGE-P4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Blue</td>
<td>45FVL-6LGE-A2</td>
<td>45FVL-6LGE-P4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>White</td>
<td>45FVL-5LGE-A2</td>
<td>45FVL-5LGE-P4</td>
</tr>
</tbody>
</table>

- 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.

<table>
<thead>
<tr>
<th>LED</th>
<th>State</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>OFF</td>
<td>Stable light signal</td>
</tr>
<tr>
<td></td>
<td>ON</td>
<td>Stable light signal</td>
</tr>
<tr>
<td>Orange</td>
<td>OFF</td>
<td>Output</td>
</tr>
<tr>
<td></td>
<td>ON</td>
<td>Output ON</td>
</tr>
</tbody>
</table>

Operation Indicator and Stability Indicator

Light on operation

- Stable range (light interrupted)
- Unstable range
- Output
- Operation Indicator
- Stability Indicator

Dark on operation

- Stable range (light on)
- Unstable range
- Output
- Operation Indicator
- Stability Indicator

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.
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.

<table>
<thead>
<tr>
<th>Designation</th>
<th>Lead Color 2m (6.5ft) Cable</th>
<th>Pin Assignment 4 Pin Pico QD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Termination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V+</td>
<td>Brown</td>
<td>1</td>
</tr>
<tr>
<td>0V</td>
<td>Blue</td>
<td>3</td>
</tr>
<tr>
<td>Output</td>
<td>Black</td>
<td>4</td>
</tr>
</tbody>
</table>

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