Photoelectric Sensors

FE7W Series
Collision Avoidance Sensors

- Collision avoidance sensor for Automatic Guided Vehicles (AGVs)
- Multiple scanners enclosed in a single housing
- 3-lobe scanning—one frontal and two 45° side scanners
- 8 operating frequencies

See pages 728-730 for FE7W Series specifications, wiring and dimensions.

Diffuse Mode

See page 728

Sensing Range: 3 m

Outputs: NPN, PNP

Two independently adjustable scanning zones enable 2-stage operation.

1. When an object is detected in the first zone (output 1), up to 3 meters, the AGV speed is reduced.
2. When an object is detected in the second, shorter zone (output 2), up to 2.5 meters, the AGV stops.

See pages 728-730 for FE7W Series specifications, wiring and dimensions.
### Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>FE7W-DA5K</th>
<th>FE7W-DB5K</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SENSING RANGE</strong></td>
<td>3 m</td>
<td>3 m</td>
</tr>
<tr>
<td><strong>SENSITIVITY ADJUSTMENT</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>MODEL NUMBER(S)</strong></td>
<td>FE7W-DA5K</td>
<td>FE7W-DB5K</td>
</tr>
<tr>
<td></td>
<td>FE7W-DA5K-907*</td>
<td>FE7W-DD5K</td>
</tr>
<tr>
<td><strong>OUTPUT:</strong> Transistor</td>
<td>NPN normally open</td>
<td>NPN normally closed</td>
</tr>
<tr>
<td><strong>LOAD CURRENT</strong></td>
<td>100 mA max.</td>
<td>100 mA max.</td>
</tr>
<tr>
<td><strong>VOLTAGE DROP</strong></td>
<td>≤ 1 VDC</td>
<td>≤ 1 VDC</td>
</tr>
<tr>
<td><strong>SHORT CIRCUIT AND OVERLOAD PROTECTION</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>REVERSE POLARITY PROTECTION</strong></td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>SUPPLY VOLTAGE</strong></td>
<td>18-30 VDC</td>
<td>18-30 VDC</td>
</tr>
<tr>
<td><strong>LED(s)</strong></td>
<td>Yes (3)</td>
<td>Yes (3)</td>
</tr>
<tr>
<td><strong>CURRENT CONSUMPTION</strong></td>
<td>≤ 70 mA</td>
<td>≤ 70 mA</td>
</tr>
<tr>
<td><strong>OPERATING MODE</strong></td>
<td>Light on</td>
<td>Dark on</td>
</tr>
<tr>
<td><strong>RESPONSE TIME</strong></td>
<td>≤ 80 ms</td>
<td>≤ 80 ms</td>
</tr>
<tr>
<td><strong>READINESS DELAY</strong></td>
<td>≤ 100 ms</td>
<td>≤ 100 ms</td>
</tr>
<tr>
<td><strong>SWITCHING FREQUENCY</strong></td>
<td>6 Hz</td>
<td>6 Hz</td>
</tr>
<tr>
<td><strong>PROTECTION (IEC)</strong></td>
<td>IP64</td>
<td>IP64</td>
</tr>
<tr>
<td><strong>LIGHT SOURCE</strong></td>
<td>Infrared LED</td>
<td>Infrared LED</td>
</tr>
<tr>
<td><strong>AMBIENT LIGHT RESISTANCE</strong></td>
<td>≤ 10,000 lux</td>
<td>≤ 10,000 lux</td>
</tr>
<tr>
<td><strong>TEMPERATURE RANGE</strong></td>
<td>Working: +14 °F to +140 °F</td>
<td>+14 °F to +140 °F</td>
</tr>
<tr>
<td><strong>HOUSING MATERIAL</strong></td>
<td>Polycarbonate</td>
<td>Polycarbonate</td>
</tr>
<tr>
<td><strong>LENS</strong></td>
<td>Plastic</td>
<td>Plastic</td>
</tr>
<tr>
<td><strong>STANDARDS</strong></td>
<td>EN 60947-5-2</td>
<td>EN 60947-5-2</td>
</tr>
<tr>
<td><strong>APPROVALS</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Wiring Diagrams

#### DC

**Cable Connection**

**FE7W-DA5K, FE7W-DB5K**

- Red (+)
- White (–)
- Yellow
- Black
- Blue
- Green
- Light Blue
- Brown
- Orange

**WS/scanning area control input**

**RD/right scanning control input**

**LD/left scanning control input**

**Frequency control**

**Output 1:** Front far lobe

**Output 2:** Front near lobe and side lobes

**Note:**

Control inputs ON ≤ 1.5V, OFF ≥ 5V

#### Wiring:

1. Wire the supply and sensor load per the circuit diagram
2. To activate the special features of the FE7W, which include frequency selection (FS1, FS2, and FS3), beam width changeover (WS), and the right and left scanning lobes (RD and LD), the specific control inputs must be used.
3. The power supply and output cable should not be wired in the same conduit with AC control wiring. Either place the wiring in a separate conduit or with wiring to other low voltage, low current solid state devices.
4. Terminate leadwire with devices that provide a solid mechanical connection, e.g., crimp style terminals, self-lifting pressure plates.
5. Leadwire can be extended up to 100 meters. When extending leads, use #22AWG or larger leadwires

When extending leadwires, consider how the resultant voltage drop or potential noise pickup may affect your application.

6. If a voltage regulator is used for the power source, it should be well grounded.

### Additional Data

See pages 729-730

* -907 indicates three triple-turn potentiometers for increased resolution. Other versions have three single-turn potentiometers.

- Stocked item
- Typical delivery 4 weeks or less

Consult factory for all other models.
### Diffuse Mode

#### EXTERNAL CONTROL INPUT

<table>
<thead>
<tr>
<th>Detection Area</th>
<th>WS</th>
<th>Front Scanning Lobe</th>
<th>Open (H)</th>
<th>Short (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RD</td>
<td>Right Scanning Lobe</td>
<td>Short (L)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LD</td>
<td>Left Scanning Lobe</td>
<td>Short (L)</td>
<td></td>
</tr>
<tr>
<td>RD/LD</td>
<td></td>
<td>Right and Left Scanning Lobe</td>
<td>Short (L)</td>
<td></td>
</tr>
</tbody>
</table>

#### EFFECTIVE BEAM SHAPE

**Horizontal (Top view, typical)**

![Diagram of Horizontal Top View](image)

**Horizontal (Side view, typical)**

![Diagram of Horizontal Side View](image)

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Subject to modifications without notice

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Photoelectric Sensors

**Frequency Changover Code Table**

Each numbered frequency below corresponds with a specific operational frequency

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>FS1 Input</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>●</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>FS2 Input</td>
<td>☐</td>
<td>☐</td>
<td>●</td>
<td>●</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>●</td>
</tr>
<tr>
<td>FS3 Input</td>
<td>☐</td>
<td>●</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

oler ≥5VDC  ● ≤1.5VDC

**Dimensions (mm)**

**FE7W-DA5K, FE7W-DA5K-907, FE7W-DB5K**

**Mounting**

1. The FE7W is a long-range diffuse (proximity) scan device. Since a 3 meter diffuse scan control can see a 76mm diameter reflector at a distance of over 30 meters, extreme care to prevent a shiny object or reflector from being in the path of the FE7W light beam. Building walls and wall hangings should be painted in matte finish, dark colors (preferably black) to help prevent the beam from reflecting back to the sensor and inadvertently operating stop or slow functions, particularly when an AGV is making a turn.

2. If more than one FE7W is being used in the same area, assign different frequencies to them to prevent sensors from interfering with each other (refer to the frequency changeover code tables).

   To prevent mutual interference, the FE7W Series permits use of up to eight different light pulse frequencies. If your system requires nine or more frequencies, merely adjust the frequencies within each specific work area as the AGVs arrive to help prevent no more than eight vehicles from being in the same vicinity at any time.

3. If other photoelectrics are used in conjunction with the FE7W, their beam trajectory should be carefully oriented to minimize possible interference. The right/left sensing lobe, in particular, must be protected from interfering light as the AGVs maneuver through their service routes.

4. If other photoelectrics are used in conjunction with the FE7W, their beam trajectory should be carefully oriented to minimize possible interference. The right/left sensing lobe, in particular, must be protected from interfering light as the AGVs maneuver through their service routes.

**Sensitivity Adjustment**

1. The detection distance of this diffuse scan photoelectric sensor is dependent on the shape, size, and color of the target object. Scan range is increased when the object to be detected is brighter (more reflective), larger, or more perpendicular to the FE7W.

2. Since the sensitivity adjustment and emitter/receiver are both located in the front of the housing, take care that your hand does not interfere with the beam when setting the range.

3. The sensitivity of outputs 1 & 2 (OUT 1 & 2) can be adjusted independently of each other. We recommend adjusting OUT 1 (longer distance) first to check for the possible influence of background and surroundings, then adjust OUT 2.

4. Use the furnished screwdriver to adjust sensitivity. Place object to be detected at a specified position and gradually turn sensitivity control variable resistor clockwise from the extreme counterclockwise position.

   Keep turning until the operation indicator lights up or the output is changed from OFF to ON for light operate versions (ON to OFF for dark operate). Adjust each of the two detection zones in this manner. The LED indicators for OUT 1 & 2 are light-operated alignment indicators.

5. After completing sensitivity adjustment, check the adjustment with the object removed to be sure the sensor was not influenced by the background and surroundings. Repeat this confirmation throughout the entire routing of the AGV.

6. If you find the sensitivity adjustment was influenced by the background or surroundings, determine whether: 1) the detection distance should be reduced or, 2) the interfering object should either be removed, repositioned, or made less reflective by changing it’s angle or color. Refer to the section on mounting, item 1.

7. The right and left sensing lobes (FE7W-DB5K and FE7W-DE5K listing only) have a common sensitivity adjustment. Both sides must be adjusted at the same time.

8. When neither left nor right detection is required, turn the SENS.3 variable resistor fully counterclockwise (OFF position).

9. When detection width switching (WS) is activated, the widths of both OUT1 and OUT 2 are changed simultaneously.

10. To prevent tampering after the sensitivity pots have been set, cover them with the furnished rubber cap inserts.