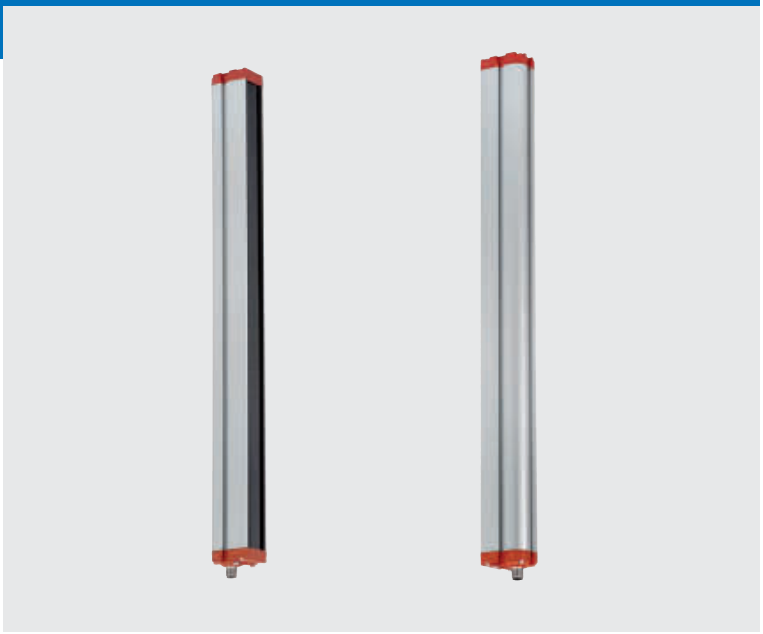
Analog Light Grid in Robust Aluminum Housing

# F3EM2

The F3EM2 light grids provide reliable area monitoring in a robust housing. The analog output provides simple area measurement such as height detection.

- Robust aluminium housing
- Analog output for simple height detection
- Brackets included with Light Grids
- Measurement ranges from 150 mm up to 2100 mm.



## Ordering Information

| Measurement Range (mm) | Pitch | Sensing Distance | Beams | Connection | Model |
|---|---|---|---|---|---|
| 150 | 5 mm | 3 | 30 | M12-5pin | F3EM2-005-150-AV |
| | 18 mm | 15 | 8 | | F3EM2-018-150-AV |
| 300 | 5 mm | 3 | 60 | | F3EM2-005-300-AV |
| | 18 mm | 15 | 16 | | F3EM2-018-300-AV |
| 450 | 5 mm | 3 | 90 | | F3EM2-005-450-AV |
| | 18 mm | 15 | 24 | | F3EM2-018-450-AV |
| 600 | 5 mm | 3 | 120 | | F3EM2-005-600-AV |
| | 18 mm | 15 | 32 | | F3EM2-018-600-AV |
| 900 | 5 mm | 3 | 180 | | F3EM2-005-900-AV |
| | 18 mm | 15 | 48 | | F3EM2-018-900-AV |
| 1200 | 5 mm | 3 | 240 | | F3EM2-005-1200-AV |
| | 18 mm | 15 | 64 | | F3EM2-018-1200-AV |
| 1500 | 5 mm | 3 | 300 | | F3EM2-005-1500-AV |
| | 18 mm | 15 | 80 | | F3EM2-018-1500-AV |
| 1800 | 5 mm | 3 | 360 | | F3EM2-005-1800-AV |
| | 18 mm | 15 | 96 | | F3EM2-018-1800-AV |
| 2100 | 18 mm | 15 | 112 | | F3EM2-018-2100-AV |

## Rating/Specifications

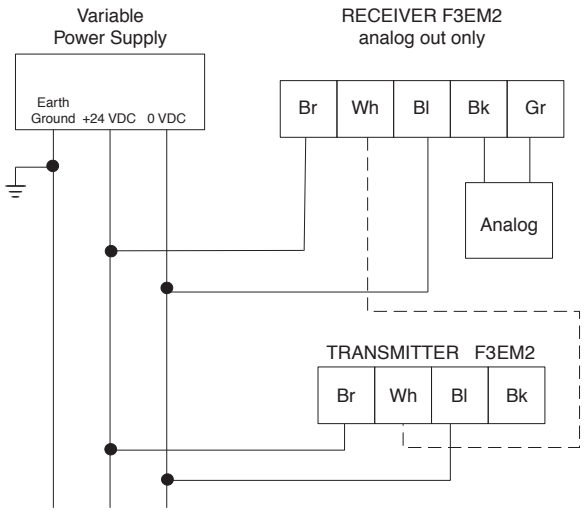
| | | F3EM2-005_ | F3EM2-018_ |
|---|---|---|---|
| Sensing distance | | 0 to 3 m | 0 to 15 m |
| Vertical measurement range | | 0 to: 150, 300, 450, 600, 900, 1200, 1500, 1800 mm | 0 to: 150, 300, 450, 600, 900, 1200, 1500, 1800, 2100 mm |
| Minimum detectable object size | | 10 mm | 30 mm |
| Beam axis pitch | | 5 mm | 18 mm |
| Analog output | | 0-10 VDC (12 bits), max. load current 15 mA | |
| External input | | Strobe signal (for alignment procedure) | |
| Response time | | 4 ms + 80 $\mu$s x number of beams | |
| Power-on delay | | 1 s max | |
| Light source (wavelength) | | Infrared LED (880 nm) | |
| Power supply voltage | | 24 VDC ±20% | |
| Current consumption | | 150 mA max | |
| Operating temperature | | –10 to 55°C | |
| Storage temperature | | –25 to 70°C | |
| Protective circuits | | Reverse polarity protection, output short-circuit protection | |
| Degree of protection | | IEC 60529 IP65 | |
| Material | Case | Aluminium | |
| | Cover | Polycarbonate | |

### Connector cables

| | Type | Features | Material | | Model | |
|---|---|---|---|---|---|---|
| | | | Nut | cable | straight | angled |
| M12 | General purpose | 5 wires | CuZn | PVC 2 m | XS2F-M12PVC5S2M | XS2F-M12PVC5A2M |
| | | | | PUR 2 m | XS2F-M12PUR5S2M | XS2F-M12PUR5A2M |
| | | | | PVC 5 m | XS2F-M12PVC5S5M | XS2F-M12PVC5A5M |
| | | | | PUR 5 m | XS2F-M12PUR5S5M | XS2F-M12PUR5A5M |

## Output circuits

### Analog models (F3EM2-[...]-AV)




#### Connector PIN assignment - Receiver

| Type | Internal wiring | Pin | Color | Signal name |
|---|---|---|---|---|
| M12 n5 pole | | 1 | Brown | +Vs |
| | | 2 | White | Wire sync |
| | | 3 | Blue | 0V |
| | | 4 | Black | Analog + |
| | | 5 | Gray | Analog reference |



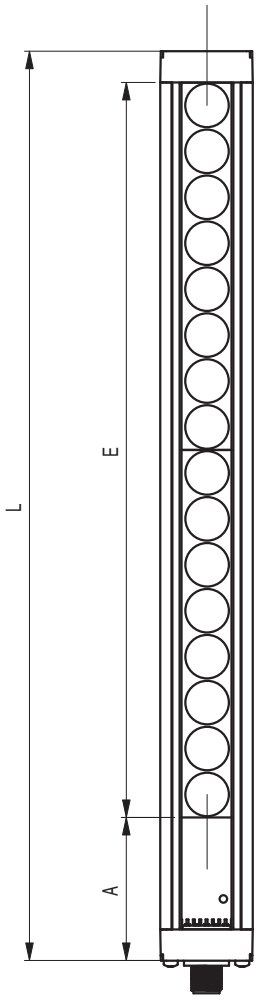
#### Connector PIN assignment - Transmitter

| Type | Internal wiring | Pin | Color | Signal name |
|---|---|---|---|---|
| M12 n4 pole | | 1 | Brown | +Vs |
| | | 2 | White | Wire sync |
| | | 3 | Blue | 0V |
| | | 4 | Black | Not used |

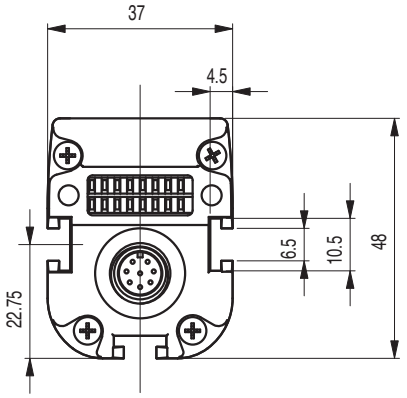


For synchronization by wire please connect white wires of transmitter and receiver.

## Dimensions




L: Total length
E: Detection zone
A: Dead zone without detection capability

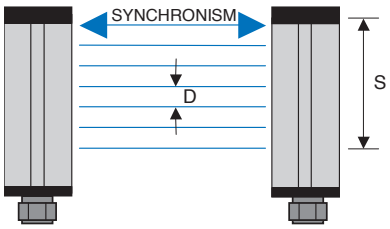



All dimensions shown are in mm

| Model | Detection Zone E (mm) | Total length L (mm) |
|---|---|---|
| F3EM2-005-150-AV | 159 | 218 |
| F3EM2-018-150-AV | 147 | 217 |
| F3EM2-005-300-AV | 318 | 277 |
| F3EM2-018-300-AV | 294 | 364 |
| F3EM2-005-450-AV | 477 | 536 |
| F3EM2-018-450-AV | 441 | 511 |
| F3EM2-005-600-AV | 636 | 695 |
| F3EM2-018-600-AV | 588 | 658 |
| F3EM2-005-900-AV | 954 | 1013 |
| F3EM2-018-900-AV | 882 | 952 |
| F3EM2-005-1200-AV | 1272 | 1331 |
| F3EM2-018-1200-AV | 1176 | 1246 |
| F3EM2-005-1500-AV | 1590 | 1649 |
| F3EM2-018-1500-AV | 1470 | 1540 |
| F3EM2-005-1800-AV | 1908 | 1967 |
| F3EM2-018-1800-AV | 1764 | 1834 |
| F3EM2-018-2100-AV | 2058 | 2128 |

## Operation

The F3EM2 measuring light grid features optical synchronization. This function is provided by the upper beam located on the opposite side of the connector (see illustration below). During operation this beam must always be kept free (unblocked). Otherwise it will result in a loss of synchronism between the transmitter and receiver. For applications where all beams are interrupted, synchronization by wiring can be activated via dip switch settings. Please refer to chapter 4 or 5 in the operating manual.

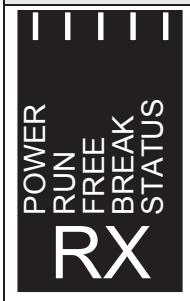



S: Sensing area
D: Beam axis pitch

### Indicator LEDs

For functions of indicator LEDs please refer to the tables below:

Status of Receiver is displayed by 5 LEDs:

| Disposition of indicator | Name of indicator | Color |
|---|---|---|
|  | POWER | Green |
| | RUN | Yellow |
| | FREE | Green |
| | BREAK | Red |
| | STATUS | Yellow |



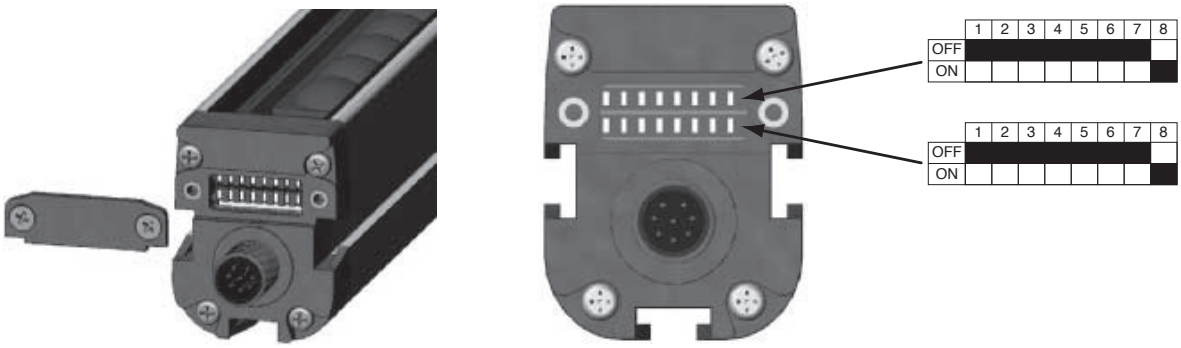
Status of Transmitter is displayed by 5 LEDs:

| Disposition of indicator | Name of indicator | Color |
|---|---|---|
| | POWER | Green |
| | STATUS 1 | Yellow |
| | RANGE | Green |
| | Not used | |
| | STATUS 2 | Yellow |



### Selector switches (dip switches)

Various output modes, synchronization by wire, can be changed by selector switches. To access selector switches unscrew the end cap of the receiver unit:



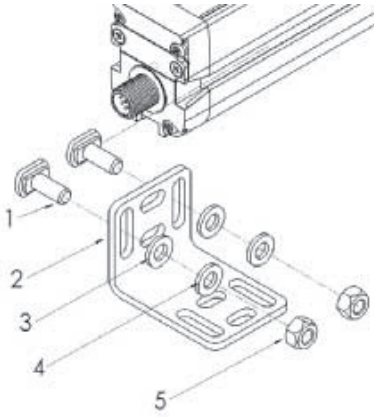

Note: There are two lines of dip switches in each transmitter and receiver. The settings must be done for both lines. Change the setting of the dip-switch and close the cap again. The light grid can now be reconnected to the power supply.

# Mounting

## Mounting accessories

The F3EM2 system is mechanically installed by using the T-slots on the two sides or the back-side of the housing.

Use the movable bolts, washers, spacers and nuts to attach the mounting brackets as shown in the picture

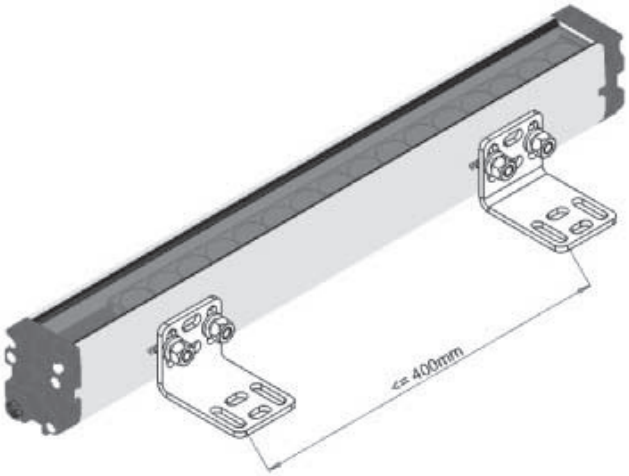



| ID | Description |
|---|---|
| 1 | M6 bolt |
| 2 | bracket |
| 3 | M6 washer |
| 4 | M6 spacer |
| 5 | M6 nut |

Note: Shipments contain a different quantity of brackets, depending on the length of the light grid. Longer light grids contain a higher number of brackets, following the rule of one bracket every 400 mm.

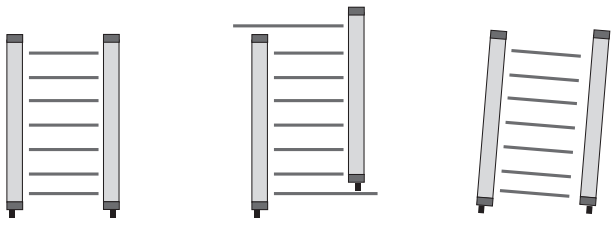
## Additional mounting rigidity

It is recommended that the distance between the mounting brackets is 400 mm or less for optimum performance of the F3EM2 system.




## Mechanical Mounting

Please mount the light grids in proper alignment as shown in the pictures below by using the brackets provided with the light grids.



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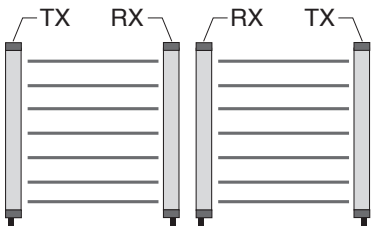
If several light grids are installed close to each other, interference of the light grids must be avoided. In this case the assembly should be carried out as follows:



## Precautions

**⚠ WARNING**

**The F3EM2 multi-beam photoelectric sensor with beam evaluation function is not a safety component for ensuring the safety of people which is defined in EC directive (2006/42/EC) or by any other regulations or standards.**

### Power Supply Voltage and Output Load Power Supply Voltage

Do not connect an AC power supply to the Sensor. If AC power is supplied to the Sensor, it may be damaged, explode or burn. Make sure that the power supply to the Sensor is within the rated voltage range. If a voltage exceeding the rated voltage range is supplied to the Sensor, it may explode or burn.

### Operating Environment

Do not use the sensor in locations with explosive or flammable gas. Make sure that the product is operated in accordance with IP65 standards.

Do not subject the sensor to excessive shock when mounting.

When you use the sensor in the vicinity of an inverter motor, be sure to connect the protective earth ground wire of the motor to earth. Failure to ground the motor may result in malfunction of the sensor.

### Mounting the Sensor

Do not strike the sensor with a hammer or any other tool during the installation of the Sensor.

### Cleaning

Never use paint thinners or other organic solvents to clean the surface of the product

### M12 Connector

Always turn OFF the power supply to the sensor before connecting or disconnecting the metal connector. Hold the connector cover to connect or disconnect it.

Secure the connector cover by hand. Do not use pliers; otherwise the connector may be damaged.

If the connector is not connected securely, it may be disconnected by vibration or the proper degree of protection of the sensor may not be maintained.

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