IR6003/7
IR Oil Mist/Smoke
Detector

Product User Guide

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The Tyco Intelligent Oil Mist/Smoke Detector system consists of an IR6003/x Oil Mist/Smoke Detector and a 6005/x Power Universal Interface Module (P-UIM).

The Oil Mist/Smoke Detector has been designed to be highly sensitive to the presence of Oil & Kerosene mists or smoke particles in the path of the detector beam. The detector has been developed for use in enclosed oil rig wellheads areas, generator rooms and turbine enclosures. The detector automatically compensates for contamination of the detector lenses and signals when a point is reached where further deterioration cannot be tolerated and the lenses require cleaning. Two levels of alarm status are provided a "Low" (pre-warning) and "High" level. Also a "Beam Blocked" status is provided in the event that the beam is interrupted.

The P-UIM, converts the output signals from the Oil Mist/Smoke Detector to 5 sets of volt free contacts, which provide the detector status for the following conditions:

“Fault”
“Clean” (Clean detector lenses)
“Beam Blocked”
“Low” Level alarm
“High” Level Alarm

2. Features

2.1 Detector

Automatic Self-Calibration.
Range 2 to 30 metres.
Weather Proof to IP65.
Certified Intrinsically Safe.
Robust Design.
Heavy duty mounting bracket available.
Independent block output.
Cleaning status output.
Dual automatic compensation.

2.2 P-UIM

Wide operating voltage range; with internal voltage regulation.
Ability to accept direct input from the detector or input from the detector via a barrier.
Remote reset feature.
Alarm/Fault volt-free output contacts.
Local indication of P-UIM and Detector status.
Screw or DIN rail mounting.
3. Functional Description

3.1 Initialisation

When the detector is switched on the LED indicator flashes briefly to signify power-up. During the first 10-seconds the detector performs auto-calibration to establish the quiescent obscuration level.

Note:
It is important that the beam path is cleared to a healthy state (no obscuration) prior to resetting the detector. If the beam path is not healthy the detector will recalibrate to the current level of obscuration and may well report false alarm/fault conditions as the path clears. If obscuration is high (dirty lenses or smoke/oil mist present) then the detector will not be able to establish an operational state and will report a Clean fault (Clean LED pulses ON for 4 seconds) or a Life fault (Life LED is illuminated continuously). The PUIM will latch the fault condition and the Detector/P-UIM will require resetting once the beam path is clear.

3.2 Alarm Level Detection

The detector monitors the obscuration level within the beam path and when it detects a loss of 0.5 dB it latches a low-level alarm condition. If the loss is maintained within the 0.5 to < 1.5 dB band during the subsequent 15-second alarm condition monitoring period, a low level alarm will then be reported (detector LED pulses ON/OFF for 30 seconds). If the loss exceeds 1.5 dB then a high level alarm is latched and this status will be reported (detector LED pulses ON/OFF for 2 minutes) at the earliest at 8-seconds from the beginning of the alarm condition monitoring period. If the high level occurs subsequent to the initial 8 seconds of the alarm condition monitoring period and before a total of 15 seconds has elapsed, the high level alarm will be latched and reported immediately.

It should be noted that if the level of loss during the alarm condition monitoring period falls below 0.5 dB. The latched alarm level will be reset and the detector continues to monitor.

3.3 Beam Blocked

If the level of obscuration increases suddenly to a high level of loss a beam-blocked status will be latched and if the level is maintained for 60 seconds, Beam Blocked will be reported (detector LED flashes ON for 2-seconds). If the beam-blocked level of obscuration clears for more than a few seconds during the 1-minute beam-blocked condition-monitoring period, the detector returns to its normal operating state.

3.4 Dual Automatic Compensation

The Detector automatically compensates for gradual detector lens contamination and also compensates for the more rapid environmental changes (e.g. temperature change). The detector will report a CLEAN fault (detector LED flashes ON for 4 seconds) once. If the detector is not cleaned it will continue to operate until a LIFE fault is detected (detector LED ON steady) at which point the detector latches to an OFF condition. The detector must be cleaned and the reset once the LIFE fault has been detected.
4. Indicators

When the detector is switched on the LED indicator flashes briefly to signify power-up. During the first 10-seconds the detector will latch the fault condition and the Detector/P-UIM will require resetting once the beam path is clear.

4.1 DETECTOR

DETECTOR – Red LED:  Low Level Alarm - The LED pulses 0.5 sec ON, 0.5 sec OFF for 30 seconds.  
               High Level Alarm - The LED pulses 0.25 sec ON, 0.25 sec OFF for 2 minutes.  
               Life Fault – The LED is ON if the beam is blocked on power-up or reset and the detector fails to calibrate.

4.1.2 P-UIM

OUTPUT ON - Green LED: Indicates the supply is healthy. It extinguishes during the reset period.

OPEN – Red LED:  Is lit when the detector connection is open circuit.

SHORT – Red LED:  Is lit when the detector connection is short circuit.

LIFE – Red LED:  Is lit flashing to indicate the P-UIM and Detector are both healthy.  
               Is lit steady to indicate a life fault  
               Is off for all other fault and alarm conditions.

CLEAN – Red LED:  Is lit when a cleaning fault condition has been detected.

BEAM BLOCKED – Red LED:  Is lit when a beam-blocked condition has been detected.

LOW – Red LED:  Is lit when a Low Level Alarm has been detected.

HIGH – Red LED:  Is lit when a High Level Alarm has been detected.

4. Controls

4.2 P-UIM

4.2.1 P-UIM

RESET (Top Panel):  Pressing the RESET pushbutton will cause the system to restart.

RESET (Remote Input):  The RESET input should be connected to the 24 V supply via a normally closed contact.  
               Open the reset contact for <1 sec will cause the P-UIM to reset.  
               Open the reset contact for >1 sec and <4 sec will cause the P-UIM and the IR Detector to reset.  
               Open the reset contact for >4 sec will cause a fault.
5.1 Detector Mounting Details

To site the detector, find an unobstructed path, ideally above head height that covers the area to be monitored. When choosing the beam path the direction of any prevailing air currents should be noted to assess the direction that any oil mist would be conveyed.

It should be noted that the beam must not be within 500 mm of any wall or partition. The operating range is 2 to 30 metres.

The reflector sheet must be mounted on a flat surface (self-adhesive backing) such that the detector and reflector are aligned horizontally and vertically. To assist alignment a tool is available (Part No. 01-33-21) to ensure that the detector beam is aligned correctly onto the reflector. The alignment tool makes it possible to visibly see the infra-red beam hitting the target reflector when correctly aligned. Due to the nature of operation of the alignment tool, it is recommended that it should be used in subdued light conditions. The physics of the reflector construction enable the reflector to be up to 10 Degrees out of alignment in any one plane as detailed in the following diagram.

<table>
<thead>
<tr>
<th>Type</th>
<th>Reflector size</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.6 x 0.6 Metres</td>
<td>2 to 10 Metres</td>
</tr>
<tr>
<td>2</td>
<td>1.2 x 1.2 Metres</td>
<td>10 to 30 Metres</td>
</tr>
</tbody>
</table>
5. Installation

5.2 Detector Mounting Bracket

We recommend the use of the 01-33-12, U-Bracket, to mount the IR Detector and to provide alignment facilities. The bracket is supplied with all appropriate hardware to affix the oil mist detector to it.

![Detector Mounting Bracket Diagram]

- Use a 10 mm Box Spanner To Adjust
- 10 mm clearance required
- RADIAL PIVOT: 35 mm
- LATERAL PIVOT: 220 mm (Max)
- 5 mm
- 160 mm
- 30 mm
- 19 mm
- 25 mm
5. Installation

5.3 Detector Connection Details

The diagram above shows the detector connected to a local junction box via the flying lead (Part No. 01-33-14). The local junction box will require connecting to the P-UIM, which provides the necessary Detector to user equipment interface.

5.4 Flying Lead Connections

When the detector has been mounted the FLYING LEAD can be plugged into the detector. Align the 6-way connector and insert. Firmly tighten the screw-locking ring to ensure weatherproofing.

The free end of the cable can now be wired into a local junction box as shown above. Entry into the junction box requires a stuffing gland with a clamping range of 6 to 11 mm.

**Please note the wire colour vs polarity, Brown is NEGATIVE, Blue is POSITIVE.**

**Warning**

*If the detector is mounted in a hazardous area then an approved junction box and glands must be used. Connections must be via a IS Isolation Safety Barrier as specified in the System Diagram SD-6003.*
5. Installation

When connecting ensure polarity is observed all the way through to the P-UIM, (or via I.S Barrier if used).

5.4.1 Normal Operation (without the use of an I.S Barrier)

- Positive (+) to P-UIM Terminal 4 (Ballast +)
- Negative (-) to P-UIM Terminal 6 (Detector -)

5.4.2 Hazardous Area Operation (when using an I.S Barrier)

- Positive (+) to P-UIM Terminal 4 (Ballast +)
- Negative (-) to P-UIM Terminal 6 (Detector -)

5.5 P-UIM Mounting Details

5.5.1 Din Rail Mounting

The P-UIM will mount directly on to TS35 DIN rail or screw mount onto a flat surface.
5. Installation

5.5.2 Screw Mounting Details

Screw 2 off M3 x 16 mm long screws 3 mm into the mounting holes. Feed the P-UIM over the mounting screws as shown above and twist clockwise to align. Tighten the mounting screws to lock the P-UIM in place.
5. Installation

5.6 P-UIM Connection Details

5.6.1 Input Wiring

5.6.2 Output Wiring
Once the Detector has been installed correctly by connecting it to the hazard monitoring system via the P-UIM, the user should power up the detector loop and perform the following confidence checks

1. The Detector LED blips ON briefly as it receives power from the P-UIM. The P-UIM LIFE indicator is flashing and the OUTPUT ON indicator is ON steady all other indicators are extinguished.
2. Wait 20 seconds and check that the status detailed in step 1 above remains unchanged.
3. Block the Detector Beam path for 1-minute and check that the detector signals a beam blocked state (LED flashes ON for 2-seconds). The P-UIM BEAM BLOCKED indicator is lit steady. Remove obstruction from the beam path.
4. Initiate a short reset and check that the P-UIM returns to the status detailed in step 1.
5. Initiate a long reset with the beam path blocked and check that Detector indicates a LIFE fault (LED is lit steady). The P-UIM LIFE Indicator is lit steady. Remove the obstruction from the beam path.
6. Initiate a long reset and check that the P-UIM returns to the status detailed in step 1.

7. Operating Parameters

7.1 Detector

The Detector receives its dc supply from the P-UIM and provides status to the P-UIM as follows:
1. A normal/healthy detector input condition is indicated when the current is >20 mA and <32 mA (nominally 25 mA). The LED on the front of the detector will be extinguished.
2. A low alarm condition is indicated when the current pulses from normal to 42 mA with a 1 second equal mark space ratio for a period of 30-seconds.
3. A high alarm condition is indicated when the current pulses from normal to 42 mA with a 0.5 second equal mark space ratio for a period of 2-minutes.
4. A beam blocked condition is indicated when the current switches from normal to 17 mA for a period of 2-seconds.
5. A cleaning fault condition is indicated when the current switches from normal to 17 mA for a period of 4-seconds.
6. A life fault condition is indicated when the current falls to 17 mA for >5-seconds.

7.2 P-UIM

The P-UIM supplies the detector circuit and monitors the current in the detector loop to determine the detector status as follows:
1. An open circuit condition is detected if the current is <6.3 mA for >2 seconds. 2. A normal/healthy detector input condition is when the current is >20 mA and <28 mA.
3. A low alarm condition is detected when the current pulses from normal to >28 mA and <42 mA with a 1 second equal mark space ratio for a period of 5 seconds.
4. A high alarm condition is detected when the current pulses from normal to >28 mA and <42 mA with a 0.5 second equal mark space ratio for a period of 5 seconds.
5. A beam-blocked condition is detected when the current switches from normal to <16 mA for a period of 2 seconds. The fault detection-monitoring period is 5 seconds from the receipt of the fault state.
6. A cleaning fault condition is detected when the current switches from normal to <16 mA for a period of 4 seconds. The fault detection-monitoring period is 5 Seconds from the receipt of the fault state.
7. A life fault condition is detected when the current falls to <16 mA for >5 seconds. The fault detection-monitoring period is 5 seconds from the receipt of the fault state.
8. A short circuit condition is detected if the current increases to >74 mA for >5 seconds. The fault detection-monitoring period is 5 seconds from the receipt of the fault state. Power is removed from the detector

Note:
When the alarm or fault condition has been rectified the P-UIM and Detector should be reset.
8. Maintenance

Every 3 months clean the detector lenses and the reflector using warm water and a mild detergent. Dry and polish with a clean soft non-abrasive cloth.

Every 3 months after cleaning the detector lenses and reflector test the system using the commissioning procedure as specified in section 6 of this manual.

9. Specification

9.1 Detector

<table>
<thead>
<tr>
<th>Electrical</th>
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<tbody>
<tr>
<td>Operating Voltage:</td>
<td>24 V (via P-UIM)</td>
</tr>
<tr>
<td>Quiescent Current:</td>
<td>25 mA</td>
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<tr>
<td>Alarm Current:</td>
<td>80 mA max.</td>
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<tr>
<td>Beam Length:</td>
<td>2 to 30 Metres</td>
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<tr>
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<td>Weight:</td>
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<tr>
<td>Material:</td>
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<table>
<thead>
<tr>
<th>Environmental</th>
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<tbody>
<tr>
<td>Operating Temperature:</td>
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<td>Housing Protection:</td>
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<td>BASEEFA certification:</td>
<td>Eex ib IIIB T5</td>
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9.2 P-UIM

<table>
<thead>
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<td>Operating Voltage:</td>
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<td>Power Consumption:</td>
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<tr>
<td>Quiescent:</td>
<td>100 mA</td>
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<tr>
<td>Alarm/Fault:</td>
<td>130 mA</td>
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<tr>
<td>Detector Supply:</td>
<td>up to 80 mA</td>
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<tr>
<td>Alarm Contacts:</td>
<td>24 V 1A (NO Volt Free)</td>
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<tr>
<td>Fault Contact:</td>
<td>24 V 1A (NC Volt Free)</td>
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<tr>
<td>Energised = Healthy</td>
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</tr>
<tr>
<td>De-energised = Fault</td>
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<td>Weight:</td>
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<td>Material:</td>
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<table>
<thead>
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<td>Operating Temperature:</td>
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<tr>
<td>Storage Temperature:</td>
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<td>Humidity:</td>
<td>0 to 90% RH (non-condensing)</td>
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