

LAS-10 AIO
Leakage Alarm System
Atmospheric oil spray- and gas detection
All In One detector



**Installation, operation and
maintenance manual**

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1. Introduction

DASPOS A/S is specialized in the Leakage Alarm System, LAS-10/LAS-12, an atmospheric oil spray- and gas detection system, developed to meet demands for durable fire protection solutions, within the maritime business.

With more than 25 years of experience in the maritime industry, we have been heavily involved in the technical aspects of oil mist detection and notably in the research and development phase of equipment targeted prevention of fires and explosions on board ships and oil rigs, originated from atmospheric oil mist and leakages.

Nowadays, engine rooms are often characterized by significantly higher oil pressures and a substantial decrease in crew members, due to improved engine designs. Our products have been developed to meet these assumptions and provides following benefits:

- LAS-10 AIO is specially developed for smaller engine rooms and hydraulic rooms where the easy installation doesn't involve a smoke screen test to identify the air movement and the detector can be installed by the ship's crew.
- Suitable for heavy fuel, diesel oil, hydraulic oil and lubricating oil.
- Detection of both oil sprays and hydrocarbon gasses.
- Covers a much larger area than existing products.

Our mission is to contribute globally with the most advanced marine safety equipment in order to improve the safety for the crew, ship, cargo, oil rig, production output, environment, and subsequently for the business cost efficiency. Our revolutionary and patented Leakage Alarm System will do this, by significantly reducing the risk of engine room fires, explosions and pollution.

DASPOS A/S

Improving safety at sea

2. Safety instructions



To avoid personal injury, damage to property and/or malfunctions:

- Handle equipment in accordance with chapters; **Safety instructions** and **Maintenance**.
- The Leakage Alarm System must not undergo any modifications, without a previous agreement with DASPOS A/S.
- Avoid installing detectors where: vibration is excessive, extreme temperatures may be experienced, maintenance will be complicated, high levels of humidity and water may occur and/or there is a risk of electromagnetic interference.
- Detectors may under no circumstances be installed in explosive atmospheres (ATEX-areas).
- Use appropriate personal protective equipment and turn power off, when working with electrical installations.

2.1 Oil leakages

Leakages from broken pipes or valves, gaskets or sealings, welding fractures or likewise, often occurs in high pressure oil systems during initial failure conditions. These conditions can lead to a rapid and comprehensive generation of oil sprays and/or hydrocarbons, and the result of these types of leakages will always be pollution, explosion or fire, if not detected in time.

The danger occurs when particles of 3-10 μm is allowed to form a mist in the atmosphere. When this type of oil vapour reaches the LEL¹, the condition can be classified as truly hazardous and may, if no action is taken, result in fire and/or explosion. The ignition temperature of this type of oil spray can be extremely low depending on the type of oil being atomised.

Oil mist generated by being boiled off can produce particles of 3-10 μm in diameter. This mist is visible and is known as blue smoke. Temperature and area of contact surface, naturally affects the amount and rate of oil mist generated. At this stage a temperature as low as 150°C could result in ignition. Possible heat sources causing the ignition include heat exchangers, exhaust pipes, turbochargers, electrical contacts, static electricity, faulty wiring, high- and low pressure turbines and hot surfaces in general.

¹ **Lower Explosive Limit** (LEL): The lowest concentration (%) of a gas or a vapor in air capable of producing a flash of fire in presence of an ignition source (arc, flame, heat). At a concentration in air below the LEL there is not enough fuel to continue an explosion. Concentrations lower than the LEL are "too lean" to explode but may still deflagrate.

3. Description²

The LAS-10 AIO comprises two main components:

- Detector
- PSU/Relay unit

3.1 Detector

The **detector** consists of an aluminium housing containing a sealed enclosure for the **detector PCB**. Air inlets in the housing allows air to be drawn inside the **detector** by the built-in **fan**, pass the **sinter filter** (containing a gas sensor) and through the replaceable filter, creating a differential pressure, monitored by a pressure sensor. The **fan** is shielded by the **protective grille** and the **detector** is connected to the **PSU Relay unit** through the **detector plug and cable**. Both the gas sensor and the pressure sensor are located on the **detector PCB**.

3.2 PSU/Relay unit

The **PSU Relay unit** consists of aluminium housing, fitted with **cable glands**, containing the **PSU** and the **interface PCB** on which you will find the Fault output relay and the Alarm output relay.

The presence of oil- or gas polluted air in the surrounding atmosphere of the detector will either increase the aforementioned differential pressure or the output of the gas sensor, and if these readings exceeds predetermined values in the alarm settings, the system will activate the alarm relay.

As default the Hydro Carbon gas sensor are factory set to activate the alarm relay at 17% of the LEL for Methane – and lower for other Hydro Carbon gasses.

The system also has some built-in fault monitoring, which will activate the fault relay. See “8. Fault finding”, for a specification.

² Components in **Bold** letters are available as spareparts, see list of spareparts.

4. Technical specifications

| Leakage Alarm System | |
|--------------------------------|---|
| Detector | |
| Detection range | > 0,002 mg oil/liter air |
| Airflow | 600 m ³ /hour |
| Reaction time | 5-10 sec. depending on preset alarm limit |
| Gas Detection | Hydrocarbons |
| Material | Aluminium |
| Dimensions | Ø190 x 235mm |
| Weight | 5,5 kg |
| Power supply | 24 V dc |
| Power consumption | 45 W |
| Enclosure rating | IP44 |
| Operating temperature | -25 ~ +70°C |
| Humidity limit | 0 - 95% RH |
| Power supply/Relay unit | |
| Number of detectors | 1 |
| Material | Aluminium |
| Dimensions | 255 x 190 x 90mm |
| Weight | 3,3 kgs |
| Power supply | Input voltage: 90-305 V ac Output voltage: 24 V dc |
| Power consumption | 5W |
| Enclosure rating | IP65 |
| Operating temperature | -20 ~ +60°C |
| Humidity limit | 0 - 95% RH |

Figure 4.1

5. Installation and commissioning

5.1 Preparations

Installing a Leakage Alarm System requires preparations. First step is to determine a suitable position for mounting of the detector. Areas such as hydraulic pumps and around main- and auxiliary engines and in funnels are the most obvious locations for the LAS-10 AIO detector. Other relevant areas are applications characterised by higher oil- temperatures or pressures.

Next step is to verify air movements in relation to the application. In general, air will move towards ventilation extractors and turbo chargers and the detector should therefore be positioned as close to the machinery as possible. Likewise detectors should not be installed next to ventilation blowers as these will prevent mist formations from being drawn into the unit.

5.2 Installation

5.2.1 PSU/Relay unit

The PSU/Relay unit is mounted next to the detector in the engine room.

Avoid installing the PSU/Relay unit where: vibration is excessive, extreme temperatures may be experienced, maintenance will be difficult, high levels of humidity and water may occur and there is a risk of electromagnetic interference.

5.2.2 Detectors

The detector is designed to be mounted in the engine room and should be located as close to the relevant application as possible. In the interest of accessibility, during e.g. maintenance, mount the detector in or next to high traffic areas and in reasonable heights if possible.

Avoid installing the detector where: vibration is excessive, extreme temperatures may be experienced, maintenance will be difficult, high levels of humidity and water may occur and there is a risk of electromagnetic interference.

5.2.3 Detector Print Card details

The unit can operate as stand-alone or be part of a larger system using RS485/422 serial port, and alarm and fault relay outputs.

The system consists of the following parts

A sensor with print and fan, which is built into a specially designed aluminum housing.

D = 188mm H = 235mm and

A connection box in gray aluminum. 90x160x260mm excl. adapters and cables.

The box is IP65.

Sensor print card LAS-10 AIO has connection for:

Fan Motor, 4 terminals (+ DCV, 0V, NC, NC).

Supply and relay outputs, 8 terminals (+ DCV, DCV +, 0V, 0V, Alarm1-2, FAULT1-2).

RS485/422 serial port, five terminals (A, B, Y, Z, 0V).

LED connector, Red / Green LED for alarm and fault indication.

Hoses for pressure sensor, (LOW and HIGH).

Programming connector PIC Pro +5 V..

System description:

Measurement of gases and vaporized oil in the air: 1000 times per second. The measured differential pressure across a filter using the built-in fan.

Ambient temperature, max 60 C °.

Supply 90 to 305 Vac.

Internal power supply, 22Vdc to 27Vdc.

Alarm and error Solid State relay outputs max 24VDC/100mA.

CPU program (PIC18F2620) sits in base for easy replacement and software update.

The system starts in Inhibit for 5 min. for both GAS and oil sensor.

Gas is measured from 0ppm to 300ppm or from 0 to 100%. Alarm will be given above 50 ppm or 17% (or 33% if Switch 9 is ON).

Pressure sensor measures the pressure difference, 0% to 100% . Alarm can occur between 8% and 100%. The alarm limit adjust itself every hour. Flow fault will occur below 4% and above 80%.

When the system detects that the filter is removed, “reset” is active for 15 seconds. If the filter is not placed in the socket within 15 sec the fault relay will get active. The “reset” time is displayed by LED flashing red / green.

5.2.3.1 DIL-Switch settings:

Setting option on Switch 1 to 10

Switch 1-4, the sensor address1-15.

Are only used when alarms and faults are transferred to LAS12 using **serial port**.

Switch 5 Fault Relay (NC / NO)

NC Fault solid state relay is normally closed and switches to open on alarm

NO Fault solid state relay is normally open and switches to closed on alarm

Switch 6 Alarm Relay (NC / NO)

NC Alarm solid state relay is normally closed and switches to open on alarm

NO Alarm solid state relay is normally open and switches to closed on alarm

Switch 7, 8 (0.0), (0.1), (1.1), (1.1) (Not used now, Baud rate is always 19200)

(0.0), seen two 2400, 8bit, none parity bits, 1 stop bit, none (2400 8-N-1-N).

(0.1), seen two 4800, 8bit, none parity bits, 1 stop bit, none (4800 8-N-1-N).

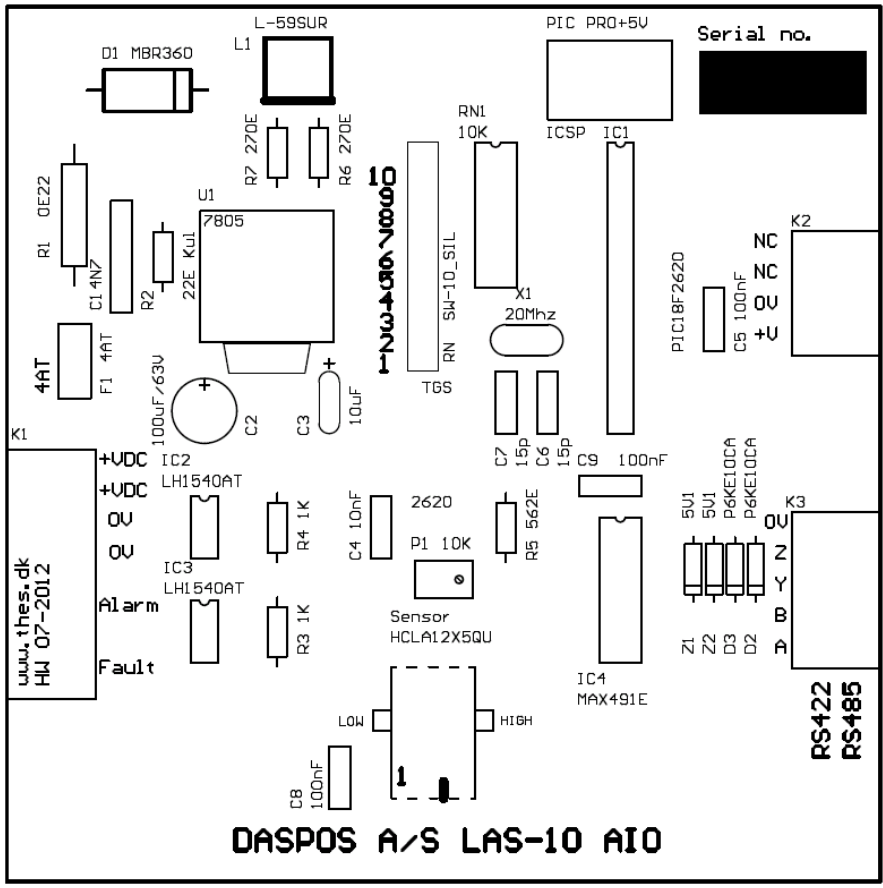
(1.0), seen two 9600, 8bit, none parity bits, 1 stop bit, none (9600 8-N-1-N).

(1.1), seen two 19200, 8bit, none parity bits, 1 stop bit, none (19200 8-N-1-N).

Switch 9

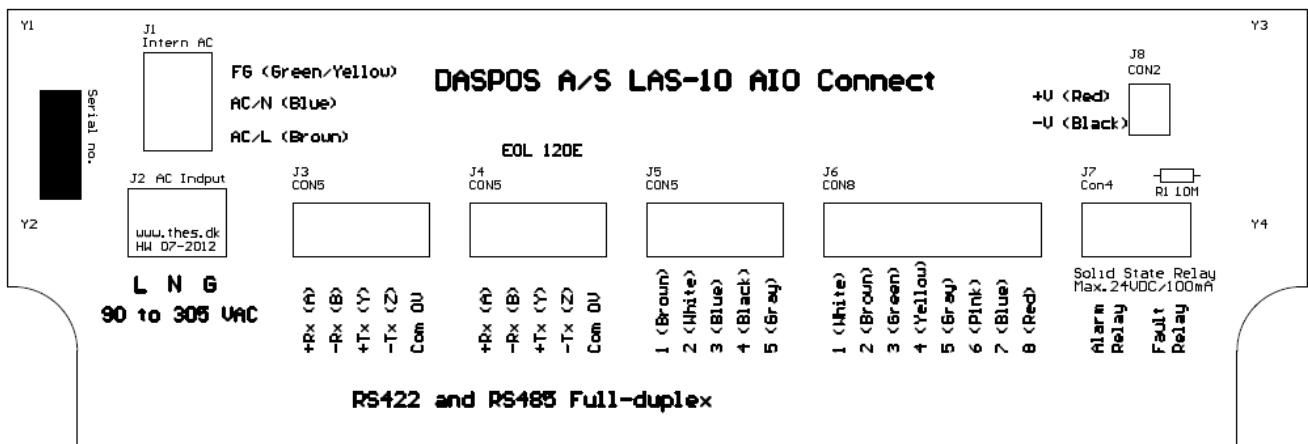
Gas alarm limit is set to double by ON.

Switch 10 Spare.



5.2.4 Power Supply Unit connections

- PSU unit Print Card LAS-10 AIO has terminals for:
- Power Supply 90 – 305 Vac/127 – 405 Vdc (J2)
- RS485/422 data (Not used in stand alone mode) (J3+J4)
- DATA transmission (Not used in stand alone mode) (J5)
- Detector connection – preconnected (J6)
- Relay outputs, 4 terminals Alarm1-2, FAULT1-2. Max 24Vdc/100mA (J7)



5.3 Commissioning

5.3.1 Test procedure

| System test | |
|-------------------------|---|
| Methodological design | To provoke an alarm on the detector: Decrease the open area of the filter to the extent of an alarm. Expose the gas sensor to any kind of gas to the extent of an alarm. To provoke a fault on the detector: 1. Remove the filter from the detector for more than 15 sec. The input voltage is measured on the detector PCB on connector K1, terminal 1 + 2. |
| Test criteria | When a fault/alarm is provoked, the event must be visible on the detector LED and the related fault-/alarm relay must be activated. The voltage on the detector fan must be 21V DC and is adjusted on the PSU. |
| Training of engine crew | As a result of the training, all relevant members of the engine crew must fully understand the purpose of the Leakage Alarm System and furthermore know how to operate it during normal, alarm- and failure conditions. |

Figure 5.1

6. Operation

The Leakage Alarm System AIO is pre-programmed regarding alarm limits –

The gas alarm limit is as default set to activate the alarm relay at 17% of LEL and can in case of an inappropriate low set point be set to 33% on the dip switches on the detector pcb.

The Oil filter limit is set to activate the alarm relay at 5% above the actual level of the differential pressure across the filter and is automatically adjusted every hour.

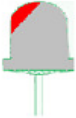
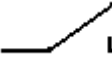
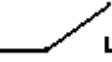

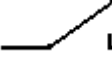


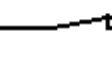
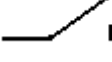





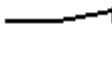

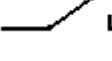
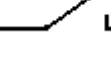
6.1 Status of detector

The status of the detector is alerted via the Alarm relay and the Fault relay.

The LED on the detector will also show the status of each detector during various conditions and should be read as follows:

| LED color | Situation | Activation of relay |
|--------------------|-----------------|---------------------|
| Constant green | Power on/normal | Both relays Off |
| Flashing Red | Alarm | Alarm relay On |
| Constant Red | Alarm accepted | Both relays Off |
| Flashing Green | System fault | Fault relay On |
| LED Off | Fan fault | Fault relay On |
| Flashing Green/Red | Alarm Reset | Resets relays |

6.1.1 LED Messages

| | | Relay position | |
|---|--|--|---|
| | | Alarm | Fault |
|  | Initiating 5 minutes after power up |  |  |
|  | "Normal" Detector ON |  |  |
|  | "Alarm" Excess Gas or Oil level |  |  |
|  | "Acknowledged Alarm" Rectify Alarm condition |  |  |
|  | "Fault" Rectify Fault condition |  |  |
|  | "Resetting" Relocate the mesh within 15 sec. |  |  |

To reset an alarm: Replace the filter for a few moments and the LED will begin flashing Red/Green. Place the filter back in the slot within 15 sec to reset the alarm. The LED will now show a constant green light if the situation that caused the alarm is rectified.

6.2 Oil detection

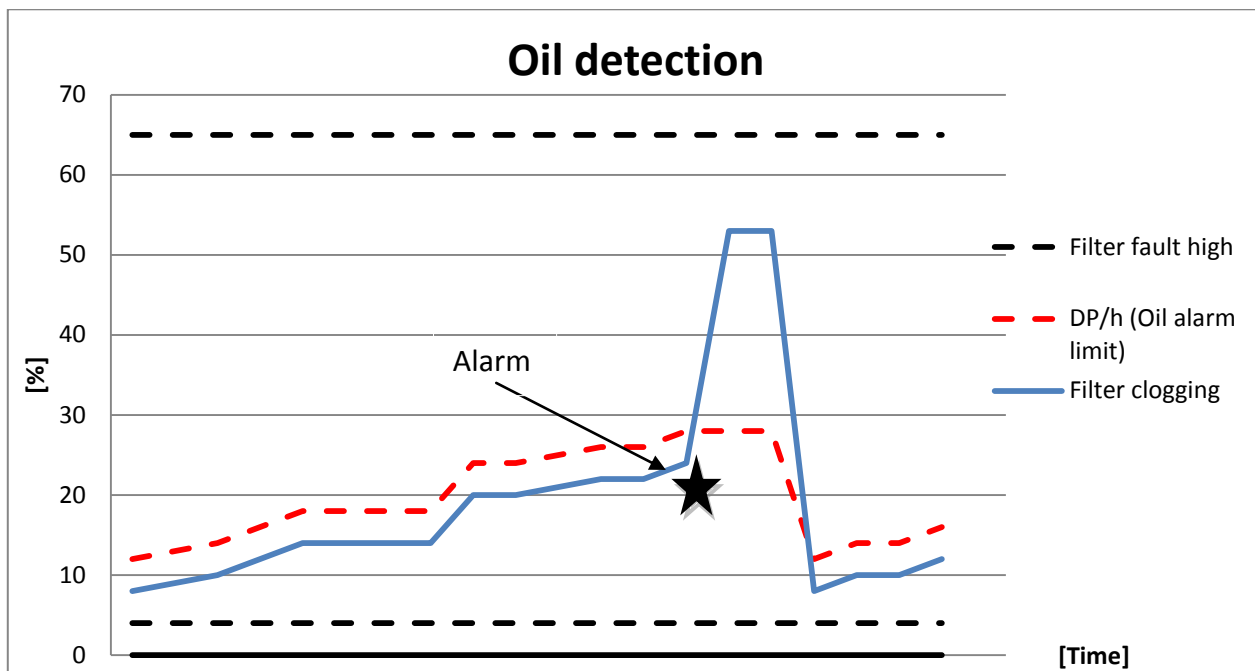


Figure 6.1 shows the clogging of a filter, an oil leakage and a cleaning.

6.3 Gas detection

Following alarm limits, in relation to the gas detection:

| | |
|------------------------|--|
| Gas Alarm Limit | The current threshold for the presence of hydrocarbons is 17% of LEL. |
| Extended GAL | The limit can for special areas be increased on DIL-switch to 33% of LEL |

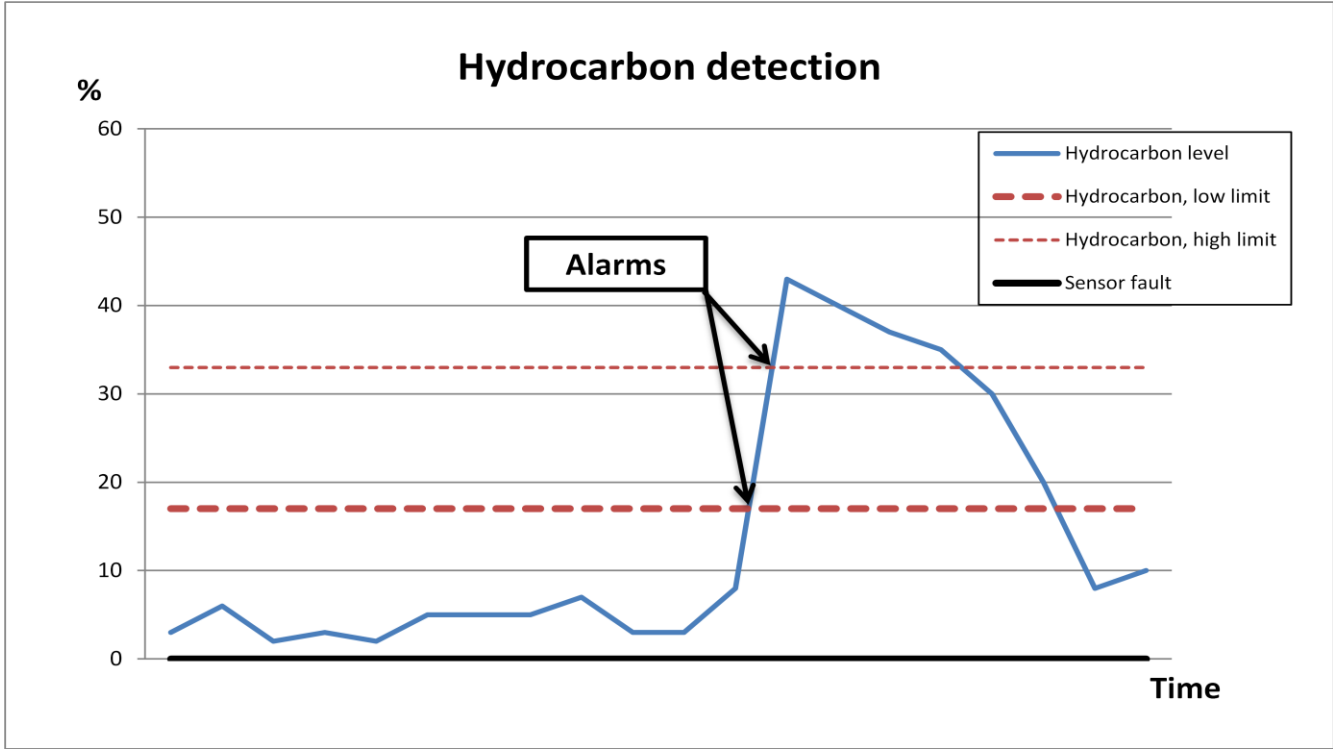


Figure 6.3 illustrates gas detection

7. Maintenance

The Leakage Alarm System is easily maintained, the only component which requires periodically attention are the filters. In time, the surface of the filters will be covered with oil-, grease- and dust particles which need to be removed.

7.1 Filter

When the dp filter needs to be cleaned, the system will notify the crew by giving a warning by activating the Fault relay.

Oil, grease and dust will easily come off using warm water and soap, atomized diesel oil or degreasers of all kinds, dry cotton rags and compressed air.

Be sure to remove all particles, as leftovers will complicate future cleanings. When the filter is installed, the tongue and groove must fit into each other.

7.2 Sinter filter

The sinter filter only seldom needs to be cleaned. Depending on the frequency of events and the location of detectors, the surface of the sinter filter tends to build up an oil film which needs to be removed, in order to generate proper detection results.

Oil film easily comes off using warm water and soap, atomized diesel oil or degreasers of all kinds, dry cotton rags and compressed air. Be sure to remove all particles, as leftovers will complicate future cleaning of the filters.

Be careful not to damage the gas sensor, located inside, if unscrewing the sinter filter.

7.3 Calibration

Calibration of detectors should only be performed by authorized DASPOS personnel and is only relevant if deemed necessary by the owner or DASPOS A/S. Minimum every 2 years i recommended.

8. Illustrations

Power supply



Detector printcard



9. Spare parts

9.1 List of spare parts

| Spare part | Article no. |
|---|-------------|
| Detector, complete unit | D-1116 |
| Fan | D-2741 |
| Power/comms socket 8-pole | D-2866 |
| Power/comms plug 8-pole incl. 3 m cable | D-2870 |
| Screw for DL cover | D-1813 |
| Detector pcb | D-3889 |
| dp Pipes 2 pcs | D-2647 |
| Detector hose 2 pcs | D-2868 |
| Hose stud straight | D-1832 |
| O-ring, cover | D-1874 |
| LED 3-colour | D-2872 |
| Fingerfilter | D-2874 |
| Screw for fan/fingerfilter | D-2875 |
| Power supply unit, complete | P-1114 |
| Sinter filter | D-2645 |
| LAS-10 filter, fine mesh | D-1009 |
| Fuse, 4A 250v | P-1111 |
| Detector bracket | M-1010 |

10. Contact Information

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