



Application note MAC View®-Particles

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Revision 1.03

Introduction

Thank you for choosing one of our MAC View® products. All our products distinguish by quality, application uniqueness in different situations and considered application software.

For the right operation it is important to take notice of several base points when you install the apparatus. Due to this, the equipment will then function optimal.

Advice for placing the control units

De control units, which are made of aluminum, are IP65 waterproof and can be used in almost every industrial environment.

Mounting has to be done at a steady and shock free surface. The equipment uses 230 Volt with grounding.

The equipment can be managed through buttons at the front side of the control unit. It is practical to place the unit on a height of 1,8 meter.

When it is not possible to place the unit at this height, the unit can be placed in a switch-cupboard, on bigger height. By connecting the unit on a computer or on a network, it is possible to control the installation on distance.

General

For the right placement of the sensors, it is important to know as much as possible of the air streams in the area. Every space has its death corners and places where air streams dominate. At some places a unit can measure low concentrations, because there is almost no air movement, so filthy air do not reach the sensor. Placement at rooms that are frequently opened and closed by doors gives the mostly deviant measurement.

For all locations rules, there must be enough air around the sensor.

When the most important air streams are determined and the MAC View® control unit is placed, the sensor can start measuring. When the measurement data is not in agreement with the visual filthy in the hall, it can be that the sensor is placed at a wrong place. To determine the right place an extension cord can be used to try measurement with the sensor at another place.

Determine the number of dust sensors

Dust measurement in an industrial environment is a relative new technique. In the first place the aim of the of the measurement must be determined. It is important that you determine the number of sensors and the place before you start.

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Some targets are:

- Control ventilation systems
- To get understanding in total dust load of the environment
- Doing measurement at breathe level according the laws for working circumstances
- A combination of forgoing targets

To use the unit for controlling ventilation systems in large halls, it is in the first place important to determine the height of the sensors. (Breathe-height or just higher.) The height of the sensors is definitive for saving energy. (**See: Definition height of sensors**)

In the forgoing we suppose that the dust spread smoothly through the hall. In practice, this situation will almost never occur; some locations (dust at source-locations) in the hall are more polluted then other locations.

The behavior of dust is essential different as a gas. Air streaming spreads dust, which starts with convection (heat sources), draught (open doors), whirls (transport, crane) and much more other influences. The dust load in a hall is rarely homogeneous.

The **MAC View®** sensor will provide a measure result in all situations, it must be said that this result is only the average value if there is chosen for the right number of sensors and when they are mounted at the right place.

To understand in the place and the number of the sensors, the following mentioned rule could be used: By dividing a(n) (production-) area in pieces of 12 x 12 metre and declare the theoretical dust load for each piece of approximately 150 m², gives understanding in the concentration of the specific areas. These parts are determinant for the number and placing of sensors.

The schematic looks like this:

A	Pollution source	Light pollution				Pollution source
B	Light pollution			Pollution source	Moderate pollution	
C				Light pollution		
	1	2	3	4	5	6

In the diagram above there are 3 separate pollution sources, whose spread-combined area is 1000m², and the total area is 2700 m².

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For an optimum operation of the system, it is necessary to place 3 separate sensors in the areas where the sources are. Because of this, the air pollution is vented away in the necessary time. In that case there is no intervention of dust in other areas.

The sensors should be placed in the areas A1, B4 and A6. As alternative the sensors in the areas A6 and B4 can be replaced by 1 sensor in area B5, the system will respond slower on the pollution because the distance to the source is larger. The areas next to the sources will then have more pollution.

The ventilation system has to work longer because the area is bigger.

Further it is important for the placement of the sensors, that the design of the air extraction installation is good. Particular the direction of the air stream is important for the place of the sensors.

We distinguish three variants:

- Vertical ventilation system, for example: roof ventilators
- Push systems, this causes a horizontal air stream.
- Push-pull systems

Determination of the height of the sensors

By the determination of the height of the sensors, pay attention to the following points:

- Energy saving
- Control ventilation systems or air vents
- Doing measurement at breathe level according the laws for working circumstances
- A combination of mentioned point

When you chose for energy saving, placing the sensor low to the ground is most efficient. This makes clear that in the most surroundings (think at welding areas) there is a 3-layers division in the air; each layer is approximately a third of the total height of the hall. The layer with the most pollution is mostly the highest layer. When the sensor is placed at 3-3,5 metres above ground level, the ventilation system will extract the most filthy or polluted air.

At a sensor height of 1,6-2 metres above ground level (at breathe level) the fine-dust is usually lower, so this makes ventilation less necessary. The upper polluted layer remains visible, but in this situation the most energy is saved.

Vertical ventilation

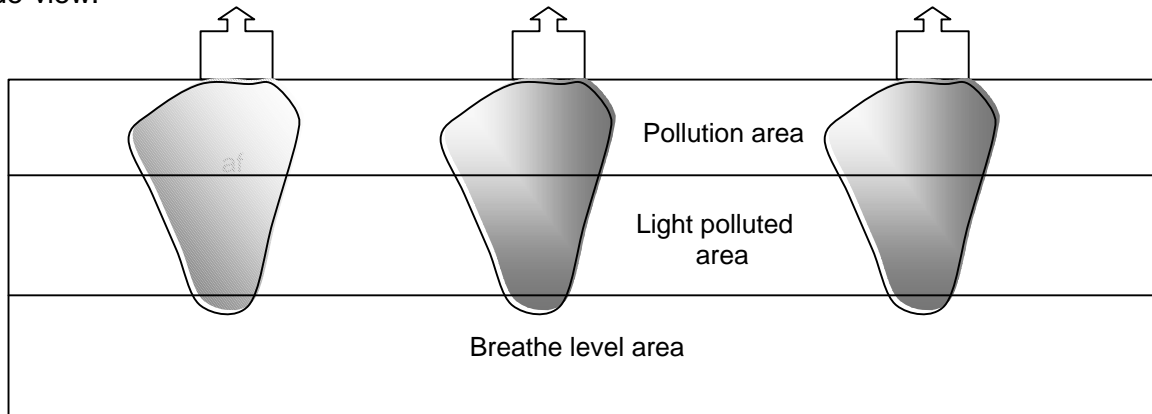
With vertical extraction it is important to prevent placing the sensors in the extraction cone of the fans. This can cause fault measurements. Especially when the sensors are placed at high a level.

When the sensors are placed at breathe level, the problem of fault measurements is an issue.





Side-view:



Although we dissuade placing a sensor in the extraction cone of the fan, it can be considered in situations when it is impossible to choose another place, because there are too many harassing effects. In that case we advise to place the sensor close to the fan or ventilator.

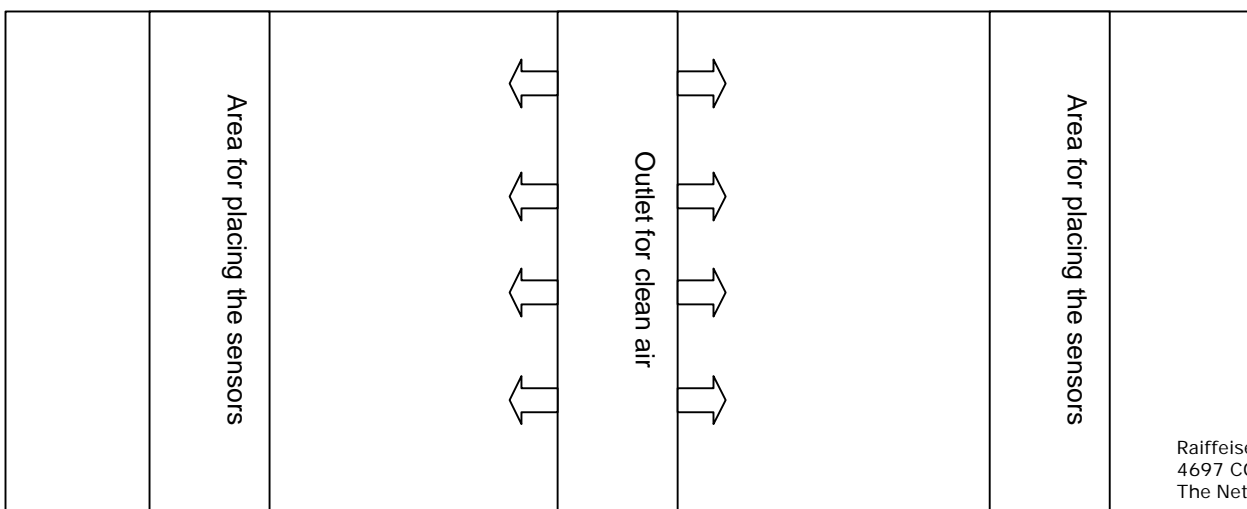
When you place the sensor close to the fan it is important to choose a sensor with pinch connectors, so that with the use of a flow meter the air stream through the sensor can be controlled at 0,25m/sec.

When the maximum allowable concentration in the extracted air is reached, the control unit will shut down the ventilation system. By using the MACView® in this way, the advantages of the MACView® are not all used, especially the possibility of saving energy. When you increase the values in the MACView® the system is shut down at a higher concentration, but at breathe level the air will answer the de standard norm.

Blow systems

With blow systems (horizontal air stream) attention must be paid to the place of the extraction vents and the place of the outlet for clean air. The best place is at a distance of 2/3 of the total distance between the extraction vents and the end of the hall.

Top view:



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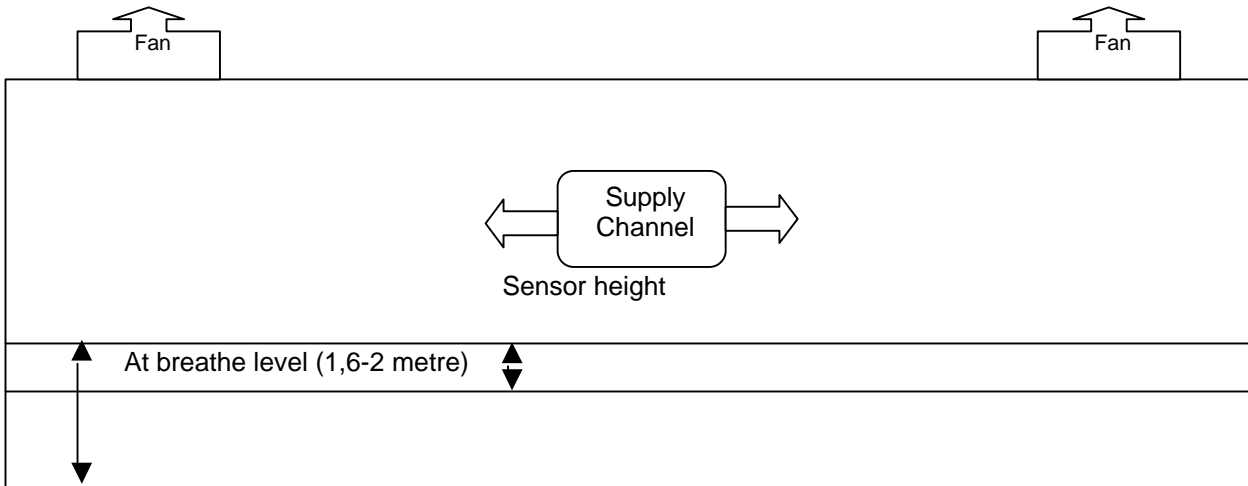
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Front view:

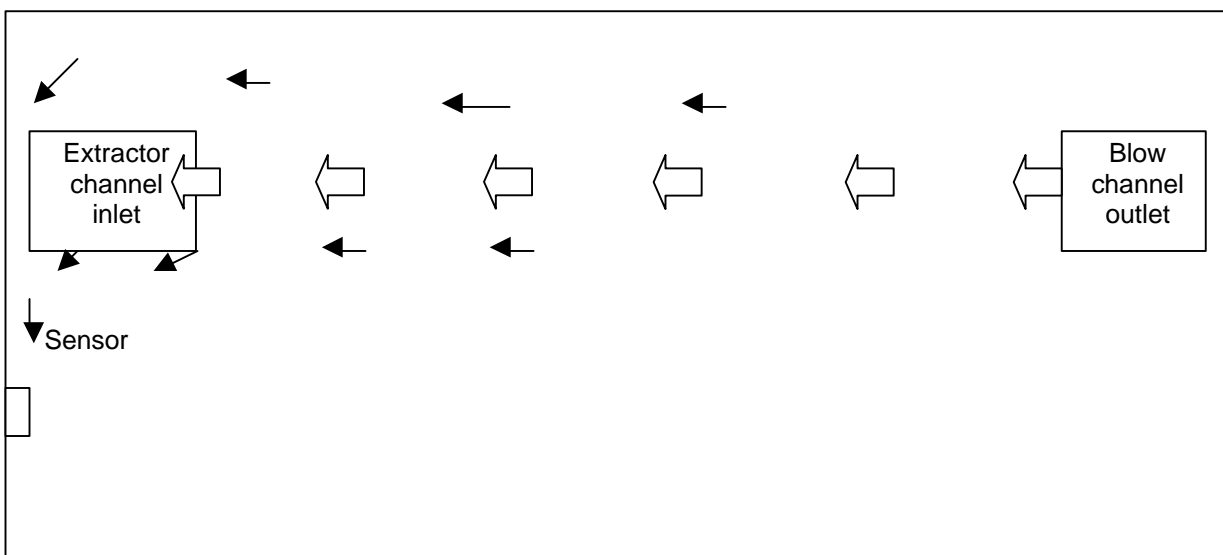


Push-pull systems

With “push-pull” installations it is possible to place the sensors directly on the wall. Through the specific air circulation, which is characteristic for such installations, the polluted air will normally reaches the opposite wall. It is significant to determine the right place by means of different sensor positions.

Here below is an example of the air circulation of a push-pull system, with the advised places of the sensors.

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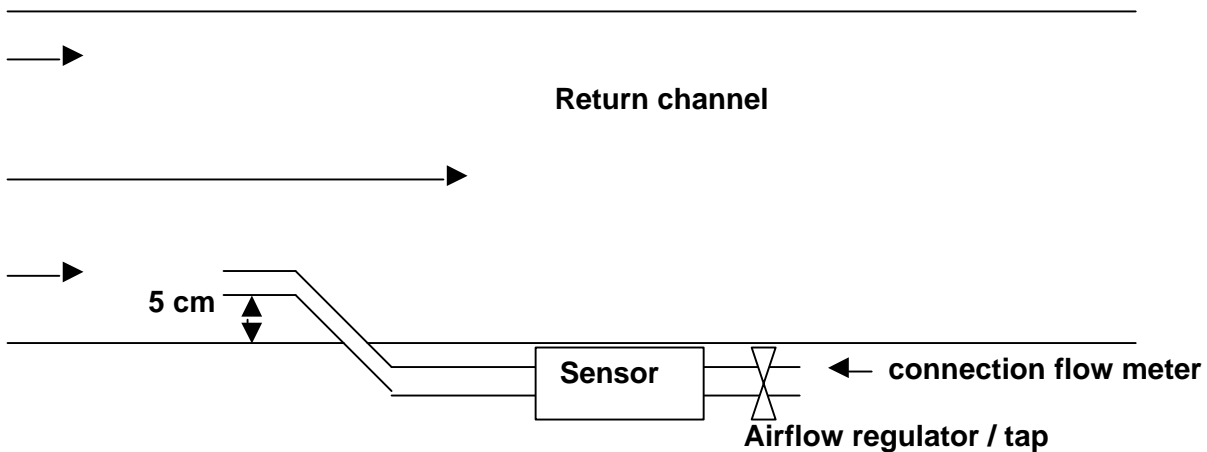
Channel measurement

A third possibility is to measure in ventilation channels. This can be done when there is no other possibility to place the sensor elsewhere, or where it is necessary to measure the returning air from an air cleaning system, for example done in the wood processing industry.

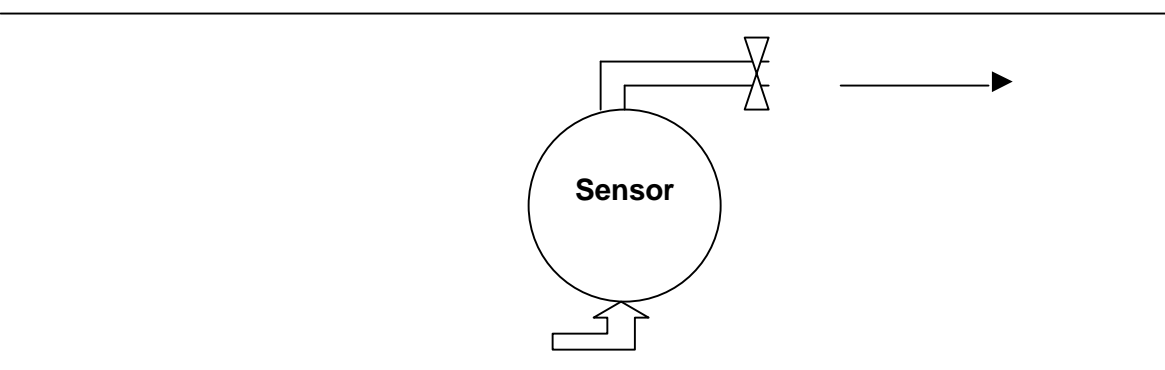
In this case we use a sensor with pinch connections

The sensor is connected on a channel by use of a small tube. The end of the tube is brought in the air channel. To avoid whirls the tube has to be placed at least 15 cm from the channel wall, with a hole in the opposite of the air stream direction. Mostly a funnel is placed to the inlet of the tube in the ventilation channel. In the output tube a regulator will be fitted to control the quantity of air through the tube. Using a flow meter can help you determine the airflow. After the regulation of the airflow, the flow meter can be removed.

In the schema it looks like this:



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The MAC **View**® Particles is especially useful for, control the ventilation system, but also to register the dust load in the area. For this purpose the MAC **register**® software is standard delivered. When placing the sensors at the right places you get understand how the dust load is.

If you want to receive a total overview of the dust load of an area, you can consider setting up a more extensive measurement system.

In this case it is not important where the pollution sources are, but on every piece (the 12 x12 meter areas) of a hall must a sensor placed. The default size depends of the dimensions of the hall, but commonly you can use 150 m². The distance of the sensor above the floor depends of the desired goal. Obvious is a measurement at breath level. In this case you can use the registered data for representation in risk analysis or in a work circumstances report.

By using the control software for more then one sensor, it is possible to use the data for other purposes like we mentioned before as for clean air installations and for energy saving programs.

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