

# OPERA

## Iodines & Aerosols Sampler

### TECHNICAL SPECIFICATIONS

Designation: **Sampler of airborne aerosols and iodines**

Reference: P-537-100

#### Classification:

Medium flow air sampler for airborne aerosols and iodines with deferred analysis.

#### Description:

A servo maintains the sampling flow rate at preset values for each sampling channel.

The device is monitored locally and/or remotely.

Results are available locally and/or remotely.



#### OPERA complies with the following standards:

**NF-M-60-760:** sampling of aerosols for the measurement of radioactivity in the environment.

**NF-M-60-759:** determination of the volumic activity of airborne iodines in the atmospheric environment.

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## Iodines & Aerosols Sampler

### Operation

- 24 / 24, by continuous periods of 1 to 7 days (depending on the type of filter).
- One air flow measure every minute, ensuing an adjustment of the pump supply voltage frequency.
- Stop/Start locally and/or remotely.
- Shutdown and re-start in the event of a mains power fault.
- Daily SMS / e-mails testing communication.
- SMS / e-mails sent for every abnormal occurrence.
- Local setting of operating parameters.

OPERA is organised in several compartments within a metal housing.

The « user » compartment is easily accessible and contains the aerosols and iodine sampling heads, as well as the human / machine interface.

The « control » compartment incorporates data management, control of the sampling channels as well as communication modules.

The « pumps » compartment contains the pumps operating on the 2 sampling channels.



### AEROSOL CHANNEL

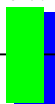
The aerosol channel is made of an air inlet, a sampling head, a flow meter and a pump.

The air inlet is shared by both aerosols and iodines channels.

It is protected by an antistatic coated cowling, and can be equipped with a wire mesh against insect ingress.

### Suitable filters:

- Paper filters, fibreglass, electrostatic polypropylene.
- Outside diameter / effective: 130/120 mm, 140/130mm.
- Other dimensions on request, subject to pump capacity.
- Filter support supplied with storage case.



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## Iodines & Aerosols Sampler

### Sampling head:

Compliant with NF M 60-760 standard

Composition :

Stationary lower half.

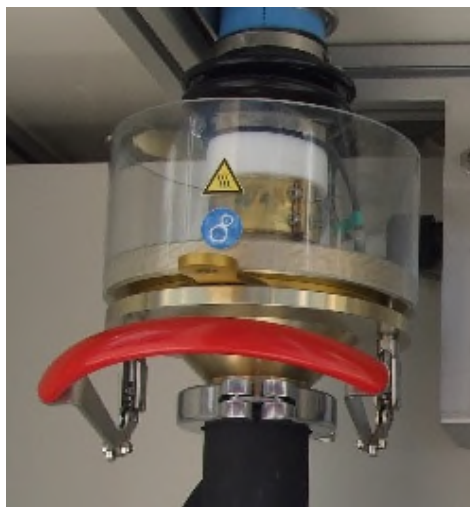
Mobile upper half enabling filter positioning.

Fastening handle actioning lateral locks.

Sealing ensured by o-ring and rubber bellow.

Condensation is prevented during sampling by means of a 275W heated collar set for  $T_{amb} < 25^{\circ}\text{C}$ .

Antistatic coated cover.



### Flow rate measure :

Mass flow meter placed on a branch on the main air circuit.

Branch circuit ratio 1/30

The response of the assembly is determined by calibration.

Output voltage 1 to 5 volts.



### Aerosol sampling pump:

Double stage side channel turbine.

Powered by three phase variable frequency drive 10-50 Hz 230 Volts 3 kW.

Monitoring of the sampling flow by three phase variable frequency drive 10-60 Hz 230 Volts.

Maximum pressure loss acceptable at  $70 \text{ m}^3 \cdot \text{h}^{-1}$  : 250 hPa.

Power usage at maximum pressure loss: 2.2 kW.

Adjustable sampling flow rate:  $60 \text{ m}^3 \cdot \text{h}^{-1}$  to  $90 \text{ m}^3 \cdot \text{h}^{-1}$ .

The air sampled is evacuated through an exhaust pipe.

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## Iodines & Aerosols Sampler

### IODINE CHANNEL

The iodine channel is made up of an air inlet, a setup measuring relative humidity, a cartridge holder head, a flow meter and a pump.

#### Air inlet

Part of the air previously sampled by the aerosols sampling head is pumped through an activated carbon cartridge.

The air is returned to the circuit after the branch circuit.

#### Filtering media

« Activated carbon »: impregnated activated vegetable carbon to trap radioactive iodine  
Standard cartridge diameter 57.7 mm

#### Air humidity monitoring

The efficiency of the activated carbon depends on humidity. The iodine sampling channel is equipped with a patented device ensuring that humidity is kept below 30%.

### Iodine sampling head

The sampling head can hold 1 to 2 cartridges.

Standard: isolated by two solenoid valves with monitoring of overpressures caused by atmospheric variations by means of a membrane situated upstream of the iodine sampling head.

Optional three phase: no solenoid valves.

Cam locking mechanism.

Cartridge effective diameter 51 mm

Sealed by two o-rings.

Stationary upper part

Mobile lower part to release the cartridge(s).



### Flow measurement

Mass flow sensor situated in the air circuit of the iodine channel.

Response time of the assembly determined by calibration.

Relative error on the sampled flow rate < 0.8%.

Output voltage 1 to 5 Volts.



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## Iodines & Aerosols Sampler

### Iodine sampling pump

90W single channel turbine.  
24V continuous power voltage.  
Monitoring of the sampling flow rate by continuous voltage 0-10V.  
Maximum acceptable pressure loss at  $4.5 \text{ m}^3 \cdot \text{h}^{-1}$  : 90 hPa.  
Power usage at maximum pressure loss: 90 W.  
Adjustable sampling flow rate from  $2.1 \text{ m}^3 \cdot \text{h}^{-1}$  to  $4 \text{ m}^3 \cdot \text{h}^{-1}$ .  
Exhaust pipe.

### Aeraulics - Miscellaneous

Evacuation nozzle available.  
Flexible connecting pipes inside the housing.  
Fast connection of the exhaust pipe.

### Monitoring

Onboard PC operating under Windows XP, 5.7" TFT tactile screen

Flow measurement chains:  
10 bits analog - digital converter.  
Each flow measurement results from the average of 10 single measures.  
Calculation of the sampling flow rate from the calibration curve.  
Calculation of the volume since the last volume counter reset.

Temperature measurement chain:  
10 bits analog - digital converter.  
Calculation of the temperature from the manufacturer's calibration curve.

Servo control of the flow in the aerosol channel via an 8 bits digital potentiometer for the control of the variable frequency drive associated to the centrifugal pump.  
Servo control of the flow in the iodine channel by variation of the centrifugal pump power voltage.  
Regulation ratio :  $\pm 1.0\%$  of the nominal flow

Multi level access (user / administrator / maintenance), pin code protected.

Power failure occurrence:  
Battery power backup for both PC and GPRS modem for a lapse of time allowing emission of report messages and PC shutdown.  
Operating parameters backup  
Sampled volume backup

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## Iodines & Aerosols Sampler

### Input Output

5.7 " tactile screen

RS232 port  
USB port  
Ethernet port  
Modbus TCP port

Data backup by USB key  
Software update by USB key

Reports sent via GPRS Modem.  
Onboard web server.

Detectable anomalies:  
Flow rate out of factory set range  
Abnormal current supply to the pump  
Temperature out of factory set range  
Communication anomaly on a sampling channel  
Mains power failure > 10 seconds



### Housing

40 mm cross section anodized aluminium profile.  
Walls and bottom out of stainless steel sheet.  
Formed stainless steel lid.  
White lacquered paint RAL 9002

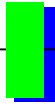
The pumps are located in the lower part of the housing. Side vents allow air circulation.

The upper part of the housing is divided in two areas:  
Air circuits and Human Machine Interface at the front  
Electronics and computing at the back

An inspection hatch is located at the back of the housing. The inspection hatch is fastened with screws. The top compartments front and back have sliding doors equipped with a turn/push key lock.

The door frames are made out of 25mm cross section profile, the door panels are made of a coloured composite (RAL 9016).

4 adjustable feet.  
Ground anchors.



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## Iodines & Aerosols Sampler

Electrical compartment located in the upper part at the rear of the housing.  
3 x 6 mm<sup>2</sup> power cable  
Default output: active security on-off contact (contact open in the absence of voltage)  
Main switch

### Protections:

Variable frequency drive: 50A fuse gL/gG  
Electronics: 6A circuit breaker Curve C  
Heated collars: 6A circuit breaker Curve C  
SIEMENS variable frequency drive with EMC filter.

24V / 12V continuous power

13.8V continuous power for the battery charge

In the event of a power failure, the battery will allow message reports to be sent, and proper shutdown of the PC.

Aerosol / iodine / input output monitoring housing: proprietary onboard circuit boards and software.  
Onboard PC operating under Windows XP Embedded  
Communication between PC and monitoring housings via RS485 / MODBUS

## EMC

Designed for optimal protection.  
Electrical continuity between mechanical parts.  
Electromagnetic compatibility tests have been carried out by an external agency accredited by COFRAC.

## Materials

Air circuit: Aluminium  
Aerosols sampling head: Alodyne 1200 treated aluminium

Filter support: Gold anodized aluminium  
Storage case: Aluminium

Branch circuit: Teflon coated polyamide  
Tube upstream of the iodine head: Teflon  
Iodine channel heater: Aluminium  
Iodine channel cartridge holder: Alodyne 1200 treated aluminium

Frame: Anodized aluminium  
Sheet metal work: Lacquered EZ steel

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## Iodines & Aerosols Sampler

### Power

#### Standard

230Volts  $\pm$  10 % single phase 50Hz (optional 230V 50 Hz two phase without neutral supply)  
Upstream 2-pole differential circuit breaker advised: 300 mA high immunity ( type SI (Schneider)  
HPI (Legrand) G (Moeller) ) curve C, 32 A.  
Maximum power usage 5 kW

#### Optional three phase:

400V three phase without neutral supply 50Hz  
Upstream differential circuit breaker advised: 300 mA high immunity type SI 32 A.  
Maximum power usage 5 kW

### Environment

Sound level < 60 dB at a distance of 1m at nominal flow.  
Temperature range: -20°C, + 40°C  
Ingress Protection rating IP 54.

### Dimensions and weight

Frame dimensions: 1100 x 700 x 1330 mm (l x p x h)  
Ground clearance: 98 mm  
Air inlet height: 1800 mm  
Weight: 140kg

### Miscellaneous

EEX Certification: none

### Decommissioning

We undertake to remove free of charge our appliances at the end of their working life, and to have them dismantled in approved waste treatment plants.

## References :

#### 1-Sampler

OPERA mono phase P-537-100  
OPERA three phase P-537-100-T

#### 4-Iodine sampling head

Single P-535-141  
Double P-535-142

#### 2-Aerosol sampling head

Sampling head dia 130 / 125 mm P-535-115  
Sampling head dia 140 / 130 mm P-535-123

#### 5-Options :

Extended temperature range  
Sintered stainless steel dia 130mm M-531-154  
Insect protection wire mesh P-537-121

#### 3-Filter holder and storage case

Filter holder dia 130 / 125 mm P-535-122  
Filter holder dia 230 / 220 mm P-535-123

*Additional options developed on request*