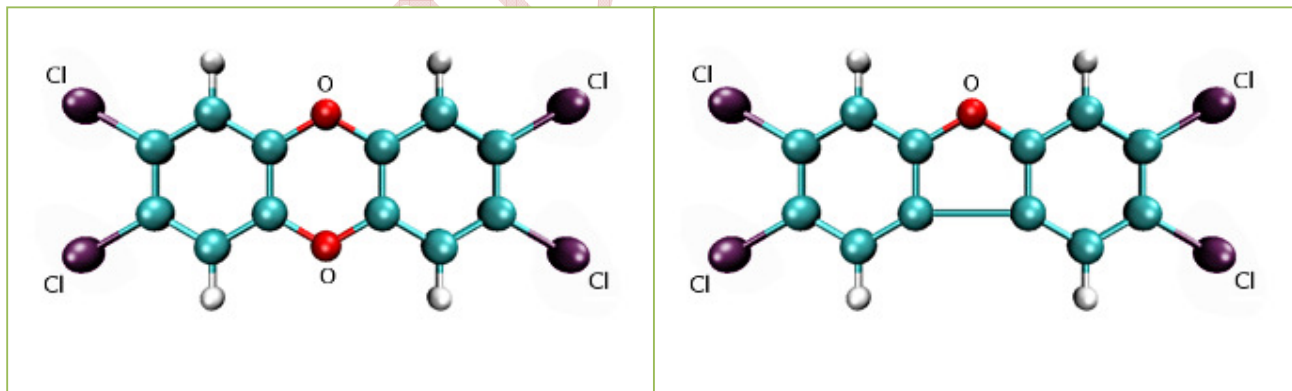


## DECS

### Technical presentation



October 26th, 2018

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# 1 SAMPLER DESIGN

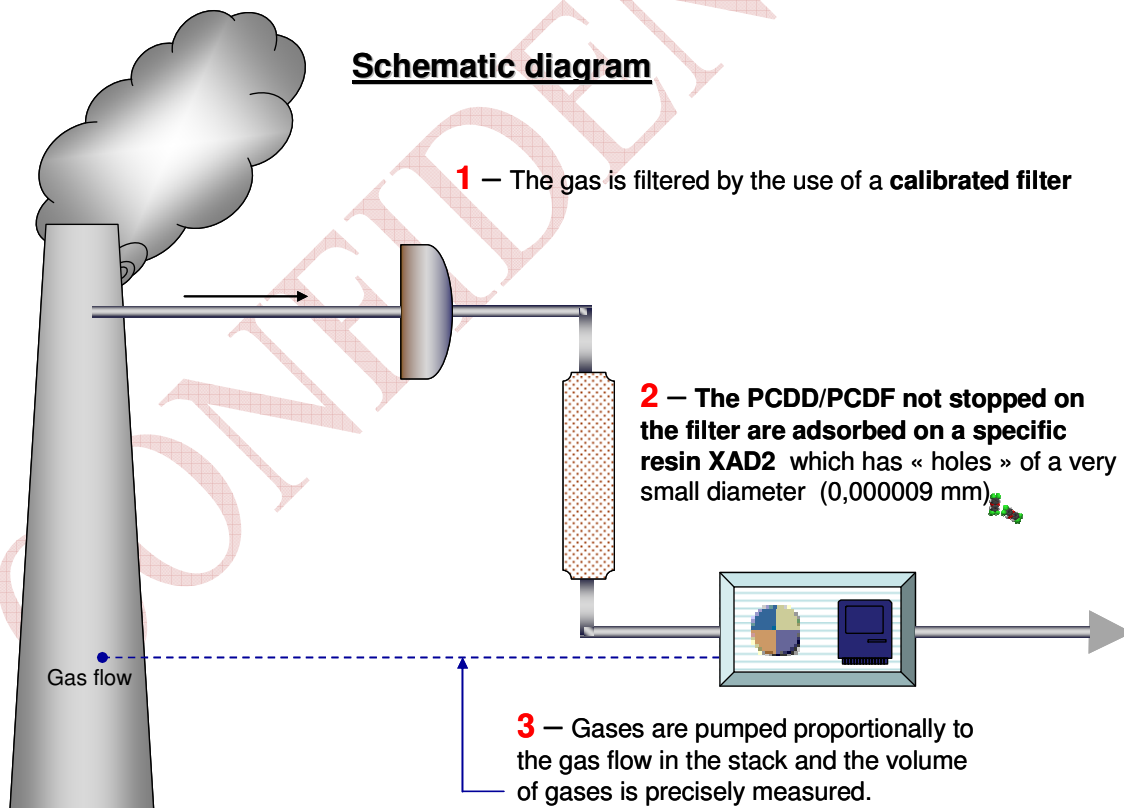
## 1.1 General operation

The objective of operation of a sampler for the determination of the PCDD / PCDF – dioxins and furans - is to take all the PCDD/PCDF as required by the legislation, and to take only the PCDD/PCDF imposed by this legislation.

*To take all the PCDD/PCDF*, a sampler operates in two stages:

- A filtration which retains the " large " PCDD/PCDF too big to be adsorbed on the resin of the second stage, (the pores of the resin are very small: 90 Å),
- An adsorption which retains the PCDD/PCDF not retained by the filter.

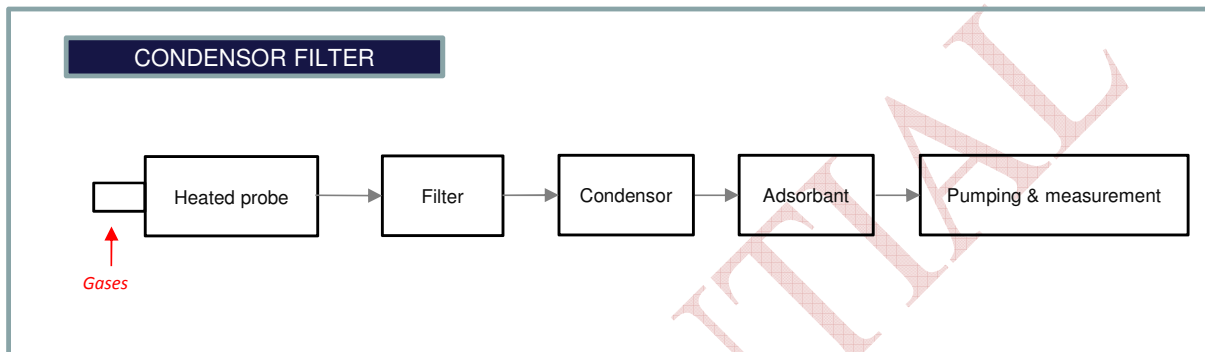
A sampler pumps gases proportionally to their flow in the stack. Pumped volume is measured.



## 1.2 DECS

All the sampling requirements described here above are fulfilled by the sampler proposed by TECORA - the DECS- The sampling method used by the DECS is known as of the "filter/condenser method".

**This method which fulfils norms in force in Europe, in the USA, in Asia, etc. is the only worldwide universally recognized method.**



In the DECS, a sample of gas is taken in the stack proportionally with the flow of the gas in the stack by using a heated probe (to avoid condensations and the formation of mud in the probe).

Before the beginning of sampling, the probe is heated and purged in order to flow out the dust charged with PCDD/PCDA which could have settled in start up phase of the incinerator.

The sample is filtered on a gauged industrial filter having a certificate of effectiveness, then cooled at a temperature lower than 20°C so that the adsorption on resin XAD2 is carried out in accordance with its specification.



Filter



XAD2  
column

The installation is **fully automatic**.

## 1.3 Filter technology

### Working conditions

All worldwide norms demand filtration efficiency to be more than 99.5% for particles of 0.3  $\mu\text{m}$ . (In the USA, it is 99.9% !).

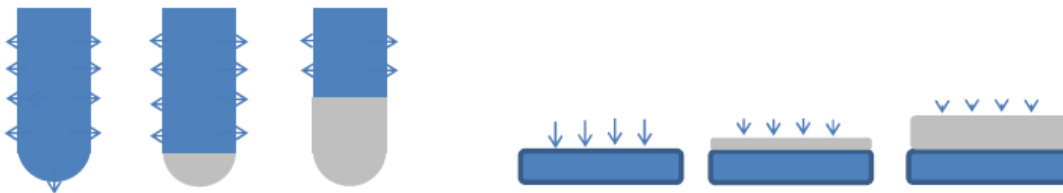
This efficiency can also be reached if the filtered gas is dry. Any moisture such as condensates drops down the efficiencies at values lower than 97% and moreover, which are not stables.

Therefore, it is absolutely necessary to filter a dry gas.

**In DECS technology, the gas is heated in the probe in order to eliminate any traces of condensate before filtering.**

### Filter capacity and pressure drop

Filtration could be made by using flat filter or thimble filter.



DECS uses a thimble filter where crystal. This technology has two advantages :

- “Dust” could be “stored” in order to avoid plugging the installation,
- No pressure drop which could involve production of wrong values.

### Filtration efficiency

As requested by USA, Europe, etc. authorities, the efficiency of the filter supplied by TECORA is officially certified:

- **Efficiency better than 99.9% for particles of 0.3  $\mu\text{m}$ .**

## 2 REFERENCES

The main references of the DECS during the recent years are the following.

**More than 145 DECS are installed.**

MWI = Municipal Waste Incinerator

IWI = Industrial Waste Incinerator

WWTP = Waste Water Treatment Plant

Year	Lines	Country	City		Plant type	Customer2
2017	2	France	Ludres	54	MWI	SICK / VAL'ERGIE
2016	2	France	St Etienne	42	WWTP	TECHTEAM / FMI
2016	1	France	Rochefort	17	MWI	Secauto / Vinci
2015	2	France	Massy	91	MWI	SICK / ENORIS
2015	4	France	Colombes	92	WWTP	SIAAP
2015	1	France	Boulogne sur Mer	59	WWTP	TECHTEAM / Communauté de communes
2014	2	France	Massy	91	MWI	ENORIS
2014	1	France	Lacq	64	WWTP	SMTB
2014	1	France	Brevans	39	IWI	SICK / Alpha recyclage
2014	1	France	Aurillac	15	WWTP	CABA
2014	1	France	Rillieux La Pape	69	MWI	SICK / VALORLY
2014	1	France	Lanester	56	IWI	GUERBET
2014	1	France	Ile de la Réunion	97	MWI	SICK / SICA des Sables
2014	1	France	Romans	26	WWTP	Ville de Romans
2014	1	France	Valence	26	WWTP	Ville de Valence
2014	2	France	Valenton	94	WWTP	SICK / SIAAP
2014	3	France	Monthyon	77	MWI	SMITOM
2014	1	France	Rouen	76	WWTP	TECHTEAM / Station Emeraude
2014	1	France	Elboeuf	76	WWTP	TECHTEAM / La Crea
2014	1	France	Jarrie	38	IWI	CEZUS
2014	1	France	Pontenx Les Forges	40	MWI	SIVOM
2013	1	France	Bassens	33	IWI	PROCINER - SARP INDUSTRIES
2013	1	France	Le Passage	47	MWI	SITA / SOGAD
2013	2	France	St Fons	69	WWTP	TECHTEAM / SAUR
2013	2	France	Vert le Grand	91	MWI	SEMARDEL
2013	3	France	Calce	66	MWI	SICK / CYDEL
2013	2	France	Rillieux La Pape	69	MWI	SICK / VALORLY
2013	2	France	Villers Saint Paul	60	MWI	SMVO
2013	1	France	Paillé	17	MWI	SMICTOM
2012	3	France	Lyon	59	MWI	Grand Lyon
2012	1	France	Cornillé	35	WWTP	TECHTEAM / SAVE
2012	2	France	Douchy	59	MWI	SIAVED
2012	1	France	Courrières	62	IWI	SOTRENOR - SARP INDUSTRIES

2012	3	France	Limay	78	IWI	SARP INDUSTRIES
2012	1	France	Bassens	33	IWI	SIAP - SARP INDUSTRIES
2012	1	France	Greze en Bouere	53	Recycling	APROCHIM
2012	1	France	Chauny	02	IWI	ARF/DEM
2012	1	France	Vendeuil	02	IWI	ARF
2012	1	France	Montauban	82	MWI	SIRTOMAD
2012	2	France	Concarneau	29	MWI	VALCOR
2012	1	France	Strasbourg	67	WWTP	ABB / VALORHIN
2012	1	France	Rosny sur Seine	78	WWTP	ABB / OTV
2012	3	France	Limoges	87	MWI	COM. AGGLO. LIMOGES
2012	2	France	Labeuvrière	62	MWI	ARTOIS COMM
2011	1	France	Sens	89	MWI	COM. DE COMMUNES DU SENONAIS
2011	1	France	Lons le Saunier	39	MWI	SYDOM
2011	2	France	Schweighouse	67	MWI	SMITOM
2011	2	France	Villejust	91	MWI	SIOM
2011	1	France	Noidans le Ferroux	70	MWI	SYTEVOM
2011	2	France	Villefranche	69	MWI	SYTRAIVAL
2011	1	France	Livet	38	MWI	COM. DES COMMUNES DE L'OISANS
2011	2	France	Bellegarde	01	MWI	SIDEFAGE
2010	3	France	Grand Quevilly	76	MWI	SMEDAR
2009	3	France	St Ouen	93	MWI	SYCTOM
2016	1	Italie	Termoli		Biomass	Loccioni
2015	1	Italie	San Vittore del Lazio		MWI	ACEA S.VITTORE
2015	1	Italie	Grosseto	-	Mobil system	Regione Toscana
2014	3	Italie	Brescia	-	MWI	A2A BRESCIA
2014	1	Italie	Aosta	-	Metal	Acciaierie Cogne
2014	1	Italie	Bagnolo Mella	-	Metal	Duferdofin
2013	1	Italie	Brescia	-	Metal	FERRIERA VALSABBIA
2012	1	Italie	Taranto	-	Metal	ILVA
2012	2	Italie	Brescia	-	Metal	ORI Martin
2012	1	Italie	Brescia	-	Metal	IRO
2012	2	Italie	Cremona	-	Metal	ARVEDI
2012	1	Italie	Bolzano	-	MWI	ECO RESEARCH
2011	2	Italie	Pisa	-	MWI	GEOFOR
2011	3	Italie	Torino	-	MWI	TRM
2011	2	Italie	Terni	-	Metal	Thyssen Krupp
2010	3	Italie	Acerra	-	MWI	A2A Partenope
2010	1	Italie	Bagnolo Mella	-	Metal	Duferdofin
2010	1	Italie	Casto	-	Metal	RAFFMETAL
2010	1	Italie	Macomer	-	MWI	Tossilo
2010	2	Italie	Parona	-	MWI	LOMELLINA ENERGIA
2010	2	Italie	San Vittore del Lazio	-	MWI	ACEA S.VITTORE
2010	1	Italie	Terni	-	MWI	ACEA Terni
2009	2	Italie	Cremona	-	MWI	AEM CREMONA
2009	3	Italie	Schio	-	MWI	AVA
2009	1	Italie	Badia Al Pino	-	Metal	Chimet

2008	1	Italie	Bergamo	-	MWI	BAS POWER
2008	1	Italie	Brescia	-	MWI	A2A BRESCIA
2008	1	Italie	Crotone	-	MWI	ABB / HAFNER
2009	1	Italie	Livorno	-	MWI	AAMPS
2008	2	Italie	Poggibonsi	-	MWI	SIENA AMBIENTE
2008	3	Italie	Milano	-	MWI	CORE
2007	1	Italie	Mobile	-	Metal	RAMET
2006	1	Italie	Brescia	-	MWI	A2A
2006	1	Italie	Robillante	-	Cement	BUZZI UNICEM
2006	1	Italie	Ternate	-	Cement	Holcim
2006	1	Italie	Val di Susa	-	Metal	AFV BELTRAME
2015	1	China	Ningbo	-	WWTP	BCT / Ningbo EMC
2015	2	Ireland	Dublin		MWI	INOVA / SICK
2014	1	Andorra	Andorre	-	MWI	SPIRAX / Andorra government
2011	1	USA	New England	-	MWI	COVENTA ENERGY
2010	1	Finland	Turku	-	MWI	KONTRAM OY

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## 3 CERTIFICATIONS

### 3.1 TUV CERTIFICATION

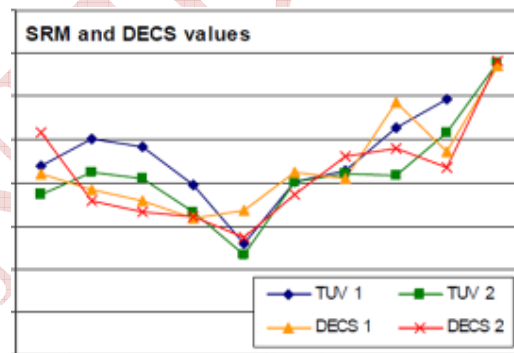
The validation objective is to prove the capability of DECS to capture efficiently Dioxins and Furans.

The validation tests were performed according to a protocol test which is in accordance to EN1948-1 and EN13284-1 and for the laboratory test according to EN1948-2 and 3.

Till today TECORA realised several tests with parallel validation with **Standard Reference Method** (SRM) based on EN1948-1, with excellent results. The tests were performed by laboratory with accreditation ISO 17025.

In 2010, TECORA performed equivalence tests to EN 1948 with TUV Rheinland with the objective to certify the DECS as equivalent to EN1948. Within this test a total amount of 10 parallel tests of two parallel train DECS and two parallel train of standard reference sampler EN1948 were performed and additional two long term test of few weeks with a parallel train of DECS were performed. The results met the EN1948 requirements, obtaining a successful certification.

TUV certification is made by doing a comparison between 2 DECS and a reference method system according to EN1948 during several weeks.



DECS certification is valid for sample duration of several hours up to 8 weeks



**This certification is a warranty on the quality of the sampling.**

## 3.2 MCERT CERTIFICATION

TECORA obtained mCERTs certification for the DECS by SIRA.

The mCERTs certification scheme is the only existing certification process in Europe for the isokinetic equipment applied in stack testing.

The certification declares compliance of candidate equipment to specification “*Performance Standards and Test Procedures for Automatic Isokinetic Samplers*” Version 2 September 2005, issued by Environment Agency of England and Wales, recognised national Authority for environmental protection.



**MCERTS certification is the warranty of the quality of isokinetic sampling**

► Our certification has been obtained by doing test on wet gas.

Unlike dilution method, the results obtain are not affected by variation of gas humidity.

Using dilution method, you can have big dilution ration (\*3 or 6) on PCDD/PCDF concentration which are already very low. This creates big uncertainty on measurement.

## 3.3 EPA CONFORMITY

Unlike European standard where you can have the choice between 3 method (filter/condenser, Dilution, cooled probe), **the EPA23 rules allow only filter/condenser method.**

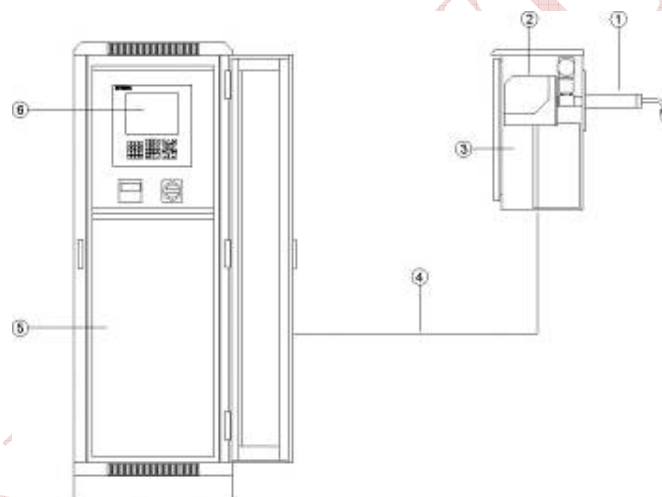
**Using this method, the DECS is the only instrument in the market which fullfil the requirements of EPA23.**

## 4 EQUIPEMENT PRESENTATION

### 4.1 General description

*The scope of supply for each line includes*

- 1 Heated probe with nozzle (titan). For Ilva project, nozzle diameter is 5 mm.
- 2 High capacity filter for dust with official efficiency certificate (as requested by norms)
- 3 Cartridge for adsorbent XAD2;
- 4 Pneumatic/electric connection between the units
- 5 Control unit with system of measurement;
- 6 Control panel with colour screen LCD, keyboard, printer and port USB



## 4.2 Sampling unit

**The sampling unit is positioned on the stack through a flanged port.**

DECS is designed to comply with the sampling line according to international standards: the US EPA 23, the EN1948 and all requirements of EN13284 concerning the materials and the isokinetic condition application.

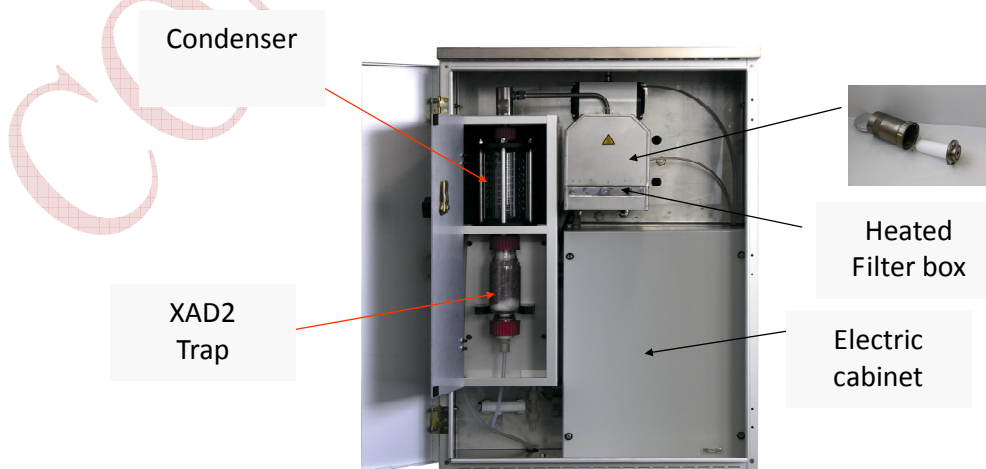
The sampling line consists of:

- The heated probe with titanium suction line, curve and nozzle
- Built in Pitot tube and thermocouple are provided to measure the gas velocity and the flue gas temperature
- Heated box with titanium filter holder with quartz high efficiency filter (thimbles available for large collection as well as flat diaphragm for short collection) according to EN13284
- Liquid cooled condenser and subsequent adsorbing trap containing XAD2 on the wet gas stream.

The Sampling Unit of DECS provides utility functions:

- Leak test
- sampling line purging
- sampling line cleaning
- Probe heating
- Filter box heating
- Sample cooling

All temperatures: in stack, probe, filter box, cooler condenser and other major parameters as pressures and differential pressure are measured, stored during the sampling operation, in a mass storage memory and managed through an alarm supervision system.



## 4.3 Control Unit

The Control Unit is composed by a standard industrial electric cabinet, equipped with an external graphic display for the supervision and control of the sampling operation.

The control unit perform following functions:

- Supervision and control of the automatic sampling operation by industrial programmable logic controller (PLC) and a LCD display with keyboard for the man machine interface;
- Isokinetic conditions;
- Gas sampling line with measurement devices for volume and flow;
- Gas conditioning device;
- Provide all input / output of the system and electrical protections;
- Alarm management.

The operating parameters and system configuration are available on the front LCD colour display. On the front of the cabinet is available an industrial functional flat keyboard to navigate the supervision software to modify and introduce data.

The DECS system has available USB port for the data downloading and system software upgrades by USB flash memory.

The DECS system provides three level of access to system software configuration:

- Operator level (only data and action related to the normal operations);
- Supervisory level (configuration parameters and alarms settings);
- Administration level (full access).

The DECS control cabinet provides as well visual and signal output information about his operating status: sampling operation, stand-by, and failure condition.

Those conditions are reported on the LCD display, on the traffic light display on top of the cabinet and by digital output signal to any plant supervision data acquisition device. As standard are available analogue inputs to acquire oxygen, gas flow rate and water vapour in gas.

DECS can also communicate using Modbus TCP/IP protocol.

DECS performs sampling system auto-calibration function.



## 5 DECS DETAILED OPERATION DESCRIPTION

### 5.1 General Operation description

DECS is a fully automatic long term sampling which operates automatically during the sampling according a pre-defined program without any supervision requirements.

In order to start sampling operation the user shall provide the sampling device (filter cartridge with quartz filter and glass adsorbent trap) duly prepared by a lab with a defined standard spiking. The filters are tagged in order to track the sampling and analysis. The filters are installed in the sampling unit. The operator will check that all connections sampling line and refrigeration line are fine and will proceed to the sampling start.



The operator from the front keyboard will define the sampling parameter for the incoming sampling campaign:

- Filters tags;
- Sampling duration (time or volume);
- Sampling starting time;
- Proceed to leak test;
- Other configuration parameters if required

During the standby mode or inactivity, DECS provides to seal off the sampling line from the stack corrosive and contaminating atmosphere with a counter air flow purge.

As soon as the starting time occurs, DECS provide automatically a leak test from Sampling Unit to dry gas meter and pump in Control Unit, to check sampling line leakages.

DECS provides to heat the probe and the filter box to the set temperatures over due point (recommended 125°C or more if necessary for dry application).

As soon as the probe and the filters box and the trap reached the set temperature, the DECS sampling start and will continue for the programmed time or volume, except programmed stops for suction line cleaning or plant contact for stop.

The heated probe and filter box, during sampling operation temperature is kept under control and maintained constant avoiding the condense formation and sampling alteration.



The control system will keep under control automatically the isokinetic condition and log the isokinetic deviation. All other parameters and alarms are logged and trigger alarms in case of anomalous operation, with possibility to send alarm by hardwired digital output or through the network. The alarms can be set in order to force different action from the sampling system to be defined by user.

The flue gas sample is sucked through the suction line into the quartz filter, where all particles content will be captured. The heated probe/filter technique prevent the particulate to move from the stack to the cooling device avoiding that the condensate and the adsorbent are overloaded, and it prevents potential losses of the particulates inside the condensate after the adsorbent stage.

The gas still hot leaves the filter box to enter the condenser device, which is a glass serpentine immersed in a glass jacket where the cooling liquid flow in counter flow, obtaining an efficient temperature exchange.

The liquid condenser makes the sample cool down quickly to a temperature less than 20°C, then the cooled gas together with the gas condensate go through the adsorbing cartridge, filled with an appropriate quantity of XAD2. The XAD2 will capture all the micro-pollutants contained in the cooled gas and gas condensate.

After the adsorbing stage the sample led to the Control Unit through sampling line (protected from frost when installation is outdoor) and the gas is cooled and dried before reaching the dry gas meter and the pump.

The condensate separated in the Control Unit is collected and automatically discharged.

A relative humidity sensor makes the instrument able to monitor the gas drying system efficiency and to produce an alarm in order to prevent malfunctioning.

The flow and sampled volume measure are performed with two different measuring elements to ensure a data security, one dry gas meter used as reference measurement and an accurate mass flow meter.

Data concerning the flow, volume, isokinetic conditions and stack measure is saved every 5 minutes and can be easily transferred on a flash memory USB compatible to any personal computer. The industrial PLC provides all data calculation in real time for the volume and flow at normal and actual conditions.

In order to prevent emergencies or system's stop, during the sampling a series of alarms is activated. Active alarms are displayable on the screen and their occurrence is stored in order to identify the stop cause.

If the alarm which caused the stop returns to normal conditions the instrument restarts automatically.

During the stops the sampling line is closed by the interception valve and under pressurized air flow in order to avoid particulate overload once the sampling restarted.

When DECS complete the sampling, the sampling line is intercepted and suction line is thermally desorbed at high temperature and then blown with high pressure air.

If for any reason, the sampling is suspended and thus the system is in standby mode, automatically the DECS provides with a diagnostic which is capable of underlining system anomalies.

In case of power network black-out or accidental plant shut-down a system recovery is managed by the programme. A back up battery allows a PLC saving operation data before turning off.

The instrument restarts automatically, storing a message in which date, hour and non-programmed stop reason appear.

## 5.2 DECS Utilities: leak test, purging and cleaning

### 5.2.1 Leak test

**Leak test is performed automatically**, by the system, to check eventual loss in the sampling line. The leak test can be programmed each time before to start of the sampling and/or when the sampling is completed and/or at regular intervals during the sampling.

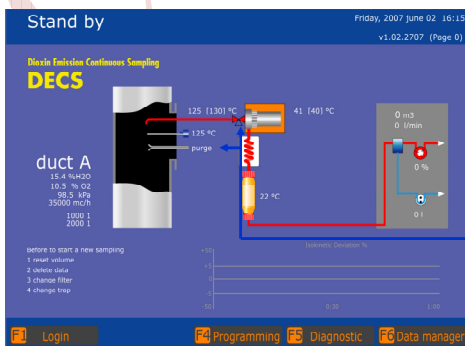
### 5.2.2 Purging

**Air purging and high air pressure cleaning** of the suction line in the probe along with probe heating, avoid the probe to be contaminated during long term service and **made useless the need of the removal from the stack to make the suction line cleaning**.

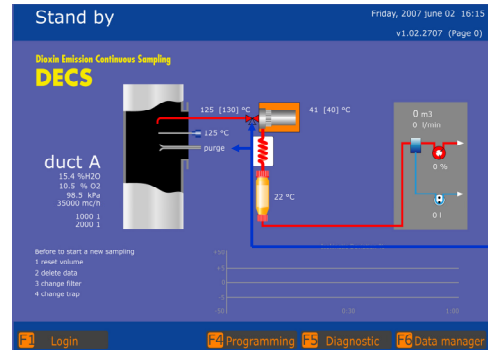
### 5.2.3 Cleaning

At the start and at the end of the sampling operation the probe and the nozzle are cleaned with a blow of high air pressure for few minutes. During stand by periods the probe and the nozzles are purged with air to avoid particulates and other pollutants to enter the probe to keep free from contamination and corrosion the nozzle and the suction line.

The Pitot tube is provided with an automatic air pressurized cleaning system, which works in cycles during sampling according to application requirements.



High pressure Purging



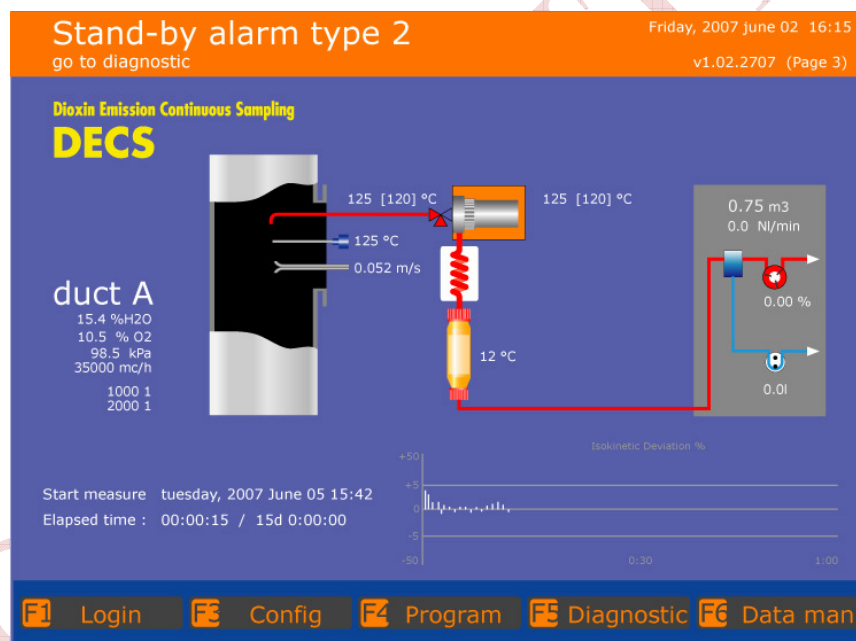
Low pressure Purging



## 5.3 Information displayed by DECS

Displayed parameters :

- In stack temperature
- In stack flow
- In stack abs.Pressure
- Gas water vapour content (data sent by the plant)
- Gas oxygen content (data sent by the plant)
- Heating probe temperature
- Heating particulate filter temperature
- Adsorbing cartridge temperature
- Sampling flow
- Gas sampled volume
- Isokinetic deviation
- Availability (ration between sampling elapsed time and plant run time)



## 5.4 Provided and acquired auxiliary signals:

The control board allows the acquisition of the following analog or digital signals with inputs 4-20 mA:

### Input

- Gas flow (as an alternative to Pitot tube measurement)
- Gas oxygen content (necessary to correct concentration according to oxygen reference)
- Gas water vapour content (necessary to adjust isokinetic flowrate)
- Others if required (CO<sub>2</sub>, shut-down, start-up)

### Output

It is possible to remote the alarms through 3 relay NO contacts which communicates:

- Sampling running
- Sampling in stand by
- Sampler in alarm

Besides, the system is available to be connected using Modbus TCP/IP protocol.

## 5.5 Measure report

In addition to Log file the measure report is recorded.

The final report is a summary for all measure point and some instrument's setting.

### **Measure ID**

Sampling ID	= Sampling identification number
Date Hour Start	= Sampling date and starting hour
Date Hour Stop	= Sampling date and stop hour
Total Elapsed Time	= Sampling total time

### **Gas specification**

Gas density	= Gas density
Average humidity	= Gas humidity (min, max, mid)
Average O <sub>2</sub>	= Gas oxygen , min, max mid (if equipped as outside signal)
Stack temperature	= Gas temperature (min, max, mid)
Stack Pressure	= Absolute stack pressure (min, max, mid)
Stack gas flowrate	= Gas flow ( min, max, mid)

### **Sampling Data**

Isokinetic deviation	= Final isokinetic diversion
Sampled Volume dry norm	= Dried sampled volume
Sampled Volume wet norm	= Humid sampled volume
Filter Temperature	= Particulate filter averaged temperature

XAD2 temperature = Adsorbing cartridge averaged temperature

**Stack Volumetric Flowrate**

Wet gas stack condition = Stack condition range

Wet gas normal condition = Humid condition range

Dry gas normal condition = Dry condition range

**Availability of instrument** = ration between sampling duration and plant running duration

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## 6 TECHNICAL SPECIFICATION

### Emission working limit

Stack temperature	: $\leq 350^{\circ}\text{C}$ (design up to $400^{\circ}\text{C}$ )
Gas flow range	: $2 \div 40 \text{ m/s}$
Water vapour content	: $\leq 50\%$ in volume (design up to saturation)
PM concentration limits	: $150\text{mg/m}^3$
Dioxin & Furans concentration range	: $0,0001\text{-}10\text{ng/m}^3 \text{ I-TEQ}$

Programmable sampling time duration : 6 hours till 8 weeks

### Sampling unit ambient location limits :

Ambient temperature	: $-10 + 50^{\circ}\text{C}$
General protection	: IP 55

### Control unit ambient location limits:

Ambient temperature	: $0 + 40^{\circ}\text{C}$
Humidity	: $10 \div 90\%$ related non condensing

### Size and weight

Samplig unit (probe excluded)	: $810 \times 540 \times 360 \text{ (hxbxl)}$ - weight 35 kg
Control unit	: $1900 \times 600 \times 600 \text{ (hxbxl)}$ – weight 90 kg

### Supply:

Voltage	: 220 V 50Hz
Installed power	: 2 Kw per line
Averaged consumption	: 1 Kw per line
Frost protection in case of outdoor installation	: $9\text{W/m}$
Compressed air consumption	: $0.8 \text{ m}^3/\text{h}$
Compressed air consumption in stand by	: $1.2 \text{ m}^3/\text{h}$
Compressed air pressure needed	: from 5 a 10 Bar

### Cooling system

Cooling device with closed circuit	
Power consumption	: 1.15kW for RFC20 type
Could be replaced by distribution network	: $0.3 \text{ m}^3/\text{h}$

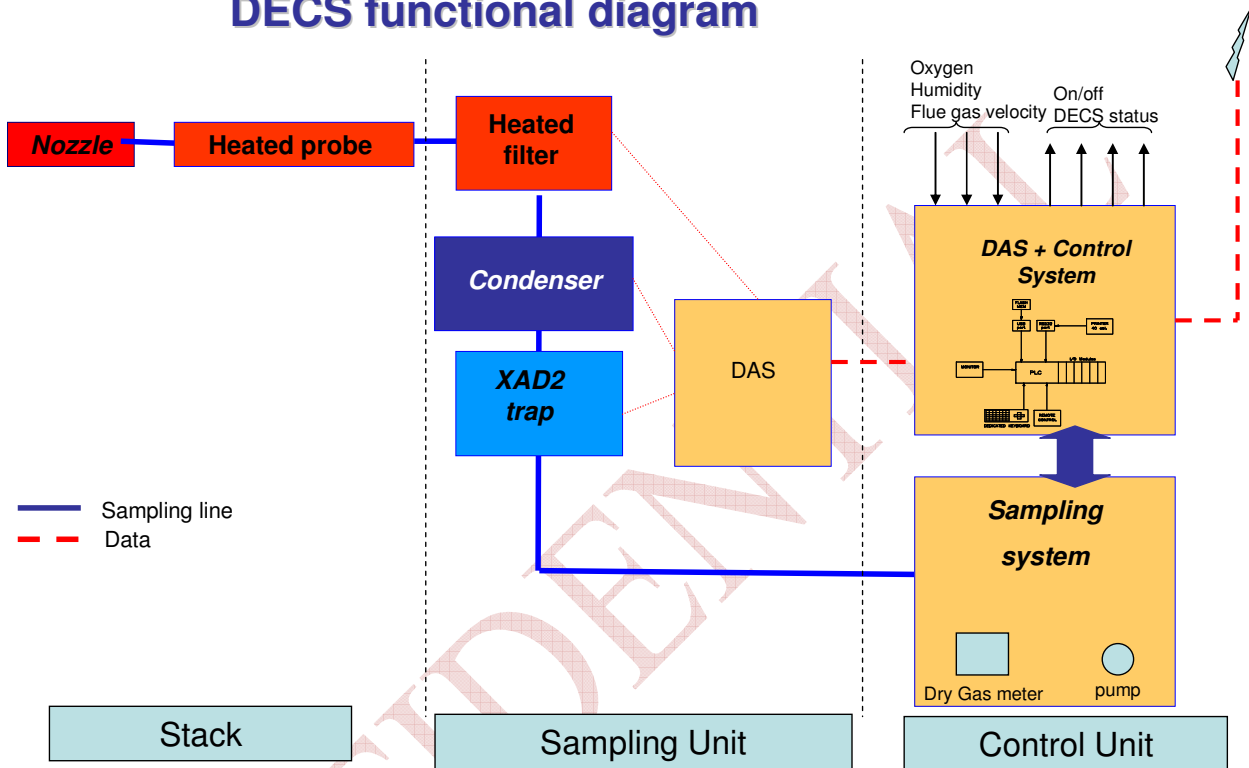
### Maintenance interval

	: 2 visits per year
necessary	One visit for control and cleaning if
spare part replacement	One visit for complete maintenance with

## 7 INSTALLATION

### Functional diagram

#### DECS functional diagram



#### Customer battery limit :

Materials and services which are usually provided by the customer like scaffolding, instruments for gas welding, pressurized air, power and electric installation, masonry works, electrical and isolation works, conduit and external tubes, uplift system etc... .

### 7.1 Sampling Unit

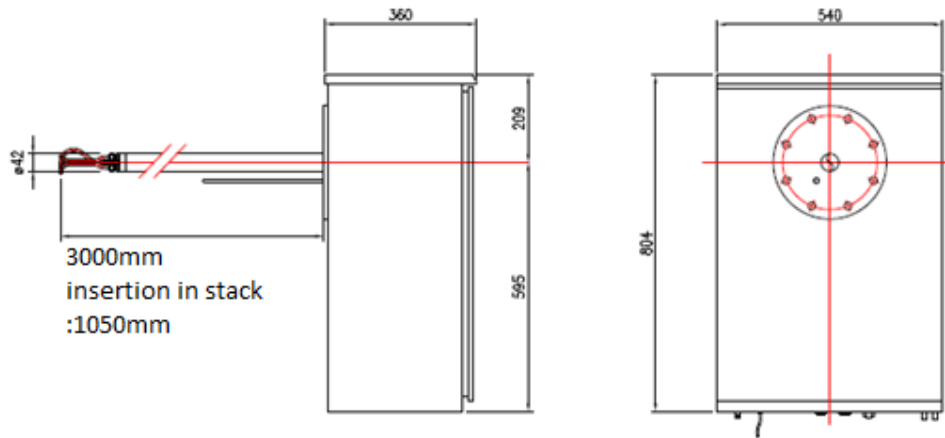
The sampling unit is located on a DN 150 PN6 port (or DN 100 PN6 – for other please contact TECORA)

The port position and orientation will be defined between ILVA and the Environmental Authority.

The sampling point is at an altitude of about +53 meters.

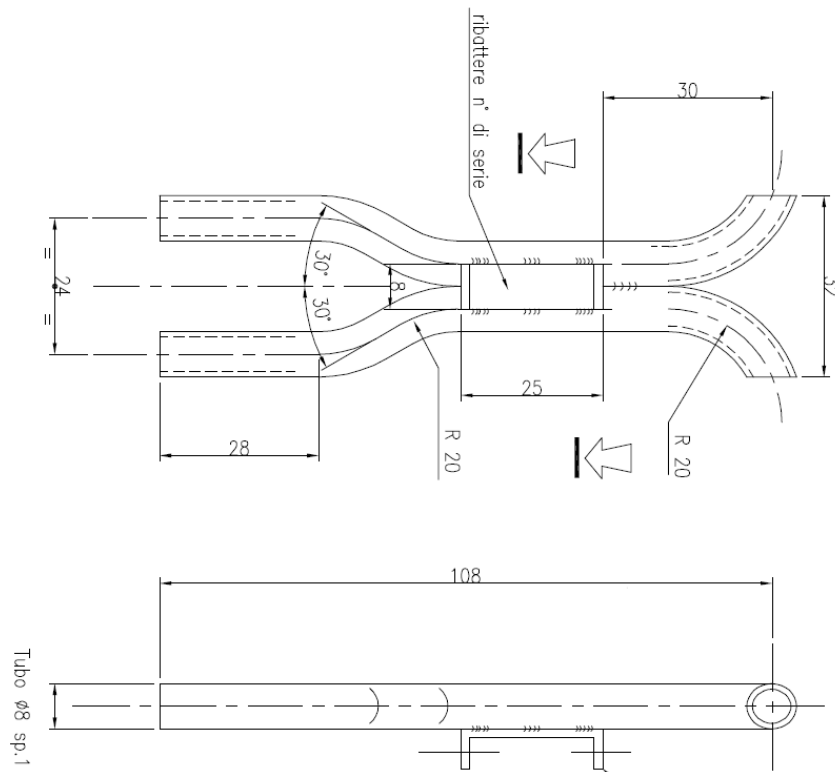
Minimum port high : 800mm - Nominal 1300mm

## Standard version in a cabinet

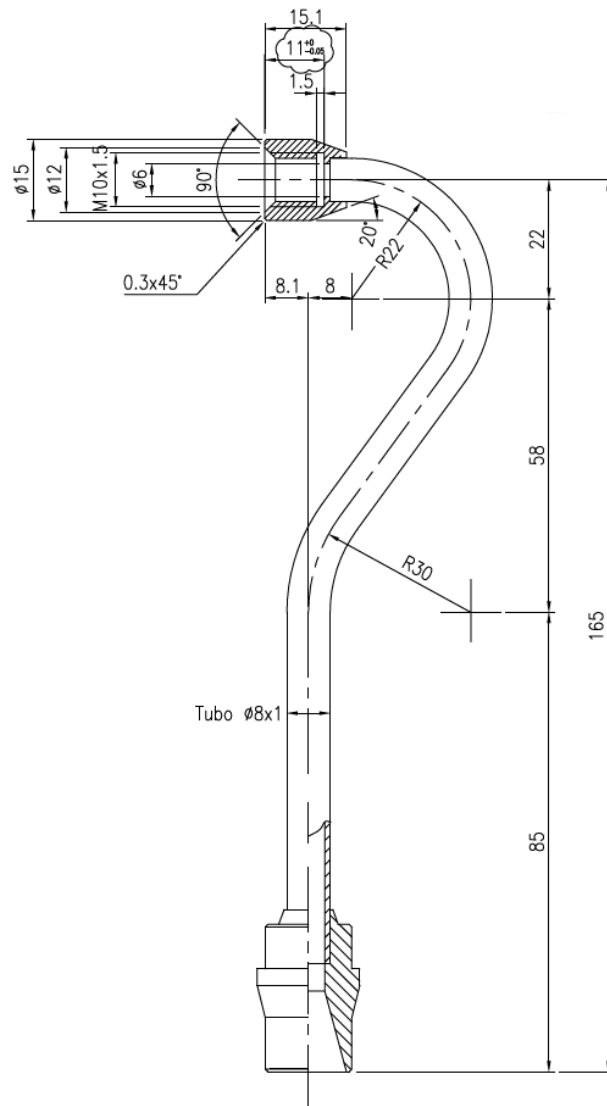


For ILVA project, the titanium probe has a total length of 3000mm of which 1050mm inside the duct.

## Pitot dimensional information



Nozzle dimensional information.



## 7.2 Cooling water or closed circuit cooling device .

The sampling unit needs water to chill and condense the sample collected.

In order to do this, a closed circuit cooling device can be installed. Place of cooler is depended of condition on plant. It is better to put it as close as possible of the sampling unit but it could be placed in other position if ambient conditions make it necessary.

**For ILVA project, the cooler is installed upstairs as close as possible of the sampling unit**



Cooling unit

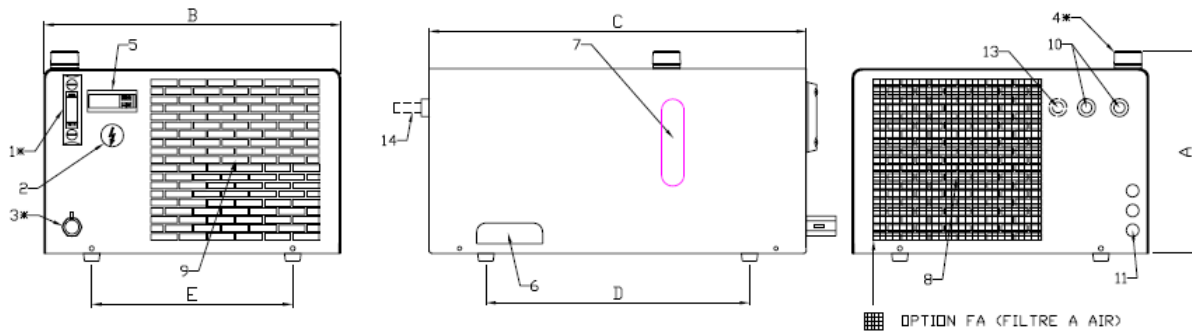
## Characteristics

### Closed circuit device

Ambient temperature : -20°C up to 55°C for RFC  
Efficiency : 10°C at inlet for ambient temperature of 50°C.

### Dimensions and Weighth

For RFC20 : 71kg



	<b>RFC20</b>
A (mm)	450
B (mm)	660
C (mm)	760
D (mm)	540
E (mm)	465

- 1\* : Voyant d'eau (d'huile)
- 2 : Marche-Arret / On-Off  
- Monophasé : Interrupteur
- 3\* : Vanne de vidange
- 4\* : Remplissage
- 5 : Thermostat
- 6 : Poignées
- 7 : Voyant d'eau gamme INOX
- 8 : Entrée d'air

- 9 : Sortie d'air
- 10 : Raccordement hydraulique GF1/2"
- 11 : Alimentation électrique
- 12 : Pieds ou fixation M10
- OPTIONS
- 13 Remplissage automatique
- 14 : Entrées/sorties diamètre spécifique
- \* : Sauf version D ou DP



## 7.3 Sampling unit and control unit connections

For the connection between the control unit and the sampling unit it is necessary a cable runway large of around 60mm.

Besides hooks for vertical tracts, pipes and cable are needed.

In cable runway will be installed:

- 1 sampling tube PTFE 6\*8 with frost protection if installation is outside
- 1 tube for compressed air 4\*6
- 1 communication cable type Belden
- 2 power cable to powered sampling unit and cooling device

## 7.4 Control Unit

The control unit should be positioned in an air conditioned room. (If not, see option)

The control board and services set up are shown in the attached picture “control unit positioning”.

In order to enable a good service please follow this indication:

### Electricity

An electric line positioned under the differential protection of 30 mA must be linked to the control board.

The protection devices interruption capacity in case of short circuit is 10KA

Power supply V. 230-50 Hz 1 fase +N + Earth

Capacity 2 kVA

### Pressurized Air

Instrument air dry without oil

Pressure from 5 to 10 Bar

Connections from 1/4” with ball valve .

### Auxiliary signals and alarms

Any signals as oxygen and humidity must be led to the control board.

## 8 SPECIFIC INFORMATION REGARDING ILVA PROJECT

ILVA already uses DECS for continuous sampling of PCDD/F at stack of primary emissions of sinter plant.

New instrument is using same technology.

### 8.1 Calibration certificate

DECS will be delivered with the usual calibration certificate.  
Example of report are provided with the offer.

### 8.2 Shelter (option)

Actual shelter is too small to install a new DECS inside.

Ilva request to quote a new shelter able to receive 2 DECS inside (the old one and the new one)

We can offer (as an option) a shelter in Polyester for outside installation. This kind of shelter is design for industrial atmosphere.

	External	Inside
Size	3m x 2m x 2.5m	2.9m x 1.9m x 2.35m
Weigth	742 kg (total charge of 1589kg)	

Floor :

- Wood + polystyrene 75mm
- Up to 500kg/m2
- PVC RAL 9010

Wall:

- Sandwich panel 47mm
- Insulation 40mm
- Ral 9010
- Door with cross bar

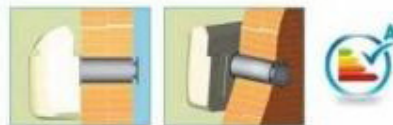


Power box:

- Differential circuit breaker 30mA 40A
- Circuit breaker 16A for power plug
- Circuit breaker 10A for lamp
- Circuit breaker 10A for airconditioner
- Circuit breaker 2A for air fan
- 2 \* Circuit breaker 16A for heated hose
- 2 \* Circuit breaker 10A for DECS

OPTION : air conditioner:

- Type Windy 4HP
- 2.43kW
- Gas R410A
- Heater and cooler



In charge of Ilva:

- receive the shelter on site
- install shelter on site
- connect new shelter to power - compressed air - signals (O2 value, start/stop, instrument status...)

New shelter will hold both control unit of the two DECS (existing and new).

The actual offer do not include new cables between sampling unit and control unit of the existing installation in case it is necessary to change them.

### 8.3 Validation test

All cost of validation test are supported by ILVA.

Validation of the new DECS must take place from the comparison between the two DECS systems operating simultaneously over a long period (about 4 weeks or more) to get a good evaluation of long-term sampling.

For the acceptance, a comparison will be made between the analytical data of PCDD / F, expressed in ng I-TEQ / Nm<sup>3</sup>, deriving from the two DECS systems and analyzed by the same laborator.

Considering that we need to compare the existing Decs with the new one that must be two perfectly equal systems, we will refer to the Protocol "Management of the validation of the tests related to the long-term sampling of PCDD / F from the E312 chimney", that is: ".. methods regarding comparability of acceptability are those reported in the UNI EN 1948-3: 2006 point 14.3 for the evaluation of "external variability" by calculating an acceptable confidence interval (95%) equal to  $\pm 0.05$  ng I-TEQ / Nm<sup>3</sup> for concentrations of about 0, 1 ng I-TEQ / Nm<sup>3</sup>. For concentration values of PCDD / F > 0.1 ng I-TEQ / Nm<sup>3</sup> a new confidence interval (95%) must be defined and agreed ".

## 9 PLANNING

T0 : Order sent from Ilva to CDL TECORA

T0+7 days : Order register and receipt of account

T0+12 weeks : shipment of full equipment on site

T0+13 weeks : delivery on site of equipment and beginning of installation

T0+15 weeks : end of installation of equipment on site by ILVA

T0+16 weeks : technician of CDL TECORA visit for installation of existing DECS control unit inside shelter with start up.

T0+17 weeks : technician of CDL TECORA visit for validation of installation, configuration of instrument and start up.

T0+21weeks : end of validation test