

Technical Cleaning in DATA CENTERS



QIECO Smart
AUTOMATION • DATA • ENERGY

Emilio Sapina / Victoria Statkevich

emilio.sapina@securetechnicalrooms.com
victoria.statkevich@securetechnicalrooms.com

www.securetechnicalrooms.com

1. INTRODUCTION

Team Leaders



← **Emilio SAPINA, CEO**
BS & MS in Electronics Engineer
15 years Data Center



← **Ariana Sapina**
Project Manager, 3 years DC Cleaning & Sales



Juan Jose MARTIN, CTO →
BS in Mechanics Engineer
25 years Seismic & Vibration



Xana Vazquez →
Technical Manager, 2 years DC Mechanics



← **Victoria Statkevich**
Area Manager, 3 years DC Sales

Main Data Center Clients

- DIFC in UAE
- ABU DHABI Police in UAE
- HSBC Bank in UAE
- ETISALAT in UAE
- HUAWEI in UAE
- APPLE in UAE
- MCC in UAE
- BP in Irak
- T-Systems in Saudi Arabia
- STC in Saudi Arabia
- ARAMCO in Saudi Arabia
- Guadalajara University in Mexico
- INTERXION in France
- TELEFONICA in Peru
- Continent 8 in Gibraltar
- EQUINIX in Spain
- COLT in Spain
- INTERXION in Spain
- NTT in Spain
- BRITISH TELECOM in Spain
- Ministry of Industry in Spain
- Ministry of Defense in Spain
- Ministry of Taxes in Spain
- Madrid University in Spain
- IBERDROLA in Spain
- INDRA in Spain
- Procter & Gamble in Spain
- Bank of Sabadell in Spain
- BBVA Bank in Spain
- La Caixa Bank in Spain

2. TECHNICAL CLEANING and DISINFECTION

Technical Cleaning



During normal use of a Data Center there is a continuous increase of dust in the air in the environment.

In order to minimize this pollution that will be introduced in the critical room a technical cleaning is required.

Technical Cleaning is **ONLY FOCUSED on the DUST IN THE AIR** within the Data Center.

Limits and Standards

ISO 14644 limits the pollution in the air of Data Centers, level 8 is required as maximum.

A certificate of Measurement of the Technical Cleaning will ensure the performance of the room under the international standard limits avoiding high pollution to go into the servers.

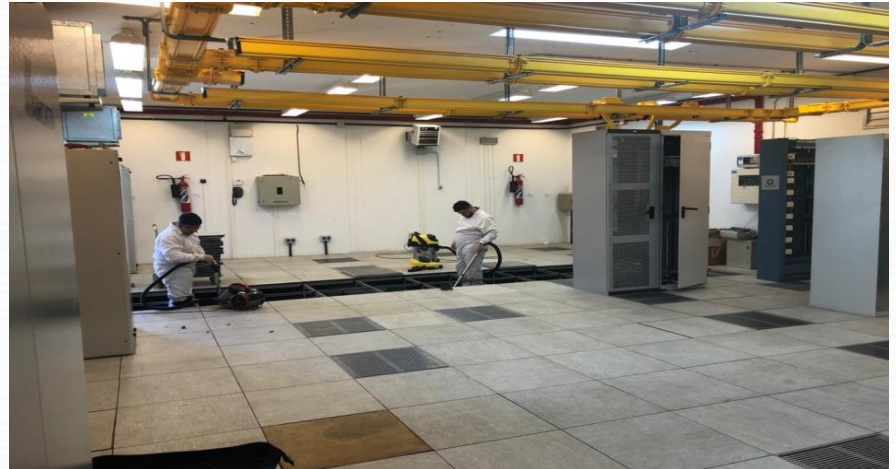


Table 1 — Selected airborne particulate cleanliness classes for cleanrooms and clean zones

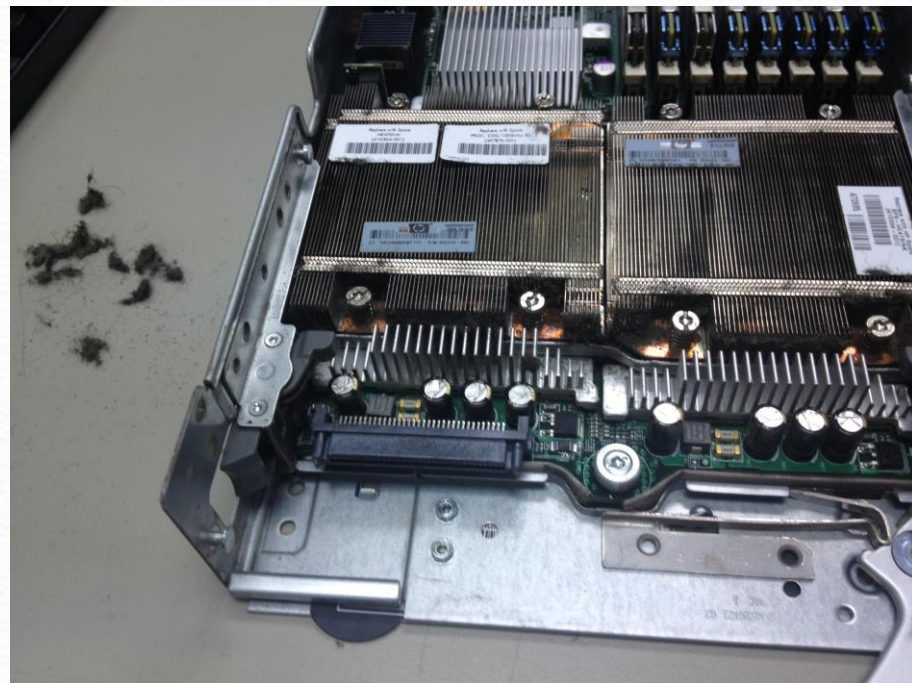
ISO classification number (N)	Maximum concentration limits (particles/m ³ of air) for particles equal to and larger than the considered sizes shown below (concentration limits are calculated in accordance with equation (1) in 3.2)					
	0,1 µm	0,2 µm	0,3 µm	0,5 µm	1 µm	5 µm
ISO Class 1	10	2				
ISO Class 2	100	24	10	4		
ISO Class 3	1 000	237	102	35	8	
ISO Class 4	10 000	2 370	1 020	352	83	
ISO Class 5	100 000	23 700	10 200	3 520	832	29
ISO Class 6	1 000 000	237 000	102 000	35 200	8 320	293
ISO Class 7				352 000	83 200	2 930
ISO Class 8				3 520 000	832 000	29 300
ISO Class 9				35 200 000	8 320 000	293 000

NOTE. Uncertainties related to the measurement process require that concentration data with no more than three significant figures be used in determining the classification level

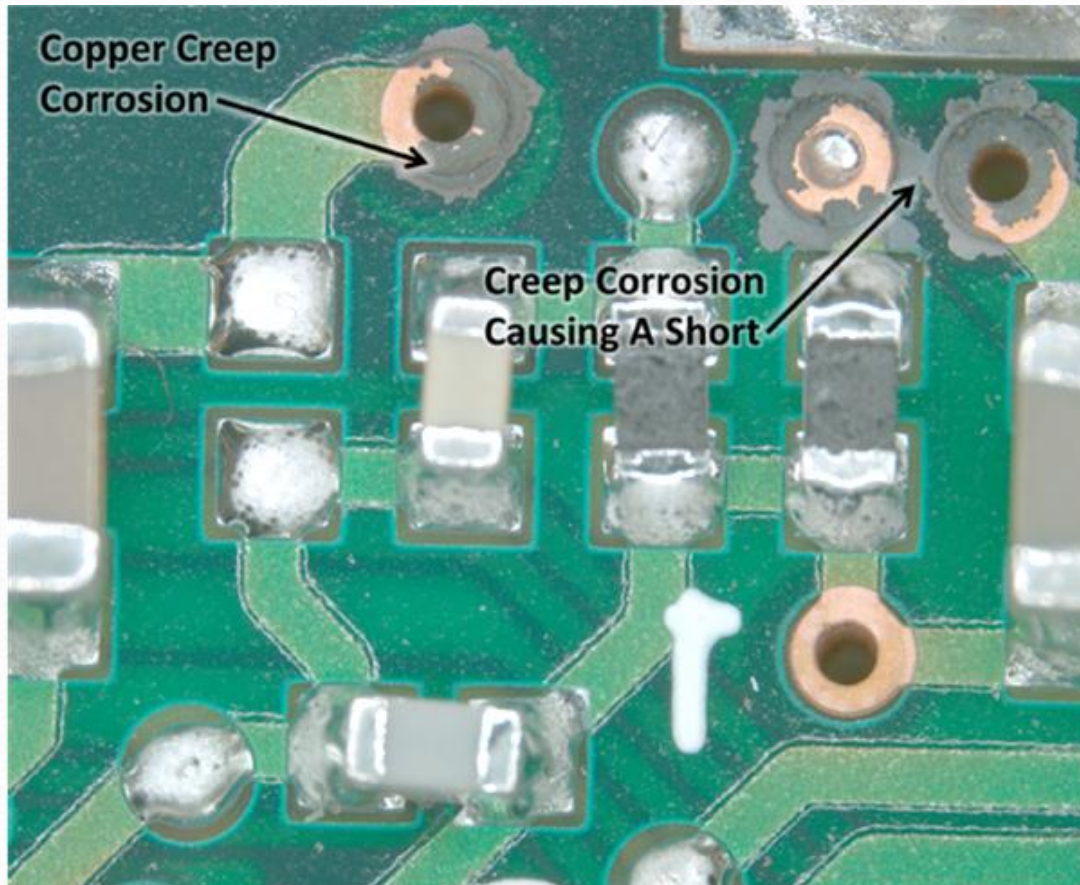
Sample of A Dangerous Data Centre Environment



Sample of A Dangerous Data Centre Environment



Sample of A Dangerous Data Centre Environment



Example of copper creep corrosion on a lead-free circuit board



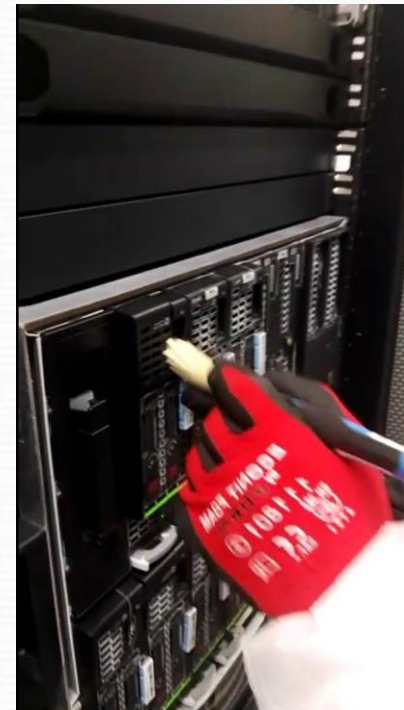
Technical Cleaning Benefits

- Extend the life of the equipment, avoiding contamination thereof
- Minimize the risk of fire as the result of accumulated dust on the hardware
- Avoid electro static discharge causing transmission failure between computers
- Avoid the existence of ferrous material (oxides)
- Minimize the mechanical wear and hardware failures
- Minimize air pollution and remove alive contaminants
- Maximize Airflow to the ventilation Grids, then maximize cooling
- Avoid cleaning by which no qualified personnel that can cause system crashes
- Keep Data Center environment free of contaminants
- Extend the life of air conditioning filters
- Avoid using strong cleaning agents that may attack the hardware and pollute the environment
- Minimize possible infections of personnel because virus and bacteria

Who Can Clean A data Centre

An unprofessional and uncertified person **must not be allowed to operate, manage or attend to any part of a data centre.**

So it is advice that ONLY trained and certified professional with proof able experience must be the ONLY one allowed to Technically clean and sanitize a data centre.



Installation: Process of Technical Cleaning

1st step:

Measurement of the quantity of dust in the air according with ISO 14644

2nd step:

Cleaning of top of the racks and flat parts outside of the racks

3rd step:

Cleaning of the fans of IT devices with small brush and HEPA filter vacuum

4th step:

Robotic HEPA filter vacuum to absorb all ambient dust deposited in the floor

5th step:

Cleaning of raised floor, both tiles and under floor HEPA filter vacuum

6th step:

Deep Cleaning of Contamination Control Tiles installed at the doors entrances

7th step:

Measurement of the quantity of dust in the air according with ISO 14644

→ Check the video in youtube of the technical cleaning process:

www.youtube.com/watch?v=KGb1Z3a57xA

Sample of Risk Assessment

Date issued	January 2017		Account	CLIENT NAME
Task	Technical Cleaning Data Centers 1, 2 and 3			
HAZARDS				
Health & Safety Hazards		Environmental Hazards		Quality Hazards
- Dust in the air while removing powder - Risk of fall into raised floor when tiles are open		- Risk of inneficient cooling temporally in some racks due the opened tiles		- risk of disconnection of some not correctly fixed cable
Who might be affected by these hazards		STR staff (contractor), 1, 2 and 3 security, Visitors &/or environment		
RISK EVALUATION		Likelihood	Severity	Risk Rank
		2	3	6
CONTROL MEASURES:				
- Our team has more than 25 years experience cleaning data centers, last year we cleaned with no problem in ER3 DC. - In the case of doubt of a cable that could be disconnected during the cleaning, our team has the order to advise immediate to check if disconnected during the cleaning. - Normally all cables are disconnected before our job, team wont touch the rear part of the racks where connections are. - If the team doubt or think that is dangerous, they simply do not clean such part. - During the job, maximum 3-4 tiles will be open during the minimum time possible, and marked with red cons. - All the team cleaning will carry special paper suit to protect againgt suspension powder and dust. - Finally we have our Liability Insurance to cover any damage caused during the Technical Cleaning Process.				
RESIDUAL RISKS EVALUATION		Likelihood	Severity	Risk Rank
		1	2	2
Risk Color Code				
1-4 (LOW)		5-12 (MEDUIM)		15-25 (HIGH)

Videos of Technical Cleaning in Data Centers



Sanitization and Disinfection

- Hand Disinfection of all accessible surfaces with disinfectants approved by the WHO or Local Ministry of Health, normally based in Alcohol or Bleach
- Hand Disinfection of all accessible surfaces using Electrolyzed Water, as a result HOCl y NaOH are very effective oxidants.

(+) Positive pole
Chemical reaction formula



(-) Negative pole
Chemical reaction formula



General Detergent 20%

Cresol, Phenol 40%

Ethanol (Alcohol) 60%

Sodium Hypochlorite (Bleach) 80%

Electrolyzed Water 99.95%



NaClO disinfectant

alcohol disinfectant

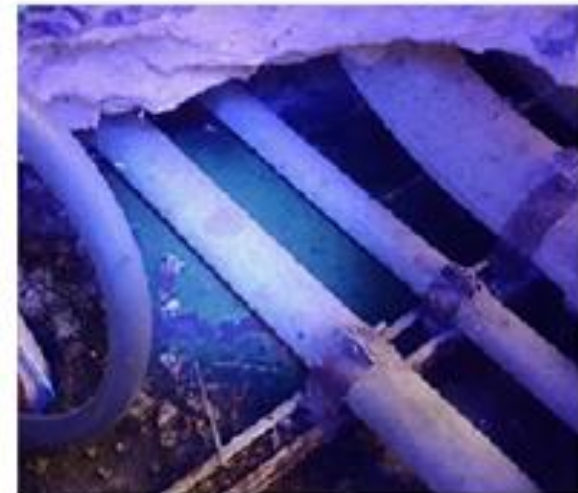
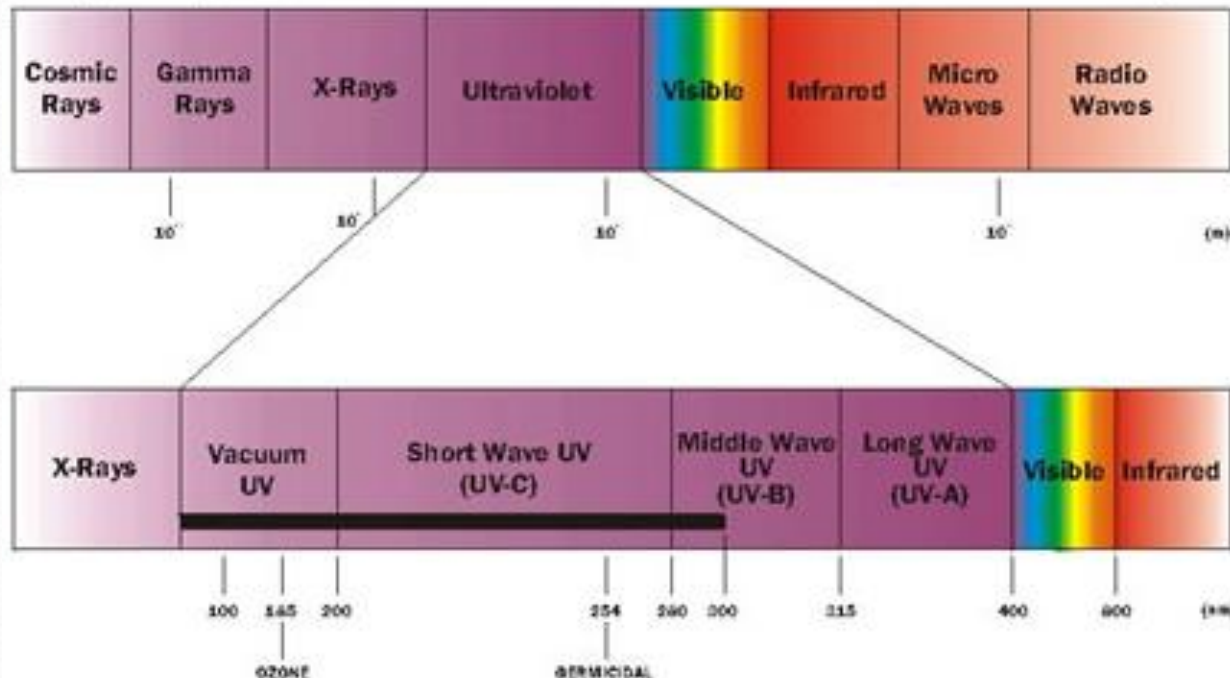
Sanitization and Disinfection

UV-C disinfection of the parts that are touched by the technicians in the room, as door handles, switches, panic bars, etc.

- We can even see the dust using UV bulbs
- Very dangerous to point directly to the eyes or human body

ELECTROMAGNETIC SPECTRUM

(with expanded scale of ultraviolet radiation - 1 nanometer = 10^{-9} meter)



Sanitization and Disinfection

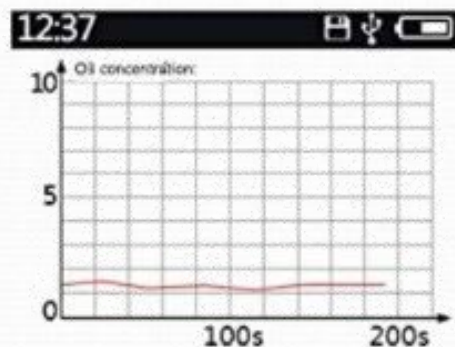
An Ozone disinfection generally alters the molecular structure of certain microorganisms such as viruses or bacteria, besides use in environments Data Center is feasible because:

- Working in areas with high HUMIDITY
- It operates in a wide TEMPERATURE range
- DO NOT CREATE hazardous waste to the environment

We need to take care about the O3 **Concentration Level** according to WHO



Real-time curve display
Gas concentration curve change



Online Monitoring of Dust (Temperature & Humidity)

Especially designed for Critical Rooms, with constant monitoring of Dust, wireless connection of the sensors, with WIFI or GPS Router.



14:19

PM 1.0	1	µg/m³
PM 2.5	2	µg/m³
PM 10	4	µg/m³
Temperature	25	°C
Humidity	36	% RH
PC >= 0.5 µm	1,157,143	Count/m³
PC >= 1 µm	214,286	Count/m³
PC >= 5 µm	0	Count/m³

Connected
2023-03-27
12:18:09

STR - GATEWAY

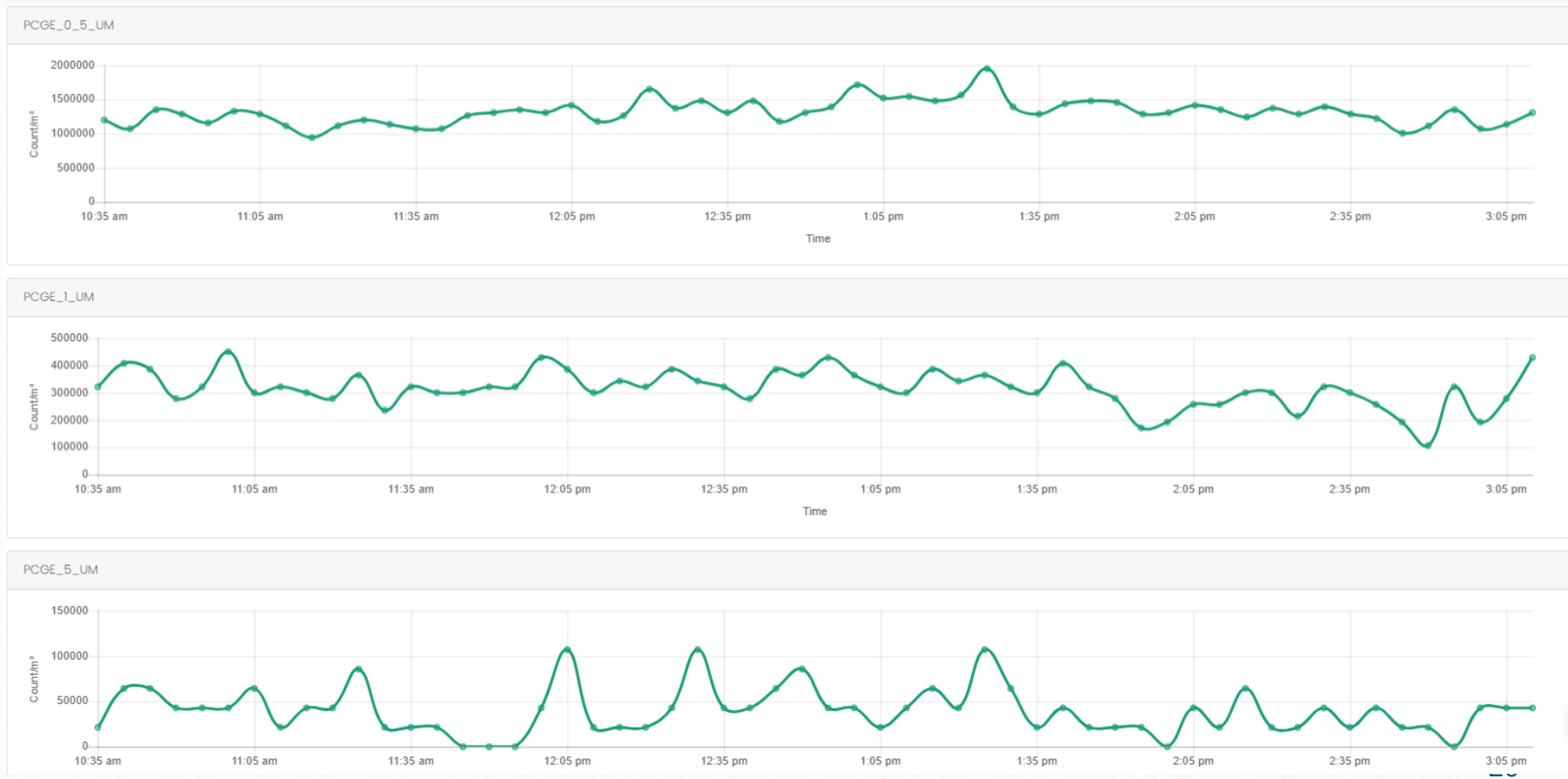
Device Type:
GY36 Gateway

Zigbee Messages Received	6	#/min
Zigbee Messages Sent	1	#/min
Reconnects	0	#/min

Connected
2023-03-27
12:18:20

Online Monitoring of Dust (Temperature & Humidity)

Especially designed for Critical Rooms, with constant monitoring of Dust, wireless connection of the sensors, with WIFI or GPS Router.



Contamination Control Mats

A good Technical Cleaning should last over time.

Data Centers should be kept clean according to ISO 14644 Class 8.

80% of dust and dirt in the critical area occurs in the feet (Source: 3M).

Contamination Control Mats located at the entrance of the technical rooms avoid more than 99% of the dust and dirt from entering the room and near the ground level.



Contamination Control Mats



← Just Cleaned Unit, not new,
pictured unit is about 2 years old

1 day of intense job, dust is in the unit,
not inside the room →



CORROSION AND DIRT LEVEL ANALYSIS CARD

The specific ASHRAE Pollution Control regulations “**2011 Gaseous and Particulate Contamination Guidelines For Data Centers**” regulates the maximum permissible Corrosion level in Copper and Silver for 1 month period:

- **Copper** reactivity rate of less than 300 Å/month
- **Silver** reactivity rate of less than 200 Å/month

- The **Corrosion and Dust level Card** meters will be installed inside the Critical Room, near the main door, to measure and control the level of Corrosion and Dust of the room.
- Includes a PDF Report after 6 months taking environmental samples
- Also controls the level of suspended particles, according to ISO 14644-1.



CORROSION AND DIRT LEVEL ANALYSIS CARD

ISO 14644-1:2015 Air Particle Report

SAMPLER DATA:

Sampler ID: 130384
Test Start (dmy): 30.12.2019
Test End (dmy): 16.01.2020
Test Length (days): 17

SCOPE:

Test results correspond to ISO 14644-1:2015 which is a widely accepted standard for qualifying indoor air cleanliness. ISO 14644-1:2015 specifies the classification of air cleanliness in terms of concentration of airborne particles. ASHRAE recommends that data centers maintain ISO 14644-1 Class 8 or lower (see "Gaseous and Particulate Contamination Guidelines For Data Centers" - ashrae.org).

TEST RESULTS:

The average test result during the sampling period corresponds to the following ISO 14644-1 Class:

ISO 14644-1 Class 8

Particle Parameter:	Test Result:	Class Limit:
0.5 Micron/m3	546'941	3,520,000 $\geq 0.5 \mu\text{m}$ particles/m3 (ISO 14644-1 Class 8)
1.0 Micron/m3	129'277	832,000 $\geq 1 \mu\text{m}$ particles/m3 (ISO 14644-1 Class 8)
5.0 Micron/m3	4'553	29,300 $\geq 5 \mu\text{m}$ particles/m3 (ISO 14644-1 Class 8)

Information:

ISO 14644-1:2015 is an internationally accepted standard that specifies the classification of air cleanliness in terms of the concentration of airborne particles per cubic meter. ISO 14644-1:2015 cannot be used to characterize the physical, chemical, radiological, viable or other nature of airborne particles.

Particle Metrics Report

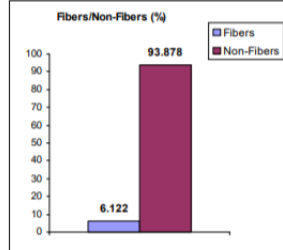
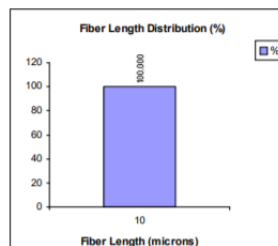
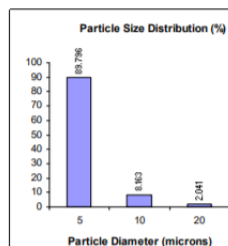
SAMPLER DATA:

Sampler ID: 130384
Test Start (dmy): 30.12.2019
Test End (dmy): 16.01.2020
Test Length (days): 17

SCOPE:

This report provides comprehensive particle metrics including size and shape. In-depth particle knowledge is invaluable for accessing contamination risks as well as identifying sources of particle contamination and improving air cleanliness.

TEST RESULTS:



ANSI/ISA-71.04-2013 Air Corrosivity Report

SAMPLER DATA:

Sampler ID: 130384
Test Start (dmy): 30.12.2019
Test End (dmy): 16.01.2020
Test Length (days): 17

SCOPE:

Test results correspond to ANSI/ISA-71.04-2013 which is an internationally accepted standard that categorizes environmental conditions in relation to the deployment and reliability of electronic equipment. ANSI/ISA-71.04-2013 defines 4 levels of air quality that relate to different rates of reactivity or corrosion of copper and silver: G1, G2, G3 and GX. ASHRAE recommends that data centers maintain Level G1*.

TEST RESULTS:

Copper:
221 Angstroms/30 Days

Test result corresponds to severity level G1 – Mild (European standard EN 60721-3-3 Level 3C1). An environment sufficiently well controlled such that corrosion is not a factor in determining equipment reliability.

Silver:
32 Angstroms/30 Days

Test result corresponds to severity G1 – Mild (European standard EN 60721-3-3 Level 3C1). An environment sufficiently well controlled such that corrosion is not a factor in determining equipment reliability.

INFORMATION:

This report shows the actual amount of corrosion measured on the metal coupons. The corrosion of metals is caused by both gaseous and particle contaminants and is accelerated by heat and moisture. Gases which cause metal corrosion include hydrogen sulfide, sulfur and nitrogen oxides, chlorine and hydrogen fluoride; as well as caustic gases, such as ammonia and oxidizing gases, such as ozone. Particulates which corrode metals include chlorides (salt).

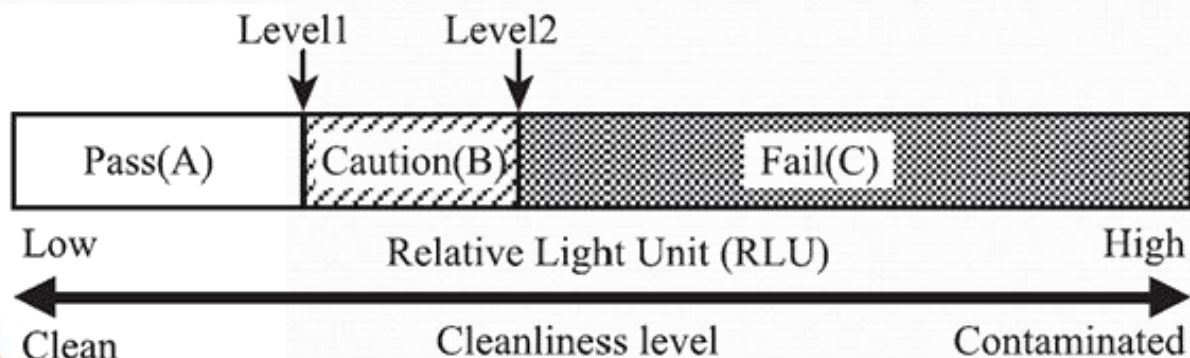
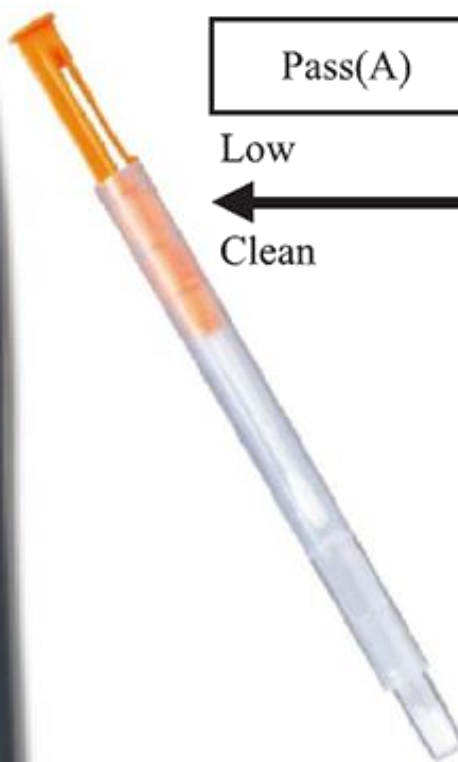
Since metals do not react in the same way, it is important to monitor the corrosion rates of different metals (combination corrosion coupon testing). Copper is particularly sensitive to temperature and humidity (water). It is also more sensitive to hydrogen sulfide (H₂S). Silver is less sensitive to humidity and temperature, and it is more sensitive to sulfur dioxide (SO₂) than hydrogen sulfide (H₂S). Copper coupons cannot detect the presence of chlorine, a particularly dangerous contaminant to metals while silver is sensitive to chlorine. Iron (Fe) is particularly sensitive to humidity and aluminum is very sensitive to chlorides (salt).

Metal corrosion can weaken the integrity of structures and indicate the presence of pollutants that endanger human health. Metal corrosion in electronic equipment can cause needles or nodules to grow out of electronic components including silver solder causing short circuits. Corrosion can also cause metal plated surfaces to flake thereby causing short circuits. Metal corrosion can also cause failure of electrical contacts as well as thermal related failures.

The switch to lead-free (RoHS compliance) manufacturing affects almost all electronic products, and some of the more common materials used as replacements were more sensitive to common atmospheric pollutants than lead-based materials. Manufacturers of industrial process control equipment have used ISA-71.04 since its initial publication for warranty compliance because they understood that their equipment had to be protected due to the corrosive nature of the environments in which it would be used (see "Gaseous and Particulate Contamination Guidelines For Data Centers" – ASHRAE.org).

* Source: "Gaseous and Particulate Contamination Guidelines For Data Centers" - by ASHRAE TC 9.9 (ashrae.org)

SURFACE DUST TEST



Easy-to-use, lightweight luminometer for ATP measurement. For reliable monitoring of liquids, dry and wet surfaces as part of hygiene control in the manufacturing sector. Not suitable for the detection of virus contamination.

Level 1 for Steel is 200 RLUs for Data Center Environment
Level 2 for Steel is 400 RLUs for Data Center Environment

Odor Control in Data Centers



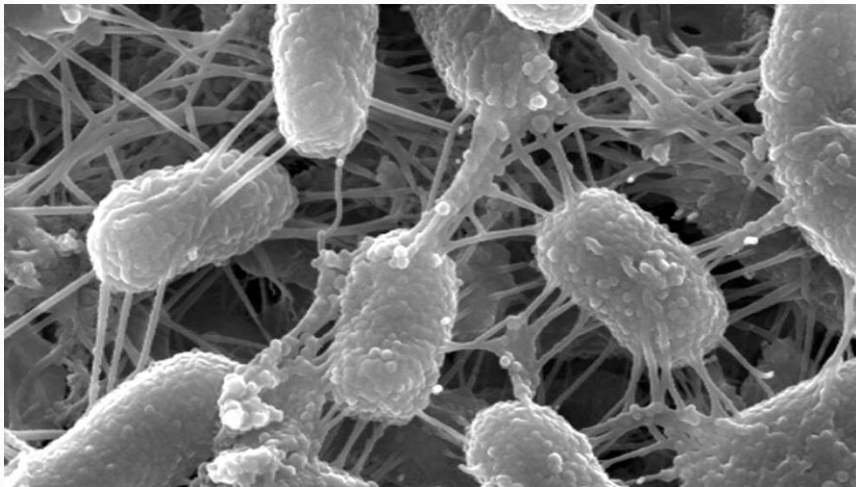
With a double membrane pump, provides air pressure to the tank / boiler and then to the nebulizer that micronizes and expels it outside where a small fan helps to a better distribution.

Odor Control in Data Centers

The Device nebulizes a fragrance chosen by the client in the DATA CENTER, eliminating any type of bad smell present in the air.

Works autonomously or connected with a tube to the AA conduit for a more uniform and efficient distribution.

With an aluminum tank/boiler with a capacity of 2.5 liters that gives it a long autonomy.



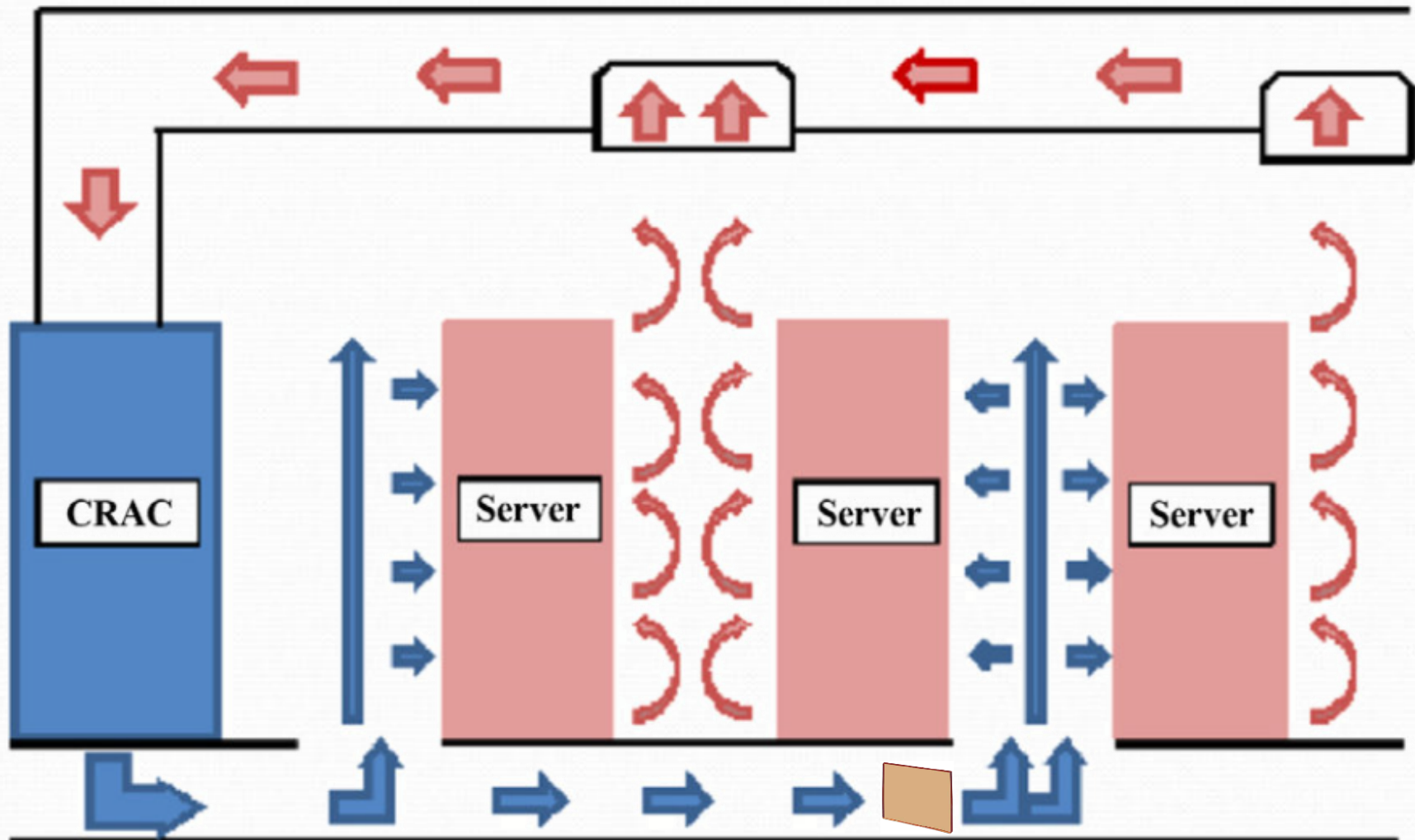
Odor Control in Data Centers



Range of products specially designed to neutralize permanent odors in the air or on any type of surface. It consists of essential oils, which are complex formulas derived from natural vegetable substances such as flowers, fruits, herbs, roots etc.

Control Odor Neutralizers, unlike deodorants and / or air purifiers, do not hide odors; but they eliminate them completely from the environment. Neutralization consists of the precipitation (chemical or physical destruction) of the molecules that cause the bad smell.

Odor Control in Data Centers



Bioremediation of hydrocarbons

Bioremediation of hydrocarbons that have contaminated soils, waters coasts, ports, rivers, or swamps.

The preparation is composed by a selection of natural strains that have the ability to degrade hydrocarbons such as diesel, fuel, and all kinds of oil.

The bacteria break down the hydrocarbon, reducing it to essential elements or compounds simple as CO_2 , H_2O and organic waste.

Once your power supply runs out (hydrocarbon), the area is decontaminated, the bacteria die and rejoin the cycle natural as protein food for other organisms alive.



Bioremediation of hydrocarbons: Certifications



Universidad de Vigo

Certificado de la Universidad de Vigo sobre la inocuidad del método Biopulcher para la descontaminación de hidrocarburos.



Empresa homologada por el Ministerio de Fomento y la Dirección General de la Marina Mercante.

Certificado del CSIC sobre la bioseguridad y eficacia del método Biopulcher para la descontaminación de hidrocarburos.



Bioremediation of hydrocarbons: Success Case

In February 2018, Storm Emma affected the port of Gran Tarajal (Fuerteventura, in Spain) where a fleet had docked of pontoons loaded with machinery and work equipment.

The storm sank 7 boats in one of the ports largest in the Canary Islands, **pouring hundreds of tons of hydrocarbons and their derivatives to port waters.**

For 8 months, was decontaminating the port waters from the initial contamination and from all spills that occurred during the cutting process of the sunken ships.

Bioremediation treatment carried out in the port of Gran Tarajal (Fuerteventura), is the case of decontamination of hydrocarbons with biological methods largest held in a port in Spain.



Sample of Certification

CERTIFICATE ISO 8 UNDER ISO 14644-1

DOLLY COMPANY LTD

After the Technical Cleaning and Measurements according ISO class 8 made in mentioned rooms, we certify the accomplishment of the Levels of Contamination accepted by the standard ISO 14644-1, class 8.

This Certificate is valid for 1 year since the following date, according to the standard itself.

MONACO DATA CENTER



CERTIFICATE BY:

A handwritten signature in black ink, appearing to read 'Emilio Sapina'.

Emilio Sapina, CEO

Secure Technical Rooms SL

COMPANY AND DATE:

February 12th 2019

Thank You



01001110 01001111 01001001 01010010



QIECO Smart
AUTOMATION • DATA • ENERGY

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emilio.sapina@securetechnicalrooms.com
victoria.statkevich@securetechnicalrooms.com
www.securetechnicalrooms.com