



BUG PEST CONTROL USING HEAT

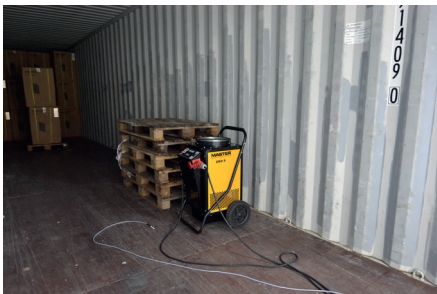
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DISCLAIMER: We do not take responsibility for damages caused by the misuse of EKO heaters.
Please consult professionals before use.





INSECT BUG PEST CONTROL METHODS

INTRODUCTION

In recent years we have witnessed an increasingly rapid growth of people moving between continents and a growing number of traffic in goods. This has led to the unwanted spread of insects and parasites.


Insects can attack people, the food we eat, lurk in hotel rooms, restaurant kitchen, bakeries and warehouses.

Insects are unpleasant in sight and dangerous for our health. So far, we have tried to control the spread of these unwanted insects with the use of chemicals.

Chemicals have many side effects. This is why other methods needed to be developed: easy-to use for the cleaning professionals and not harmful to the them and the surroundings.

To get a sense of what solution we needed to provide to solve this problem we asked Prof. Luciano Suss, Past Professor at the University of Milan, to make a study on this subject and help us to develop this introductive brochure.

This introductive brochure will lay out how to tackle this problem in an environmentally conscious and effective way.

 Insects can nestle and create serious problems in artificially created environments where people live, produce or sell foodstuff.

Modern man has put at their disposal incredible amounts of settings which are favorable to their development. The use of powerful poisons can help to eliminate such insects, but they present many risks:

- risks to the surrounding area, when these poisons leak out from the treated space
- contaminated insects that are eaten by predators, or to people who come in contact with the poisons themselves
- risk of not solving the problem completely when the poisons kill the insects, but not the actual larvae or eggs

Thanks to the development of technology, it is today possible to defend against these insects without using poisons at all.



MOST COMMON INSECTS AND BUGS

There are many unwanted insects in this world with some of the most common ones cited below.

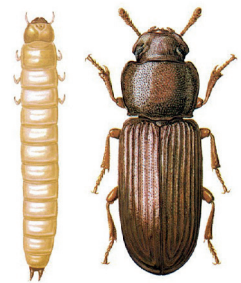
BED BUGS (*Cimex lectularius*)



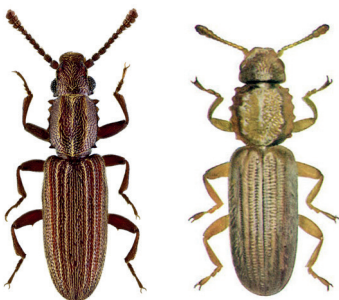
- In recent years bed bugs (*Cimex lectularius*) have become more and more widespread with environments that were previously free from infestation such as hotel rooms, rail carriages and airplane cabins now suffering from this surge.
- These are species that can withstand fasting for many months. In the daytime they hide in mattresses, baseboards and at night they come out of hiding places and feed on the blood of people or animals.
- After mating, females lay white, oval eggs (1/16" long) into cracks and crevices. An individual bed bug can lay 200 to 250 eggs in her lifetime. The eggs hatch in 6 to 10 days and the newly emerged nymphs seek for blood.
- The main carrier of these bugs are travellers' suitcases. The bug in fact 'gets on board' a suitcase and travels with the passenger. The transition can take place during a stay in an infested hotel or in the luggage compartment of an airplane.
- They are found in hotel rooms, suitcases, train carriages, airplanes, ambulances and hospital beds.
- Being only 3.5mm in diameter they can flatten themselves to get through very small spaces.
- The optimal temperature for killing insects, larvae and eggs is about 50°C.
- The bugs need to be exposed to the temperature for a minimum of one hour, preferably longer.

FLOUR BEETLE (*Tribolium castaneum*) (Coleoptera)

- The Flour Beetle is from the Coleoptera family.
- They feed on various plant substances, in particular of the powdery kind such as flour and bran.
- They are found in food stores and bakeries and are widespread throughout the world due to global trade.
- Adult Flour Beetles measure 2.5-4.5mm.
- They deposit up to 500 eggs and are able to sometimes resist treatments that use toxic gases.
- Adults can even survive for a long time in an airless environment.
- The optimal temperature for killing insects, larvae and eggs is about 50°C.
- The bugs need to be exposed to the temperature for a minimum of one hour, preferably longer.



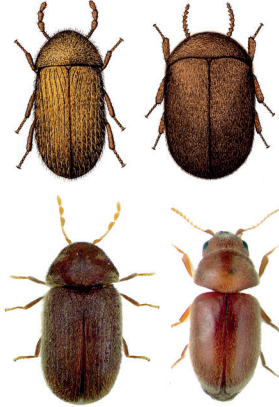
GRAIN BEETLE (*Oryzaephilus surinamensis* e *Oryzaephilus mercator*) (Coleoptera)



- The Grain Beetle feeds on foods such as dried fruits, meats, cereals and rice.
- They are primarily found where these dry foodstuffs are stored and are widespread due to global trade.
- They deposit up to 500 eggs four times a year.
- The adult Grain Beetle measures about 3.5mm.
- The optimal temperature for killing insects, larvae and eggs is about 50°C.
- The bugs need to be exposed to the temperature for a minimum of one hour, preferably longer.



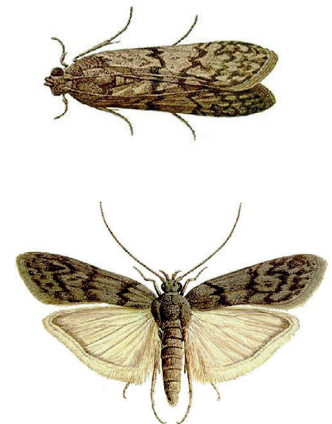
CIGARETTE BEETLE (*Lasioderma serricorne*)
AND DRUGSTORE BEETLE (*Stegobium paniceum*) (**Coleoptera**)



- The beetles and their larvae feed on a variety of pet foods, including dried and processed foods such as grains, pasta, raisins, rice, seeds and even cockroach poison.
- They are found in food stores, bakeries and restaurants.
- The adult beetles are small in size, around 4mm.
- A female beetle can lay up to 100 eggs on the food products from which the larvae will feed.
- The optimal temperature for killing insects, larvae and eggs is about 50°C.
- The bugs need to be exposed to the temperature for a minimum of one hour, preferably longer.

MEAL MOTH (*Ephestia kuehniella*) (**Lepidoptera**)

- The larvae of the meal moth are responsible for the most common infestations of any foodstuff.
- They are found in food stores, bakeries and restaurants.
- They feed on dried fruit, tobacco, flour, spices, chamomile, fabrics, dried fish and horsehair.
- As fully formed butterflies they move quickly, infesting foodstuffs.
- The larvae of this species have the ability to bite through plastic and cardboard; thus, even sealed containers may be infested with eggs.
- The distal of two thirds of their forewings are generally reddish brown in color with a copper luster. The more proximal parts of the wings are yellow-gray or white-gray, with a dark band at the intersection between the proximal and distal regions.
- Adults are 8-10mm in length with 16-20mm wingspans.
- The butterflies lay between 100 and 300 eggs and are 0.5-0.6mm long and difficult to see with the naked eye.
- The optimal temperature for killing insects, larvae and eggs is about 50°C.
- The bugs need to be exposed to the temperature for one hour.



DUST MITES (*Dermatophagoides pteronyssinus*) (**Pyroglyphidae**)



- House dust mites, due to their very small size and translucent bodies, are barely visible to the unaided eye.
- A typical house dust mite measures 0.2–0.3 mm (0.008–0.012 in) in length. They feed on skin flakes and on some mold.
- A mated female house dust mite can live up to 70 days, laying 60 to 100 eggs in the last five weeks of her life. In a 10-week life span, a house dust mite will produce approximately 2,000 fecal particles and an even larger number of partially digested enzyme-covered dust particles.
- The mite’s gut contains potent digestive that persist in their feces and are major inducers of allergic reactions such as wheezing.
- The optimal temperature for killing insects, larvae and eggs is about 50°C. The mites need to be exposed to the temperature for one hour.

PEST CONTROL METHODS



BUG PEST CONTROL USING CHEMICALS IS DANGEROUS AND POISONS THE ENVIRONMENT

Chemicals are the traditional way of getting rid of bugs and insects. There are several poisons on the market used for bug killing but the drawback being that they are not good for the environment or the people using them.

In fact, in living spaces or in businesses that produce and market foodstuffs, pesticides cannot be used due to high toxicity levels and the poison being in the air for long periods of time.

Products available on the market are not strong enough to get rid of all the bugs, eggs and larvae, even with repeated treatments which are extremely costly.

Furthermore, chemicals are powerful poisons for other living things, including humans and pets. They therefore require skilled individuals with the qualifications for use and storage.

When using chemicals in any liquid or gas form, all contaminable objects must be removed beforehand. After chemical treatments, the environment must be thoroughly cleaned to remove any chemical residues. Very long application times are needed to try and eliminate larvae hatching from eggs, sometimes even days.



BUG PEST CONTROL USING CHEMICALS IS DANGEROUS AND POISONS THE ENVIRONMENT



PEST CONTROL METHODS



BUG PEST CONTROL USING HEAT IS SAFE AND RESPECTS THE ENVIRONMENT

In this ever increasing drive to use environmentally friendly methods it is important to highlight the ecological potential of extermination by the use of heat.

The optimal temperature for rapid development of insects range from 27-33°C, depending on the species. It is also known that the insects, in every stage of development, including egg, die within minutes if a temperature in the environment of around 50-60°C is reached. Between 40-50°C total mortality occurs in one day as insects die from dehydration.

It is therefore evident that if the room temperature is raised above 50°C, insects, larvae and eggs can be totally killed.

It is essential that this temperature is achieved in every nook and cranny and as fast as possible. Killing the bugs via heat requires heaters that distribute a **large flow of hot air to carry out a total eradication (eggs, larvae and insects) within a few hours.**

Environments are made up of diverse structures

and materials, often with variable temperatures. For instance consider different types of flooring, windows, walls and installed systems.

The thermal conductivity varies greatly but the required temperature must be reached at every point, otherwise the insects and bugs will simply leave their normal shelter and move to a location with temperatures more suitable for their survival.

Rapid heating works best within metal structures but is slower on tiled floors and on wooden materials.

To reach temperatures around 50-55°C the most favorable period is usually during the summer months where environments and structures are already hot.

The heaters must be able to maintain the temperature above 50°C, without exceeding 70°C.

During the treatment either regular inspections using a 'pointing' thermometer or applying temperature sensing probes with remote control are required at critical points eg under mattresses or on the floor.



FIGHTING BUGS USING HEAT IS SAFE FOR PEOPLE AND RESPECTS THE ENVIRONMENT

It is possible that, in particular, mobile adult insects tend to escape to reach more favorable environments. Therefore, it is advisable to plug any holes, cracks or gaps in the tiled floor or doors that will prevent the insects from escaping.

Biotests can also be used to gauge the success of the operation. The biotests are small boxes containing insects, larvae and eggs that can be placed inside the room. Their death will be proof of the effectiveness of the treatment.

At present, both in Europe and in other parts of the world, exterminations are carried out with heating

the entire building, particularly in mills and food factories. It is useful to verify the results by placing numerous "biotests" on-site, containing the species to be destroyed, at different stages of development.

For this eradication technique different machines are able to produce large quantities of hot air to obtain the required result in the shortest possible time.

This technique can also be used in lesser environments, in shorter times, thanks to the use of smaller sized machines. For example in hotel rooms, railway carriages, artisan bakeries, restaurant kitchens, ambulances and first aid premises.

ADVANTAGES OF ERADICATION WITH HEAT



- It is not necessary to empty the rooms which are to be treated. It is in fact sufficient to remove only objects or foods that can not tolerate 60°C – plastic film (type: Domopak), chocolate, flowers etc
- No specific cleaning is needed after the heating process, as no toxic residues remain in the air
- Gets rid of all insects, larvae and eggs and avoids risk of only partial eradication
- Acts quickly
- No protective clothing is required against chemicals
- No "chemical" licenses are required for the operators
- The premises are accessible immediately after treatment
- It is not necessary to store toxic materials
- It is possible to monitor the temperature and have the certainty that the treatment has been effective

BIOTESTS

Biotests are provided by specialized laboratories. They are small containers containing the infesting insects at various stages of development, ie eggs, larvae and adult insects.

These biotests will verify the effectiveness of the treatments by the mortality rate achieved.



PEST CONTROL METHODS

PARASITE PREVENTION

There are several ways that you can prevent bug infestations.

Firstly, all necessary steps should be taken to prevent an infestations including removing food debris, sealing up nesting cracks and keeping all living spaces perfectly clean.

It is advisable to carry out periodic preventive treatment of the rooms with the use of dry heat which will avoid the spread of bugs.

MONITORING

Despite all preventative measures, it is always possible that an infestation will occur due to their ability to fly or being transported by either people or objects.

Therefore, it is good practice to monitor any bug problem by visual inspection or better with the use of food or pheromone traps especially in the case of Lepidoptera.


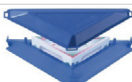




However it is important to realize that you will only be able to see the adult bugs as the eggs and newborn larvae cannot be seen with the naked eye.

THE USE OF TRAPS

There are many variations of traps on today's market. Some are suitable for catching the Lepidoptera which infest foodstuffs, others are able to monitor, catch in or out of flight the Coleoptera.

These traps have long been used in the food industry, but it is also appropriate to use them in artisan production environments such as bakeries and pizzerias, to promptly eliminate the onset of an infestation.

The same traps can be used in a preventative manner as well.

PEST	TRAP	IMAGE
Tribolium castaneum, Oryzaephilus surinamensis, Oryzaephilus mercator	3 way trap pherotrapp multispecie	
	Shield trap (optional)	
Lasioderma serricorne Stegobium paniceum	Anoblidi	
Plodia interpunctella Ephestia kuehniella	Geopad verde	
	Moth hanger	
Cimex lectularius	Bed bug trap	

APPLICATIONS

HOTELS



The most common pest in hotels is *Cimex lectularius*. In the day time it nestles in the seams of mattresses, in door and window frames, carpets, skirting boards and picture frames as well as in wooden furniture joints.

At night the pest comes out of its hiding places to find a feed.

To monitor this, it is advisable to periodically install traps in the rooms to highlight the presence of bed bugs.

Among the prophylaxis practices it is very important that each individual hotel room is treated periodically with heat as you have to take into account escaping pests into other rooms. It is recommended that the affected room and all adjacent rooms above and below are treated. So effectively five rooms require treatment when one is affected.

Again sealing off any possible escape routes is essential with double-sided adhesive tape.

After the treatment, traps should be placed in the rooms to highlight the presence of surviving bugs.

HOSPITALS AND HOSTELS



Like with the hotel rooms above the most common pest affecting hospitals and hostels is *Cimex lectularius*.

Monthly treatments are necessary with heat at 50-60°C in individual rooms as again you have to take into account escaping pests into other rooms. To help prevent this happening sealing off any possible escape routes is essential with double-sided adhesive tape.

After the heat treatment traps need to be installed to highlight the presence of surviving bugs.



AIRPLANES



More and more passengers are complaining that they were attacked by bed bugs on trains and airplanes. It is essential to eradicate these pests firsthand with periodic heat treatments.

TRAIN CARRIAGES



Train carriages or sleeping berths have frequently had bed bug infestation problems due to the high amount on travellers in this transportation mode. Periodic heat treatments are recommended.

AMBULANCES



Cimex lectularius is again the most frequent pest in this application. Treatments with extended heat for two hours at 50-60°C are recommended.

POLICE CARS AND VANS



Police cars and vans are often used to transport people with low hygienic levels. They can be easily contaminated by bugs. Heat can quickly clean cars or vans eliminating all bugs and eggs.

APPLICATIONS

PIG FARMS



Pig farms can suffer from bug infestations. With heat treatment it is possible to eliminate all bugs and eggs between one generation and the other without the danger of using poisons.

CHICKEN FARMS



Chicken farms are often infested from bugs. With heat it is possible to eliminate all bugs between one generation and the other. Heat penetrates deep into the farm structure killing bugs and eggs.

ANTIQUE CARPETS



Antique carpets can be severely damaged by bugs. Heat is a clean and deep way to eliminate insects, larvae and eggs and preserve the carpets over time.

BOATS



Heat can be used for the in-depth extermination of bugs and parasites that have burrowed into the wood of the helm and other wooden parts of the boat.



WOOD TRANSPORT CONTAINERS

(BEFORE OR AFTER LOADING)



Transporting wood often means to transport insects overseas which can be dangerous for the wood or for agriculture. With EKO heat it is possible to kill all the bugs in the wood and to eradicate the container from resident insects.

ARMY BARRACKS AND DORMITORIES



New guests in dormitories might carry undesired bugs with them. The whole dormitory will quickly be infested. Heat is a fast and safe way to eradicate the dormitory or to prevent the development of bugs.

FOOD TRANSPORT CONTAINERS

(BEFORE LOADING)



Food containers carrying goods such as fruit and vegetables need to be completely free of bugs and insects. In this application the use of chemicals is banned as it would effect the food. With heat it is possible to kill all the bugs before loading the food.

CELLS AND PRISONS



New inmates could bring unwanted bugs in with them. The whole dormitory will quickly be infested. Heat is a fast and safe way to eradicate the cells and prevent the further development of bugs.

APPLICATIONS

ARTISAN BAKERIES, PROFESSIONAL KITCHENS, RESTAURANTS, PIZZERIAS, ICE CREAM PARLOURS

Moths belonging to the Lepidoptera family and the Flour Beetle thrive in environments such as flour mills, bakeries and storage areas in professional kitchens. They lay their eggs in the flour which are then invisible to the naked eye.

Businesses incur the risk of fines and closures from local authorities and health inspectors which can be very costly to them.

It is advisable to install permanent traps on the premises to highlight the presence of these insects and bugs. Even the careful cleaning of the production area and monitoring of the situation are unfortunately still not sufficient.

Using chemicals in environments where food is produced or stored, as previously stated, are not only harmful to the food and people but do not totally resolve the problem. It is also impossible to carry out treatments with 'toxic gases' as these rooms are generally installed in residential buildings and food should be removed in advance and each machine washed down afterwards.

The ideal solution is to use continual hot air as it can completely clean the production environment without interfering with the other materials and equipment present in the premises and in surrounding areas.



MASTER EKO 9 ELECTRIC HEATER 9 KW



YouTube Video



SMOOTH TEMPERATURE INCREASE

The temperature of the air flowing through is increased in amounts of 15°C each time. 20°C->35°C ->50°C- 60°C. The big air flow allows a fast increase and an even temperature distribution. This solution avoids temperature shocks, which would let insects run away.

HIGH AIR FLOW

The high air flow quickly mixes the air in the room allowing to heat everywhere.

- Compact and lightweight (34kg)
- It delivers 1400m³/h of hot air using only 9 kW at 380-400V (three phase)
- Connection to an external digital remote thermostat THK, specific for this application, included in the package
- Overheat thermostat
- Motor with thermal protection and intervention
- The MASTER EKO is placed inside the room and recirculates the air increasing the temperature by 15°C at a time.

SPECIFICATIONS		MASTER EKO 9
Heating power	kW	9
	Kcal/h	7740
	Btu/h	30709
Air displacement	m ³ /h	1400
Power supply	V/Hz	380-400 / 50
Phase		3N
Rated current	A	13.8
Remote thermostat		digital
Product size (l x w x h)	mm	550 x 606 x 921
Box size (l x w x h)	mm	602 x 646 x 858
Net/gross weight	kg	35/42
Pallet	pcs.	4



THK – digital remote thermostat, included in the package
4150.137

MASTER EKO 3 ELECTRIC HEATER 3 KW



SMOOTH TEMPERATURE INCREASE

The temperature of the air flowing through is increased in amounts of 15°C each time. 20°C->35°C ->50°C- 60°C. The big air flow allows a fast increase and an even temperature distribution. This solution avoids temperature shocks, which would let insects run away.

- Compact and lightweight (19kg)
- EKO 3 delivers 800m³/h of hot air using only 2.8 kW at 230V (single phase)
- Connection to an external digital remote thermostat THK, specific for this application, included in the package
- Overheat thermostat
- Motor with thermal protection and intervention
- The MASTER EKO is placed inside the room and recirculates the air increasing the temperature by 15°C at a time

HIGH AIR FLOW

The high air flow quickly mixes the air in the room allowing to heat everywhere

SPECIFICATIONS	MASTER EKO 3	
Heating power	kW	2.8
	Kcal/h	2866
	Btu/h	11260
Air displacement	m ³ /h	800
Power supply	V/Hz	230/50
Phase		1
Rated current	A	12.4
Remote thermostat		digital
Product size (l x w x h)	mm	455 x 440 x 600
Box size (l x w x h)	mm	500 x 400 x 655
Net/gross weight	kg	19/24
Pallet	pcs.	12



THK – digital remote thermostat, included in the package
4150.137

MASTER EKO 150 DIESEL HEATER 150 KW



DIESEL OIL



BIG POWER FOR BIG ROOMS

SMOOTH TEMPERATURE INCREASE

The temperature of the air flowing through is increased in amounts of 15°C each time. 20°C->35°C ->50°C->60°C. The big air flow allows a fast increase and an even temperature distribution. This solution avoids temperature shocks, which would let insects run away.

HIGH AIR FLOW

The high air flow quickly mixes the air in the room allowing to heat everywhere.



- The MASTER EKO 150 is an extremely powerful heater which is able to treat large spaces, ie. chicken farms, pig farms
- It delivers 12.800 m³/h of hot air
- It uses only 2.8 kW of electric power at 220-240V
- Connection to an external digital remote thermostat THK, specific for this application, included in the package
- Connection to flexible tubes to disperse heat in critical points
- High air pressure, allowing the use of long flex tubes
- Air recirculation, allowing the heater to be placed outside the room being treated

SPECIFICATIONS		MASTER EKO 150
Fan		axial
Total air pressure	Pa	250
Air displacement	m ³ /h	12,800
Flex tube	cm	1 tube Ø 70 cm, 2 tubes Ø 51 cm or 4 tubes Ø 34 cm
Heating power	kW	150
	Btu/h	512.000
	kcal/h	129.000
Remote thermostat		digital
Summer ventilation		yes
Flue tube	mm	200
Electronic box protection		IP 55
Rated current	A	12,6
Power supply	V/Hz	220-240/50
Product size (l x w x h)	mm	2200 x 985 x 1620
Box size (l x w x h)	mm	2150 x 840 x 1560
Net weight/gross	kg	380/410



THK – digital remote thermostat, included in the package
4150.137

REMOTE CONTROL OF DISINFESTATION JOB

INTELLIGENT MONITORING

To support disinfestation and documentation of temperature levels the IMCS exists in a special edition that accommodate the need for continuous data in short periods.

With Dantherm IMCS for EKO heaters you can add multiple wireless temperature sensors into the room.

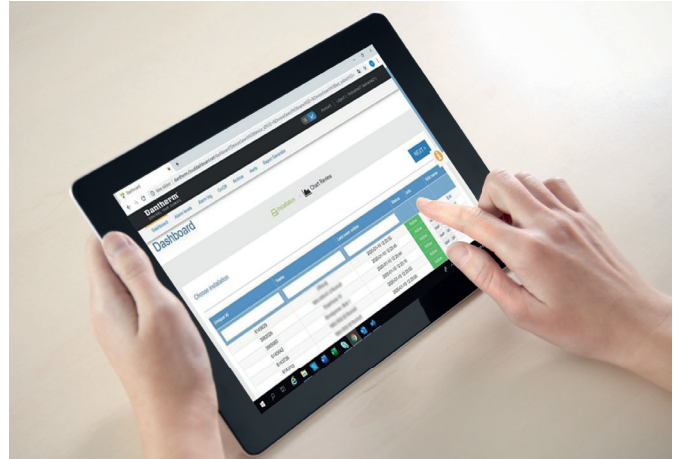
It allows:

MONITORING:

Remotely control the temperature of each sensor.

RECORDING:

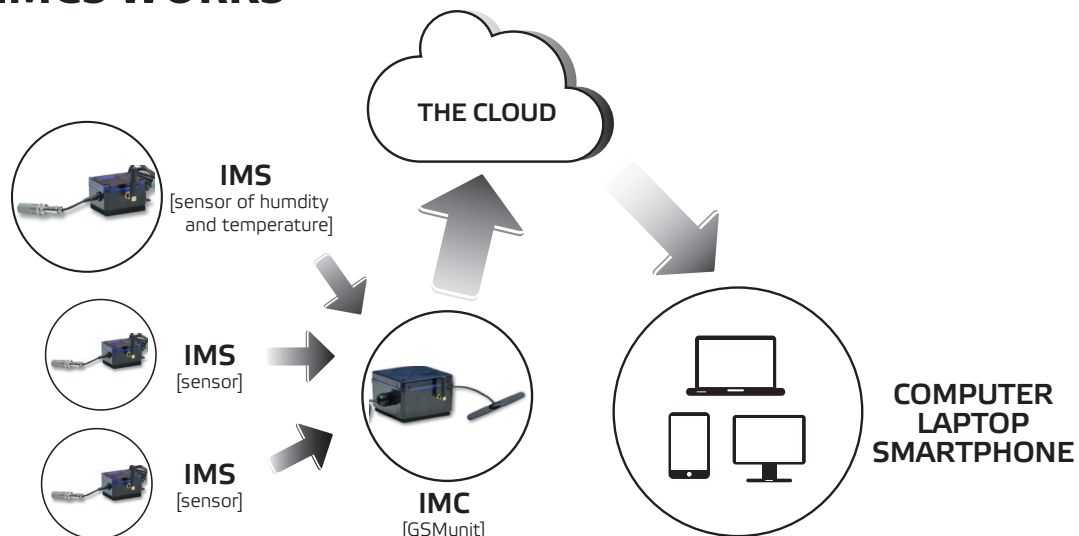
Record the temperatures in the room, giving a secure documentation about the disinfestation job done.



With the computer or a tablet you can access to the cloud and read in a **DASHBOARD** the following information:

- Temperature
- Humidity
- Running time

HOW IMCS WORKS



The **IMS SENSORS** measure the temperature and the humidity in the room and send the information to the **IMC**, the GSM COMMUNICATION UNIT.

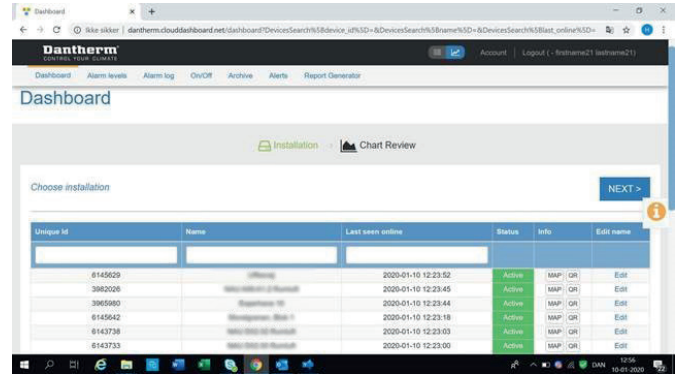
The **IMC** sends the information to the Cloud.

REMOTE CONTROL OF DISINFESTATION JOB

INTELLIGENT MONITORING

IMCS DASHBOARD

- Administration of any number of desinfestation job
- QR codes to scan IMC and get information or scan more sensors
- Alarm administration and Alarm receivers
- All data in close to real time
- All cases saved in Dashboard Archive



IMC (GSM unit)

IMC: This unit collects the data from several IMS units (up to 32 sensors) and sends them via GSM to the cloud.



IMS (sensor)

IMS: The wireless sensor IMS measures temperature and humidity in the room and communicates with the IMC unit.

SPECIFICATION	
IMC (GSM unit)	
Capacity	Up to 32 sensors per system
Power	230V
Product size (l x w x h)	17 cm x 16 cm x 9 cm
Transmitting	GSM-signal present
IMS (sensor)	
Power	3 pcs alkaline AAA
Transmitting	wireless 433 mhz
Size sensor (l x w x h)	8.5cm x 6.5cm x 6.5cm
Size probe (l x Ø)	4cm x 1.4cm
Accuracy probe	+/- 1.8%RH with long term stability
Temperature range probe	-40°C – +90°C
Humidity range probe	0-100%RH (not in water)



For better results and documentation of effects it is recommended to use more sensors in the critical places in the room.

MCS MASTER[®]

CLIMATE SOLUTIONS

MASTER CLIMATE SOLUTIONS IS A DANThERM GROUP BRAND

AERIAL[®]  **calorex[®]** **Dantherm[®]**

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