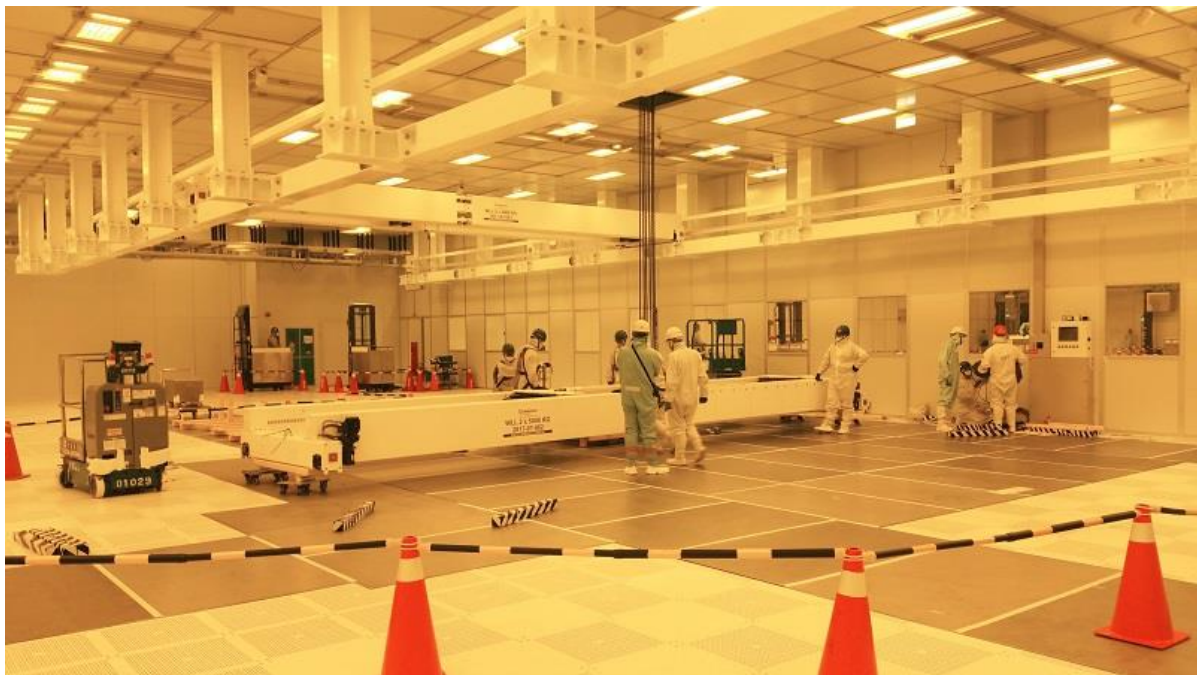


## **Make the right choice for your cleanroom cranes: discover success factors in 3 areas of focus**

**Hygienic lifting and hoisting solutions with reduced risk in controlled environments**



## Summary

**Safe and efficient hoisting and lifting is essential in controlled environments. There is a lot to consider. From choosing the right materials and cable trays to having dedicated software developed, no two controlled work environments are the same. Companies themselves set very diverse requirements, and regulations differ for each sector and country. Discovering success factors in three areas of focus can help filter the best options. And ultimately make choosing the best cleanroom crane for your company or industry much easier.**

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## Introduction

### Cranes in cleanrooms

**How can your hoisting and lifting equipment meet high standards and requirements?**

**What are important points to consider? Make sure to be well prepared.**

About conditioned environments:

- They limit process contamination
- Companies set highly diverse requirements
- Regulations differ for each sector and country
- Laws and regulations are becoming increasingly strict

Gain insight in three areas of focus:

- Configuration of your hoisting and lifting solutions
- Material and surface treatment
- Eclectic components

**Are you involved in (re)designing a controlled work and production environment? And are you exploring what the right choices are for cleanroom cranes? Then you will inevitably encounter a surprising range of options and points to consider. It is important to be well prepared. This whitepaper describes what you need to be aware of in order to make your project a success.**

### Controlled environments

A controlled environment is designed to limit contamination during work or product processes. This could include controlled spaces in food processing or in the pharmaceutical industry, or cleanrooms in sectors such as the semiconductor industry. Contamination can exist in the form of dust, fibers, microorganisms, particulate matter (e.g. due to friction and wear of metals) or material evaporation.

What is a cleanroom? This term has a specific definition, which involves counting the number of particles of a certain size that are present in one cubic meter. An ISO 5 cleanroom contains 3520 particles that are 0.5 µm or larger in one cubic meter. As a comparison, the air in a typical urban environment contains 35 million particles of that diameter in one cubic meter.

### Basic principles for your sector

Cleanrooms are used in several industries such as semiconductor manufacturing. In the pharmaceutical industry, controlled environments are installed to protect products or processes. And in the food processing industry, better control of the manufacturing process helps extend expiration dates, for example.

## **In the following three sectors, efficient lifting and hoisting is a must:**

### **• Semiconductor industry**

The high-end semiconductor market requires controlled lifting solutions for light and heavy components and tools on a molecular and atomic level. Your sector faces strict requirements and uses specially designed equipment with a strong emphasis on minimizing contamination from unwanted materials and gasses.

### **• Pharmaceutical industry**

Whether you manufacture medication or medical devices, quality cleanroom cranes made of class A components minimize the spread of small particles and contamination. Smooth surfaces are easy to clean, and applications such as coating agents containing silver ions help to limit the growth of microorganisms and bacteria. The cranes work quietly and accurately.

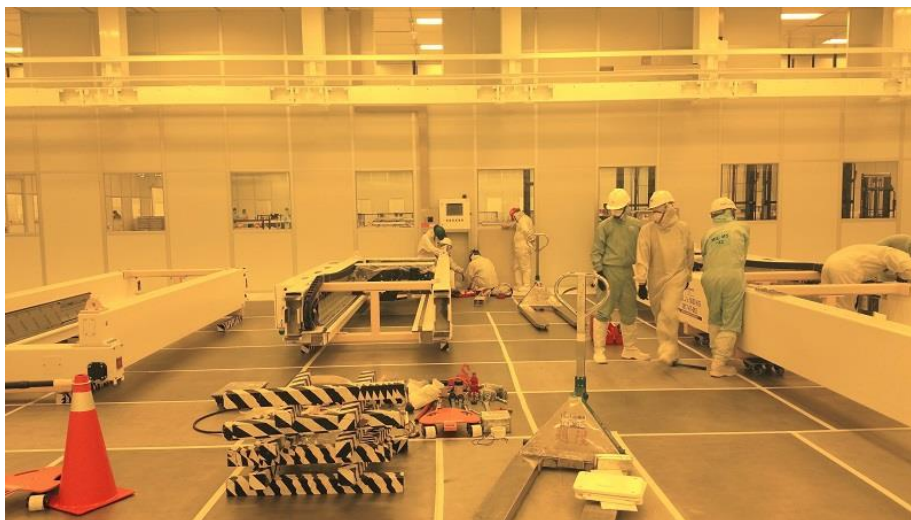
### **• Food processing industry**

Extremely hygienic cleanroom cranes minimize the formation of microorganisms. They leave very few particles behind and cause negligible contamination. These cranes have a functional design that is virtually free of surfaces, cracks, openings and hollow spaces. This minimizes the risk of contamination and helps meet the strict demands of the food processing industry.

## **Increasingly strict laws and regulations**

Depending on the country and sector, you may have to deal with very different laws and regulations. Companies are assessed by independent inspection bodies such as SGS, TUV as well as overseas bodies such as Apave and the FDA. In general, requirements are becoming increasingly strict across a wide range of sectors.

As a result, there is a growing need for production to take place in controlled environments. It also explains the significant increase in the use of controlled environments and cleanrooms over the last thirty years.



## Valuable insights

Ergonomic lifting and hoisting equipment increases efficiency and workplace comfort. How can you use this equipment effectively while also complying with strict regulations and requirements in terms of hygiene and food safety? How can you ensure that your hoisting and lifting equipment meet high requirements and demands? What factors should you consider?

This whitepaper offers you valuable insight into this topic, which can be divided into three focus areas: **configuration of your lifting and hoisting solutions**, **material and surface treatments** and **electrical components**. It will help you determine the success factors involved in making the right choice for your new cleanroom crane.

## **Focus area 1 Configuration of your lifting and hoisting solutions**

**Every cleanroom has its own specific requirements and there is a wide range of solutions and possibilities to choose from.**

High-quality cleanroom cranes:

- Cause minimal contamination
- Leave very few particles behind
- Can be used with precision
- Are compliant with laws and regulations

There are several smart features, including:

1. Software and “overhead” systems
2. Automatic balancing
3. Anti-sway control
4. Load weight determination
5. Application of a preload
6. Coordinated positioning
7. The correct barriers
8. Innovations such as a drip tray under the motor, coatings containing minimal molecular contamination
9. New Dyneema hoist rope

**There are many different mechanical and electrical lifting and hoisting solutions for controlled environments. These often involve ergonomic applications for materials that are otherwise too heavy to move manually. At the same time, hygienic systems also help to prevent contamination and micro-bacterial growth.**

Every cleanroom has its own specific requirements and profile. For example, is it necessary to keep the number of particles below a certain minimum level? Or is preventing contamination and the development of microorganisms crucial? Be sure to keep the correct classifications in mind and choose a customized crane for your controlled environment(s).

**The advantages of high-quality cleanroom cranes:**

- cause minimal contamination and leave behind a very limited number of particles
- work extremely precisely
- compliant with current laws and regulations and (international) standards, such as ISO 14644



## Wide range of possibilities

Lifting capacities can vary from less than fifty kilos to well over twenty tonnes. You can have only one crane or multiple cranes, and they can be powered electrically or manually. Virtually anything is possible. Ergonomic overhead cranes and jib cranes contribute to higher efficiency and more workplace comfort. Sophisticated hygienic systems, for example, help to move products from 'dirty' zones to 'clean' zones.

An example of this last application:

1. A 'big bag' is hygienically filled with pharmaceutical powders, meaning that the inside of the bag and its contents are free of bacteria.
2. This big bag is placed on a 'dirty' pallet in the warehouse (dirty zone).
3. This pallet is then placed in a lock consisting of several compartments enclosed behind roller doors. This part of the lock is also a dirty zone.
4. The big bag is lifted off the pallet with an overhead crane.
5. Using a start/stop-system, the big bag is moved through the compartments. This is done in such a way that only one roller door is opened at a time. That prevents anyone from coming into direct contact with UV light.
6. In one of the closed compartments, the big bag is rotated around its axis and at the same time irradiated with UV light with a wavelength of about 230 nm. The sides, bottom and top of the big bag are irradiated. The UV light destroys the bacteria due to the vibration, rendering them harmless.
7. The last compartment is the 'clean' zone (production room). Here, the big bag is placed on a 'clean' pallet.

## Innovations and smart functions

A 'simple' overhead crane can also be manufactured high-tech. By constructing it differently and applying smart designs, you can minimize impurities and contamination during product handling. Below are some examples of innovations that may offer added value.

### 1. Software and 'overhead' systems

Lifting and hoisting equipment can be integrated at a high level with other existing systems and software in your organisation.

An industrial example:

1. An overhead crane with a double hoist transports a tray with products from position A (start position where the tray is manually latched on) to position B, above a bath filled with a substance. Then, the tray lowers into the bath, allowing the products to be fully submersed.
2. The products remain submersed for a time. This period is programmed in advance, depending on the product and process.
3. Then the crane lifts the tray back to start position B.

4. The products drip for a while in this position, for example to dry and to prevent contamination of the next bath. This period is programmed in advance.
5. The crane then goes to position C above a bath with a different substance. For
6. example, a cleaning agent that removes the remaining liquids from the previous bath.
7. The same cycle as in start position B is followed. X-time in, x-time out and then on to another phase through to the final station.
8. Once the final station has been reached, the tray can be detached manually or it can continue on its way to a follow-up process.
9. If the tray is detached or the products are removed, the crane, after being released, will go back to its original start position and repeat the cycle.

This semiautomatic system also takes into account hygiene, the work environment (ergonomics) and efficiency. The control is software operated. This is easily done using a control box equipped with several buttons in combination with switch boxes in the field or via an overhead system.

## **2. Automatic balancing**

This technique is mainly used in the high-tech industry. You can lift at several points (e.g. two, three or four) at one time. In some cases, this requires extreme precision. The system starts to lift until a certain force on the hoisting strap has been reached (this is called 'application of a preload').

When the load is equal on all of the hooks, they will lift synchronously. Using sensors and measuring points, a load can be aligned precisely against the lifting eyes. This accuracy is up to 1mRAD/m, which is equal to a difference in height of one millimeter per one meter. There are developments underway to improve this number up to 0.1mRAD accuracy.

## **3. Anti-sway control**

Imagine that you are moving a horizontal load and you stop (let go of the control). The crane bridge will stop operating but the load will continue moving as a result of the forward acceleration. The load will start to swing. This 'sway' is an uncontrolled movement that can have harmful consequences for the immediate surroundings.

Anti-sway control makes the system somewhat 'smarter'. When you release the forward acceleration button to stop the system, it will remain moving for a while and the sway will be minimized. Applying anti-sway control can also have its disadvantages, however. Because the  $\Delta T$  (delta time, decelerating movement) increases, it is harder to position the load onto the right point. The choice of whether or not to use sway depends on your application.

Please note that because speeds are very low, especially in cleanroom applications, sway is used considerably less in these applications.

## **4. Load weight determination**

This function displays the load in each separate hook with a tolerance of 0.5 percent per ten thousand kilos. This can be read out and can give a good indication of the load. It can also prevent the load from being lifted in the case of an overload. You can include measurements that are important for ensuring that the indicated level according to the specified FEM classification (European Materials Handling Federation) is not exceeded.



Suppose you need to lift ten thousand kilos, but a higher number is displayed on the indicator. This lets you know that the load is too heavy to lift. If you are sure that the load is lighter, then there may be an obstacle in the hoisting path. The load may not be mounted properly and may be bolted in certain positions, or the load may have gotten hooked somewhere.

### **5. Application of a preload**

This is mainly used for precise lifting in cleanrooms or with products that are sensitive to shock. For example, imagine your product weighs ten thousand kilos. When lifting starts, the hoisting strap chain is being checked and tensioned to approximately 9.900 kilos. That means the product is still in a stable position on the ground.

When all points are equally tensioned, the last lift is performed in a controlled manner (at a slow speed). The product will be lifted gently. If this is done in an uncontrolled manner, the product and the crane will undergo an enormous sudden shock. This kind of a peak and shock load can prove to be disastrous for the product and the crane installation.

### **6. Coordinated positioning**

In some cases, you want to lift and/or lower your load at an exact point. These can be predetermined positions (such as in the industry example). The advantage is that you can allow the system to function semi automatically. At this time human input is still necessary, but automatic systems are being developed in which the hook can be attached to the interface of the machine automatically.

One example is a bunker for storing nuclear waste. No living being is allowed to enter this kind of environment. The material is placed in the bunker via different routes and eventually picked up with an overhead crane and brought to its final position. This is a fully automatic process.

### **7. The correct barriers**

Choose the correct barriers for your lifting or hoisting equipment. The right choice may also be no barriers at all. A hood around a motor is not necessarily cleaner, impurities and bacteria can accumulate on the inside of the hood. When the hood is enclosed so that cleaning is impossible, contamination of your product flow is very likely.

### **8. Use of innovative components**

Innovative components help you increase the reliability of your systems. Here are three examples:

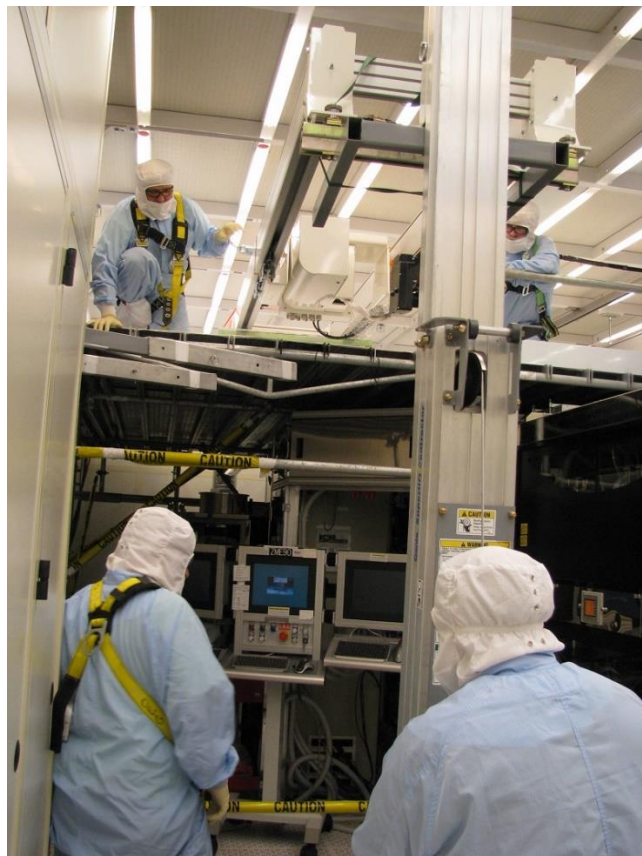
1. There are special motors available for environments that are cleaned with (bactericidal) chemicals, for instance in the food processing industry. There is an aseptic version of motors without fans, without cooling ribs, and with special coatings or completely in stainless steel instead of a coating.
2. You can opt for a drip tray under the motor. The smart factor here is not the drip tray itself, but that it is large enough to collect the volume of oil inside the gear unit. The tray is easy to detach without spilling.
3. You can use a Dyneema Tycan® chain instead of a steel or stainless steel chain. They have virtually the same strength, but the Dyneema Tycan® is many times lighter. That means it is easier to use and more ergonomic. The release of particles is also different,

the particles are lighter than those of stainless steel or conventional steel. Hence, the ‘grade’ of the underlying surface stays ‘cleaner’.

### **9. New Dyneema hoist rope**

We also focus on innovations. At this moment we are developing a hoist rope in cooperation with a specialist in winches. It concerns a special Dyneema rope made of UHMWPE fiber (ultra-high molecular weight polyethylene fiber), in short a synthetic material. It is suitable for lifting (relatively) heavy materials at great heights. These hoist ropes are especially suitable for cleanroom usage.

In addition to the hoist ropes, we also frequently use Dyneema sling hoists. The biggest advantage with Dyneema is that it minimizes contamination of its immediate surroundings. A Dyneema releases far fewer particles than a steel wire rope or a chain, for example. Any particles still produced are much lighter, resulting in better surface cleanliness. Furthermore, every chain or steel wire rope needs to be lubricated, which also causes contamination in a room. A Dyneema does not need lubrication.



## Focus area 2 Material and surface treatment

**Guarantee hygiene while ensuring efficient cleaning and contributing to a long service life for lifting and hoisting equipment.**

Choose a suitable design:

- Wet industry: generally exclusive use of stainless steel materials
- Dry industry: stainless steel or painted steel
- ATEX-free systems
- Surface treatments
- Which kinds of surface treatments should be chosen
- Risks of improper surface treatment

**The requirements of your work or process environment determine what material criteria and/or surface treatment is most suitable for your lifting or hoisting device. This allows you to guarantee hygiene while ensuring efficient cleaning and contributing to a long service life for lifting and hoisting equipment.**

Which lifting and hoisting equipment do we see the most in controlled environments? That would be overhead cranes, jib cranes and hoists, for example:

- hoists equipped with a stainless steel chain
- complete stainless steel hoists
- sling hoists

### **Wet industries: stainless steel**

In wet industries, you may have to deal with aggressive liquids. This could include chemical cleaning agents or meat juices such as blood and brine (a condiment with salt, etc.). These substances can react aggressively with materials used in your constructions and machines. In many cases, stainless steel is the right choice to prevent the surface from being affected and as a result causing materials to age rapidly.

### **Dry industries: stainless or painted steel**

In dry industries, your choice of materials is less obvious. Raw materials for processing can be the deciding factors. Often you can choose from different materials such as stainless or painted steel. The right choice depends on the application. A crane system made of steel that is suitable for pharmaceutical and cleanroom applications cannot, for example, be replaced one-to-one with a stainless steel version made for the food processing industry.

Stainless steel is stronger than steel. But stainless steel has a different composition, making it more brittle. Stainless steel is also often four to five times more expensive than painted steel (depending on the output form). If the stainless steel version is heavier as well (to shift the plastic breaking point) then costs can easily get out of control. For some applications, using steel with the right surface treatment is sufficient. This can result in opting to use painted steel for producing the system.

### **ATEX-free systems**

ATEX includes all situations where there is a chance of gas or dust explosions. This mainly occurs in the food processing and pharmaceutical industries and in production rooms with powders and dusts. For example, in the production of coated nuts, many particles get released as a result of the abrasive motion of the nuts rubbing against each other. In combination with a spark caused by static energy, a certain quantity of these particles in the air can pose an explosion hazard. ATEX is the collective term for all the standards involved with preventing explosions.

### **Stainless steel surface treatment**

When choosing stainless steel materials, different surface treatments are possible. All of these treatments result in a different surface roughness. Some examples include:

- **Blasting**  
Different kinds of blasting grit are used to achieve different degrees of roughness. This occurs as a result of the blasting grit damaging the product surfaces. Basically, it rounds off the peaks on the surface of the material. This causes the ‘scratches’ to become less deep and the surface to appear smoother.
- **Polishing**  
This involves multiple scraping motions, using coarse to fine sanding materials. As a result, the surface is treated in such a way that the coarseness reduces considerably, even to a point of possibly developing a reflective surface.
- **Electrolytic polishing**  
Here, material is removed from surfaces using an electrochemical process. Metal ions (on the product) move to cathodes (not a part of the product). As a result, the surface is levelled off and imperfections disappear.
- **ViwateQ® water blasting**  
This process removes the oxide layer from the surface. It removes unwanted contaminations and burned welding areas. After processing, a new oxide layer appears through natural passivation.
- **Grinding materials**  
This process is rarely used as it leaves ‘deep’ marks (linear), in which micro bacteria are able to grow. This is dependent on grain size.
- **Eccentric sanding**  
This process results in a nice appearance. Marks also develop in this process, of which the depth depends on the grain size and the sanding equipment. Because movement takes place eccentrically, the marks are not as deep as with grinding.
- **Staining**  
This process involves (weak) acids ‘affecting’ or being used to treat metals and it is often used to remove discolorations after welding. This method is not as common as others, as acid can be harmful and the processes can cause contamination.

**In general: the finer the surface, the higher the costs.**

This could be a consideration depending on the application in your organization. If you work with powders, you will likely want a smooth surface for easy cleaning with a damp cloth. But you also will not want it to be too smooth, as that will attract powders (adhesion).

**Other options for processing surfaces?**

There are different ways of processing a surface, which are entirely dependent on the purpose and specific requirements. These processes are to be divided into categories and versions related to the application. Examples include:

- powder coating (through ionization and heating)
- wet painting (spraying of liquid paint)
- anodizing
- electro galvanisation
- galvanisation
- silver plating

**When should a certain surface treatment be chosen?**

This depends completely on the product and differs from case to case. There are countless options and applications that can vary according to the situation and organisation. Consider the influences of:

- acids
- salts
- product dependency
- UV resistance
- mode of cleaning (dry, wet, with or without chemicals, different chemicals)
- environment (humidity, temperature, salinity in the air)

In general, we often see coatings used in dry environments, and this is more common in the pharmaceutical industry than in the food processing industry. Synthetics without a surface treatment can sometimes absorb moisture, thus forming a place for bacteria to attach. That is why many synthetics in the pharmaceutical industry are coated. Depending on the product contact surface, a paint with nanoparticles (for example silver) is a good solution. These nanoparticles have an antimicrobial application.

**Risks of an incorrect coating**

If coatings migrate or break off, they can end up in processes (as flakes). Also, the growth of microorganisms in a controlled room or cleanroom is to be strictly avoided. Furthermore, coatings protect steel against the effects of acids and oxygen, thereby preventing oxidation. Oxidation affects the surfaces of materials, causing strength and elasticity of the steel to decline and to break or bend. With some materials, oxidation occurs deeper in the material and can cause particles to be released with all the related consequences.



### **Why is a correct surface treatment so important?**

A correct surface treatment:

- achieves a smooth surface
- ensures a closed surface (without holes and cracks)
- hardens but does not break off
- has low migration tendencies
- can be easily washed and/or cleaned to reach the desired grade
- has an antimicrobial application

When choosing a surface treatment, pay close attention to how it is to be cleaned. For example, with wet or dry process, with a damp cloth or with chemicals.





## Focus area 3 Electrical components

Electrical components involve risks in a controlled environment. What factors should you consider?

Barriers for E-components:

- the position of an E-box in a wet area
- a stainless steel or painted steel E-box
- IP54, IP69, what does an IP value mean?

Discover the possibilities:

- Sloping or flat top
- Variety of cable trays
- Variety of cable glands
- Remote login
- Dedicated software

**All lifting and hoisting equipment comes with electrical components. These involve risks in a controlled environment. How do you implement electrical components hygienically and safely into your work environment? What factors should you consider and what (new) options are available?**

Common electrical components in lifting and hoisting equipment include:

- control boxes and maintenance switches
- components in the field such as control panels, HMI screens, remote controls and emergency stop buttons
- safety sensors, switches and contact sensors
- conductors in different designs

### **In wet areas**

E-components barriers in wet areas are almost always necessary. A major disadvantage of this is that ventilation is also necessary while packing an item. This is especially true when temperatures rise. But in this case, moisture can also enter the space, which can result in the growth of bacteria in a 'closed space'.

Of course, water and electricity do not go together. How can you solve this issue? Simply put, this can be achieved by keeping moisture away from the electrical components. In damp environments where cleaning is done with water, this is no easy task. A properly closed system could offer a solution. Does this not provide an adequate solution as your E-box is being cooled with a ventilation system? Then another option is to create excess pressure inside the E-box.

### **Stainless steel or painted steel e-box?**

For liquids and wet areas, you normally choose stainless steel boxes. In dry industries, the choice can be determined based on the processes and/or materials that are processed.

‘Aggressive’ materials can influence the choice made. If the materials affect the coating, then the choice for stainless steel is easy.

This can result in migration or contamination of the coating in your product. In addition, damaged, ‘open’ iron surfaces can oxidize. This means that oxidation could contaminate your process. In this case, the position of the E-box is also relevant. Is it located in the same area, or is it hanging above or next to the process locations, or is it perhaps located in another room? All of these factors have to be taken into consideration when choosing the materials.

### **IP54, IP69: what does an IP value mean?**

The IP code (International Protection Rating) is a coding system for electrical devices. This internationally recognized scale indicates the safety level against any possible hazards for users and against personal damage through use in aggressive environments. The ‘I’ stands for ‘ingress’, the degree of protection against objects. The ‘P’ stands for ‘protection’, the degree of protection against moisture.

‘IP54 or higher’ does not mean that materials are dust free for example, but it is a degree of protection against objects and moisture. In other words, internal protection from external elements. For example, an electro motor is often IP54:

- The ‘5’ (the ‘I’) means the motor is sufficiently protected against external particles, that are bigger than dust particles. That means that dust particles can still penetrate but they do not negatively affect normal use of the motor.
- The ‘4’ (the ‘P’) means the motor is protected against an x number of liters of liquid (spray) under a certain angle (splash-proof) at a minimum. Therefore, the motor cannot withstand high-pressure cleaning or immersion in water.

IP69 is one of the highest achievable protection levels. This level can be further specialized, represented by the addition of a letter. For example: IP69K is often used in the food processing industry where cleaning is done with liquids and where hygiene plays a crucial role. The higher the number, the greater the protection.

### **Sloping or flat top?**

An E-box can be provided with a horizontal plane or a slope at the top. The latter version is only available in stainless steel.

## **Inclined plane**

### Advantages:

- It is not possible to place anything on top of it, e.g. coffee cups, etc. Anything that is placed on an E-box is a potential contaminator. Materials deposited temporarily on the E-box can end up in the flow unexpectedly. For example, a pencil can roll off the box and into the product flow, or a piece of paper can get blow away as someone passes and can end up in the process.
- Immediate contamination of the surface is minimized.
- Liquids drip off the E-box, preventing the formation of puddles.

### Disadvantages:

- A higher E-box is required because components cannot be installed in the sloping part.
- The E-box can only have an inclined plane when made of stainless steel.
- Because of the IP value, no mounting holes are provided and post-processing is always necessary.

## **Straight/horizontal plane**

### Advantages:

- This is the standard version, so it is cheaper than the inclined option.
- The full content of the box is used.
- The E-box is usually available in additional versions (such as door positions).
- Steel coated E-boxes are already provided with mounting holes. The stainless steel version is not provided with mounting holes, so you would need to make your own provisions here.

### Disadvantages:

- Anything can be put on top of the box and could end up in the flow, such as pencils, paper and cloth.
- Coffee cups can cause coffee residue/circles which is not hygienic.
- Damage or contamination to the surface is more common. This includes scratches that can cause oxidation or in which microorganisms grow (in the case of stainless steel).

## **Variety of cable trays**

Open or closed cable trays? This also depends on the environment (wet or dry) and on the products that are being processed. The position of the tray can also be a decisive factor. The great advantage of completely open systems, with for instance wire trays, is that these can be cleaned easily, wet or dry (using high pressure and/or compressed air).

In the food processing and pharmaceutical industries you actually do not want hollow spaces that you are not able to clean. Anything can grow here, such as bacteria, insects and small pests (from the cacao moth to mice). Both can lead to complications. The cacao moth is an

insect (in the pyralid moth family) which is commonly found in the nut and chocolate industries. It can lay about two hundred eggs on a product.

Larvae can burrow into the product and feed on it. Larvae is a major contaminant here. It attacks the product and contaminates it with faeces and webs. Not to mention mice. One noticeable factor is that in some countries (such as the US, Saudi Arabia and Malaysia), people often opt for closed cable trays at food processing factories. This can differ in every industry and country, so make sure to stay well informed.

### **Variety of cable glands**

Glands come in a variety of different types. When should you choose one over another? This is once again application-related, wet or dry. It also depends on whether you use a steel coated or stainless steel box. In addition, it also depends on whether your E-box emits signals, such as with frequency-controlled motors or other signal cables.

This is achieved using shielded cables. These are connected via special cable glands in the E-box or to the component for proper shielding. Due to this protection, the signals are only weakened to a minimal degree and the system continues to operate at an optimal level.

### **Remote login**

In principle, a service provider can log into the system via an ethernet connection. This can be done from anywhere that has internet (with the correct credentials). We use remote login to monitor systems, to read it for maintenance, to check for faults and usage as well as to install new software and updates.

Mennens is committed to many different clients worldwide. Because we can provide and process data digitally and gain insight into malfunctions, we are able to switch gears quickly and apply the right measures.

### **Dedicated software**

Do you want to complete a fixed program in your working method? Such as in the example of a production line or a tunnel where materials are transported from a 'dirty' to a 'clean' space? In addition to your crane system, a dedicated software is required for this, and the program contains the programmed steps. On request, we can provide and develop dedicated software, together with a specialised partner in control techniques. We take into account your way of working to achieve (time) efficiency and safety.



## **Conclusion: Every detail counts**

**A controlled environment is a (very) pure working environment, in which hygienic and ergonomic hoisting and lifting is crucial. Choosing the right hoisting and lifting equipment depends on many different factors, that are very specific for every cleanroom.**

In any case, ask yourself the following questions:

- How are you planning to clean, dry or wet?
- What standards will you follow in designing the space?
- If this involves an ISO classification, what classification is it?
- Are there any ESD, anti-static or ATEX requirements, for example?
- What kind of products will be worked with?
- What are the requirements for surface cleanliness?

These are just a few of the many areas of focus that you should consider if you want to invest in (new) facilities and / or spaces. It is also important to make an inventory of the controlled work and production environments and the requirements you will (likely) have to deal with.

### **A total solution**

Choosing the right hoisting and lifting equipment is ultimately about finding the best possible total solution. Sophisticated innovations make a huge difference here. It also helps to already consider the crane in the earliest stages of the construction of your cleanroom.

There are many factors that influence the (long-term) optimal performance of a crane. These can include integration options in existing work environments, the ergonomic design and the placement of hoists, switches and corners. But it can also involve, for example, keeping loads in position during transport.

### **Request an inspiration session**

Are you (re)designing a production environment, or are you considering this for the future? Get inspired! Let us join you in the process. Based on the space and the desired setup, consultants will provide you with customised advice with no obligation. Ensuring that your crane is perfectly integrated into the space available.



## Origin

PP4C (Professional Partners for Cleanrooms) is a strategic alliance between a number of specialized companies. They are active in the design, construction and maintenance of cleanrooms and laboratories in a broad spectrum of market segments. PP4C is also active in medium- and high-care areas in the food industry.

White paper authors: Cleanroom Cranes – Designed & Engineered by Mennens.

Since 1998 Mennens has been specialising in Cleanroom Cranes. These are cranes, which are used in cleanrooms and controlled environments with an air cleanliness class of 04/05 according to ISO 14644-1.

Mennens offers a range of basic products tailored to your needs. Each item of hoisting equipment is unique and can be delivered with a diversity of specific options. Mennens offers single and multiple cranes with single and multiple hoisting units. All cranes are made of A-class materials, are non-contaminating, non-out gassing, accurate and quiet. And include internationally known quality labels. Products by Mennens will improve your handling efficiency while making the workplace a more productive and safer environment. Equipment combined with a service contract guarantees 24/7 support for your equipment.

For more information, see: <http://www.pp4c.nl> and/or <https://www.cleanroom-cranes.nl/>.

