krion
PORCELANOSA Grupo

# FABRICATOR MANUAL

krion

PORCELANOSA Grupo

## INDEX

# Introduction

In this guide you will find all of the necessary information for processing KRION™ elements correctly and safely. These are the correct procedures for guaranteeing customer satisfaction.

The processing procedures described are those that are recognized in Europe, the USA, Middle East and Africa. These instructions must be followed in order to take advantage of the 10-year Krion PORCELANOSA GRUPO installation guarantee.  (See conditions at the end of this manual).

This manual is not intended to be fully comprehensive. Although the information it contains is sufficient for carrying out the majority of your projects, other more advanced processing techniques may exist. Please contact Krion before attempting any technique that is not described in this manual.

Find out more about KRION™ processing. Contact your KRION™ supplier.

Krion will not accept any liability if these techniques are used with other products.

PORCELANOSA Grupo

# General information about Krion

01

## 1. GENERAL INFORMATION ABOUT KRION™

KRION™ is a new generation of solid surface a company belonging to Grupo Porcelanosa. KRION™ is a material which falls within the Solid Surface category, governed by regulation ISO 19712, "materials characterized by their homogeneous appearance, renewable surfaces and inconspicuous seams".

A material that is warm to the touch with an appearance similar to natural stone, KRION™ is made of two thirds natural minerals (ATH: alumina trihydrate) and a low percentage of high-resistance resins. This composition ensures exclusive characteristics, such as nil porosity, antibacterial properties without the need for any kind of additive, hardness, resistance, low maintenance and an easy-to-clean surface.

Krion carries out two different forms of production: sheets in different formats and colours and sinks and washbasins by injection. The material has an approximate density of 1756 kg/m$^3$; this information will help the end client make any calculation necessary for good results in packaging, transport and transformation. Thanks to the relative density formula, the weight of all different formats of sheets can be calculated.

### 1.1. SHEET

Below is a table showing the different formats of sheets of KRION™ and the series manufactured. It must be highlighted that year after year, new series and new products are released, therefore the table shown may change.

| THICKNESSES | FORMATS | SNOW WHITE EAST | COLORS SERIES | COLORS+ SERIES | LIGHT SERIES | NATURE SERIES | STAR SERIES | ROYAL SERIES | ASTEROID SERIES | ROYAL+ SERIES | TERRAZZO SERIES | LUXURY SERIES | ART VEINS SERIES | OPALE SERIES | MATERIA SERIES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 mm · 1/8" | 2500 x 760 mm · 98 7/16" x 30" | ✓ | | | | | | | | | | | | | |
| | 2500 x 930 mm · 98 7/16" x 36 5/8" | ✓ | | | | | | | | | | | | | |
| 6 mm · 1/4" | 2500 x 760 mm · 98 7/16" x 30" | ✓ | ✓ | ✓ | ✓ (2) | ✓ | ✓ | | | | | ✓ | | | |
| | 2500 x 930 mm · 98 7/16" x 36 5/8" | ✓ | ✓ (1) | | ✓ (2) | | | | | | | | | | |
| | 2500 x 1350 mm · 98 7/16" x 53 3/16" (*) | ✓ | ✓ (1) | | ✓ (2) | | | | | | | | | | |
| | 3680 x 760 mm · 145" x 30" | ✓ | | | | | | | | | | | | | |
| | 3680 x 930 mm · 145" x 36 5/8" | ✓ | | | | | | | | | | | | | |
| | 3680 x 1350 mm · 145" x 53 3/16" (*) | ✓ | | | | | | | | | | | | | |
| 9 mm · 3/8" | 3680 x 760 mm · 145" x 30" | ✓ | | | | | | | | | | | | | |
| 12 mm · 1/2" | 3680 x 760 mm · 145" x 30" | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | 3680 x 930 mm · 145" x 36 5/8" | ✓ | ✓ (1) | | ✓ (2) | | | | | | | | | | |
| | 3680 x 1350 mm · 145" x 53 3/16" (*) | ✓ | ✓ (1) | | ✓ (2) | | | | | | | | | | |
| | 3680 x 1520 mm · 145" x 60" (*) | ✓ | ✓ (1) | | ✓ (2) | | | | | | | | | | |
| 19 mm · 3/4" | 3680 x 760 mm · 145" x 30" | ✓ | | | | | | | | | | | | | |

(1) Only available for the colours FROST WHITE (6101), CREAM (6501), PEARL (6502), LIGHT GREY (6902) and GREY (6903)

(2) Only available for the colour EXTREME LIGHT (4102).

All sheets produced have had their corresponding identification code printed on them. This code can be found on the back of the sheet and on one of the edges of the longer area. This code is of vital importance as it allows the traceability of the sheet.

### 1.2. SINKS

Washbasins and sinks made with KRION™ are only produced in white, and also identified by a batch number.

### 1.3. ADHESIVES

Krion manufactures its own adhesives. All colours have their own adhesive and are produced in cartridges of 50ml and 250ml. In this manual there is a section exclusively dedicated to everything related with KRION™ adhesive (storage, handling, characteristics, etc.).

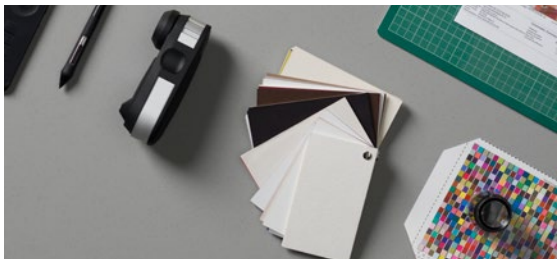
## IMPORTANT

All batch numbers of sheets, sinks and adhesives are of vital importance, as they indicate values related with traceability, date of manufacture, expiry date (in case of adhesives), etc. In chapter 4. "Traceability" of this manual, all this information can be seen in more detail.

### 1.4. SECTORS

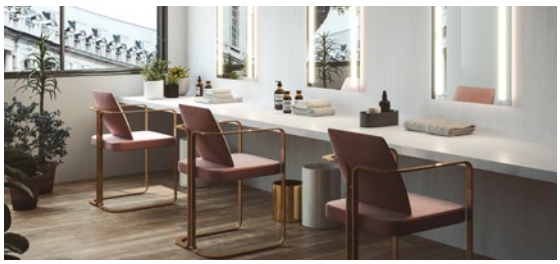
All this makes KRION™ the perfect choice as a material for a wide variety of sectors including:

HOUSING
Thanks to its exclusive technical properties and aesthetic qualities, KRION™ is an ideal solution in homes.



DESIGN
KRION™ can be used to make customized products or in made-to-measure projects.

RESTAURANT
KRION™ generates a sensation of warmth and comfort, perfect for restaurants of all kinds.



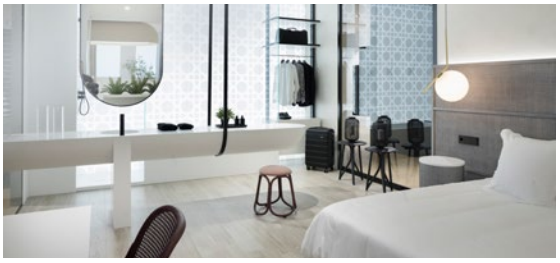
COMERCIAL PREMISES & BUSINESSES
With its large format, broad design potential and wide selection of colours, KRION™ can be integrated in any setting, regardless of its shape.

TRANSPORT

Its durability, imperviousness, resistance to the elements and to corrosion, and easy adaptability all make KRION™ an unparalleled choice for use in vessels.

PUBLIC & GOVERNMENTAL BUILDINGS

A highly adaptable material, perfect for designing surfaces and products of all kinds or for combining with other materials (ceramic, glass, metal, wood etc.), leading to the creation of settings with a highly distinctive appeal.



HOTELS

Hotel facilities of all kinds can be fitted out with KRION™, from the reception area to hotel rooms, restaurants, spas and gymnasiums.

HEALTHCARE

A warm-looking, seamless, anti-bacterial material that is hygienic, low on maintenance and easily repairable in situ.

## 1.5. APPLICATIONS

The KRION™ range's numerous different series can be used in a wide variety of applications.

PRODUCTS

OUTDOOR WALL CLADDING

INDOOR WALL CLADDING

FURNITURE

RETAIL FURNITURE

KITCHEN COUNTERTOPS

BATHROOM EQUIPMENT

SIGNAGE

## 1.6. CHARACTERISTICS

### NATURAL

This material is made of two-thirds natural minerals (ATH – aluminium trihydride) and a low percentage of high-resistance resins.

### ULTRA-WHITE

KRION™ offers a degree of whiteness over 99.8%, which in combination with its high refraction index provides a pure, brilliant white that is unique among existing solid surfaces.

### ANTIBACTERIAL

KRION™ does not allow bacteria or fungi to grow or spread. This is an intrinsic property of the composition of the material, without the need for additives to achieve this permanent effect. This makes it an ideal material for locations with demanding hygiene and sanitation requirements, such as operating theatres or clean rooms.

### EASY TO CLEAN

Any normal stain, superficial burn, graffiti or marker pen stain can be removed, immediately returning the surface to its original appearance simply by following the recommended cleaning instructions.

### FOOD GRADE

KRION™ is a food-grade product and meets US and European standards, meaning it can be used in contact with foodstuffs.

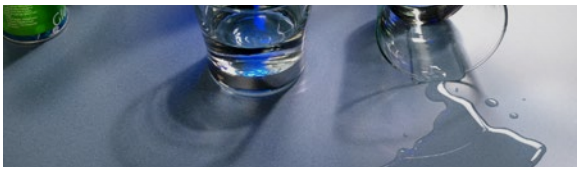
The applying KRION™ is also ideal for rest areas, cafeterias or canteens.

### ECOLOGICAL

KRION™ is an eco-friendly material, being made up of two thirds natural minerals. Other aspects which make it an environmentally friendly material are that it does not emit volatile organic compounds, and is easy to repair as it can be restored to its original appearance. This reduces the need for replacement, thereby complying with the durability requirements outlined in international environmental guidelines.

## 100% RECYCLABLE

KRION™ is also eco-friendly as it is 100% recyclable. All KRION™ products can be reprocessed and used again in the production cycle, thus avoiding further depletion of natural resources. Certain KRION™ ranges are manufactured with up to 35% recycled materials. Its lifecycle can also be prolonged by creating new products, compositions and designs from pre-used ones.



## HIGHLY RESISTANT TO CHEMICAL ATTACK

The material's resistance to chemical attack makes it ideal for use in laboratories, professional facilities and in all types of applications where it is necessary to easily return the surface to its original condition without effort.

## RESISTANT TO EXTREME ENVIRONMENTS

KRION™ surfaces are capable of withstanding extreme environments, such as marine environments, exposure to steam, immersion in water or freezing conditions, amongst others.


## RESISTANT TO SUNLIGHT

KRION™ is a product that is extraordinarily resistant to deterioration caused by UV radiation. The most stable colour is white; please consult the manufacturer for information on other colours. Inappreciable change in colour (white colours) during 10 years.

## HIGHLY RESISTANT TO FIRE

The KRION™ product range is considered to be practically fireproof as it does not allow fire to spread. It is classified according to the UNE-EN 13501 standard as Euroclass B-s1-d0.

## INVISIBLE JOINTS

KRION™ items and sheets can be bonded together using specially formulated KRION™ adhesive for high-resistance seamless bonds.

KRION™ adhesive with an EXCLUSIVE FORMULA.

Functionally seamless and hygienic.

Sink integration.

## FREEDOM OF DESIGN

KRION™ is a compact next generation mineral which allows curves to be formed - impossible to achieve with other materials. With KRION™ shapes and forms can be freely created, as the sheets may be thermoformed and joins are imperceptible.

## THERMOFORMABLE

With KRION™ we can obtain specific curvatures by applying heat and force for a specific period of time.

## CAST COMPLEMENTARY ITEMS

Due to the exclusive formulation of KRION™, both cast pieces and sheets with imperceptible joins can be manufactured and combined to create sensational seamless designs.

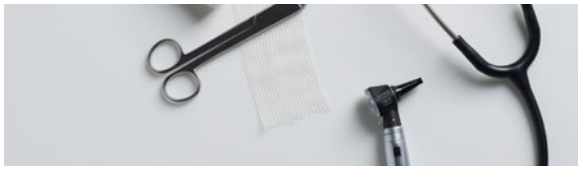
## BACKLIGHTING

KRION™ Lux can be used to create backlit spaces. By combining different thicknesses of the material, it is possible to create spectacular lighting effects.

IMPROVED TRANSLUCENT WHITE that does not alter the colour of the light source.

## A LIGHTWEIGHT MATERIAL

Because KRION™ has a lower density than other solid surfaces, like high-performance porcelain, artificial quartz or natural marble, it is easier to handle, for instance in the creation of countertops and more lightweight furniture, without relinquishing all the other properties of this solid surface.



## NON POROUS

KRION™ is a non-porous material and so it prevents the build-up of bacteria. This makes it ideal for places with strict health and hygiene conditions, such as operating theatres or clean rooms.

## COMPRESSIVE STRENGTH

A compression test is a test used to determine a material's resistance or capacity to withstand a certain load without it breaking or becoming deformed. Thanks to its high compressive strength, KRION™ has a compressive performance on a par with stone. These values can be used by designers and/or architects to calculate the design parameters for structures.

## LOW THERMAL CONDUCTIVITY

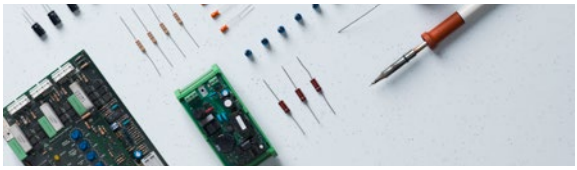
Thermal conductivity is a physical property, determining a material's capacity to transmit heat. The lower the thermal conductivity, the higher the material's insulative capacity. Using KRION™ on walls or other surfaces contributes to the energy efficiency of rooms or façades.

## BENDING STRENGTH

Bending strength is a combination of tensile and compressive strength. This type of load can deform materials by making them sag. Many solid materials cannot withstand high loads and they crack. In contrast, KRION™ has a high bending strength. Thanks to the high bending strength of KRION™, it is easier to transport and it can be used to create aesthetically pleasing overhanging sections and surfaces with higher safety guarantees than other materials.

## SOUND INSULATION

Thanks to its intrinsic physical properties - a seamless, low-density material of varying thicknesses with no pores -, KRION™ helps to insulate noise. This is due to its density, nil porosity, different thicknesses, and lack of seams.



## ANTI-STATIC

Static electricity is a build-up of electrical charges on the surface of a material, sometimes generated by friction with another material. Many materials are classified according to their electrical resistivity. KRION™ is rated as being anti-static and very close to insulative, according to the ESD (Electrostatic Discharge Association).

## RESISTANT TO IMPACTS

KRION™ has the highest capacity to absorb impacts of all solid surfaces. In impact tests using large-diameter balls (324 g) dropped from a height of 1.9 metres, it withstood ten consecutive impacts without breaking, demonstrating its very high resistance.

## 1.7. K-LIFE


KRION™ K·Life 1100 is a product created, manufactured and commercialised by KRION Porcelanosa Group. The exclusive composition of KRION™ K·Life 1100 allows the material to inherit the technical and aesthetic characteristics of the mineral and combine them with the technical characteristics of polymers and photocatalysis, with clear exclusive characteristics: the ability to facilitate decontamination of the air, non-proliferation and elimination of bacteria without the need for any kind of additive, hardness, zero porosity, resistance, durability, elimination of chemical products, easy repair, low maintenance and easy cleaning. For more information, read the safety datasheets, technical notes and other related documents.

At Krion we are committed to going further with the excellent material we already have, thanks to continuous development in recent years. Thus, the high performance of an advanced material is maintained, incorporating that of the photocatalytic effect. At a photocatalytic level, the results are improving with the development of new technologies. Our objective has always been to maintain the intrinsic properties developed by KRION™ and to implement the new properties, allowing the material to perform in a way which is not comparable with products developed expressly for photocatalysis. Nevertheless, our R&D department continues to work on lines of research which improve all characteristics of KRION™.

It is made up of 2/3 natural mineral ATH (Alumina Trihydrate), 1/3 latest generation acrylic resin developed by Krion, and a series of activators selected for both their efficiency and their compatibility with KRION™, introduced in the formulation through KEAST technology; "KRION™ ECO-ACTIVE SOLID TECHNOLOGY®".

The name of this new technology which explains the patented process refers to:

K for KRION™, because the main objective, which has taken precedence in development, has been no variation or backward step in the advanced properties of the material or its quality, as may occur in the majority of developments of similar materials (K·LIFE is the result of continuous improvement which incorporates our existing 1100 Snow White product) and that now all clients using KRION™ 1100 Snow White will benefit exclusively and without limitations.

E for its ecological aspect, given the company's strong commitment to sustainability in addition to the existing certifications (GreenGuard, Reach, Hpd, Bisphenol Free, etc.) and acquired for photovoltaic activity represented through the EPD.

A for being an active material which also produces a benefit in its lifespan (or use of the material). It fulfils a double function: firstly, it has the function of use as an object or project; and secondly, it contributes to benefitting and improving quality of life, due to being an active photovoltaic material.

S for being a solid photovoltaic material throughout its mass. This means that this activity lasts over time, regardless of wear and/or transformation of the material.

T for the exclusive technology developed, patented and used in the production process to achieve the final result of the material.

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# Safety and hygiene

02

# 2. SAFETY AND HYGIENE

## 2.1. IDENTIFICATION OF HAZARDS

Like all materials, KRION™ may generate hazards and risks which must be taken into account. Below is an analysis of the main general risks, specifying hazards to health, causes (where applicable) and preventive measures to avid these hazards becoming accidents.

## 2.2. GENERAL RISKS AND PREVENTIVE MEASURES

The use of PPE (personal protective equipment) is of vital importance for minimising risks such as noise, inhalation and contact with chemical products and inhalation of dust present in any workshop which uses KRION™ day to day as far as possible. Loading of KRION™, the falling of objects in handling, impacts from objects or tools, and the projection of fragments or particles constitute another group of risks which are also present during work.

### 2.2.1. LACK OF TIDINESS AND CLEANING IN THE WORKPLACE

Having a clean, tidy work area may help increase efficiency when handling KRION™. Additionally, working in an area which is not tidy or clean presents a series of hazards such as the following:

- People falling due to slips and trips.
- Impacts with objects and work equipment in the workshop and in transit areas.
- Injuries due to cuts or pricks with hand tools, cutting tools or sharp edges.
- Falling of objects due to unstable storage.

PREVENTIVE MEASURES

- The work post, transit areas, corridors and exits must be kept unobstructed.
- Avoid the accumulation of waste and unnecessary pieces or objects on the floor, on machines or on work tables.
- With regard to storage of materials, stack them as indicated in the fabricator's manual.
- Upon completing a task, tidy the work area, put away the tools which will not be needed, and check that machines have been stopped.

### 2.2.2. TRANSPORT AND HANDLING OF KRION™

PREVENTIVE MEASURES

- Wherever possible, substitute manual operations with the use of suitable machinery.
    - Lifting equipment must be used in acceptable safety conditions, therefore machines must be in appropriate operating condition, undertaking periodic reviews, checking that all elements of the machine work properly before use, checking the proper state of auxiliary elements such as ropes, cables, hooks.
    - The use of these machines must be carried out following strict safety measures, as well as making loading and unloading manoeuvres slowly, not leaving loads suspended, not moving loads over people or work posts, etc.
- In case of not being able to use any auxiliary loading method:
    - Use protective gloves and safe footwear with reinforced toecaps to avoid cuts or impacts.
    - During handling, adopt the following guidelines:
        1. Hold the load close to the body.

2. Ensure good foot support, slightly separated and one slightly further forward.
3. Squat with knees bent and back straight.
4. Lift the load using leg muscles, not back muscles.
5. Firmly hold the load with both hands and keep it close to the body throughout transport, taking short steps.
6. Avoid sudden movements of the back, especially turns, even when handling light loads. Turn by moving feet instead of turning at the waist.
7.

### 2.2.3. STORAGE

Proper storage of the material, as indicated in this manual, may prevent dislodgement, slippage or falls which may have serious consequences.

PREVENTIVE MEASURES

- If KRION™ is stored vertically, it must be ensured that sheets do not protrude from the level of the shelving, preventing them from becoming unbalanced.
- Do not leave sheets of KRION™ protruding from stacks.
- Do not place heavy stacks on structural walls.
- Do not exceed the safe load of frames or the floor.
- Do not clime frames to reach upper shelves; use stairs.
- The proper location of warehouses, as well as the proper ordering and placement of materials, improves safety and prevents time from being wasted, improving productivity.

### 2.2.4. PROJECTION OF PARTICLES

The projection of fragments or particles, especially into the eyes, is one of the greatest risks, therefore the constant use of glasses with lateral protection is recommended. They must be used in KRION™ machining operations, such as cutting, milling and sanding. The projection of chemical products such as alcohol and KRION™ adhesive must also be controlled in application processes.

PREVENTIVE MEASURES

- Install localised capture and suction systems on machines and tools for chips or particles of KRION™.
- Use protective glasses with the CE marking against the projection of chips and dust.

### 2.2.5. MACHINES AND TOOLS

One of the main risks to avoid when working with KRION™ are cuts and amputations by cutting elements of machines and tools. For example, during configuration, adjustments, changes of tools, maintenance, cleaning, repair of breakdowns, etc.

PREVENTIVE MEASURES

- Purchase safe machines and tools, with the CE marking.
- Only use machines and tools with ground connection.
- Protect the cutting part of machines and tools with safeguards.
- Take precautions to avoid tools being activated accidentally.
- Keep machines and tools in a good state of repair.
- Machines must only be used by individuals who have been informed of their dangers and trained in their use.
- Use machines following manufacturer instructions and only for work for which they have been designed, even if it is possible to use them for other work.
- Carry out periodic maintenance on machinery and tools, as recommended by the manufacturer.

- Use the personal protective equipment necessary in each operation (gloves, glasses).
- Do not use machinery or tools while under the influence of drugs or alcohol.

### 2.2.6. EXPOSURE TO NOISE

Exposure to high levels of noise, whether generated directly by the activity carried out for transforming KRION™ or by the environment in which this activity is carried out, may cause significant harm to people's health. The harm caused by noise may range from damage to hearing, such as deafness or acoustic trauma, to effects such as irritability, stress or digestive disorders, among others.

PREVENTIVE MEASURES

- Purchase machines and other work equipment taking into account the level of noise they produce during their normal operation.
- Carry out appropriate maintenance on machinery and tools.
- Use coverings on walls and ceilings which absorb sound.
- Isolate sources of noise.
- Reduce exposure times, establishing work shifts, avoiding walking through high exposure areas, etc.
- Define and indicate areas of exposure to noise.
- Install ventilators, extractors, etc. as far as possible from usual work areas.
- Inform workers of the risks of working with noise.
- Use hearing protection against all kinds of noise: automated machines, motors, tools, impacts with surfaces, etc.
- Undertake periodic medical checks to detect potential loss of hearing in exposed workers, thereby being able to adopt appropriate preventive measures.

### 2.2.7. RESPIRATORY RISKS

The inhalation of dust, mist or vapours produced in operations such as sanding, polishing, application of adhesive, cleaning with alcohol, etc. entail a series of risks to the worker's health. Prevention programmes must therefore be established to reduce or eliminate exposure to these substances. When selecting the appropriate breathing protection, it will be necessary to identify contaminants, determine environmental concentrations and evaluate the respiratory protection which is most suitable in each case.

Below, some of the most common contaminants in work with KRION™ are highlighted.

KRION™ dust: Mechanical work on KRION™ generates dust. Depending on the type of machine used, the quantity and size of the particles will differ. Machines such as mechanical saws, routers, drills, etc. generate chips. Sanders and polishing machines mainly generate dust.

Vapours: Alcohol, silicone, protective renders or KRION™ adhesive and protectors which are used in various KRION™ transformation processes may release harmful substances when applied. Vapours, normally invisible, can be detected by smell. If the operation is carried out by spraying, in addition to vapour, mist will be generated.

PREVENTIVE MEASURES

- Requiring safety datasheets of the products from the manufacturer.
- For operations in which there may be exposure to particles or vapours, use a mask or half mask with combined filters for particles and organic vapours, or disposable masks for vapours and particles.
- For sanding or polishing, use self-filtering masks (FFP2 at minimum) or half masks with filters for particles (P2 minimum).
- In cleaning and bonding of material, use a half mask with filters for organic vapours.
- Carry out operations of sanding, cleaning with alcohol, application of KRION™ adhesive, etc. in

ventilated places whenever possible.

- Install extraction systems located in the place of origin of dust, vapour, smoke, mist and suspended particles.
- Extractors may provide total or partial elimination of dust or vapours.

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# Receipt and inspection

03

## 3. RECEIPT AND INSPECTION

Krion always manufactures material which is compliant with all quality requirements in accordance with regulation ISO 19712. Nevertheless, each sheet, washbasin or adhesive manufactured undergoes its corresponding quality controls to verify that it is a product which fulfils these requirements.

### IMPORTANT

After receipt, it is necessary to inspect the KRION™ material for any potential flaw, as in this case it will be necessary for the client to contact the corresponding PORCELANOSA store to manage a potential incident. It is important to highlight that Krion will not be liable for flaws in material which has already been transformed.

### 3.1. RECEIPT

It must be taken into account that there may be two different ways to receive the material, in a container or on a platform (tow truck). There must be preparation for the material being received in one of these ways and unloaded without the material suffering any variation in its form or geometry.

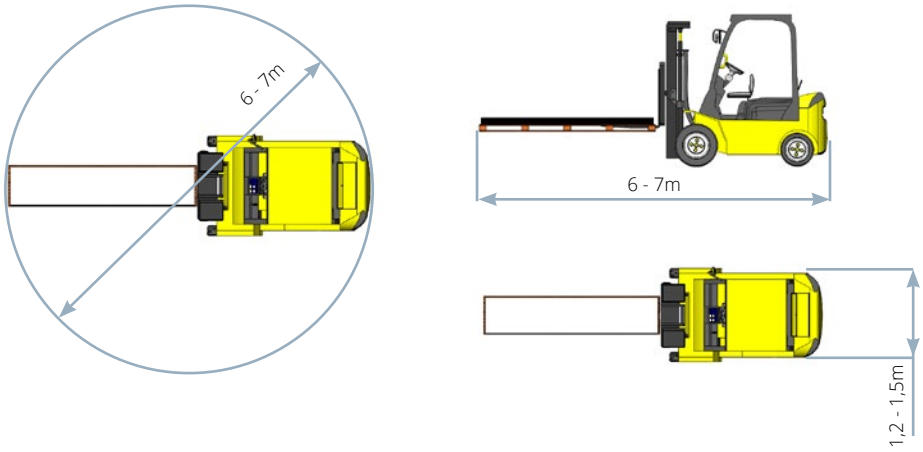
The sheets arrive on a pallet, supported on their largest side. Each pallet has similar dimensions to the sheet and depending on the sheets thickness and size, each pallet carries a different amount of sheets. Due to the weight, it is necessary to use a forklift with sufficient load capacity.

In case of receiving sheets of KRION™ in a container, the following aspects will have to be taken into account.

- It can only be accessed by one of the narrower sides, so that the length of the pallet coincides with the length of the container, the forks of the forklift having to be introduced in the shorter area of the pallet.

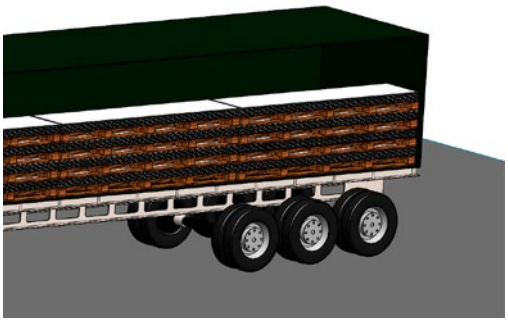
- Due to the dimensions of the forks of the forklift, it is recommended to incorporate longer forks so that the sheets do not suffer flaws when unloading.

- It is recommended to extract the pallets one by one, as the forklift will probably not support the load of two full pallets of sheets.
- It must be taken into account that the container must be located in an area where the forklift can have room to manoeuvre, as, due to the length of the pallet, it may reach a length of 6 or 7 metres in total.

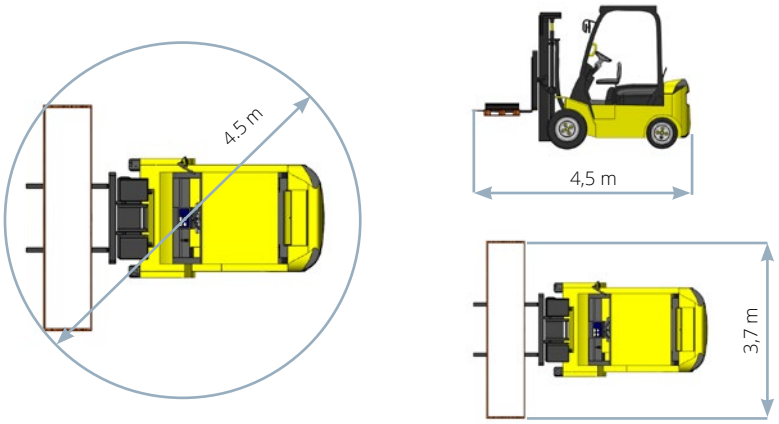



In case of receiving the material on a tow truck, the following aspects will have to be considered.

- Unlike unloading from the container, it will be sufficient to unload the pallet by introducing the forks of the forklift on its longest side.



- As in the previous case, the space for unloading the material should be taken into account. In this case, as shown in the following image, 4 or 5 metres will be necessary.



After unloading all pallets it must be checked that the pallets have arrived protected in accordance with the following image. This ensures that the goods have not been manipulated, and have arrived from the factory.


All sheets of the pallet must be protected by plastic film, ensuring that the face has a calibrated S400 finish, the rear part having an P120 finish. They are stacked on top of each other so that the P120 face is on top of the P400 face of the sheet below it. On top of the stack of sheets is cardboard protecting them, attached by a tightened strap and cardboard edges.

## 3.2. INSPECTION

Once the pallet has been unloaded from the tow truck, it is recommended to check the quality of the product received. Due to the production method, in accordance with ISO regulations, there are tolerances in some of the technical characteristics of the sheet. Krion always tries to exhaustively control this, but there may always be occasional exceptions. Below is a table indicating the potential and valid tolerances which may exist in sheets of KRION™.

| PROPERTIES | | SPECIFICATIONS | TOLERANCE | CHECK METHOD |
|---|---|---|---|---|
| Thickness | | 3,0/ 6,0/ 9,0/ 12,0/ 19,0 mm | -0,3/ + 0.7 mm | Caliper 0,1 mm |
| Length | | 2500/ 3680 mm | -3/ + 20 mm | Tape measure 1 mm |
| Width | | 760/ 930/ 1350/ 1520 mm | -3/ + 10 mm | |
| Deformation | | 0 mm | < 1.6 mm (in 1 lineal meter) | |
| Damage to corners | | 0 mm | Corner break < 8 mm | |
| Top surface | Black/ white spots (Except for Snow White) | None | As per the ISO 19712 standard Total covered area < 1 $mm^2$/ $m^2$ | Visual (TAPPI chart) |
| | Black/ white spots (Only for Snow White) | | Surpasses the requirements of the ISO 19712 standard Total covered area < 0,7 $mm^2$/ $m^2$ | |
| | Flaws: Pores, voids | | Fewer than 3 pores ≤ 0,1 $mm^2$ / plancha | Visual |
| Under-side | Flaws: Pores, voids | | < 15$mm^2$ / Sheet | Visual (TAPPI chart) |
| Top surface: Colour / Consistency within the same sheet | | No difference | No applicable tolerance | Visual |
| Top surface: Colour / Same batch | | | ΔE ≤ 1 | Visual or (Spectrophotometer) |
| Top surface: Colour / Different batch | | | ΔE ≤ 2 | |

With regard to inspection of washbasins or sinks received, their proper state must be checked. The box containing the item will be opened and it will be checked that there are no cracks or breakage and that there is no kind of anomaly, having to be protected by polystyrene. Washbasins embedded in sheets are calibrated on their upper tab, therefore it will have to be checked that there are no eye-catching

irregularities on this surface. There will always be a tolerance of flatness with regard to the sheet, but this will be minimal.

It is important to highlight that all KRION™ washbasins and sinks incorporate a leaflet for use for the end client's information.

With regard to adhesive cartridges, it is important to check that they do not have any kind of dents, that the valve protector is in the proper state and that there has been no loss.

The Fabricator must verify that:

- There are no splits, cracks or chips.
- There are no scratches.
- The colour of each sheet is uniform.
- The colour is uniform on different sheets of the same colour.
- There are no stains (black spots).
- The sheets and bowls do not have holes, chips, grooves or pores.
- The particles are distributed evenly (series with chips and betas).
- The real measurements coincide with the nominal measurements.
- The sheets are of a uniform thickness.
- The sheets do not have any deformations or buckling.
- The adhesives are not leaking and have not expired.
- The labels correspond to the product that has been delivered.

After the corresponding inspection of the material, its transfer and storage will be carried out.

Please refer to the KRION™ logistics guide and technical supply note available at www.krion.com/krion-affinity/ for more information.

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# Traceability

04

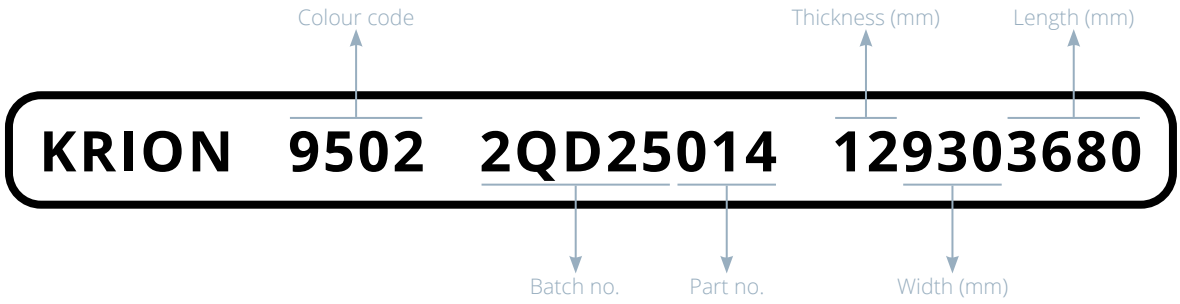
## 4. TRACEABILITY

All Krion are referenced with identification codes. Some examples of these codes are shown below, which must be taken into account for storage and subsequent use.

### 4.1. SHEETS

Each sheet of KRION™ has a batch number, equivalent to the date of manufacture. It must be mentioned that the method of showing the batch number on the sheets differs depending on the format and type of colour.

It must be taken into consideration that due to the composition of KRION™, there may be slight variations of colour between different productions. These are inherent to the product, whether on one sheet or several of the same colour.




According to the aforementioned code, the sheet belongs to batch 2QD25, with a format of 3680x930x12mm and is specifically sheet 14 of the whole production.

### 4.2. BASINS

Each piece of KRION™ made by casting from a mould has a label with a batch number unique to it. This batch number encompasses the date of manufacture, among other information, which we will detail in this point.

**2015 07 06** Year, month and day of manufacture.

**4084RLD** Internal code for traceability.

**11546** Number of piece manufactured on that day.


**201507064084RLD11546**

### 4.3. ADHESIVES

The most important aspect to take into account for adhesives is the expiry date, as the properties of an expired adhesive may be altered.

This date is shown on all cartridges of adhesive. All adhesives manufactured and commercialised by KRION™ have a 2 year lifespan, therefore, to find the date of manufacture, just subtract 24 months from the date appearing on the label of the cartridge.

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# Transport and storage

05

# 5. TRANSPORT AND STORAGE

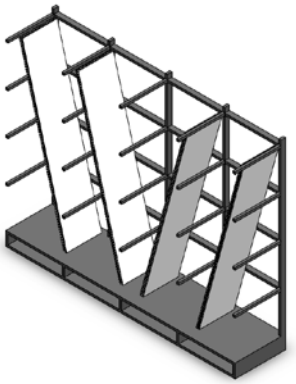
## 5.1. TRANSPORT AND STORAGE OF MATERIAL

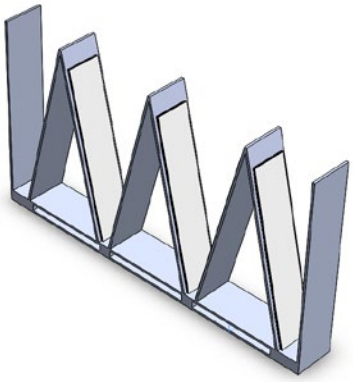
Having reviewed the material received, it must be transported to the storage area.

Depending on the form of storing the material, the pallets or sheets may be transported in different ways. Below, the different ways of storing the material are shown, and it is explained which is most convenient for transport.

### 5.1.1. VERTICAL STORAGE ON SHELVES

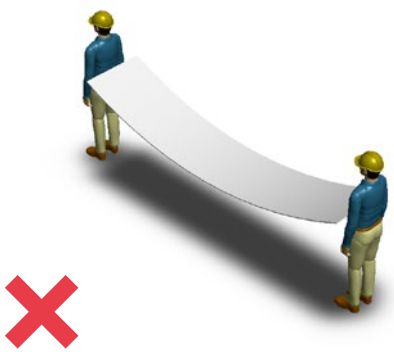
One way of storing sheets of KRION™ is to place them vertically on shelves. There are two different types of vertical shelves: those which incorporate arms (left image) and those which have a sawtooth form due to the angle of the sheet supports (right image).

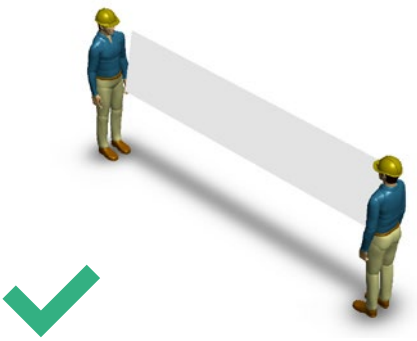




This type of storage is very efficient, as the sheets can be separated in different ways, either by series, tones or batches. Additionally, it facilitates access, as they can be removed from storage by hand or with suction cups. It must be taken into account that sheets are rectified on their edge, therefore gloves will have to be used to handle them due to the edges being sharp.

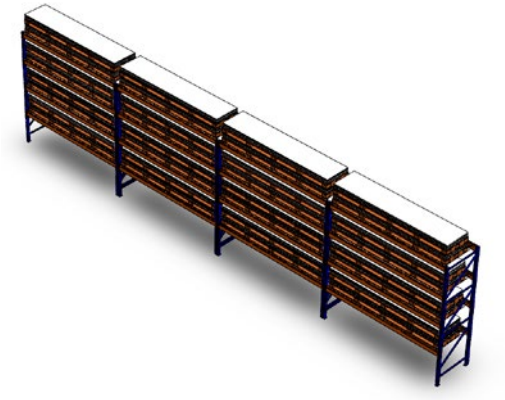
Therefore, using a forklift, the material can be transported to the shelves, and placed on them by hand or using suction cups. Sheets must always be handled by a minimum of two people due to their weight. It is important that in transport sheets are placed so that they do not buckle, as this may affect them negatively. An image is shown below of how to properly transport them.





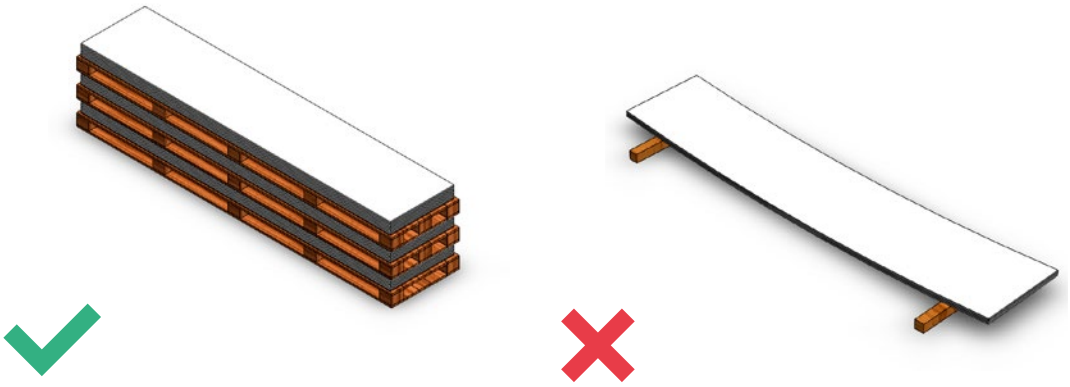
### 5.1.2. HORIZONTAL STORAGE ON SHELVES

Another way in which KRION™ sheets may be stored is on shelves of a metallic structure, so that they are placed horizontally. This must be dimensioned in advance to ensure that it will support a certain amount of material being placed upon it. Sheets may be shelved with or without depalletising. If depalletised, a sheet manipulator may help.



### 5.1.3. STACKING OF PALLETS

Another option may be stacking pallets on the floor. A maximum of six whole pallets of 12 mm (1/2") sheets or eight whole pallets of 6 mm (1/4") sheets may be stacked. Always use pallets when stacking on the floor, as the temperature difference between the sheet, the air and the floor may cause a sheet to curve.



## 5.2. TRANSPORTING UNFINISHED PIECES

From Krion it is always recommended to do the maximum work in the workshop, if it is possible that the finished furniture is already moved to the end customer's house. It would be necessary to have a qualified vehicle with which the following precautions must be taken:

- Treat the elements as fragile and valuable.
- Protect the sections with bubble wrap, cork and blankets.
- Fix the sections into place using clamps and straps in the vehicle so that they do not move during transportation.
- Use objects such as wood blocks, clamps or specially made sections to fix the elements in place in the truck when transporting them from your workshop to the customer's home.
- Always use vehicles that are capable of withstanding heavy loads and, if necessary, that include automatic unloading systems.
- Use fixing elements to prevent the countertops from splitting.
- Strengthen with elements, countertops or furniture that can easily deform.

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# Transformation techniques

06

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# Transformation techniques

## Cutting

06.1

# 6.TRANSFORMATION TECHNIQUES

KRION™ is a material which, as previously described, is produced in sheets, but which may be transformed to create units or large projects. To do so, a series of techniques are necessary for obtaining a product with an optimal, high quality finish.

It must be worked on in a similar way as wood, which allows the sheets to be cut, joined, thermoformed to create curves, etc. Therefore, Krion provides a series of tips and recommendations which will facilitate the fabricator in achieving the finishes which can be obtained with the material.

Below, each and every technique necessary for working on the material are explained, from acquisition of the sheet to installation in the client's home.

## 6.1. CUTTING

Cutting is an important part of the transformation process, because a clean cut without irregularities will have a high probability of achieving a clean, imperceptible join. Thus, two types of cut may be carried out: cutting of sections and cutting prior to bonding.

### 6.1.1. CUTTING OF SECTIONS

Tools such as the circular saw, hole saw or vertical saw will be used to carry out this type of cutting. These machines will only be used to cut sections of sheets.

#### 6.1.1.1. CUTTING WITH CIRCULAR SAW

There are fixed circular saws and mobile circular saws. The difference between these is that the mobile saw is usually used for areas where it is not possible for fixed saws to access, for example, the place of the final installation; however, the cut and type of blade used is the same. Information on cutting with this type of machine is shown below.

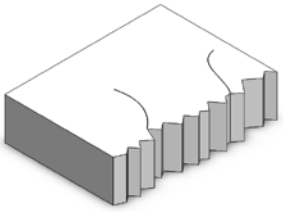
- It is usually a powerful machine, as it spins at high speed while cutting the material.
- Tungsten carbide (hard metal) discs with triple teeth are used. Diamond discs provide greater performance cutting with water, but are not recommended for cutting dry as they usually become clogged.
- Discs with sloping teeth are recommended, with an angle between -5º and 10º, similar to those used for cutting aluminium.
- Cutting discs must have an approximate module of 3.125, approximately 8 teeth for each 25 mm (1") diameter.
- Cutting discs must be properly sharpened. Blunt discs may cause cracks or fissures with high tension. An irritating noise in cutting will indicate that the disc is not sharp.
- It is recommended to always use the same disc for cutting KRION™ and not to use it for cutting other materials.

The table below, in addition to other characteristics, shows the number of teeth of a disc by its diameter.

| Diameter (mm) | Cutting widths (mm) | Disc thickness (mm) | Opening (mm) | Number of teeth (mm) | Gap (mm) |
|---|---|---|---|---|---|
| 160 (6 5/16") | 2,2 (1/16") | 2,2 (1/16") | 20 (13/16") | 48 (1 7/8") | 9,8 (3/8") |
| 200 (7 7/8") | 2,8 (1/8") | 2,2 (1/16") | 30 (1 3/16") | 64 (2 1/2") | 9,8 (3/8") |
| 250 (9 13/16") | 3,2 (1/8") | 2,6 (1/8") | 30 (1 3/16") | 80 (3 1/8") | 9,8 (3/8") |
| 300 (11 13/16") | 3,2 (1/8") | 2,6 (1/8") | 30 (1 3/16") | 96 (3 3/4") | 9,8 (3/8") |
| 350 (9 13/16") | 3,6 (1/8") | 3,0 (1/8") | 30 (1 3/16") | 112 (4 7/16") | 10,2 (3/8") |
| 400 (15 3/4") | 4,4 (3/16") | 3,6 (1/8") | 30 (1 3/16") | 128 (5 1/16") | 10,5 (7/16") |
| 450 (17 3/4") | 4,4 (3/16") | 3,6 (1/8") | 30 (1 3/16") | 144 (5 11/16") | 9,8 (3/8") |
| 500 (19 11/16") | 4,4 (3/16") | 3,6 (1/8") | 30 (1 3/16") | 160 (6 5/16") | 9,8 (3/8") |

### 6.1.1.2. CUTTING WITH COMPASS SAW

This tool is usually used to make curved cuts, or cuts with complex shapes, but cause many irregularities in materials due to its aggressiveness in the cut. It is considered a section cut as KRION™ cannot be bonded directly after cutting, having to use a router first. Additionally, it does not cut very quickly and produces a lot of vibration, which will affect the user's arms. It must be taken into account that this machine causes tension which could lead to breakage. Below is an image showing a simulation of the edge of the material after cutting with the compass saw.



### 6.1.1.3. CUTTING WITH VERTICAL SAW

This machine works in a similar way to a fixed circular saw; the only difference is that the disc is not fixed, instead having to move to cut the material. Attachment prior to the cut makes it come out straight without outage, as may occur on a fixed table saw. It must also be considered that the introduction of the material on the housing is less ergonomic, as different heights will have to be negotiated.

Sections may be cut by laser or water, but these are even less clean than those described. Laser cutting may be used to engrave logos or lettering with a natural colour contrast with the sheet.

### 6.1.2. CUTTING PRIOR TO BONDING

This involves clean cuts, without cracks or irregularities, made with the corresponding tools. Milling is the correct cut for avoiding irregularities, therefore achieving an imperceptible join. Manual routers, a CNC machine and a milling machine tupi are the best-known and recommended.

#### 6.1.2.1. ROUTER

There are different manufacturers, some better established than others. KRION™ recommends using high quality machinery such as FESTOOL, as this is what is used by the KRION™ transformation workshop.

For the selection of a router, certain requirements must be taken into account.

- It must fulfil the powers and speeds of the routers which will be worked with. A speed which is high or too low may affect the cut, which will be reflected in the result of the imperceptible join.
- It must have a system for lowering the Z axis by tenths, as operations with material such as half round materials require a certain precision.
- There are routers with different neck diameters, usually 8mm (5/16") or 12 mm (1/2"). The router must incorporate a housing change system for them.
- For a clean cut, a guided support system will be necessary. It is considered important that the base of the router is circular so that, in the case of the support moving, the axis of revolution of the router remains in its position.
- The vibration or oscillation of the router when cutting may affect the cut, therefore it must be ensured that when the cut is made, the Z axis height does not vary due to vibrations.
- Compliance with all health and safety regulations.
- Cleaning and maintenance of the router is essential. One of the major causes of breakdowns of the machine is lack of maintenance.
- It is recommended to always have different routers available which are sharp or which have little wear.
- In the case of profiling, always use routers with bearings.
- Use all possible tools so that the cut is always clean and free of irregularities.
- Understand the operation of the machine and use it correctly.


#### 6.1.2.2. CNC (NUMERICAL CONTROL)

A CNC milling machine is a tool used for machining. It works in the same way as a manual router, by removing chips. A cutter placed in the spindle of the machine turns thanks to a motor, its speed and the hardness of the cutter cutting the material. The purpose of including this type of machine in a transformation workshop is to automate work carried out with KRION™, fulfilling work and

delivery periods and precision in the cut for subsequent bonding.

Acquiring a machine of this type may entail a large investment, but it will be depreciated in a very short time. The work is automated, a cutting programme is created by software, and the machine makes the cut based on the programme without anyone having to supervise it. They are usually large in size, and may even be larger than a standard sheet of KRION™. This machine may optimize the sheet to a much greater extent than by manual cutting, and only this cut will be made, as the material can be bonded directly.

There are different types of CNC milling machines, each with different characteristics. The number of exes incorporated is considered most important. The more axes on which the machine can move, the greater the possibility of making cuts with greater difficulty. A machine with three axes will only be able to make simple cuts on X and Y axes, and lower on the Z axis; in comparison, a machine with five axes will be able to make more complex cuts and do so more quickly.

### 6.1.2.3. TABLE ROUTER

A table router  machine is an electric tool used to mill or profile edges or specific areas of pieces of hard materials. It is made up of a fixed table and rotating system. The latter turns the cutter and the operator moves the material so that the cutter makes the desired cut.

After the description of the different machinery recommended for making the different types of cuts for transforming the material, there is a series of recommendations for obtaining optimal finishes.

- Normally, the same cutters can be used for the three machines.
- The cutters recommended for profiling are helical cutters.
- It is important that the cutters are sharp, in order to achieve a clean cut without irregularities.
- At the maximum, the rotation speed must be that recommended by the manufacturer of the router. In case the cut obtained not being as desired, it is recommended to reduce the speed.
- It is recommended to make a cut with a balanced rotation speed and movement speed. High rotation speeds with very low or very high movement speeds will cause a cut with irregularities.
- Very slow movement speeds may alter the pigmentation of the sheet, which will cause a visible join.
- When making a cut using a CNC milling machine, it is recommended to carry out planning and profiling work on the finish.
- In case of profiling colours, it is recommended to cut only half a millimetre and increase the cutting speed.
- In case of not obtaining a perfect cut prior to bonding, the operation must be carried out again.
- Use masking tape in case of using the CNC milling machine for cutting small pieces. The rotation speed of the cutter may case their deviation or projection.

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# Transformation techniques

## Seams

06.2

## 6.2. SEAMS

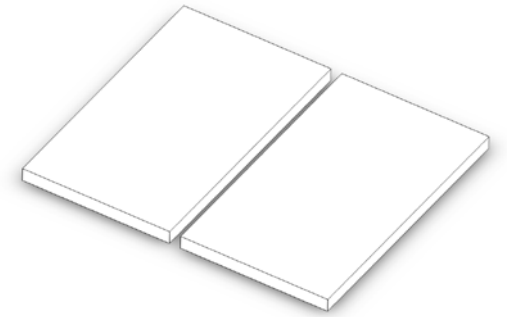
As previously mentioned in this manual, KRION™ is a material which belongs to the category of solid surfaces and is compliant with regulation ISO 19712. One of the important requirements is that its bonded joins are imperceptible; if the material is well transformed, this type of join must be obtained.

### 6.2.1. TIPES OF SEAMS

It is important that, depending on the position or the way which work will be done, the join is made in one way or another. It is important to highlight that to carry out the whole process explained in this section, the plastic must be removed from the surface of the sheet, reading point 6.3. "KRION™ Adhesive" closely. Below, the different joins that can be made with KRION™ are listed and described.

#### 6.2.1.1. BUTT JOINT

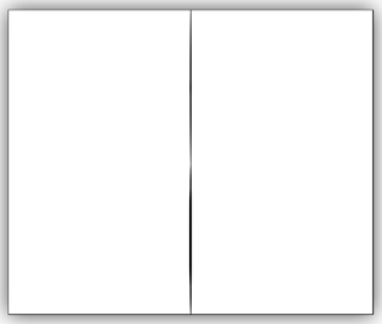
This is the most common type of join to use. This join is carried out so that the surface of the thickness of one piece is bonded with the same thickness of another. The result is a straight piece without any change of level. This type of join can be seen in the following image.



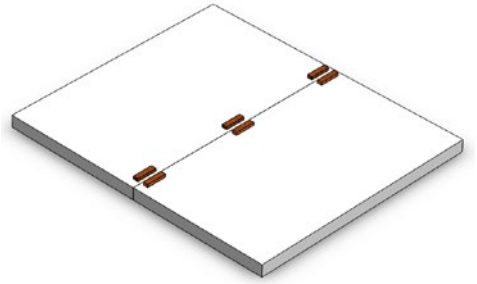
So that the result in creating this type of join is optimal, the following requirements must be fulfilled:

- The two faces or surfaces to be bonded must be rectified through a cut with a router. Bonding after a cut with a different tool will lead to a visible join. It is recommended to use a helical cutter with two blades. This type of cutter is shown below.

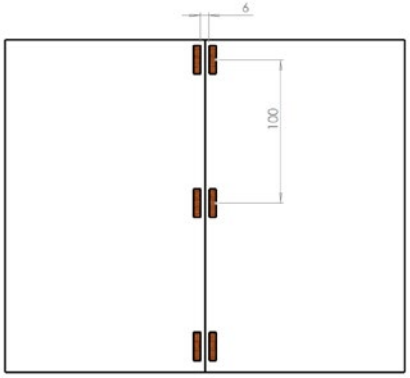
- After rectifying, the join must be presented and it must be checked that there are no irregularities. These irregularities will lead to an accumulation of adhesive in the join, and after a time, it will age differently from the sheet.



- Cover the area of the work surface below the seam with wax paper or adhesive tape to prevent the adhesive from dripping out of the seam and to stop dirt on the table from contaminating it.
- Once it has been checked that the pieces fit perfectly, the way of putting pressure on the join and retaining planimetry must be planned. For this purpose, blocks of wood or KRION™ are used, as shown on the following image.



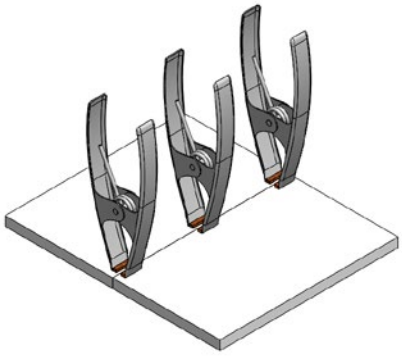
- The support blocks must be glued with cyanoacrylate adhesive at a distance of 2-3 mm (5/64" - 1/8") from the edge of the sheet to prevent the KRION™ adhesive from making contact with them. The pressure to be put on the join must be uniform throughout its length, without excessive tightening which may create raising of pieces and alter the finish of the join.
- Using small blocks and spring clamps to press the sheets together, there should be a maximum distance of about 100 mm (3 $^{15}/_{16}$") between the blocks. With larger blocks and bar or G-clamps, the maximum distance should be between 200 (7 $^{7}/_{8}$") and 400 mm (15 $^{3}/_{4}$"), depending on the size of the blocks.

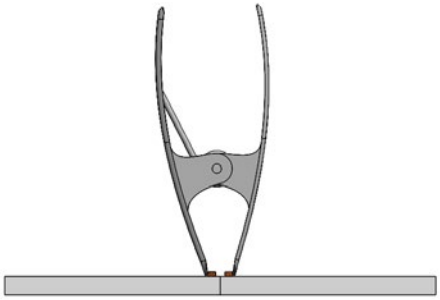


- Another very important requirement for obtaining an imperceptible join is prior cleaning of the material. Both the bonded surface and the front and rear areas near it must be free of contamination. For cleaning, is recommended to use denatured alcohol or pure solvent without any kind of additive (grease, oil, etc.). It must be cleaned with good quality paper, which is not recycled and which does not contain colourings which may contaminate the join.


Any mark of dirt, graphite pencil and even the batch number of the sheet may contaminate the join.

- It is very important that the cleaner has evaporated before the adhesive is applied.
- At this point, the adhesive will be applied to the surfaces to be bonded. To carry out the pasting process correctly, it is necessary to read point 6.3.4. "Preparing the adhesive" of this manual.
- Once the KRION™ adhesive has been applied, the clamps or screws sergeants will be placed on the blocks that have been placed to apply the necessary pressure (see image). Make sure that the adhesive overflows, as in the areas where it does not, there will be a visible joint due to the lack of adhesive. From then on, you will only have to wait for the adhesive to catalyse before making it disappear by sanding.





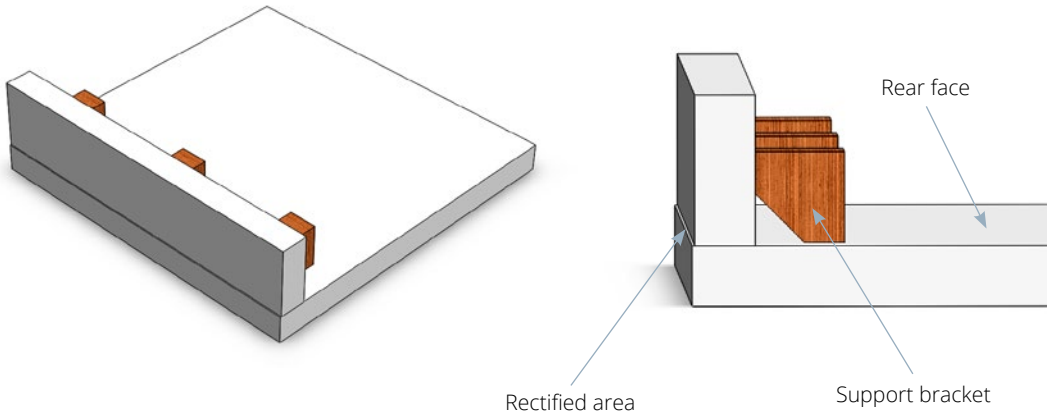
### 6.2.1.2. 90º JOINT

These are joins between two pieces which form a right angle (90º). This type of join can be made in different ways, but the most common are butt joints, mitre joints, or with a 2mm (5/64") rebate. The selection between these three will affect the chosen colour or tone of the project. In the Krion colour catalogue there are colours which depending on their distribution of chips or veins, must be bonded at 90º in one way or another. Below is a list indicating the type of join that must be made. These data have been taken from tests carried out by Krion laboratory on 12 mm (1/2") test pieces and are extrapolated to the rest of the thicknesses in Krion catalogue. At Krion, we recommend always performing a prior gluing test, given that there may be external factors that, in specific manufacturing batches, influence the data shown below.

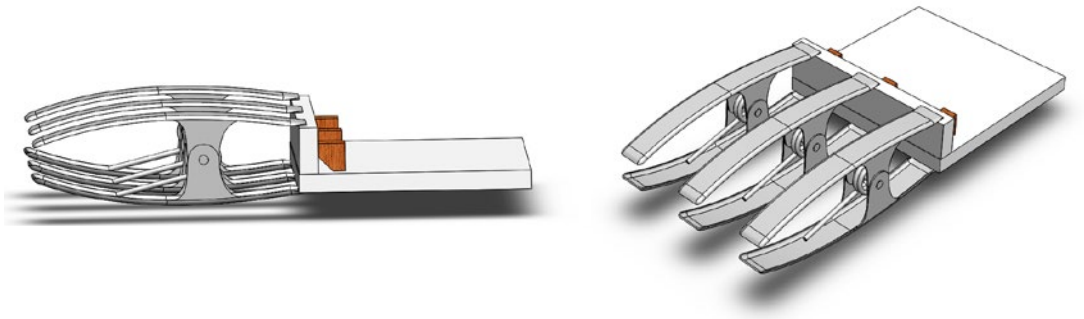
| RECOMMENDED STUCK DEPENDING THE COLOUR REFERENCE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Colour reference | | Standad recom-mended stuck | Colour reference | | Standad recom-mended stuck | Colour reference | | Standad recom-mended stuck |
| | 1100 Snow White EAST | 90 | | 0102 Clear Nature | 90 | | 9505 Cream Concrete | 90 |
| | 6101 Frost White | 90 | | 0103 Day Nature | 90 | | 9507 Taupe Concrete | 90 |
| | 6402. Pillow Pink | 90 | | 0501 Dune Nature | 90 | | 9509. Dark Copper | 90 |
| | 6501 Cream | 45 | | 0502 Camel Nature | 90 | | 9903 Deep Granite | 90 |
| | 6502 Pearl | 90 | | 0503 Earth Nature | 90 | | 9904 Bright Concrete | 45 |
| | 6506 Greggio | 90 | | 0504 Marfil Nature | 90 | | 9905 Elegant Black | 90 |
| | 6509 Moai | 45 | | 0506 Taupe Nature | 45 | | 9906 Black Mirror XL | 45 |
| | 6703 Santorini Blue | 90 | | 0507 Ebano Nature | 90 | | 9908. Black Gold | 90 |
| | 6902 Light Grey | 90 | | 0901 Grey Nature | 90 | | T101. Bianco Classico | 45 |
| | 6903 Grey | 90 | | 0902 Ash Nature | 45 | | T102. Marmo Bianco | 45 |
| | 6908 Scommentto | 45 | | 0903 Night Nature | 45 | | T103. Antico Bianco | 45 |
| | 6909 Colosseo Grey | 90 | | 0904 Pearl Nature | 45 | | T104. Vetro | 45 |
| | 6201 Imperial Yellow | 45 | | 0905 Cosmos Nature | 90 | | T902. Pietra | 45 |
| | 6301 Fruit | 45 | | 0906 Granite Nature | 90 | | T903. Concrete | 45 |
| | 6401 Red Fire | 90 | | 7103 White Star | 45 | | T904. Grigio Classico | 45 |
| | 6403 Candy | 90 | | 7502 Moai Star | 45 | | T905. Grafite Classico | 45 |
| | 6405 Happy Red | 90 | | 7701 Atlantic Blue Star | 45 | | L101 Carrara Soft | 45 |
| | 6504 Mocha | 45 | | 7904 Black Star | 45 | | L102 Nacar | 45 |
| | 6505 Taupe | 45 | | 7905 Grey Star | 45 | | L103. Snow Fall | 45 |
| | 6601 Fall Green | 45 | | 8101 Crystal White | 90 | | L105. Carrara Dark | 45 |
| | 6602. Sage | 90 | | 8103 Iceberg White | 45 | | L505 Beige Marfil | 45 |
| | 6701 Blue Sky | 45 | | 8104 Calla White | 45 | | L903 Grey Cement | 45 |
| | 6702 Atlantic Blue | 45 | | 8901 Crystal Black | 45 | | L501 Pompei | 45 |
| | 6704 Navy Blue | 90 | | 8905 Blackness | 45 | | L904. Messina | 45 |
| | 6705. Teal Blue | 90 | | 8906. Crystal Grey | 45 | | L905. Etna | 45 |
| | 6901 Black Metal | 90 | | A101 Asteoid White | 90 | | V101. Bianco Opera | 45 |
| | 6904 Bright | 45 | | A501 Asteroid Mocha | 90 | | V501. Noce Atrio | 45 |
| | 6905 Ash Grey | 45 | | A503 Asteroid Dark | 90 | | V901. Nero Palazzo | 45 |
| | 6906 Dark Grey | 90 | | A504 Asteroid Cream | 90 | | P101 Opale Bianco | 45 |
| | 4102 Extreme Light | 90 | | 9101 Cristal White + | 45 | | P601 Opale Verde | 45 |
| | 4201 Yellow light | 90 | | 9102 Polar Stone | 45 | | P701 Opale Blue | 45 |
| | 4401 Pink Light | 90 | | 9103 Bright Rock | 45 | | P901 Opale Grigio | 45 |
| | 4601 Green Light | 90 | | 9104 White Concrete | 90 | | M101. Luce | 45 |
| | 4701 Blue light | 90 | | 9105 Elegant White | 90 | | M901. Grigio | 90 |
| | 0101 White Nature | 90 | | 9106 White Copper | 90 | | M902. Amaro | 45 |

The colours which indicate 90° form this angle with a butt joint, while those that indicate 45° must be bonded through prior mitre cutting. This is due to the distribution of chips or veins of the thickness being different throughout the sheet, a change therefore being visible in the join.

To create a 90º butt joint, the same steps must be followed as for a normal butt joint, although certain points must be taken into account. Below is an image showing this type of join.

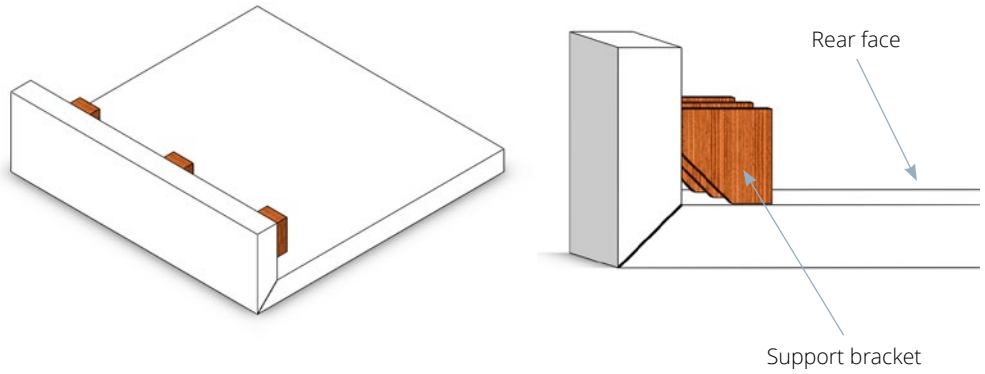



- The finish of the face of the material which is not plastic coated has a P120 finish, approximately, depending on the sanding of the calibrator, and should be treated before undertaking bonding. It is recommended to carry out a sanding process until traces or marks of the longitudinal finish disappear.
- The piece which will be bonded to the rear face of the sheet must be rectified by milling.
- It is recommended to carry out a prior presentation of the material through locking pliers, leaving approximately 0.5 mm (1/64") between the bonding join and the edge of the sheet (see previous image).
- After presentation of the join, it is recommended to place wooden support brackets, attached with hot wax or cyanoacrylate. These will help the two pieces to be bonded to be square, forming a perfect 90º angle.
- At this point, the same operation as bonding by normal butt joint must be carried out, cleaning the surfaces.
- After appropriate cleaning, the adhesive will be applied, which will require the force as shown in the following image. It is essential for the adhesive to overflow to make the join imperceptible.



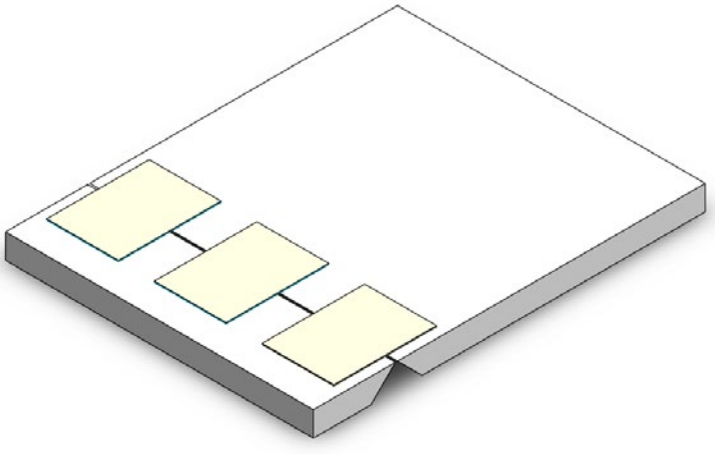
- In the case of the rectified piece being larger, it is recommended to make a larger bracket so that the surface has more support.

For bonding a 90º mitre joint, the steps below must be followed. This procedure must be carried out for the colours or series which, according to the previous list, say that it is a 45º colour. It is first recommended to view the following image to help understanding of what is being explained.

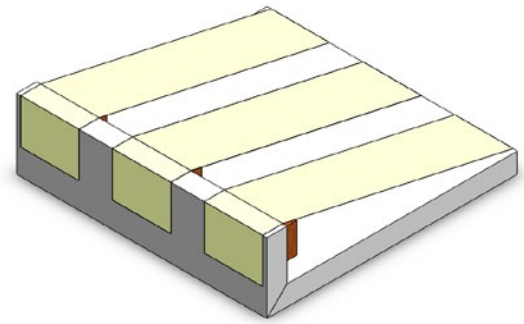



- To make the cut of the two pieces to be bonded, a 45º angle cutter must be used. The idea is that the plastic coated face of the sheet is supported on the cutting table and milled on the rear side. The following image shows this cutting.

- Having obtained the pieces, they will be rotated so that the edges obtained by cutting are facing each other. The idea is to put masking tape on the surfaces so as to facilitate bonding (see image).

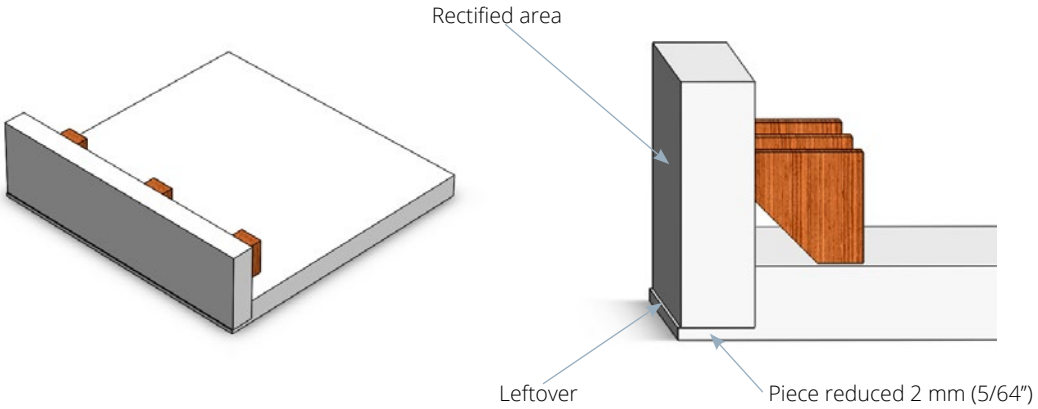


- The material will be turned over, so that the tape does not come unstuck. The material will then be cleaned as previously indicated.
- Once clean, the adhesive will be applied. The instructions of point 6.3.4. "Preparing the adhesive" must be followed. After application, leave one of the pieces fixed and place the other so that the surfaces to be bonded fit together perfectly. It is recommended to use the masking tape to tighten the join.

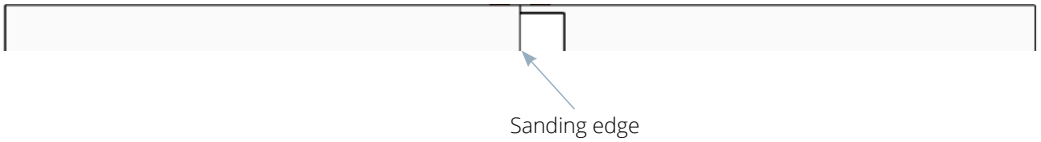


- As in the previous case, if the pieces to be bonded are larger, it is recommended to make larger brackets to have more support.

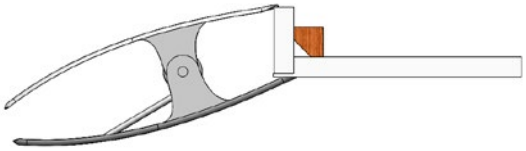
The 2 mm (5/64") rebate joint is used to substitute the mitre joint. That is, some 45º colours can be bonded in this way, thereby concealing the change of distribution of the chips which would be visible in case of being bonded with a 90º butt joint. It is recommended to carry out a prior test before direct bonding of the 2 mm (5/64") rebate joint. The following image shows this.

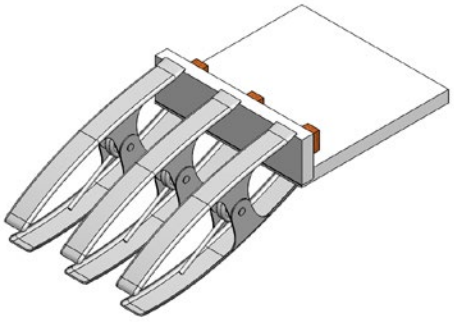



- It is a join similar to the 90º butt joint, but with the difference of the pieces having to be cut up to 2 mm (5/64") with the router.
- It is recommended to carry out the rebate so that the groove has a width of a little over 12 mm (1/2") (approximately 0.5 mm (1/64") larger), as the adhesive must overflow and be removed subsequently. It is recommended to use a resistant router so that it withstands the process and the cut is cleaner.
- After cutting, the bonding of the pressure blocks will be carried out. They will be installed in the same way as a normal butt joint, on the plastic covered face and with the same distribution.
- Subsequently, the edge of the piece which has not been cut will be removed with a sanding block (see previous image). This will be carried out so that the piece fits perfectly on the other.

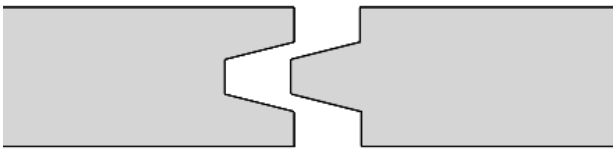


- The material will be cleaned and bonded as described in the different sections.
- The adhesive will be applied as indicated in point 6.3.4. "Preparing the adhesive".
- After application, one piece will be placed on another and the clamps will be placed as in the following image.
- After tightening the clamps over the joins, the adhesive will be left to dry for subsequent sanding.





As mentioned at the start of the section, different bonding joins can be carried out with the material. Examples of other possible joins which provide more resistance than those previously described are shown. This example is shown below:



In addition to resistance compared with other types of join, flatness between the elements to be joined is achieved. The availability of a specific type of router allows both the male and female part to be created so that the visible face is fully aligned. Below is a step by step explanation of how to achieve this type of join.

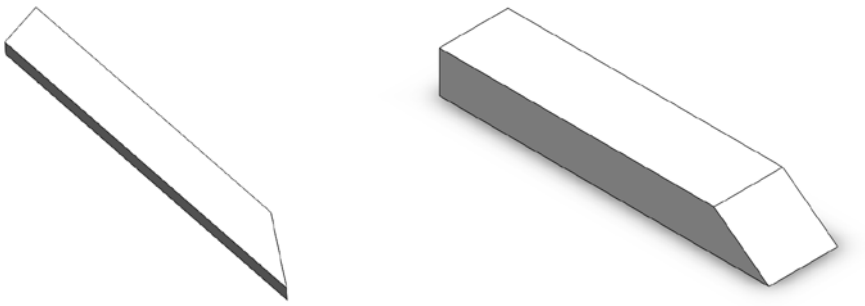
- It is necessary to place the face which will ultimately be visible in contact with the support surface used for the cut, whether a CNC table or a work table for cutting with a router. It is important for these supports to be totally flat.
- In case of creating the join by manual milling, it is recommended to have samples to check the height of the Z. Check that the movement between the router and the samples is comfortable. The router to be used is shown below.

- Having checked that the sample moves properly, make the programmed cut.
- As two grooves will be made with the same router, the Z must be modified to create the opposite piece to the one previously created.
- Once the Z has been modified, cut the piece.
- Once the two parts of the male-female joint have been made, check that their flatness is perfect.
- Having checked the flatness, carry out the bonding process as mentioned in this manual.

### 6.2.2.INTERNAL CORNERS

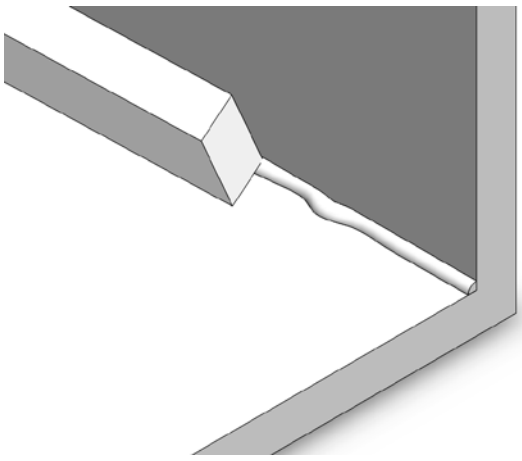
The process of removing the excess adhesive from joins is generally carried out by sanding. However, when it is a joint of two or three perpendicular planes, forming an internal corner, removing the adhesive by sanding is very complex. Only in this case is it recommended to use the following process.

The idea is to remove the adhesive when it is in a rubbery state, not when it has just been applied or when it is totally dry. The time for the adhesive to reach the rubbery state may be from 8 to 15 minutes from application, depending on the ambient temperature at the time of bonding. To remove the adhesive, a "KRION™ chisel" will be made, a piece of the material itself cut into the form of a 45° wedge (see image).



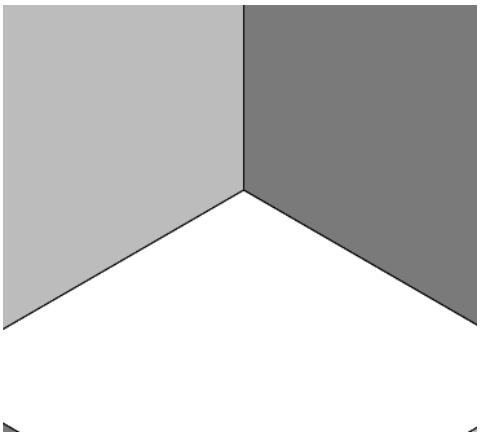
Once the adhesive is in the rubbery state, the excess adhesive will be removed with the KRION™ wedge as shown in the following images.

Clean the adhesive accumulated on the tip of the wedge with a clean cloth or paper, moistened with a little denatured alcohol or acetone type solvent.



After this process, it will be necessary to carry out a small amount of sanding by hand with a sanding block to finish removing the adhesive.

After the time necessary for the adhesive to dry properly, the sanding and final finishing will be carried out.

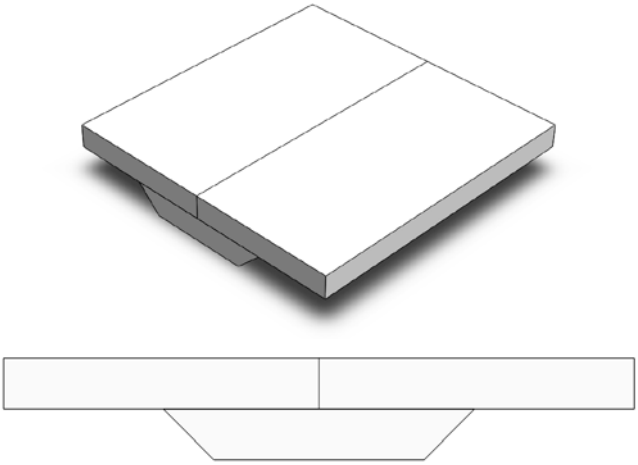


### 6.2.3. JOIN REINFORCEMENT

As a rule, the joins must be positioned in areas which do not have to bear extreme loads or continuous stress, as they have a different resistance than the material itself. However, sometimes this is unavoidable. There are different methods for reinforcing joins, described below.

#### 6.2.3.1. DOUBLE THICKNESS

An easy way to reinforce a join is by bonding it just below a piece of the sheet, forming a double thickness. The idea is to cut a piece of the same length as the join with mitre edges at 45º to achieve the maximum strength and minimize tension which the material may experience. The width of the piece must be a minimum of 50mm (2”).



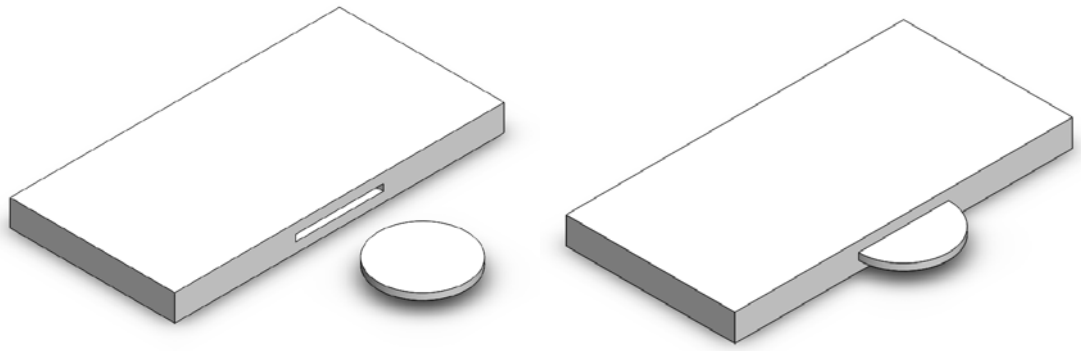
It is recommended to bond the reinforcement once the joint being reinforced has dried. First sand all remaining adhesive from the lower part and bond it with KRION™ adhesive. It is important for the whole surface of the reinforcement that will be bonded to be fully covered with adhesive

to have greater consistency. Always use the same colour of Krion as the project to make the necessary reinforcements.

When the adhesive has overflowed, the excess can be removed before it dries. It must be taken into account that some colours of KRION™ have a certain translucency, so shadows may be created if light is projected on the rear face of the reinforced surface.

#### 6.2.3.2. BISCUIT

Another way to reinforce the join is to make a biscuit joint. This involves milling the surface to be bonded to enter a piece or strip of KRION™ between them. The following image shows this type of join.



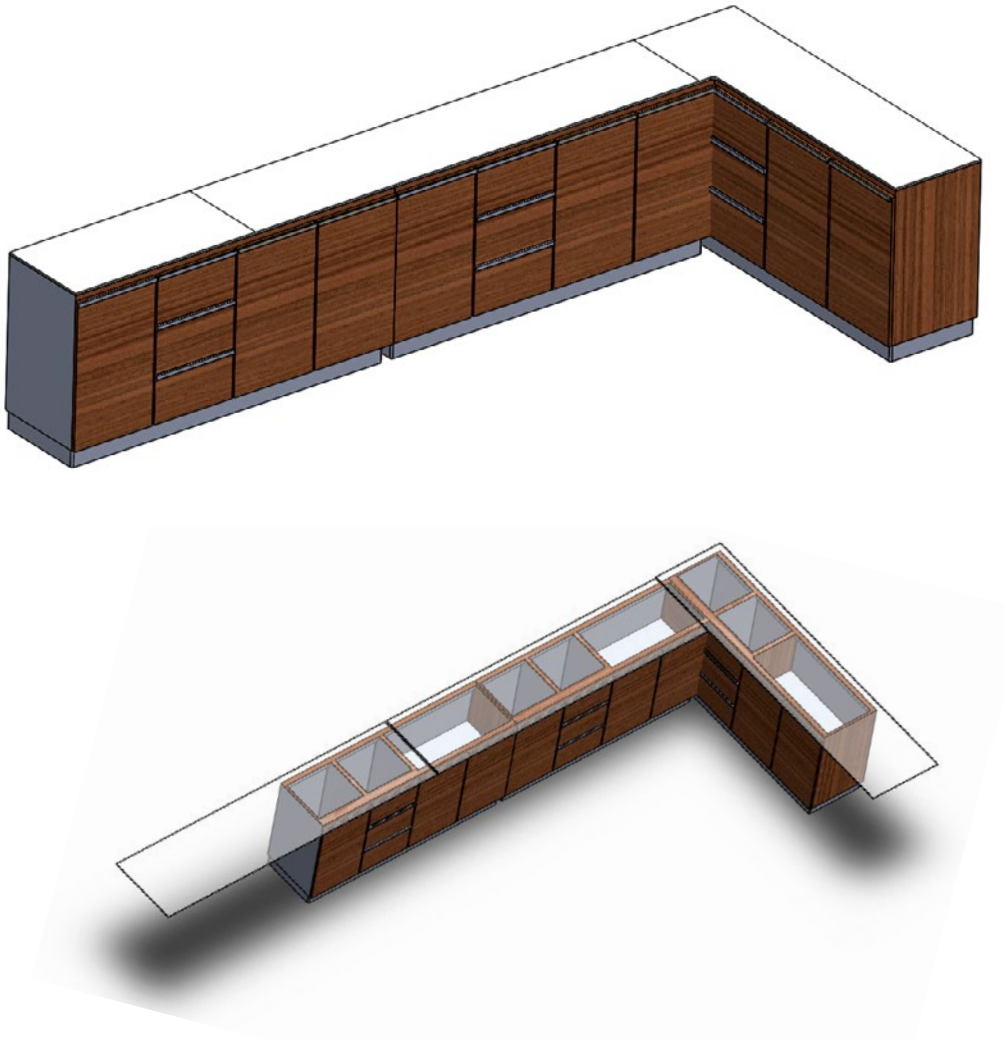
- Use a template to make sure that all of the biscuits are made in the right size.
- Place adhesive tape along the whole length of the seam.
- Fill the grooves in the biscuit with KRION™ adhesive.
- Push the biscuit into one of the slots.
- Add adhesive along the whole length of the seam.
- Adjust the two pieces of KRION™ and press using the described methods.
- Wait for 20 minutes and then sand to remove any excess adhesive and give the surface its final finish.
- Make sure that the edges of the milling bit are rounded to prevent 90º edges

### 6.2.4. POSITIONING OF JOINS

When planning the joins in a project, it is necessary to consider their placement in areas away from physical or thermal tension, such as corners or areas where there may be an accumulation of heat (kitchens, grills, dishwashers, ovens, etc.). It is also recommended to plan them in areas which are less visible to users, in areas which are above or below eye level.

The project will also have to be planned based on the installation possibilities in the client's home. It is recommended to carry out as much work as possible at the workshop, to thereby carry out as few joins as possible at the place of installation. The size of the transport vehicle, the ability to bring the produced product inside to the point of installation, as well as the type of installation to be made are factors to take into account when positioning the joins for bonding.

Below is an image with different possibilities for planning joins.



### 6.2.5. INVISIBLE SEAMS WITH TRANSLUCENT COLOURS (THE LIGHT SERIES)

The colours in the Light series are naturally translucent due to their composition. They are specially conceived to help achieve surfaces and wall coverings that are backlit in a uniform way.

The seams in KRION™ from the Light series can become noticeable, particularly when backlit. The shadow of any surplus adhesive on the back and any reinforcements or structural supports will also be visible when the final ensemble is backlit.

Follow these tips in order to ensure optimum seams when working with sheets from the Light series:

- The edges of the sheets must be milled with extreme precision (milling them straight and not at an angle) so as to avoid gaps where too much adhesive might build up.
- Remember that a seam made with straight, well-milled edges will be less perceptible when backlit than recessed or tongue-and-groove edges.
- Any surplus adhesive on the back of the seam must be removed because it does not have the same translucency as the sheet and it will show up when backlit.
- Sand the back of the whole ensemble in a uniform way, because if it is differently sanded, this will lead to different degrees of translucency.

### 6.2.6. JOINT ALTERATIONS

It is possible that during the processing of the material the glue joints may be altered, for possible reasons which are discussed below.

- Due to having moved the bonded sheets to adjust the seam before the adhesive dried. Make sure the seam is perfectly positioned before applying any pressure to it.
- Due to not having added reinforcements to the underside of the seam.
- Because too much pressure was applied when the sheets to be bonded were pressed together. This causes the adhesive to flow out of the seam, meaning the bond will not be strong enough.
- Due to not having rested the countertop on a proper base.
- Due to having sanded the seam before the adhesive had dried.
- Due to having used adhesive past its expiry date. Although this seems simple, it is the most usual cause of bonding problems.
- Due to changes in temperature while the adhesive was setting. Try to keep as stable a temperature as possible in the room or workshop where you are working (air conditioning, heating, keeping the seam out of sunlight, etc).
- Due to the contamination of the seam before or while the adhesive was drying. Clean the edges of the seam with denatured alcohol and a clean cotton cloth before applying the adhesive. Prevent other substances coming into contact with the adhesive while it cures.

KRION
PORCELANOSA Grupo

# Transformation techniques

## KRION™ Adhesive

# 06.3

## 6.3. KRION™ ADHESIVE

### 6.3.1. ADHESIVE INFORMATION

One of the main advantages of KRION™ is the potential that it offers for making seamless joins. Its hygienic properties and capacity for creating seamless continuous-looking designs of all kinds are possible thanks to the outstanding properties of KRION™ adhesive. With it, fabricators can make uniform solid-looking continuous surfaces with no joints where dirt or germs might build up. This makes KRION™ the perfect solution for projects and designs of all kinds.

KRION™ adhesive is a two-component acrylic adhesive for bonding KRION™ materials. An adhesive manufactured for the solid surface sector using cutting-edge technology, it stands out for its superior bonding strength.

In addition to complying with the strictest requirements and certificates, thanks to their development process, KRION™ adhesives also offer certain performance-related advantages:

- Cures at room temperature
- High waterproof resistance
- Minimum preparation of the surface
- Excellent scratch resistance
- Excellent impact resistance
- Excellent bonding strength
- Easy to handle and use

These characteristics make it stand out from the majority of adhesives for solid surfaces which exist on the market.

The adhesive comes in a two-component cartridge in two formats: 50 or 250 ml. It is calculated that with a 50ml cartridge, approximately 3 to 5 linear metres can be bonded. Each and every one of the KRION™ cartridges are duly labelled, with the pertinent safety warnings and identification and traceability codes, if ever required. Traceability means that different stages in the KRION™ adhesive production process can be identified using a code that contains relevant information on the process. This code is essential in any enquiry made to the factory.

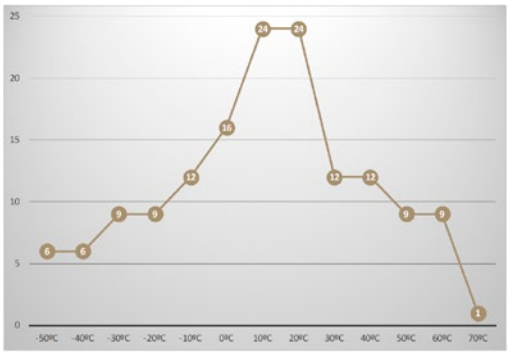
The sequence shown below is printed on the adhesive's cartridge label.


With this sequence, Krion can fully identify the adhesive and know the manufacturing date, the characteristics of the batches of raw materials used to make it, and even details of the production process.

As indicated on the label of the KRION™ adhesives, their components expire (when unopened) after about 24 months of the date when the product was manufactured by Krion. It is recommended to order the correct amount of adhesive for the planned work with the material, as making an order in excess of what will be used for work will entail loss due to expiry.

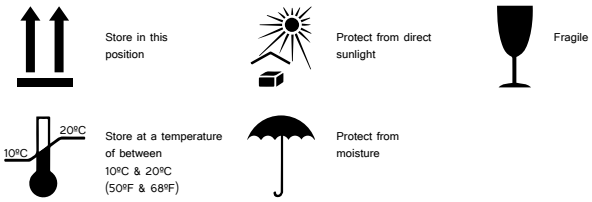
The adhesive's given expiry date is based on its storage in stable conditions between a temperature of 10ºC (50ºF) and 20ºC (68ºF).

It should therefore be stored either refrigerated or in a place with air conditioning, making sure that it does not freeze. Shown below is the expiry deadline of the adhesive in months when stored at different temperatures.




The adhesive cartridges must be stored horizontally. Stand them upright in a vertical position for at least 10 minutes prior to using them so that any possible air bubbles move upwards toward the nozzle and are expelled when the adhesive is first applied.

Special attention must also be paid to transport. The material should be transported in such a way that exposure to temperatures of over 27ºC (81ºF) is avoided. If the material is shipped, it should be kept below deck to avoid its exposure to sunlight and high temperatures. For the adhesive to remain in optimum condition during the transportation process, it is fundamental to follow the transport recommendations shown on the packaging:




KRION™ adhesives are manufactured in accordance with the strictest standards and they undergo rigorous quality controls prior to their sale and distribution. The quality controls that they undergo include:

- Controls of the density and viscosity of the adhesive's components: These quality controls are aimed at ensuring a density and viscosity in keeping with the necessary manufacturing requirements, hence ensuring the adhesive's subsequent suitability. An adhesive that is too viscous and dense will be harder to apply, while one that is too liquid and less dense will drip and be hard to spread in uniform manner.
- Colour controls: These controls are conducted to check that there is no variation in the colour of different batches of the adhesive.
- Controls of the working and reaction times: These controls are conducted to make sure that the KRION™ adhesive reacts within the envisaged time and cures properly, thus maximizing the adhesive's bonding strength.

It must be taken into account that the KRION™ adhesive cartridge is acrylic, which has UN number UN 1133, hazard class 3 and packaging group PGII. For further information on this, consult the safety datasheets.

**GREENGUARD**

This certificate assesses the air quality of work places where the material is fitted. It controls atmospheric emissions of dangerous chemical products. KRION™ and its adhesives have been awarded the highest possible rating - Greenguard Gold -, specially indicated for places used by those members of the population most sensitive to pollutants (children and elderly people).

**NSF**

This certificate indicates whether a material is suitable for contact with food products. KRION™ is rated as being apt for direct contact with food (worktops, tables etc.), whilst other materials are only rated as being apt for places where splashes might occur (wall coverings, upstands) but never for direct contact with food.

### 6.3.2. ADHESIVE HANDLING

Before proceeding to handle or use KRION™ adhesive, read the Product Safety Sheet carefully. The adhesives contain methyl methacrylate and so, if they are wrongly used, they can be flammable and potentially dangerous. In addition to this it is recommended that you refer to points: 6.1. "Cutting", 6.2. "Seams" and 6.6."Thermoforming".

The product must always be used in a well ventilated place.

The components of the KRION™ adhesive must be stored in a cool place, away from any heat sources, open flames, sparks or other combustible materials. Keep the recipients closed when they are not in use.

Use any necessary protection (goggles, gloves etc.) to prevent the product from coming into contact with your eyes, skin or clothes. In the event of contact with the eyes, wash them with plenty of water for 15 minutes and seek immediate medical attention. The adhesive is harmful if swallowed. Keep out of children's reach.

To apply the adhesive, special dual-component dispensing guns for dual-component cartridges and static mixer nozzles are required, both supplied by Krion. If pneumatic dispensing guns are used, check the regulator to adjust the air pressure. If the regulator of the dispensing gun is removed, the resulting build-up of pressure might break the cartridge cylinder.

When KRION™ adhesive's two components are mixed, the ensuing chemical curing reaction generates heat (exothermic reaction). The amount of heat will depend on the mass. Masses with a thickness of over 39 mm (1.5") may generate too much heat.

This information on the working time relates to the approximate length of time between the preparation of the mix and the moment when the adhesive loses its bonding capacity. The working time will be influenced by a combination of factors: the ratio of the mix, air temperature, temperature of the adhesive, temperature of the support and the expiry date of the adhesive. For optimum results, use the adhesive at a temperature of between 15°C (65°F) and 30°C (85°F). High temperatures speed up the curing time, making the reaction faster, while lower temperatures will slow it down or even halt it completelyz. That is why it is very important not to bond KRION™ at low temperatures.

KRION™ adhesives are specially formulated to make high-resistance seams. A prior study should always be made of the location of seams and their possible reinforcement. Consider the study of the seam location and its reinforcement, see points 6.2.3. "Joint reinforcement" and 6.2.4 " Positioning of joints".

Do not forget to check that the sheets used in the project are all from the same batch. KRION™ adhesives are for bonding and joining different pieces of KRION™.

They should never be used as putty to fill in or conceal faulty cuts or unevenly machined surfaces. The composition of the adhesives is different from that of the KRION™ sheets due to their different proportion of mineral fillers and resins.

This means that the sheets and adhesives will each age differently, and so badly made seams might become noticeable in time. Bear in mind that the adhesives are designed to be used by specialist professionals at their own risk.

The recommendations given in this Data Sheet are based on information deemed to be reliable. End users must check that the adhesive is suitable for their required application, as per the envisaged test conditions. Given that Krion has no control over the specific use, materials and handling of the product, our warranty is solely limited to replacing products by Krion in the event of manufacturing defects.

### 6.3.3. CLEANING THE EDGE OF THE KRION™ BEFORE APPLYING THE ADHESIVE

Clean the edges to be bonded with a clean cloth and denatured alcohol. Good quality paper can also be used that has not been recycled and does not contain any pigments.

Dry any residual cleaning product with a paper or clean cloth before applying the KRION™ adhesive.

Never use grease removers or products with oil or pigments.


The underside of the sheets should be calibrated and finished off to about a P120 grit (working continuously in one direction, which might leave more visible marks with certain colours). Eliminate any visible linear marks and possible dirt from the underside close to the area to be bonded. Make sure that there are no marks left from the sheet's batch number and no remains of markings on the edges to be bonded.

Carry out bonding in a clean, controlled area where there is no dust suspended in the air.

### 6.3.4. PREPARING THE ADHESIVE

Before proceeding to use the KRION™ adhesive, the following steps must be taken:

- Make sure that the colour of the adhesive is the same as that of the KRION™ sheets or that it is a compatible shade.
- Check the expiry date and make sure that the adhesive is not past this date. Do not use cartridges whose catalyst has leaked either during the transportation process or because the bottom cap

failed to close properly.

- Leave the cartridge to stand in a vertical position for 10 minutes before starting to use it. In this way, any air bubbles in it will rise close to the opening and be more easily expelled.
- Use the special dispensing gun for KRION™ adhesive. Press the release with your thumb and, at the same time, pull the plunger back to make room for the KRION™ cartridge.
- Fit the adhesive cartridge and place it in the right position on the gun housing.
- Close the top clip of the gun to lock the cartridge in place.
- Remove de cap.
- Press the trigger of the gun several times until liquid comes out of the two holes of the tube (the adhesive and the catalyst).
- Place the mixing nozzle into the right position so that the holes of the nozzle are over the holes of the cartridge.
- Screw on the nozzle cap to close it.
- Press the trigger of the gun until adhesive comes out of the nozzle.
- a little adhesive onto a piece of paper to make sure that the mix is right. The adhesive is now ready for use.
- Confirm that the surfaces to be bonded are clean.
- Place a strand of adhesive on one of the surfaces to be bonded. A strand one third the thickness of the thickness to be bonded will be sufficient.
- When you finish using the adhesive, press the release of the gun with your thumb to free the pressure on the cartridge.
- Remove the mixing nozzle and screw on its original cap. This will stop the set material in the nozzle from falling back into the tube and blocking any adhesive from coming out when the cartridge is next used.
- Remove the cartridge from the gun and keep it in a cool, dark, dry place (preferably refrigerated).

Once the adhesive has been applied, the appropriate time must be waited for the join to have maximum resistance. Below is a table showing the action time after application and the drying time based on an ambient temperature of 25°C.

It is not recommended to create the joins at temperatures lower than 15°C.

| PRODUCT PROPERTIES 25ºC (77ºF) – Bonding time (time required to acquire a resistance of 1.4 MPa or shear strength of 200 psi) | | |
|---|---|---|
| Cartridge | Working time (minutes) | Bonding time (minutes) |
| Cartridge of KRION™ adhesive | 12 - 20 | > 16 |

To ascertain this information, the adhesive undergoes a series of quality controls before its sale and distribution. Controls are carried out to ascertain the time for work and the reaction time, in order to ensure that work with adhesives is carried out in an appropriate time which allows proper curing, thereby maximizing the properties of bonding of the material.

PORCELANOSA Grupo

# Transformation techniques

## Sanding

06.4

## 6.4. SANDING

KRION™ sheets are not finished products. They must be sanded and finished off. Sanding is the final fabrication process, aimed at giving the whole fabricated surface a uniform finish. A well-sanded finish is essential in ensuring a surface that is easy to clean and care for.

The degree to which a surface is finished off directly influences its visual appearance. By using the right sequence of abrasives and the right machinery, a matt, satin (semi-gloss), glossy or high-gloss finish can be achieved. The finish given to a surface must coincide with the product's intended use and the chosen colour of the KRION™ used to fabricate it. Dark colours require a satin or glossy finish. They should not be given a matt finish, because it will not bring out their full depth and intensity.

### 6.4.1. EQUIPMENT

Generally speaking, random-orbit sanders should be used, using sanding discs with a progressively fine grit, working from a thick grit, to a medium and then a fine one.

These sanders normally come with orbits ranging from 2.5 to 8 mm (3/32" to 5/16").

Belt sander: This type of sander should not be used, since it works in linear fashion, leaving more marks. A belt sander is only appropriate during the grinding process, using a P80, P100 or P120 grit sanding disc, before going on to finish the sanding process with a random-orbit sander.


ROTEX orbital sander: The advantage of this type of machine is the possibility of combining rotation and eccentric movements. Thus, with the same machine, grinding, sanding and polishing operations can be carried out.


Random-orbit sander: These sanders move in elliptical fashion, and so no single bit of the abrasive material travels the same path twice. This random movement leads to a better finish, reducing the number of swirl marks that are left. Preferably, the sander should have a speed regulator and vacuum connection, and it should be possible to change the sanding plate.

The bigger the sander's orbit, the more material it will remove but the more scratches it will make. These bigger orbits are suitable for grinding, using a sanding disc of up to P120 or P180. When using grits of P240, P320, P400 etc., a sander with a smaller orbit of 2.5 to 4 mm (3/32" to 5/32") should be used.

A sander with a smaller orbit should also be used for dark colours so as to avoid too many scratches, since any imperfections due to bad sanding will be more easily visible on dark colours.

Polisher: For decorative purposes, KRION™ can be polished to achieve a glossy (polished) surface.

A fine-grit abrasive paste should be used to polish it (approx. 5000 to 11000 grit), applied with a random-orbit sander or, better still, with a polisher, since they are specially designed for this kindof work.

Preferably, polishers with a speed regulator should be used.

### 6.4.2. ABRASIVES

Different types of abrasive materials can be used to sand KRION™. The most common are aluminium oxide and silicon carbide grit on a paper backing. The sequence of grits that is used can differ, depending on the manufacturer. Never make a big jump from one size grit to another. There should never be a difference of more than 80 between the grit size of one sanding disc and the next. A typical sequence might be P80, P120, P180, P240, P320 and P400 for a matt finish.

There are other types of backing materials for medium or fine-grit abrasives.

Fibre-backed abrasive discs (like Scotch Brite): This kind of medium-grit disc will create a satin finish close to either a matt or gloss finish depending on the grit size. For instance, after sanding progressively up to P400 or P500, a surface can be finished off with an S800 fibre disc to achieve a satin (semi-gloss) appearance

Fabric and sponge-backed abrasive discs: With this kind of medium or fine-grit disc, a typical sequence would be S500, S1000, S2000, S3000 and S4000. The abrasive material on these discs comes on a flexible cotton or polyester fabric or sponge backing. The finer the abrasive, the shinier the finish. When working with fine abrasives, it is important to reduce the rpm of the sander to prevent the surface from getting too hot.

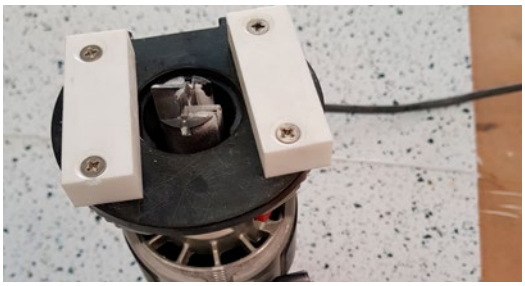
To achieve a high-gloss shine, polishing paste or cream is needed with a grit size of approximately 5000, 7000, 9000 and 11000. It should be applied using a wool or sponge buffing pad and a random-orbit sander or polisher. (Do not forget to reduce the speed of the machine when polishing).

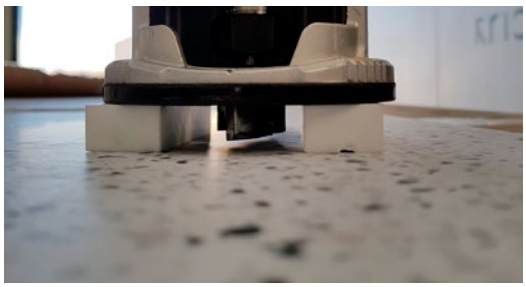
### 6.4.3. SANDING PROCESS

KRION™ sheets come with a 400-grit wet-sanded factory finish on the top surface protected with plastic film. The underside comes with more or less a 120-grit sanded finish (sanded continuously in one direction with a belt or automatic wide belt sander). To remove this effect, a random-orbit sander should always be used. This factory-supplied surface should not be left as it is when received. Take care not to exert too much pressure in case the sander or KRION™ surface gets too hot and the surface gets scratched or marked. The finer the sanding disc, the slower the sander should be. When a fine sanding disc is used at too high a speed, the surface can heat up too much and the finish become spoiled.

The first step is to grind any surplus adhesive along the joints and to sand the angles between bonded sheets. This should be done with a hard or semi-hard sanding plate and thick wool sanding pads.

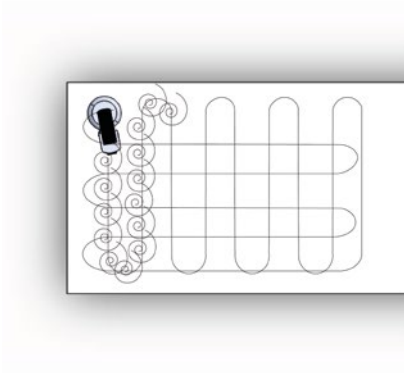
Bear in mind that this grinding stage can also be done with a small or medium-sized hand router and profile wheels. In this way, as shown in the following images. P180 grit sanding discs can be used to start the sanding process, without having to begin with bigger grits.





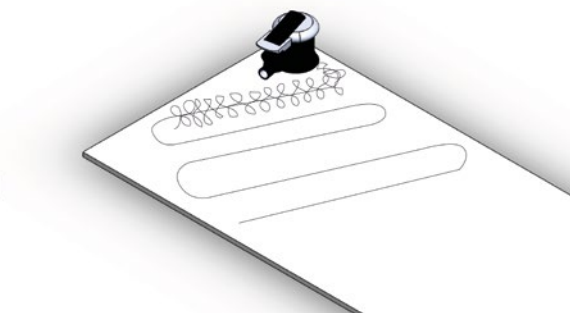
It is very important to vacuum and remove any residual dust during each of the sanding phases. Use sanders with vacuum connections or work in booths with extraction systems.

When sanding, work from top to bottom and left to right in small circular movements, overlapping the circles. (The surface should be sanded like this twice for each grit size). During each sanding phase, any marks or scratches made by the previous sanding disc should be removed. Take your time to sand the surface properly, thus ensuring good end results.



Remove any residual powder from the sander and KRION™ surface after each sanding phase.

When a fine-grit sanding disc is used to achieve a gloss finish, move the sander in random figure-of-eight shapes. This time, do not work from top to bottom or from left to right, but diagonally. Remember to reduce the speed of the sander to prevent the surface from getting too hot.



In the case of dark colours, it is advisable to wet sand the surface during the final stages with P400, P600, S800 or S1000 grit abrasives to ensure a finer finish. If you have to wet sand the surface, do not use electric tools - use pneumatic sanders.

When you sand, remember:

- Do not exert too much pressure on the sander. The amount of pressure should be uniform at all times.

- Remove any residual powder from the sander and KRION™ surface after each sanding phase.
- Work at a constant speed with each particular grit size.
- Reduce the speed when working with fine-grit abrasives.
- Replace worn sanding discs.
- Check the condition of the sander, its rotational stability, and the condition of the plate. (A worn plate or sander with mechanical problems will make marks on the surface).
- Use a hard or semi-hard plate for grinding the surface, and a soft or semi-soft plate for the finishing process.
- Once any unevenness on the surface and along the adhesive joint have been ground down, a better finish will be achieved by using a 3 mm or 4 mm (1/8" or 5/32") random orbit sander.
- Do not wet sand with an electric sander. If you have to wet sand, use pneumatic tools.
- Take your time so as to complete each of the sanding phases properly, thus avoiding any waste of time if the process has to be repeated.

See the following table for the approximate sequence of abrasives to use, depending on the colour and finish of the surface.

| SANDING AND FINISHING OFF KRION™ | | | | | |
|---|---|---|---|---|---|
| Type of finish | Pale colours | Dark colours | Type of finish | Pale colours | Dark colours |
| Matt | P120 | | Gloss | P120 | |
| | P180 | | | P180 | |
| | P240 | | | P240 | |
| | P320 | | | P320 | |
| Satin | P120 | P120 | | P320 | |
| | P180 | P180 | | P400 | |
| | P240 | P240 | | 500 sponge | |
| | P320 | P320 | | 1000 sponge | |
| | P400 | P400 | | 2000 sponge | |
| | 500 sponge or S800 fibre | 500 sponge | | | |
| | | 1000 sponge or S800 fibre | | 4000 sponge | |

### 6.4.4. THE APPROPRIATE FINISH FOR EACH COLOUR

KRION™ surfaces can be easily fabricated with tools typically used to work wood or other materials. Nonetheless, it is important to remember that this material is not scratchproof. In time, it will show signs of wear and tear, although the surface is easy for clients to clean and restore providing that it is treated right.

Clients might ask for a particular surface finish, but one should always be recommended in keeping with the end use of the fabricated KRION™ and its colour.

Signs of wear and tear are more visible on plain dark colours. That is why they are not suitable for work surfaces*, although they can be used for items of décor.

KRION™ colours can all be given any final finish: matt, satin (semi-gloss), gloss or high-gloss (polished). A matt finish is not recommended for plain dark colours, since it will not bring out the full intensity of the colour and stains will be more noticeable. These colours should be given a satin or gloss finish.

Work surfaces should be given a matt or satin finish because it makes everyday care of the surface much easier. Work surfaces  with a gloss or polished finish are more fragile and hard to care for. (Warn your clients and recommend a satin or matt finish).

The following table shows the recommended finishes for each KRION™ colour.

| TYPE OF SURFACE FINISHING | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Colour reference | Matt | Satin | Gloss | Colour reference | Matt | Satin | Gloss |
| 1100 Snow White EAST | ✓ | ✓ | ✓ | 0103 Day Nature | ✓ | ✓ | ✓ |
| 6101 Frost White | ✓ | ✓ | ✓ | 0501 Dune Nature | ✓ | ✓ | ✓ |
| 6402. Pillow Pink | ✓ | ✓ | ✓ | 0502 Camel Nature | ✓ | ✓ | ✓ |
| 6501 Cream | ✓ | ✓ | ✓ | 0503 Earth Nature | ✓ | ✓ | ✓ |
| 6502 Pearl | ✓ | ✓ | ✓ | 0504 Marfil Nature | ✓ | ✓ | ✓ |
| 6506 Greggio | ✓ | ✓ | ✓ | 0506 Taupe Nature | ✗ | ✓ | ✓ |
| 6509 Moai | ✓ | ✓ | ✓ | 0507 Ebano Nature | ✗ | ✓ | ✓ |
| 6703 Santorini Blue | ✓ | ✓ | ✓ | 0901 Grey Nature | ✓ | ✓ | ✓ |
| 6902 Light Grey | ✓ | ✓ | ✓ | 0902 Ash Nature | ✓ | ✓ | ✓ |
| 6903 Grey | ✓ | ✓ | ✓ | 0903 Night Nature | ✗ | ✓ | ✓ |
| 6908 Scommentto | ✓ | ✓ | ✓ | 0904 Pearl Nature | ✓ | ✓ | ✓ |
| 6909 Colosseo Grey | ✓ | ✓ | ✓ | 0905 Cosmos Nature | ✗ | ✓ | ✓ |
| 6201 Imperial Yellow | ✓ | ✓ | ✓ | 0906 Granite Nature | ✓ | ✓ | ✓ |
| 6301 Fruit | ✓ | ✓ | ✓ | 7103 White Star | ✗ | ✓ | ✓ |
| 6401 Red Fire | ✗ | ✓ | ✓ | 7502 Moai Star | ✗ | ✓ | ✓ |
| 6403 Candy | ✓ | ✓ | ✓ | 7701 Atlantic Blue Star | ✗ | ✓ | ✓ |
| 6405 Happy Red | ✓ | ✓ | ✓ | 7904 Black Star | ✗ | ✓ | ✓ |
| 6504 Mocha | ✓ | ✓ | ✓ | 7905 Grey Star | ✗ | ✓ | ✓ |
| 6505 Taupe | ✓ | ✓ | ✓ | 8101 Crystal White | ✓ | ✓ | ✓ |
| 6601 Fall Green | ✓ | ✓ | ✓ | 8103 Iceberg White | ✓ | ✓ | ✓ |
| 6602. Sage | ✓ | ✓ | ✓ | 8104 Calla White | ✓ | ✓ | ✓ |
| 6701 Blue Sky | ✓ | ✓ | ✓ | 8901 Crystal Black | ✗ | ✓ | ✓ |
| 6702 Atlantic Blue | ✗ | ✓ | ✓ | 8905 Blackness | ✗ | ✓ | ✓ |
| 6704 Navy Blue | ✗ | ✓ | ✓ | 8906. Crystal Grey | ✓ | ✓ | ✓ |
| 6705. Teal Blue | ✓ | ✓ | ✓ | A101 Asteoid White | ✓ | ✓ | ✓ |
| 6901 Black Metal | ✗ | ✓ | ✓ | A501 Asteroid Mocha | ✓ | ✓ | ✓ |
| 6904 Bright | ✓ | ✓ | ✓ | A503 Asteroid Dark | ✗ | ✓ | ✓ |
| 6905 Ash Grey | ✓ | ✓ | ✓ | A504 Asteroid Cream | ✓ | ✓ | ✓ |
| 6906 Dark Grey | ✓ | ✓ | ✓ | 9101 Cristal White + | ✓ | ✓ | ✓ |
| 4102 Extreme Light | ✓ | ✓ | ✓ | 9102 Polar Stone | ✓ | ✓ | ✓ |
| 4201 Yellow light | ✓ | ✓ | ✓ | 9103 Bright Rock | ✓ | ✓ | ✓ |
| 4401 Pink Light | ✓ | ✓ | ✓ | 9104 White Concrete | ✓ | ✓ | ✓ |
| 4601 Green Light | ✓ | ✓ | ✓ | 9105 Elegant White | ✓ | ✓ | ✓ |
| 4701 Blue light | ✓ | ✓ | ✓ | 9106 White Copper | ✓ | ✓ | ✓ |
| 0101 White Nature | ✓ | ✓ | ✓ | 9505 Cream Concrete | ✓ | ✓ | ✓ |
| 0102 Clear Nature | ✓ | ✓ | ✓ | 9507 Taupe Concrete | ✗ | ✓ | ✓ |

| TYPE OF SURFACE FINISHING | | | | | | | |
|---|---|---|---|---|---|---|---|
| Colour reference | Matt | Satin | Gloss | Colour reference | Matt | Satin | Gloss |
| 9509. Dark Copper | ✗ | ✓ | ✓ | L103. Snow Fall | ✓ | ✓ | ✓ |
| 9903 Deep Granite | ✓ | ✓ | ✓ | L105. Carrara Dark | ✓ | ✓ | ✓ |
| 9904 Bright Concrete | ✓ | ✓ | ✓ | L501 Pompei | ✓ | ✓ | ✓ |
| 9905 Elegant Black | ✗ | ✓ | ✓ | L903. Grey Cement | ✗ | ✓ | ✓ |
| 9906 Black Mirror XL | ✗ | ✓ | ✓ | L904. Messina | ✓ | ✓ | ✓ |
| 9908. Black Gold | ✗ | ✓ | ✓ | L905. Etna | ✗ | ✓ | ✓ |
| T101. Bianco Classico | ✓ | ✓ | ✓ | V101. Bianco Opera | ✓ | ✓ | ✓ |
| T102. Marmo Bianco | ✓ | ✓ | ✓ | V501. Noce Atrio | ✓ | ✓ | ✓ |
| T103. Antico Bianco | ✓ | ✓ | ✓ | V901. Nero Palazzo | ✗ | ✓ | ✓ |
| T104. Vetro | ✓ | ✓ | ✓ | P101 Opale Bianco | ✓ | ✓ | ✓ |
| T902. Pietra | ✓ | ✓ | ✓ | P601 Opale Verde | ✓ | ✓ | ✓ |
| T903. Concrete | ✓ | ✓ | ✓ | P701 Opale Blue | ✓ | ✓ | ✓ |
| T904. Grigio Classico | ✓ | ✓ | ✓ | P901 Opale Grigio | ✓ | ✓ | ✓ |
| T905. Grafite Classico | ✓ | ✓ | ✓ | M101. Luce | ✓ | ✓ | ✓ |
| L101. Carrara Soft | ✓ | ✓ | ✓ | M901. Grigio | ✓ | ✓ | ✓ |
| L102 Nacar | ✓ | ✓ | ✓ | M902. Amaro | ✗ | ✓ | ✓ |

KRION
PORCELANOSA Grupo

# Transformation techniques

## Sandblasting

06.5

## 6.5. SANDBLASTING

The new finish gives the KRION™ sheets an appearance very similar to natural stone, without any of the latter's drawbacks such as its weight or high porosity.

The treatment used to achieve this finish is known as "sandblasting". It consists of spraying a specific type of abrasive onto the KRION™ surface until the right finish has been created.

### 6.5.1. MACHINERY

To achieve this finish, different types of automatic or manual sandblasting machinery can be used. KRION™ recommends an automatic sandblasting machine because the finish will always be a uniform one, not dependent on the human hand. With automatic machinery, the same pressure and speed can be guaranteed, leading to optimum results.

Here is an example of a sandblasting machine:


This is a fully automatic sandblasting machine, where spray guns' speed and pressure, the conveyor belt feed speed and feed distance, and the spraying distance can all be controlled.

- SPRAY GUN SPEED: The speed at which the guns travel vertically up and down as they spray the abrasive.
- Spray gun pressure: The pressure of the compressed air used to spray the abrasive from the guns. This pressure can range from 1 to 6 bars.
- CONVEYOR BELT FEED SPEED: The speed at which the KRION™ sheet advances on the conveyor belt. Note that while the spray guns are in motion, spraying the abrasive, the sheet is stationary.
- CONVEYOR BELT FEED DISTANCE: This is the distance that the KRION™ sheet moves between passes during the sandblasting process.
- Spraying distance: This is the distance between the mouth of the spray guns and the KRION™ sheet. This distance can be slightly regulated but it is advisable not to change it.

If a hand sandblasting machine is used, a uniform finish across the entire surface of the KRION™ sheet cannot be guaranteed.

### 6.5.2. ABRASIVES

One of the most important factors in achieving the right finish is the type of abrasive that is used. Abrasives can be made of differing materials, such as:

- Glass micro beads
- White corundum
- Brown corundum
- Plastic blast media
- Ceramic shot or beads
- Agricultural abrasives
- Aluminium silicate
- Steel shot
- Stainless steel shot

White corundum is used by Krion to create its standard finishes, although any abrasive can be used if the end result sought by the client is achieved.

Each type of abrasive has different grit sizes, and so there are many possible combinations of abrasives and grit sizes.

The following table shows the grit sizes of the abrasive used by Krion, and the abrasive's chemical composition and main characteristics.

| WHITE ALUMINIUM OXIDE (WHITE CORUNDUM) | | | | |
|---|---|---|---|---|
| Particle size | | Chemical composition | | Characteristics |
| FEPA grit size | mm. | $Al_2O_3$ | 99,70 % | Hardness: 9 Mohs |
| 14 | 1,18 - 1,70 | $SiO_2$ | 0,03 % | Colour: White |
| 24 | 0,6 - 0,85 | $Fe_2O_3$ | 0,01 % | Density: 3,9 g/cm³ |
| 36 | 0,425 - 0,6 | $TiO_2$ | 0,01 % | Shape: angular |
| 46 | 0,30 - 0,425 | $Na_2O$ | 0,2 % | |
| 54 | 0,25 - 0,355 | Ca+MgO | 0,04 % | |
| 60 | 0,212 - 0,30 | | | |
| 80 | 0,15 - 0,212 | | | |
| 100 | 0,106 - 0,15 | | | |
| 120 | 0,09 - 0,125 | | | |
| 150 | 0,063 - 0,106 | | | |
| 180 | 0,063 - 0,09 | | | |
| 220 | 0,053 - 0,075 | | | |

### 6.5.3. STANDARD FINISHES

After assessing the chosen abrasive's range of grit sizes, Krion opted for 3 specific grit sizes to make its standard finishes. These finishes are called Sabbiato Sottile, Sabbiato Sereno, and Sabbiato Intenso, ranging from a subtler finish to a more pronounced one, as their names indicate.

These finishes are achieved by spraying a different grit size in each case. These are the grit sizes that are used:

- Sabbiato Sottile, FEPA grit size 100.
- Sabbiato Sereno, FEPA grit size 24.
- Sabbiato Intenso, FEPA grit size 14.

### 6.5.4. SANDBLASTING PROCESS

Outlined below is the process used by Krion to create the aforementioned finishes. If a different method is used, there might be variations in the end finish which may not be to the client's liking.

As mentioned above, the machine used for this process is an automatic one, and it sprays a constant continued amount of abrasive onto the surface to be treated.

Numerous tests were conducted by Krion to find the right parameters for each finish. These parameters might vary slightly depending on the colour or amount to be sandblasted etc.

The slower the feed speed, the better the finish, but the longer it will take. Time is a key factor in any production process and so it is always important to try and work at the fastest speed that still allows for optimum results.

#### SABBIATO SOTTILE

The parameters to enter in the sandblasting machine are:
- Air pressure: 6 bars
- Spray gun speed: Maximum
- Conveyor belt feed speed: Maximum
- Conveyor belt feed distance: 15 mm (5/8")

With these parameters, a 1m$^2$ KRION™ sheet was sandblasted in 5 mins 12 seconds.

#### SABBIATO SERENO

The parameters to enter in the sandblasting machine are:
- Air pressure: 6 bars
- Spray gun speed: 150 mm/s
- Conveyor belt feed speed: Maximum
- Conveyor belt feed distance: 20 mm (25/32")

With these parameters, a 1m$^2$ KRION™ sheet was sandblasted in7 mins y 52 seconds.

#### SABBIATO INTENSO

The parameters to enter in the sandblasting machine are:
- Air pressure: 6 bars
- Spray gun speed: 75 mm/s
- Conveyor belt feed speed: Maximum
- Conveyor belt feed distance: 20 mm (25/32")

With these parameters, a 1m$^2$ KRION™ sheet was sandblasted in 18 mins y 47 seconds.

Do not handle the sandblasted surface until the easy-clean treatment has been applied, because any mark on the surface will be permanently visible after the final treatment.

### 6.5.5. EASY-CLEAN TREATMENT

Dirt sticks to sandblasted surfaces more easily than it does to the standard KRION™ finish, because the abrasive makes tiny imperfections on the surface.

To prevent dirt and stains from building up, the sandblasted surface should be treated afterwards.

This treatment can be applied in several different ways. The most common way is with a spray gun. Care should be taken to apply the treatment as uniformly as possible, with no areas with excess amounts.

There are two different easy-clean finishes: a glossy and a natural one. Numerous tests were conducted in the laboratories at Krion to find the best possible treatment, and finally one by the manufacturer RENNER was chosen. Outlined below are the proportions in which the products should be mixed, as indicated by the manufacturer. If products by this manufacturer are not used, these proportions will not apply.

For the Natural finish, the following mix should be made:

- JO-03M077 lacquer.
- FC-M070 catalyst.
- DF-E150 solvent.

For every 1000 grams of lacquer, 30% of the catalyst and 30-40% of the solvent should be added.

For the Glossy finish, the following mix should be made:

- JO-80M070 lacquer.
- FC-M070 catalyst.
- DF-E150 solvent.

For every 1000 grams of lacquer, 30% of the catalyst and 30-40% of the solvent should be added.

Mix the products together well and pour the liquid into a compressed-air spray gun to apply it. It is better to filter the liquid first, using filter paper, to remove any solids that might obstruct the spray gun or be deposited on the surface of the sheet.

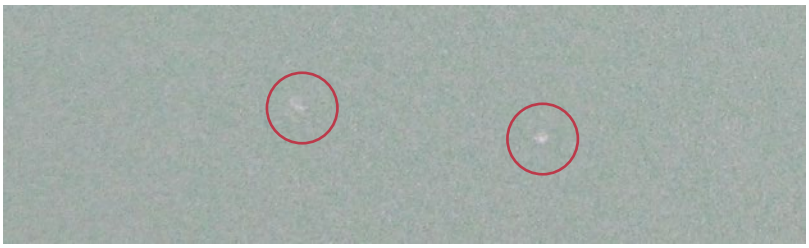
To apply the treatment, make several passes across the surface of the sheet, so that each pass overlaps half the previous one. Spray beyond each end of the sheet so that no area is left untreated. The first passes should be made horizontally, followed by vertical ones. Always use a suction booth and the necessary personal protective equipment (gloves and a mask).

### 6.5.6. POSSIBLE APPLICATION DEFECTS

During the sandblasting process, certain problems might lead to flaws in the sandblasted surface. Here are a few examples:

Whenever the type of abrasive in the sandblasting machine is changed, it is vital to clean the machinery thoroughly. If a change-over is made to a finer abrasive but some thicker remains are left, thicker marks might be perceptible on the surface finish.

In the following image, thicker marks can be seen on a surface sandblasted with a fine abrasive. This is because the sanding machine was not properly cleaned and some thicker remains got mixed in with the new abrasive.

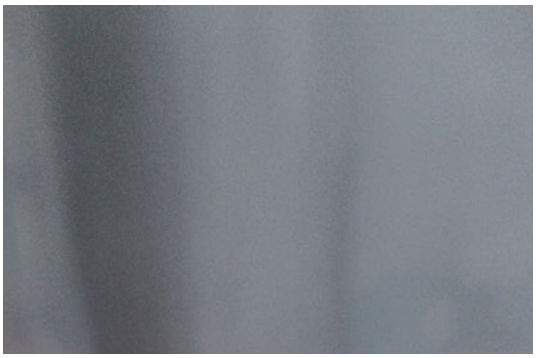


When the sheets come out of the sandblasting machine, the cabinet has a protective seal to prevent any abrasive from being sprayed outside it. In this case, it is made of black rubber. This can leave a mark, like the one shown in the photo. Every time the sheet moves forward, a rubber mark is left on the surface. Normally this mark will disappear if compressed air is blown onto the surface.

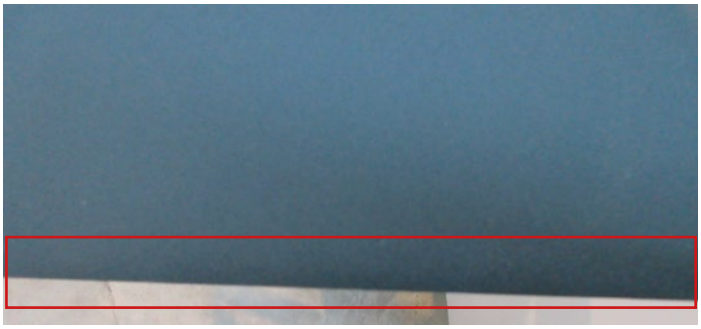
A sheet might sometimes emerge with a finish like the one shown in the photo below. This is because the spray guns stopped working properly at a certain point. This might be for one of two reasons:

Make sure the feeding tubes are properly connected to the abrasive dispenser so that it works properly, with a continuous flow of abrasive.

Check whether there is enough abrasive in the abrasive dispenser to apply the finish as required.



During the sandblasting process, to prevent strips from being left unsandblasted, an extra margin must be added to the dimensions of the KRION™ sheet when this data is entered in the machine. Add an extra 3 cm or more to the height and width so that all the edges are properly sandblasted.



### 6.5.7. RECOMMENDATIONS

Here are several tips to ensure an optimum sandblasted finish:

- Enter the correct parameters in the sandblasting machine so as to ensure optimum results.
- The sandblasting machine must be cleaned on a daily basis.
- Empty the tank of the suction unit every day.
- Clean the suction filter regularly.
- Keep the abrasives in a dry place to prevent clumps from forming which would affect the finish.
- Be careful not to mark the KRION™ when it is handled after sandblasting.
- When the machine is in operation, check the level of the abrasive in the dispenser from time to time.
- Make sure that the abrasive is properly recirculated by the machine. Check that large amounts of abrasive are being suctioned by the cyclone collector from the bottom of the cabinet.
- When there is a change-over in the type of abrasive used in the machine, make sure that no traces of the former abrasive remain,particularly when it is changed to one with a finer grit.
- Under no circumstances should the machine's protective mechanisms be turned off or removed.
- Use all necessary PPE during the sandblasting work and, in particular, when the easy-clean treatment is applied.
- Adjust the feeding tubes to ensure a continuous flow of abrasive.

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# Transformation techniques

# Thermoforming

06.6

## 6.6.THERMOFORMING

Thermoforming is a process in which, after heating the KRION™ to a certain temperature for a given length of time, it becomes bendable and can be used to make curved shapes

There is certain industrial machinery for undertaking this type of heating, which reaches the appropriate temperature for moulding the material. On the market there are two types of ovens which heat the material, through recirculation of air or heating by plates (two heating plates or one). The idea is to place the pieces or sheets inside the oven so that after heating for a certain time at a certain temperature it is possible to apply force to them to shape them. The force is usually exerted using a membrane press for 2D forms, and a hydraulic press for 3D forms. This machinery is shown below.



### 6.6.1. HEATING PROCESS – TEMPERATURE & TIME

**IMPORTANT**

Do not forget to remove the protective film before heating the sheet. Sand the sheet to obtain a matt finish before heating it. This will help to prevent the sheet from turning white or breaking. Sand all the edges and corners of the sheet to prevent it from cracking or cutting the vacuum membrane.

For the heating process, the temperature and time must be very carefully controlled. Remember that differences in time or temperature can lead to sheets of a different shade or patches that have not been uniformly heated. Thus to heat the sheets, always use ovens that ensure a stable uniform temperature across the whole surface during the entire heating time. Never use heating methods that are unable to guarantee a uniform heat or cannot monitor whether a stable constant temperature is being applied.

The whole sheet must be the same temperature throughout. If the temperature differs or is insufficient in some areas, the KRION™ might break when it is bent. The temperature to which the KRION™ sheet must be heated will depend on the complexity of the intended design. This temperature will range between 130ºC (260ºF) and 160ºC (320ºF).

A simple design with very big radii can be thermally bent at just 130ºC (260ºF). For smaller sharper radius, higher temperatures of around 160ºC (320ºF) will be needed. The required heating time is that needed for the whole surface and thickness of the sheet to reach the programmed temperature. This can rangebetween 10 and 40 minutes, depending on the thickness of the sheet and the type of oven that is used.

The following table shows the temperature/time ratio according to the thickness and kind of oven to be used.

| HEATING TIME BY THICKNESS | | |
|---|---|---|
| Thickness of sheet | Heating time (convector oven or oven with double-sided heating plates) | Heating time (oven with single-sided heating plate) |
| 3 mm (1/8") | aprox. 9 min | aprox. 12 min |
| 6 mm (1/4") | aprox. 16 min | aprox. 20 min |
| 9 mm (3/8") | aprox. 19 min | aprox. 25 min |
| 12 mm (1/2") | aprox. 22 min | aprox. 30 min |
| 19 mm (3/4") | aprox. 29 min | aprox. 40 min |

Heating rule for KRION™ sheets:

Take a minimum heating time of 10 minutes and add 1 additional minute for each mm of the sheet's thickness. This is the rule for electric ovens with double-sided heating plates or convector ovens. If you use an oven with a single-sided heating plate, add a few more minutes.

The sheets to be thermoformed and any straight sheets that will be adjacent to them should be heated in the same way.

It is recommended not to accelerate the heating of the sheet, as it is a useless process. The heating time of the sheet must never be altered; the temperature may be, but never the time, as the transfer of the temperature from one face of the sheet to the other always takes the same amount of time.

Forced cooling of the sheets could affect their resistance, making them more fragile. Leave the thermoformed KRION™ to cool to at least 60ºC (140ºF) before taking it out of the mould.

### 6.6.2. THERMOFORMING KRION™ LIGHT AND OPALE

KRION™ Light and Opale sheets should be heated to the same temperature for the same amount of time. Differences in the way the sheets are heated may lead to differences in their translucence, and this will be visible when the surface is backlit.

If a straight sheet has to be bonded to a hot thermoformed one, the straight sheet must also be heated to ensure that it has the same degree of translucence as the curved one.

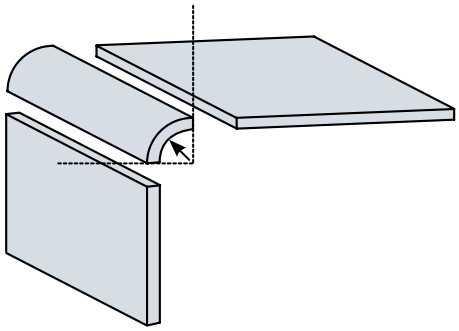
If the recommended radii of curvature are exceeded, there could be big changes in colour and translucence. If the mould does not have a sufficiently smooth finish, this unevenness will be transferred to the thermoformed shape and it will be visible when backlit. To remove this unevenness, sand the KRION™ once thermoformed.

### 6.6.3. MINIMUM RECOMMENDED RADIUS

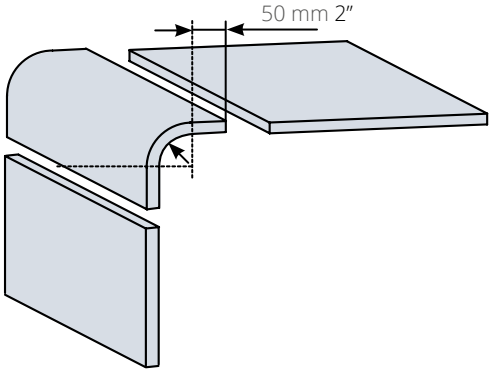
The KRION™ colour catalogue has over one hundred different colours, all with the same composition, but each with a particular additive which will give them certain transformation possibilities. When thermoforming a certain tone or colour, it must be taken into account that due to their additives, they may have a different thermoforming process than white. Below is a table indicating the capacity for thermoforming of each one of the different KRION™ colours. It is important to highlight that each year colours are discontinued and new ones are added, therefore a certain attention must be paid to the annual updates of technical notes.

Avoid just using the area of the radius. Always cut the thermoformed piece 5 cm (2") away from the area of the radius.

## WRONG



## RIGHT




The radii shown in the following tables are the minimum internal ones for thermoforming each colour.

They have been tested until a visible change in colour close to the radius was observed or until the material broke.

The radius shown in the following tables are the inside radius of the curve in mm.

| Maximum temperature | Sheet thickness | Heating time | Oven type |
|---|---|---|---|
| 160ºC (320ºF) | 12 mm (1/2") | 22 min. | 2 plate oven |
| | | 32 min. | conventional oven 1 hot plate |

| Ref. Colour | Minimum internal radius | Ref. Colour | Minimum internal radius | Ref. Colour | Minimum internal radius |
|---|---|---|---|---|---|
| 1100 Snow White EAST | 20 (13/16") | 0102 Clear Nature | 70 (2 12/16") | 9505 Cream Concrete | 90 (3 9/16") |
| 6101 Frost White | 40 (1 9/16") | 0103 Day Nature | 20 (13/16") | 9507 Taupe Concrete | 90 (3 9/16") |
| 6402. Pillow Pink | 50 (1 15/16") | 0501 Dune Nature | 50 (1 15/16") | 9509. Dark Copper | 180 (7 3/32") |
| 6501 Cream | 80 (3 2/16") | 0502 Camel Nature | 90 (3 9/16") | 9903 Deep Granite | > 300 (11 13/16") |
| 6502 Pearl | 40 (1 9/16") | 0503 Earth Nature | 50 (1 15/16") | 9904 Bright Concrete | 90 (3 9/16") |
| 6506 Greggio | 50 (1 15/16") | 0504 Marfil Nature | 50 (1 15/16") | 9905 Elegant Black | 300 (11 13/16") |
| 6509 Moai | 40 (1 9/16") | 0506 Taupe Nature | 60 (2 6/16") | 9906 Black Mirror XL | 220 (8 11/16") |
| 6703 Santorini Blue | 40 (1 9/16") | 0507 Ebano Nature | 50 (1 15/16") | 9908. Black Gold | 140 (5 9/16) |
| 6902 Light Grey | 30 (1 3/16") | 0901 Grey Nature | 90 (3 9/16") | T101. Bianco Classico | > 300 (11 13/16") |
| 6903 Grey | 50 (1 15/16") | 0902 Ash Nature | 90 (3 9/16") | T102. Marmo Bianco | 200 (7 7/8") |
| 6908 Scommentto | 40 (1 9/16") | 0903 Night Nature | 40 (1 9/16") | T103. Antico Bianco | > 300 (11 13/16") |
| 6909 Colosseo Grey | 50 (1 15/16") | 0904 Pearl Nature | 50 (1 15/16") | T104. Vetro | > 300 (11 13/16") |
| 6201 Imperial Yellow | 80 (3 2/16") | 0905 Cosmos Nature | 70 (2 12/16") | T902. Pietra | 300 (11 13/16") |
| 6301 Fruit | 70 (2 12/16") | 0906 Granite Nature | 50 (1 15/16") | T903. Concrete | 200 (7 7/8") |
| 6401 Red Fire | 70 (2 12/16") | 7103 White Star | 60 (2 6/16") | T904. Grigio Classico | 280 1(11/32) |

| Ref. Colour | Minimum internal radius | Ref. Colour | Minimum internal radius | Ref. Colour | Minimum internal radius |
|---|---|---|---|---|---|
| 6403 Candy | 40 (1 9/16") | 7502 Moai Star | 50 (1 15/16") | T905. Grafite Classico | 300 (11 13/16") |
| 6405 Happy Red | 50 (1 15/16") | 7701 Atlantic Blue Star | 70 (2 12/16") | V101. Bianco Opera | 70 (2 12/16") |
| 6504 Mocha | 50 (1 15/16") | 7904 Black Star | 50 (1 15/16") | V501. Noce Atrio | > 300 (11 13/16") |
| 6505 Taupe | 50 (1 15/16") | 7905 Grey Star | 80 (3 2/16") | V901. Nero Palazzo | > 300 (11 13/16") |
| 6601 Fall Green | 70 (2 12/16") | 8101 Crystal White | > 300 (11 13/16") | P101 Opale Bianco | 50 (1 15/16") |
| 6602. Sage | 50 (1 15/16") | 8103 Iceberg White | 80 (3 2/16") | P601 Opale Verde | 50 (1 15/16") |
| 6701 Blue Sky | 60 (2 6/16") | 8104 Calla White | 60 (2 6/16") | P701 Opale Blue | 50 (1 15/16") |
| 6702 Atlantic Blue | 70 (2 12/16") | 8901 Crystal Black | > 300 (11 13/16") | P901 Opale Grigio | 50 (1 15/16") |
| 6704 Navy Blue | 80 (3 2/16") | 8905 Blackness | > 300 (11 13/16") | M101. Luce | 80 (3 2/16") |
| 6705. Teal Blue | 50 (1 15/16") | 8906. Crystal Grey | 260 (10 1/4") | M901. Grigio | 70 (2 12/16") |
| 6901 Black Metal | 70 (2 12/16") | A101 Asteoid White | 220 (8 11/16") | M902. Amaro | 200 (7 7/8") |
| 6904 Bright | 50 (1 15/16") | A501 Asteroid Mocha | 110 (4 5/16") | | |
| 6905 Ash Grey | 90 (3 9/16") | A503 Asteroid Dark | 110 (4 5/16") | | |
| 6906 Dark Grey | 50 (1 15/16") | A504 Asteroid Cream | 120 (4 3/4") | | |
| 4102 Extreme Light | 50 (1 15/16") | 9101 Cristal White + | > 300 (11 13/16") | | |
| 4201 Yellow light | 90 (3 9/16") | 9102 Polar Stone | > 300 (11 13/16") | | |
| 4401 Pink Light | 70 (2 12/16") | 9103 Bright Rock | > 300 (11 13/16") | | |
| 4601 Green Light | 90 (3 9/16") | 9104 White Concrete | 70 (2 12/16") | | |
| 4701 Blue light | 90 (3 9/16") | 9105 Elegant White | 80 (3 2/16") | | |
| 0101 White Nature | 50 (1 15/16") | 9106 White Copper | 90 (3 9/16") | | |

| Ref. Colour | Thickness of sheet | Heating time | Minimum bending radius | Maximum temperature |
|---|---|---|---|---|
| L101. Carrara Soft | 12 mm | 22 minutes (2 plate oven) 32 min. (conventional oven 1 hot plate) | 200 mm (8 11/16") | 140ºC (284ºF) - 160ºC (320ºF) |
| L102. Nacar | | | 200 mm (8 11/16") | |
| L103. Snow Fall | | | 200 mm (8 11/16") | |
| L105. Carrara Dark | | | 50 mm (1 15/16") | |
| L505. Beige Marfil | | | 200 mm (8 11/16") | |
| L903. Grey Cement | | | 240 mm (9 7/16") | |
| L904. Messina | | | 120 mm (4 3/4") | |
| L905. Etna | | | 60 mm (2 6/16") | |
| L501. Pompei | | 15 min. | 200 mm (8 11/16") | 130ºC / 266ºF |

| Ref. Colour | Thickness of sheet | Heating time | Minimum bending radius | Maximum temperature |
|---|---|---|---|---|
| L101. Carrara Soft | 6 mm (1/4") | 22 minutes (2 plate oven) 32 min. (conventional oven 1 hot plate) | 20 mm (13/16") | 140ºC (284ºF) |
| L102. Nacar | | | 20 mm (13/16") | |
| L103. Snow Fall | | | 40 mm (1 9/16") | |
| L105. Carrara Dark | | | 30 mm (3/16") | |
| L505. Beige Marfil | | | 20 mm (13/16") | |
| L903. Grey Cement | | | 100 mm (3 15/16") | |

(*) Important in the case of the LUXURY series.

Heat the sheets to be thermally bent and any adjacent KRION™ in the same way. There is a limit to the minimum radii that can be thermally bent with this series, since the sheets contain a multitude

of chips of different sizes which might end up by jutting out or coming loose from the surface of the radius.

Heating temperatures of 140ºC (284ºF) to 160ºC (320ºF) will be required, depending on the radius, with the exception of Pompei, which should not be heated beyond 130ºC (266ºF). When heating the sheets, monitor the temperature so as not to go above the maximum indicated temperature.

The results obtained are indicative. Carry out tests before any project.

### 6.6.4. MISTAKES WHEN THERMOFORMING

Certain errors usually made when making thermoformed pieces are listed below.

- Too much heat

Check the temperature tables and heating times. If overheated, the KRION™ might burn and blister.

- Too little heat

See the tables. The sheets may not bend properly and instead break.

- Bending the sheet too fast

It might break, turn white or wrinkle.

- Non-uniform heat

The sheet might break.

- Badly made moulds

There might be wrinkles in the KRION™.

- Not leaving a draft angle

It might be impossible to remove the thermoformed KRION™ from the mould once cool. Leave a draft angle of at least 5º so as to be able to remove it easily.

- Too much mechanical pressure on the surface to be heated

There might be a slight change in the colour of the sheet.

- Sharp-edged moulds

Puede romper la pieza de KRION™ y/o la membrana de la prensa.

- KRION™ sheets with sharp edges

Smooth the edges slightly with a sanding block.

- Too sharp a bend

The KRION™ did not assume the shape of the mould and could not be properly formed. If the material is forced, it will break and/or turn white.

- Stretched KRION™

Maximum it can be stretched before breaking: 25%.
Maximum it can be stretched before turning white: 10%.

- Moulds with a rough finish

The KRION™ will have wrinkles on the surface.

- Mould not lubricated (with talcum powder)

The KRION™ might not assume the shape of the mould because it has no leeway to move. When it cools, it may be hard to remove from the mould.

- Removing the KRION™ from the mould before it cools

If it is still hot, it may bend to form the wrong shape if left outside the mould.

- Removing the KRION™ from the mould before it cools

Only the surface will be heated and it will break when bent.

- Non-uniform heat

The sheet may break because parts of it have not reached the right temperature.

- Badly positioned membrane

The KRION™ will not assume the shape of the mould, leading to flawed items.

- KRION™ that is too thick

It will be impossible to achieve the required radius.

- KRION™ sheets bonded with adhesive

The pressure will break the seal. The heat may affect the quality of the bond.

- A badly positioned mould and/or KRION™ in the press

Wrong use of pressure.
The KRION™ does not assume the shape of the mould.

- Failure to use male and female moulds

The KRION™ might not assume the shape of the mould.
The KRION™ does not bend properly.

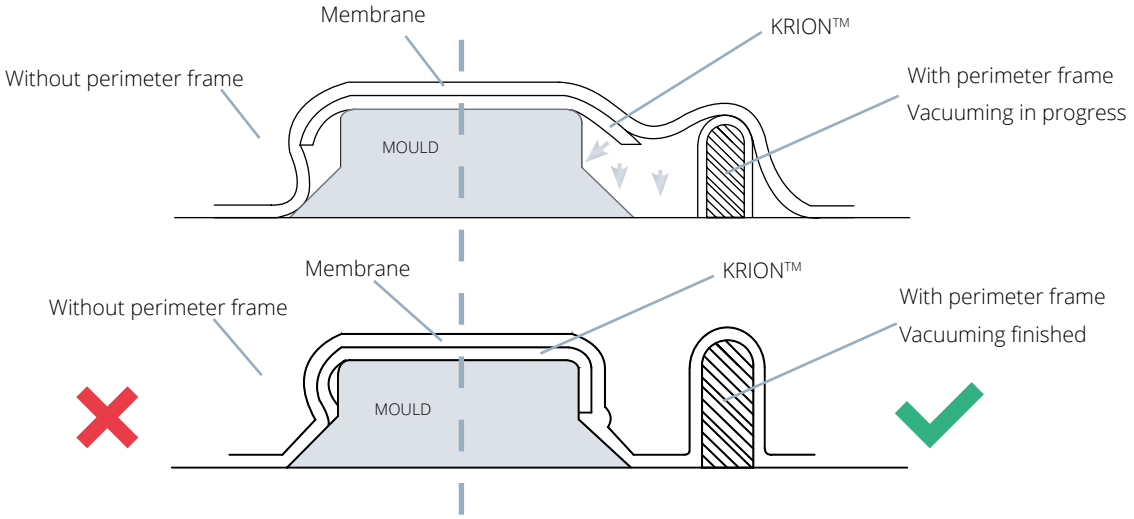
### 6.6.5. THERMOFORMING PROBLEMS

After thermoforming, pieces may be obtained which do not fulfil prior expectations. Review the table below to see whether any of these problems have arisen.

| Problem | Reason |
|---|---|
| Whitening | - KRION™ over stretched.<br>- KRION™ bent too much.<br>- Wrongly heated. |
| Blisters and bubbles | - Too hot.<br>- Heated too fast |
| A sheet with burns or changes of colour | - Too hot or too much mechanical pressure during heating.<br>- Mould with rough surface. |
| Breaks | - Too sharp a radius was used to bend it.<br>- Temperature not hot enough.<br>- Mould with sharp edges.<br>- KRION™ sheet with sharp edges. |
| Cracks | - Too sharp a radius was used to bend it.<br>- Temperature not hot enough.<br>- Mould with sharp edges.<br>- KRION™ sheet with sharp edges.<br>- Mould with too pronounced shapes. |
| Wrinkles | - Surface of mould not smooth enough.<br>- Too much heat. |
| Impossible to remove from mould | - Leave a draft angle of at least 5º to remove the item from the mould once cool (when hot, it will be bigger in volume, but when it cools, it will contract). |
| The KRION™ cannot be bent to the right radius | - See the table with radius.<br>- Heat to the stipulated temperature.<br>- Use male and female moulds.<br>- Adjust by hand before positioning the membrane.<br>- Reduce the bending speed. |
| The KRION™ does not assume the shape of the mould | - Check that the radius is possible.<br>- Male and female moulds must be made.<br>- Adjust by hand before positioning the membrane. |
| The membrane breaks | - Mould with corners.<br>- KRION™ with sharp corners or edges.<br>- Temperature too high.<br>- Membrane not elastic enough for the shape or height of mould/item to be thermoformed. |

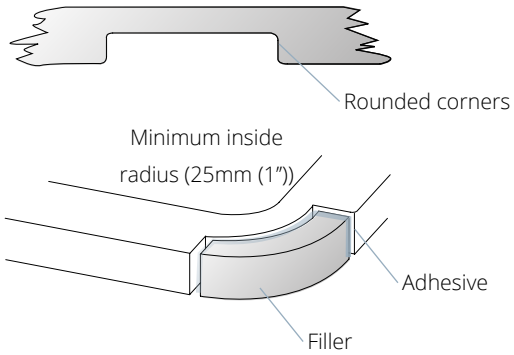
### 6.6.6. PERIMETER FRAME (VACUUM MEMBRANE)

This system ensures that the vacuum membrane fits snugly from top to bottom. The bottom drawings show the different between the side with a perimeter frame and the side without.

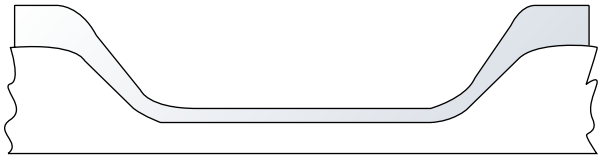



### 6.6.7. VACUUM FORMING IN ORDER TO ACHIEVE SMALLER RADIUS

By vacuum forming the material so as to reduce the thickness of the KRION™ sheet, sharper radii of curvature will be possible:




If you wish to achieve very pronounced radii with large thicknesses, it is recommended to carry out a reduction, thermoform, then carry out a filling to give the original thickness and return the previous resistance. It is recommended to carry out a test first.



### 6.6.8. THERMAL BENDING MOULDS

As previously mentioned, moulds are necessary for obtaining forms when the material is heated. An important factor when creating them is selecting the most suitable material based on the needs of the client.

If you have a vacuum membrane, this same membrane will act as a female mould (providing that the shape to be thermoformed is not too complex):

- It is always advisable to use male and female moulds, even in a membrane press.
- They should be solid and resistant to prevent them from becoming deformed. The material used to make the mould should also have a certain porosity, such as MDF or high-density polyurethane. This is essential when working with vacuum membranes.
- A vacuum membrane may have to exert pressures of close to 10 tons. With hydraulic presses, pressures of over 20 tons can be achieved.

There are three main materials for producing moulds: MDF, polyurethane foam and aluminium. The advantages and disadvantages of each will be discussed below.

MDF
Medium-density fibreboard used to create one-off pieces; that is, for tests or samples. Creating a mould from this material for a high rotation of pieces may lead to imperfections in the final piece and the alteration of the mould due to wear from pressure. Additionally, for large pieces, this material will make the mould very heavy and will not facilitate its transport or handling.

ALUMINIUM
A material which, although prepared to support wear from pressing, has other disadvantages such as cost, weight, and also reaching extreme temperatures which may affect the sheet once it comes out of the oven.

POLYURETHANE FOAM
Of the three materials, this is most suitable for creating several runs of thermoformed pieces. Additionally, it is a light, cheap material which is easy to work with, and it can be found in different densities, an important factor when helping casting carried out by the membrane press.

### 6.6.9. MANUAL OVENS

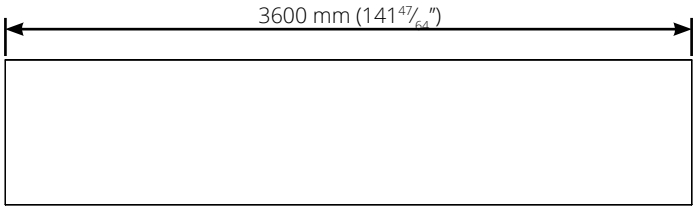
On many occasions there are fabricators who cannot afford the cost or investment of acquiring an industrial oven and press, certified by manufacturers, therefore obligated to use domestic ovens or ovens they have made themselves.

Small pieces of KRION™ can be heated in this type of oven provided that temperature can be measured reliably, and that heating is constant and uniform. In the case of not having a thermostat which shows the real temperature of the oven, it is recommended to use a laser thermometer which is able to measure the temperature of the sheet.

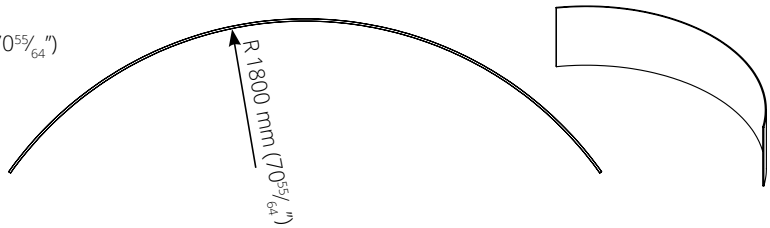
## 6.6.10. RADIUS OF CURVATURE OF THE KRION™ SHEET IF COLD BENT

Thanks to its high bending strength, KRION™ can be cold-bent to create gentle curved shapes, without having to heat the material. Depending on the thickness of the sheets, the minimum radii are:

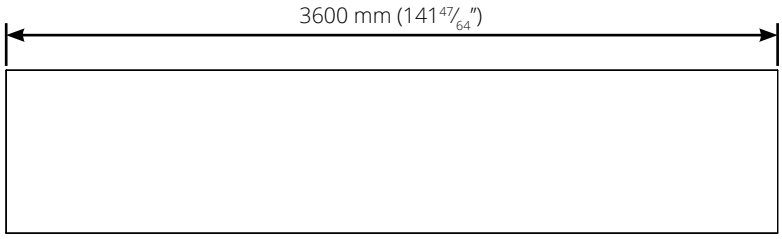
Thickness of sheet: 12 mm (1/2")
Length of sheet: 3600 mm (141 47/64")



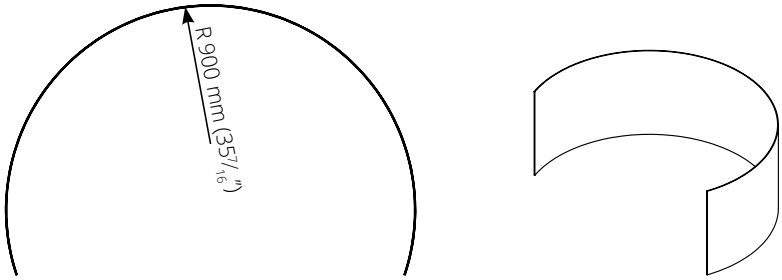

Radius of curvature: 1800 mm (70 55/64")




Thickness of sheet: 6 mm (1/4")
Length of sheet: 3600 mm (141 47/64")




Radius of curvature: 900 mm (35 7/16")



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# Transformation techniques

## Drilling and screwing

06.7

## 6.7. DRILLING AND SCREWING

If it is necessary to mechanically attach KRION™ with another material (steel, wood, etc.), this can be done in two different ways: drilling directly or through insertion of inserts.

### 6.7.1. INSERTS

There are different inserts on the market, each with different characteristics, but Krion recommends the use of expansion inserts. The idea is to machine a hole in the material in advance, with its corresponding tolerances, to insert it in the material by pressure.

These are mechanical anchoring inserts suitable for all types of materials, which provide great tensile strength. Its quick and easy installation by pressure and without the need for adhesive or special tools greatly reduces the costs and installation times of projects. Depending on the thickness of the sheet that will be used in the project, an insert with one set of dimensions or another may be introduced. Inserts may only be used in thicknesses of 9 mm (3/8") or greater; in sheets of smaller dimensions the material would be weakened and would not be functional.

As previously mentioned, it is necessary to make a hole in advance with a drill bit. It is important for this hole to be perfectly perpendicular to the sheet, not having deviations. After machining, a gauge must be used to check whether or not the hole is suitable for inserting the piece. Normally, manufacturers of inserts usually have this type of tool for sale (see image).


As seen in the image, the end of the gauge which indicates "GO" will show whether the hole is correct and the insert can be used, while the end of the gauge that indicates "NO GO" will show that it cannot. A hammer can be used for the insertion, which will facilitate it being straight in the hole.

It is recommended to carry out this procedure as indicated in this manual and as indicated in the insert manufacturer manual, as non-compliance may cause negative consequences.

### 6.7.2. SCREWS

For direct screwing on the material itself, it is necessary to use the screws specified by Krion. These metallic screws incorporate a special thread which makes them self-tapping, but it will be necessary to make a hole first to work correctly. They will be used for screwing light weight systems or objects, which will not carry out work with large loads (hinges, locks, hanging elements, etc.).

The screwing procedure is as follows:

- Check the diameter of the screw to be used.
- With the diameter, select a drill bit which is half a millimetre smaller; that is, for a 4 mm (5/32") screw, use a 3.5 mm (9/64") drill bit.
- Drill completely perpendicular to the surface, without deviation.
- The depth of the drill cannot exceed a length which leaves a base of less than 3 mm (1/8").
- Drilling can only be carried out once the hole has been made, therefore it will be necessary to drill perpendicular to the sheet.

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# Transformation techniques

## Backlighting

06.8

## 6.8. BACKLIGHTING

Carrying out different transformation techniques on the material, different forms of translucency can be obtained which will provide a wide variety of ideas for designers and architects, allowing them to obtain personalised, exclusive designs. These techniques are explained below, with all information necessary for obtaining good results of translucency.

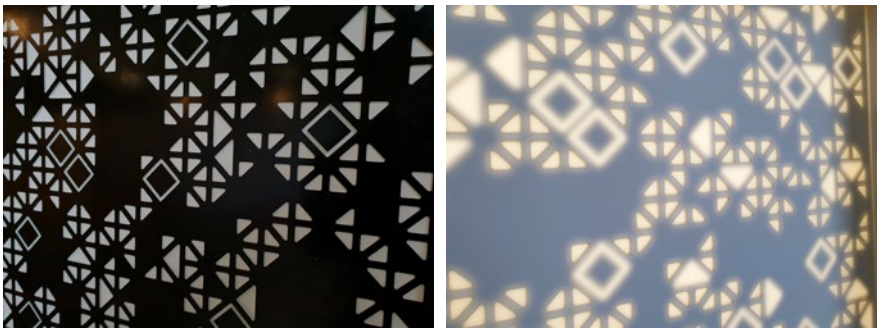
### 6.8.1. REDUCTION OF THE MATERIAL

A concept to take into account for obtaining translucency of a KRION™ colour is reduction of its thickness. It must be understood that tones with less pigment will be more easily backlit than tones with more pigment, as this will prevent light from passing through.

As well as reducing the thickness, it is important to know whether the translucency obtained should be blurrier or clearer. The light projection area is the most important factor for obtaining one kind of translucency another. If light is projected on the area which is machined, blurrier translucency will be seen on the rear part of the sheet; conversely, if light is projected on the area of the sheet which is not machined, the light will be clearer and brighter. The following image shows a combination of rear and front machining, showing areas where light is clearer and others where it is blurrier.

To obtain optimal results of translucency, it is important that the machining techniques are carried out correctly. The work speeds must be followed as recommended by the cutter manufacturer, using movements which do not cause marks or scratches which negatively affect backlighting. It is recommended to carry out prior tests to see how the material behaves in this type of work. A removal technique such as this will create a finish which will favour the quality of the machining.

Another important factor when obtaining lettering or shapes through translucency is to use masking tape on areas which you do not wish the light to affect. If the light is projected on all clear areas without reducing their thickness, there is the possibility that it will pass through and affect the tone. It is therefore recommended to apply a layer of opaque acrylic paint which will not let light pass through to these areas, or even to attach vinyl. The following image shows a sheet where a vinyl has been attached so that the light does not pass through the material. It can be seen how opacity and the desired backlighting is achieved thanks to the vinyl.



It is important to take into account the order of applications for obtaining good results. It is recommended first, before machining, to apply the corresponding paint or vinyl to the areas to be machined which have been ruled out, which will allow the contrast to be achieved. If the order of the application is altered, it will be more complicated to square a vinyl or paint the surface.

### 6.8.2. TRASLUCENT THROUGHOUT ITS THICKNESS

As previously mentioned, KRION™ has two series of colours which are translucent throughout their thickness, the Opale series and Light series, as well as some colours of other series having this property. They are used for insertion in other tones which do not have this property to show signage thanks to the contrast.

When working with the material, it is important to make perfectly imperceptible joins, as any flaw may cause imperfections which are more noticeable than those normally caused by poor finishing of the material. The following image shows poor practice with this type of tone.

### 6.8.3. INSERTION OF TRANSLUCENT KRION™ SERIES

Another procedure by which letters or shapes may be obtained through the material is inserting any of the different translucent tones Krion offers (Opale or Light series). To do so, the whole thickness must be milled so that there is a hole to allow the translucent KRION™ to be inserted.

In both the hole and the element to be inserted, it is recommended to mill the same diameter. So that the element to be introduced fits as perfectly as possible, it is necessary for there to be an equidistance of 0.2 mm (1/64"); that is, it must be 0.2 mm (1/64") smaller around the whole shape. This reduction of the edges of the element to be inserted on the sheet must be related based on the tolerance of the machine; that is, the machine may launch a programme to make the letters this size, but must also take into account the resolution of the centre of the machining, as it may cause a small mismatch between pieces. The following image shows a sign of 1100 sheet with 4102 insertion turned off and on.

## IMPORTANT

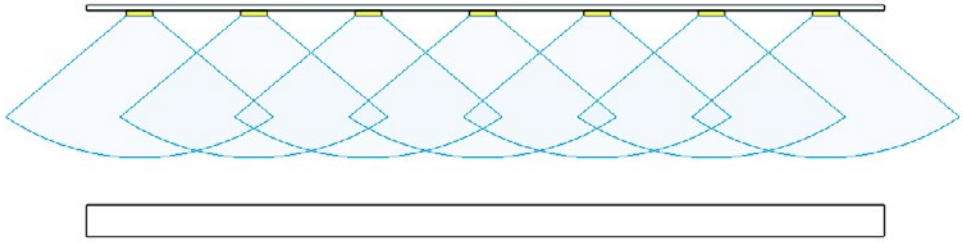
Check that the light does not pass through the part that should be opaque; if it does it must be covered.

### 6.8.4. PROJECTION OF LIGHT

Another important factor that will allow good backlighting to be obtained is projecting light on the surface. Krion recommends projecting light by LED strips, as this has great advantages over other forms of lighting. This section will explain how to undertake the installation of LED strips so that no errors or imperfections are shown in backlighting.

The most important factor for projecting light correctly is to create a good distribution of LED strips. These must be installed with a separation which is the same as or smaller than the separation of the lighting and the sheet, as shown in the following image.

The LED strips are separated from each other by 100 mm ($3^{15}/_{16}$"), and are at a distance of 110 mm ($4^{11}/_{32}$") from the KRION™ surface. This planning is more important than it seems, as it will avoid the appearance of lines on the translucent sheet. The LED projects the light, creating a beam of 120º, therefore each LED beam must overlay with its neighbour to create uniform illumination. The following image shows the effect of the aforementioned distances.



It can be observed how in the left image there is a uniform light without any marks, while in the image on the right lines can be seen, generating a slight contrast in translucency. This is due to the distance of the sheet from the LED strips not allowing the overlap of the beams of light, making it necessary to increase this distance until good results are achieved.

Another important factor with regard to the installation of LED strips is the design of their housing. It is necessary for them to be installed on an aluminium sheet surface to dissipate the heat, and inside a box or airtight zone which does not allow light to escape. Light escaping will lead to highlighted or contrasting areas, becoming an error in backlighting.

### 6.8.5. SUMMARY/RECOMMENDATIONS

- Projection of light on machined areas will provide results with blurred translucency.
- Projection of light on unmachined areas will provide results with clear translucency.
- During machining it is recommended to follow the cutting speeds recommended by the cutter manufacturer.
- Carry out consistent machining techniques. Carry out finishing techniques so that the end result always favours the result of the translucency.
- Place vinyl or opaque acrylic paint in areas which do not require translucency and which may alter the result of the backlighting.
- Following the order of application (first paint or vinyl and next undertaking machining) will always facilitate obtaining good results.
- Create perfectly imperceptible joins with series which are translucent throughout their thickness.
- Use translucent series to create inserts on non-translucent tones.
- In machining translucent pieces for insertion, it is recommended to make them 0.2 mm (1/64") smaller, although the tolerance of the machine will also be important.
- Projection of light through LED strips.
- It is recommended to distribute LED strips so that there is a separation between them which is equal to or less than their separation from the sheet to be backlit.
- House the LED strips in airtight areas where no light escapes.
- It is recommended to attach the strips to an aluminium surface, as it is a material which dissipates the heat generated.

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# Transformation techniques

## Repairs

06.9

## 6.9. REPAIRS

KRION™ is fully repairable. Any imperfection in a product made with this material can be fully repaired to its initial state. If KRION™ has to be added to the damaged area, material from the same batch number as the rest of the piece will be sought to minimize potential changes of tone. It is recommended to keep a piece of the same sheet used with the finished product in order to make repairs in the future. There are be two different ways to make a repair: by cotters or by caps.

### 6.9.1. COTTERS

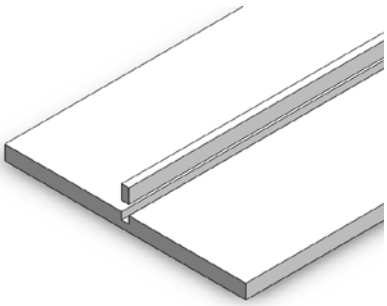
Repairs by cotters are usually carried out due to cracking or breaking of the material, lack of expansion joints in large areas or poor practice in areas where the material is exposed to thermal shock. These are the main causes of the appearance of cracks.

The explanation of how to make a repair by cotter will be made through a photographic document with comments.

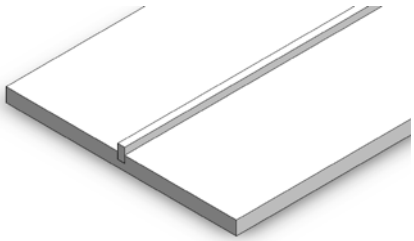
- Crack to be repaired by cotter.

- As mentioned, it is recommended to make the repair with material that belongs to the same batch as installed. Repairing the material with a different batch to that installed may cause a visible contrast in the repair.
- Select the corresponding cutter to make the groove and install it in the router. It is recommended to use the groove with a cutter of 6 to 8 mm (1/4 to 5/16") diameter.

- Through a guiding system (calibrated metallic profile or ruler), make a groove in a piece of unusable KRION™, an offcut, to test that the thickness of the groove is as required for the cotter to fit as tightly as possible. It is important to carry out this step first to check the appropriate thickness. The groove may be one or two tenths larger or smaller due to potential tolerances or wear of the cutter.
- Once the exact width of the cotter has been checked, the cotters necessary to make the repair are cut. It is recommended to make the cotters in wedge shapes so that there is no gap between pieces.



- Next, the area to be repaired will be prepared. A groove must be created on the crack so that there is a base of 2 mm (5/64").



- After making the groove, the edges of the cotter are rounded so that it fits as perfectly as possible in the groove. It is important that there is no gap between the groove and the cotter, as this way there will be less adhesive between them. If it is considered appropriate, the cotter may also be made into a wedge so that there is always contact. The idea is to introduce the cotter to check that the rounding fits as best possible. It is introduced straight, and carefully due to potential spalling.
- When it is seen that the cotter fits in the groove, the previous steps corresponding to bonding will be carried out (cleaning and application of adhesive).
- After the adhesive application, place it in the groove so that the adhesive overflows. The overflow is important as this way the joint is made imperceptible. Using a nylon hammer, the cotter may be hit gently so that it is introduced perfectly.
- At this point, it must be left to dry for a time depending on the ambient temperature. Once dry, the adhesive and excess material must be removed using a router. Placing levelled supplements on the base, the router will be lowered to a distance of 0.5 mm (1/64") from the surface. After milling, sanding will be carried out to make the surface uniform.

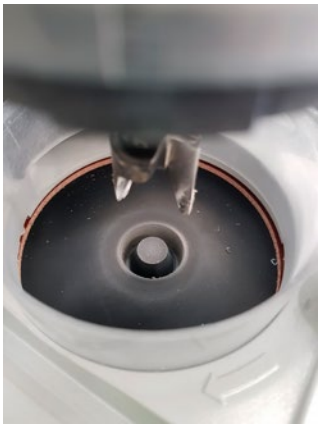
### 6.9.2. CAPS

Repair through caps is carried out to prepare small flaws or black dots on KRION™ surfaces. As with repair by cotter, it is recommended to insert KRION™ of the same batch number as the project was created with. Filling the flaws with KRION™ adhesive will not give a good result, as after a period of aging of the materials, the adhesive will be visible.

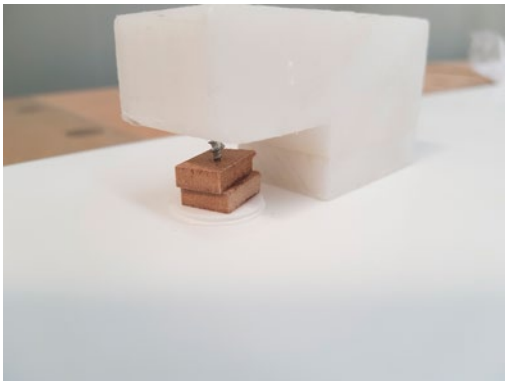
A special type of milling cutter will be required for this type of repair, cutters which make a conical hole so that another cutter can make the cap to be inserted. These cutters are shown below.

It is recommended that before perforating the surface, the base of the router is held in place to avoid potential vibrations or movements. Limit the depth of milling so that the cut does not exceed 1 mm (3/64″) thickness of the sheet; the deeper the hole, the larger the cap will have to be.

When making the cap it is also important to block the router. The lowering of the router on the sheet must be limited so that it does not exceed the thickness; if it does, the cap will fly out due to centrifugal force and may splinter or harm someone (lower 11 mm (7/16″) instead of 12 mm (1/2″)).



Once the cap has been obtained it is recommended to check whether it is valid for the repair. If it is, it must be cleaned so that all material is clean when bonding, ensuring that the adhesive overflows. Once dry, it will be sanded and the surface will be like new.



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# Transformation techniques

## Colours with veins and particles

06.10

## 6.10. COLOURS WITH VEINS AND PARTICLES (CHIPS)

The sheets of the series with chips and veins are specially designed to feature a random pattern of veins and chips, with an appearance similar to natural stone. The veins run in one main direction, with some random secondary lateral variations. They range from subtle veining to a more marked noticeable pattern. Generally, most colors with veins and chips are usually 45º colors.

The general surface pattern might undergo variations throughout the thickness of the sheets.

The general surface pattern might undergo variations throughout the thickness of the sheets. Due to these and other technical characteristics of the chips and veins series, this guide has been created to help in the fabrication process. For visual results of an acceptable standard, follow the instructions in this guide. Before carrying out any type of thermoforming or backlighting project, please refer to points 6.6. "Thermoforming" and 6.8. "Backlighting".

### 6.10.1. TECHNICAL CHARACTERISTICS

- The edges of the sheets differ in appearance from the top surface.
- The veins and chips form a random pattern, running in one main direction across the sheets.
- This product has a lower thermocurving radius than other Krion series.
- The veined pattern varies throughout the thickness of the sheets.
- Depending on the sanding and final finish, the general appearance may vary. A surface with a satin or gloss finish will be slightly darker and the veining and chips will be more clearly defined.
- The underside of the sheets differs in appearance from the top surface. The veined pattern is much stronger and more pronounced. Do not process the sheets on this side unless you seek this specific appearance.

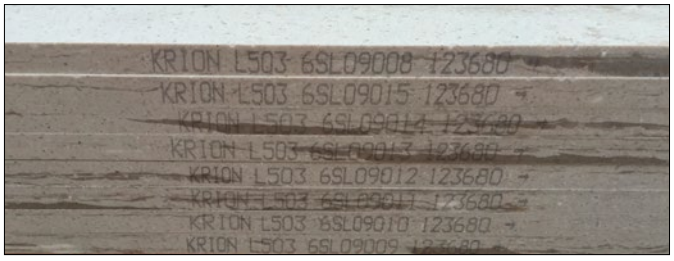
### 6.10.2. FABRICATING

#### 6.10.2.1. DIRECTION OF THE VEINED PATTERN AND COMBINATION OF VEINS

It is recommended to take the necessary time to select the areas of the sheets, find a combination and direction of veining, to obtain a good aesthetic result in the project being undertaken.

It is important that the fabricator bonds consecutive sheets directionally; that is, the batch code printed on the edge always being in the same position. It is not recommended to bond two consecutive sheets in more than one direction, as this may cause visible changes of tone.

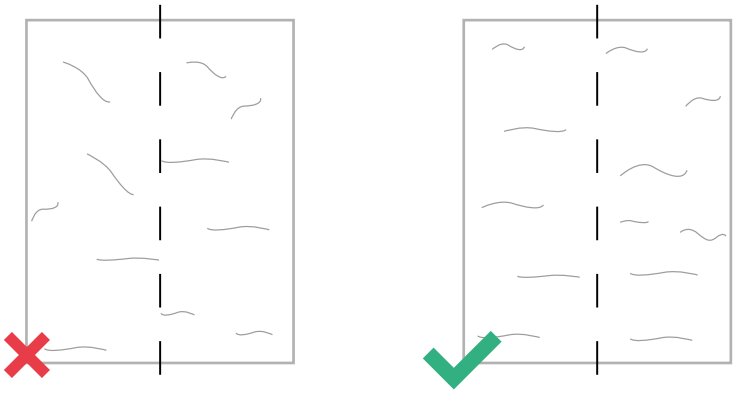
When two sheets are bonded together, always make sure the pattern runs in the same direction.



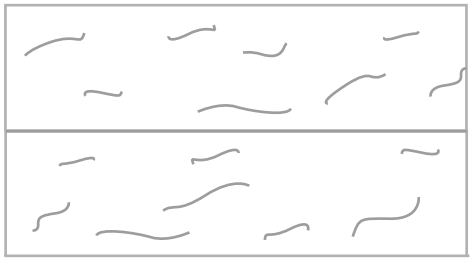
Presenting the customer with samples of possible combinations of bonded sheets, front panels, rear trims, etc. will help them know what to expect.

A certain lack of continuity in the veined pattern might be noticeable near the seam between two sheets. The more pronounced the pattern is, the more noticeable this will be.

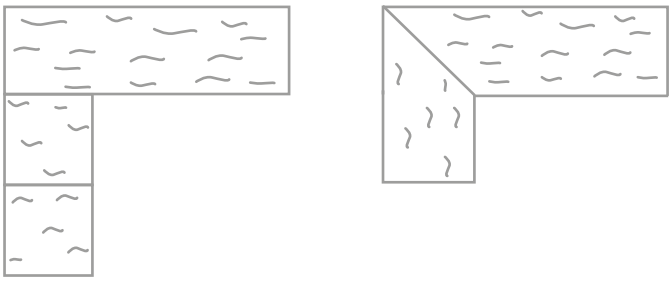
Choose areas with a softer veined pattern for the meeting point between sheets.



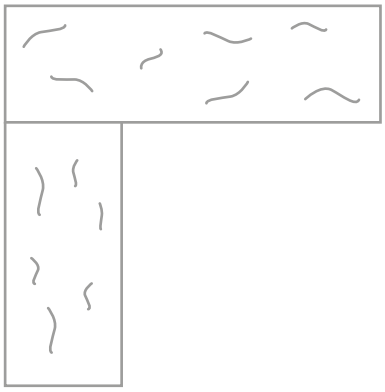
If it is desired to produce a wider width than that of the sheet, it is recommended to join the sheets so that the two have the same direction of vein. Always make sure that there is no abrupt interruption in the veined pattern at the meeting point of sheets or ensure that any abrupt interruption coincides with places where the solid surface will be cut to recess a sink, kitchen hob or other item.



When an L-shaped countertop needs to be made, it is important to analyse which of the two methods to choose:



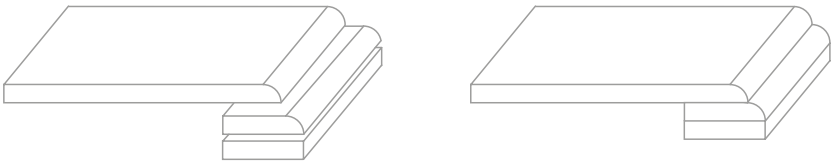
The following method is not advisable. This method can be valid providing that the meeting point between the two sheets has no veins or the veined pattern is a very soft one, thus avoiding a clearly noticeable seam.



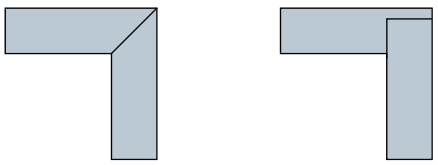
### 6.10.2.2. CREATING "STACK" FRONT PANELS, CURVED REAR TRIMS AND RECESSING BOWLS

A characteristic of the series with veining or chips is that the distribution on the surface is different than the distribution through the thickness, therefore the way of working on the material will vary when creating stacks, curved trim and integrating basins.

It is not recommended to create stacks as shown in the following image, as the difference of the distribution can still be observed.

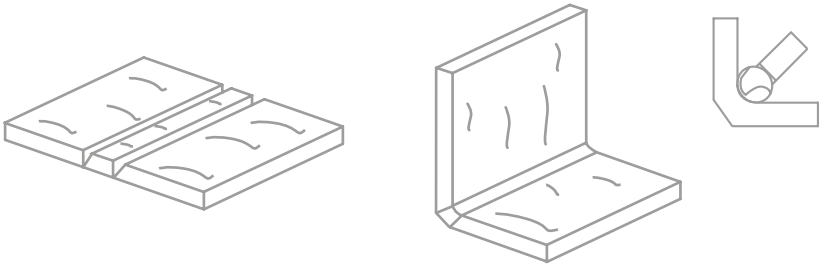


If a gable is created with mitre bonding, the continuity of veining will be ensured. An edge with a bending radius of no more than 2 mm (5/64") is advisable, because when this section is trimmed down, its appearance might be altered, leading to an abrupt change in the veined pattern. As mentioned in the point 6.2. "Seams", there are 45º colours which can be bonded through a 2 mm (5/64") groove to conceal this distribution.

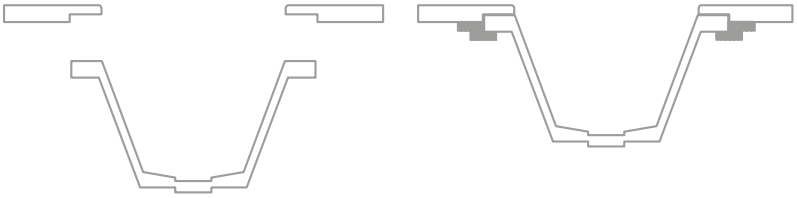


In case of the gable being too weak, it can be reinforced with double thickness or a concealed counter piece. Please refer to point 8.2. "Skirt" for further information.

For the manufacture of straight rear trim, see the point 8.1. "Trims". The transformation of a curved trim with this type of colour will be complicated, as the aesthetic will be lost and there will be a differentiation or change in the distribution of the veining. In these cases, it is recommended to replace it with a "v-grooved" or "folding" trim, as this will not cut down excessive material, thereby avoiding the change of design on the surface, ensuring continuity of the design.



The fabricator must inform the end client that if a basin is being integrated in a veined sheet, there is the possibility of the change of veining between the surface and the thickness of the sheet being very visible. To achieve or attempt to conceal this change, the thickness of the sheet may be reduced by half, introducing the flange of the basin as shown in the following image.



### 6.10.2.3. SANDING AND FINISHING OFF THE SURFACE

The general end appearance may vary depending on the progressive sandpapers that are used and the final finish given to the surface.

With a satin or gloss finish, the result will be slightly darker, with more clearly defined veining and chips. With a matt finish, the pattern will be lighter and less well defined.

Also bear in mind that the pattern of the veins varies throughout the sheet. Thus if a specific area of the surface is over-sanded, some veins might fade and other new ones appear.

Sand the whole surface uniformly, paying special attention to thermocurved areas.

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# Transformation techniques

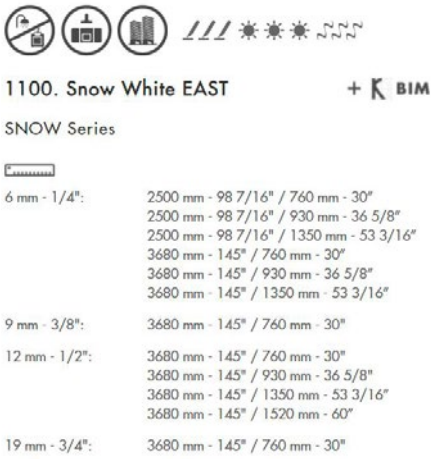
## Aspects to take into account

06.11

## 6.11. ASPECTS TO TAKE INTO ACCOUNT IN A PROJECT

This section aims to explain the way to plan projects, having to take certain factors into account when defining the colour or tone to be selected. It must be understood that the colour with most possibilities is white, and that the others do not have as many possibilities due to their composition.

It is important that when an architect, decorator or private client presents a project with a certain colour, they are aware of the characteristics or possibilities it has for transformation.




In the image above, the technical characteristics of colour 1100 can be observed. All colours have characteristics defined by these symbols. It is important to understand the meaning of each one of these symbols to assure the client of the viability of the project. The meaning of each one of these symbols is shown below.

PROPERTIES

The following icons are a basic guide to important aspects of the properties of KRION™ to take into account when choosing a colour for your project.

THERNAL BENDING

- Good potential for thermal bending, the material can be 2-dimensionally bent up to the minimum radius of curvature shown in the fabricator's manual.
- High potential for thermal bending, allowing for the creation of 3-dimensional shapes, although in the case of extreme designs, a slight whitening might be noticeable near curved sections.
- A high potential for thermal bending, allowing for the creation of 3-dimensional shapes. Extreme designs can be made with no noticeable whitening near curved sections.
- Tests in process.

* The thermoforming rating shown here is applicable as from batch no. UC01. La classification de thermoformage qui est présentée est apte à partir du lot UC01.

MARKS

- Noticeable slight marks after heavy use.
- Slight marks after heavy use, noticeable in specific lighting conditions.
- Minor marks after heavy use, slightly noticeable in specific lighting conditions.
- Tests in process.

RECYCLED CONTENT

- Colour containing some recycled material.

RESISTANCE TO UV RAYS

- Colour change of over ΔE=10 in 10 years.
- Colour change of ΔE=5 to ΔE=10 in 10 years.
- Colour change of less than ΔE=5 in 10 years.
- Tests conducted over a long period of time. No conclusive results available as yet.

TRANSLUCENCE

- Colour with a higher translucence when backlit.

COLLECTIONS

Krion™ is suitable for all kind of applications due to it´s exclusives qualities, however it has been identified by collections the color´s adequacy relating an excellent behavior on three possible frequently used applications with excellent performance and low maintenance.

Bathrooms · Kitchens · Work surfaces · Ventilated façades

- For further information on the above points, see the Technical Data Sheets. The appearance and colour of the models may vary slightly with regard to the originals. The described recommended uses are merely indicative, and they may be subject to future changes.

When selecting a colour, it is recommended to closely read the colour catalogue, which indicates the transformation characteristics of each one. In case of doubt in the selection, it is recommended to contact the Krion technical department.

### 6.11.1. 45º COLOURS

This is a very important factor when selecting colours for certain projects. In comparison with colours which are homogeneous throughout their thickness, bonding of 45º colours varies greatly due to their specific composition (different way of creating gables, trims, butt joints, etc.). They are transformed differently and this may affect their selection for certain projects. Their capacity for thermoforming with very pronounced curves is reduced in comparison with other colours.

### 6.11.2. COEFFICIENT OF LINEAR EXPANSION

When an object rises or falls in temperature, it changes in length in an amount proportional to its original length and the temperature change (KRION™ has a α coefficient of 3,5 $x10^{-5}$).

When a KRION™ top covering of certain dimensions is going to be used to cover a structural support and/or to be fitted between walls, columns etc., the coefficient of expansion and contraction of the different materials must be taken into account.

This is mainly necessary in the case of items to be fitted outdoors, in places like terraces, gardens, façades or pedestrian areas, or which will be exposed to sharp temperature changes, such as shower trays, basins, cold storage rooms, heating chambers etc.

KRION™ expands by approximately 0.7 mm (1/32") per linear metre when its temperature rises by 20ºC (68ºF). In the case of an increase in temperature of 30ºC (86ºF), the surface will expand by 1 mm (3/64") per linear metre.

Structural calculations that fail to take into account the need for expansion or contraction joints might lead to a broken KRION™ surface or a break in its seams. It is therefore crucial to take this factor into account in the final design.

The following formula can be used to calculate the expansion and contraction of KRION™:

$$\Delta L = \alpha\ Klux \cdot \Delta T\ (tc - t0) \cdot L0$$

ΔL = linear increase or contraction in mm

$\alpha\ K_{lux} = 3,5\ (10^{-5}) = 0,000035$

ΔT = temperature difference between the maximum (tc) and initial temperature (t0)

$L_0$ = total length in mm of the KRION™ material at the initial temperature (t0)

When projects involving KRION™ are being planned, it is important to take into account:

- The final application of the KRION™.
- Where the item will be fitted – e.g. outdoors or inside a house or building.
- The maximum and minimum temperatures that might be reached in the place where it is fitted or due to its conditions of use.
- Its exact location – whether it runs between between structural elements or not.
- It is also important to take into account the colour reference of the KRION™, its base support and whether there is ventilation or not, since these factors also influence the temperature that the surface might reach. When it is exposed to sunlight and other heat sources, a Snow White KRION™ (1100) surface laid on a wooden board can reach a 20% higher temperature than the environmental temperature of the place where it is located. Darker colours can reach even higher ones.

**Dark-coloured KRION™ should not be used in items located outdoors or exposed to heat sources. Only Snow White KRION™ or pale colours should be used.**

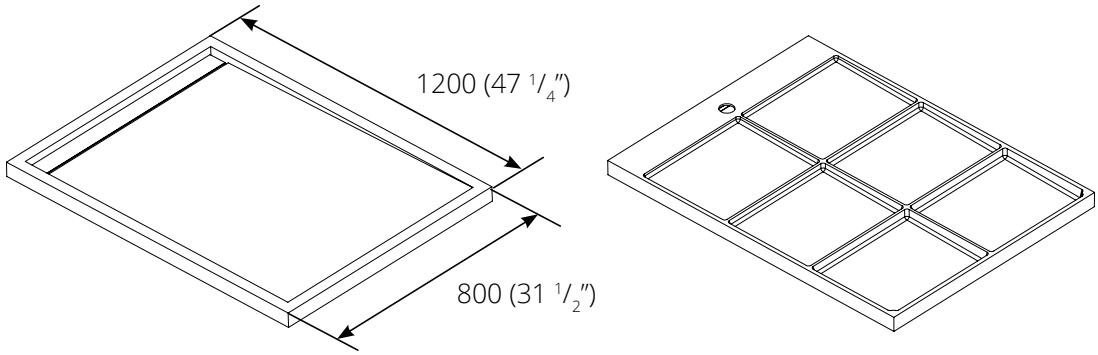
Here are some real situations that you might encounter:

### 6.11.2.1. A BUILT-IN SHOWER TRAY, SURROUNDED BY 3 WALLS

Show trays are generally exposed to temperatures that range from 15 °C (59ºF) to 40 °C (104ºF), although occasionally these temperatures might oscillate between 5 °C (41ºF) and 65 °C (149ºF).

Let us take a 1200x800 (47 $^{1}/_{4}$") shower tray made of KRION™ and reinforced with the same material. Its longest linear value must be taken to calculate the expansion joint between the perimeter of the shower tray and the perimeter of the gap where the tray is fitted. This expansion joint must be filled with an elastomeric polyurethane sealant like P404 by Butech or similar.

$$\Delta L = \alpha\ Klux \cdot \Delta T\ (tc - t0) \cdot L0 = 0{,}000035 \cdot (65\text{-}20) \cdot 1200 = 1{,}89\ mm$$




The result is that the longest side will expand by 2 mm (5/64"), in such a way that the shower tray has a length of 1202 mm (47 $^{5}/_{16}$") when it reaches a temperature of 65º (149 ºF).

If this possible expansion is distributed around the whole of the perimeter of the shower tray, a 1 mm (1/16") expansion joint will suffice but, as an extra safety margin, a slightly bigger 2 mm(5/64") joint should be left around the whole perimeter. A 2 mm (5/64") gap should also be left between the tray and the wall covering adjacent to it.

These expansion joints should be filled with an elastomeric polyurethane sealant, like P404 by Butech or similar.

### 6.11.2.2. FREE-STANDING TABLE ON AN OUTDOOR TERRACE.

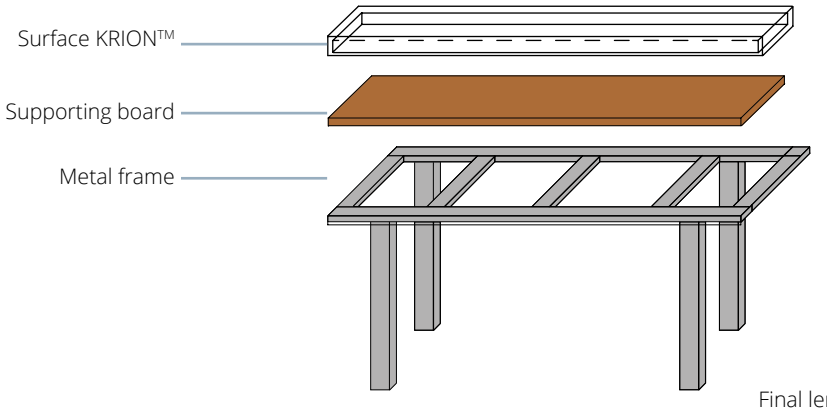
In this example, we are going to make a 2800x1100 (113 ºF) table made of 12 mm-thick (1/2") Snow White KRION™ which will stand on an outdoor terrace.

The KRION™ will be laid on top of a phenolic plywood board, in turn supported by a metal frame. It is important to remember that MDF board is not suitable for outdoor use, since it is made of compacted fibre which can be affected by damp or rain, (deforming it and affecting the top surface). Due to its outdoor location, temperatures can vary between -5 °C (23 ºF) and 45 °C (113 ºF).

With this data, the necessary calculations can be made for the design of the table. Since it does not run between two walls, we do not need to take into account the maximum temperatures that might be reached there. In contrast, we do need to take into account scenarios in which

temperatures drop and the KRION™ surface contracts on the wooden base board. In this case, a contraction joint is needed between the two materials.
We said that a minimum temperature of -5ºC (23 ºF) is normally reached in such places, but we will add another minus 10 degrees as a safety margin and take a value of -15ºC (5 ºF).

The surface will be subject to a linear contraction of 3.43 mm (1/8") when the temperature drops from 20ºC (68 ºF) to -15ºC (5 ºF).




Final length = $L_0(1+\alpha\,\Delta T)$

Final length = $2800\,(1 + 3{,}5 \cdot 10^{-5}(-15-20))$

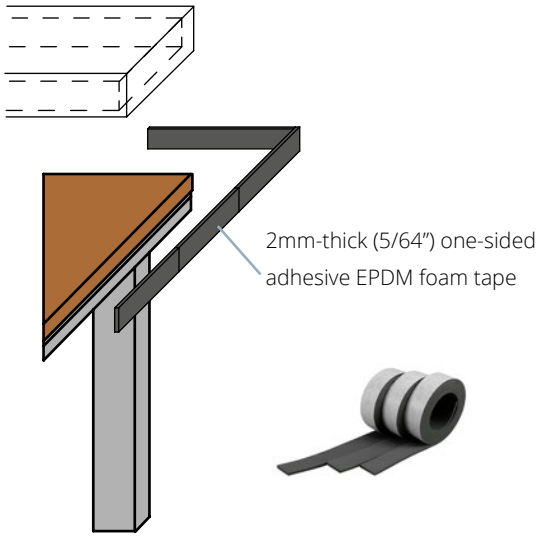
Final length = 2796.57

Expansion = 3.43 mm

The contraction can be evenly distributed by inserting a 2 mm (5/64") joint between the supporting board and the KRION™ top surface.

This gap should not be left unfilled. It must be sealed with an elastic sealant like P404 by Butech or with one-sided adhesive EPDM, CR or SBR foam tape (sold in different widths and thicknesses).

If this gap is left unfilled, the surface could break due to impacts.

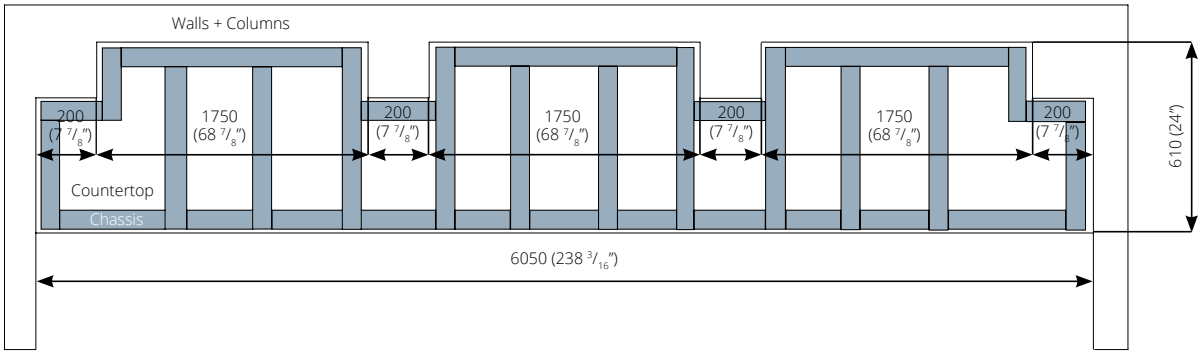


### 6.11.2.3. COUNTERTOP ON AN OUTDOOR TERRACE

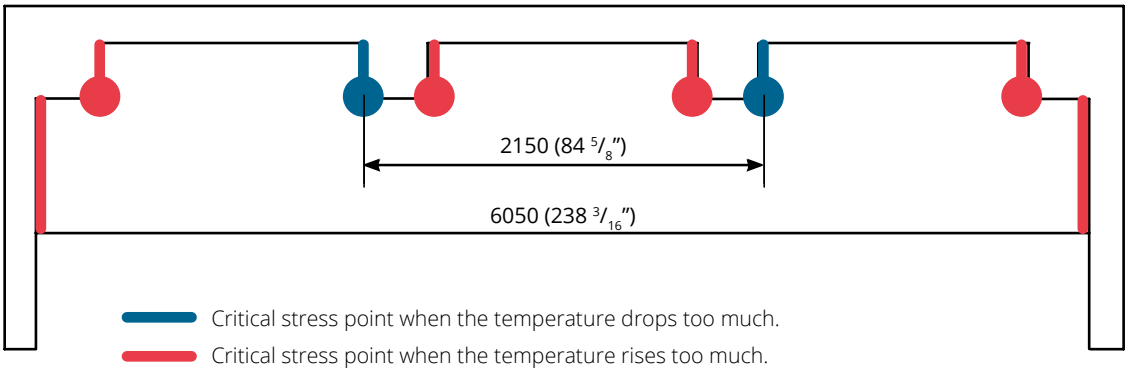
Let us imagine that we are going to make a big countertop that runs between several columns and stretches of wall. We decide to use 12 mm-thick (1/2") Snow White (1100) KRION™.

The unit under the countertop is made of brick and the countertop is reinforced with a supporting metal frame (made of aluminium or galvanized iron etc.).

GENERAL PLAN OF WALLS, COLUMNS AND COUNTERTOP




If a certain safety margin is applied, a minimum temperature of -10°C and maximum of 55°C can be taken. In this example, we have structural elements at both ends. This will mean that the surface of the countertop will expand against the columns and two side walls when the temperature rises and contract in relation to the two central columns and bottom frame when the temperature drops.




The necessary joints can be planned by making the following calculations, taking a countertop with an approximate length of 6050 mm (238 3/16") at an initial temperature of 20°C (68 °F).

ΔT ↑ 55°C - 20°C= 35 6050 x 0,000035 x 35 = 7,41 mm (maximum expansion)

ΔT ↓ -10°C - 20°C= -30 6050 x 0,000035 x -30 = -6,35 mm (maximum expansion)

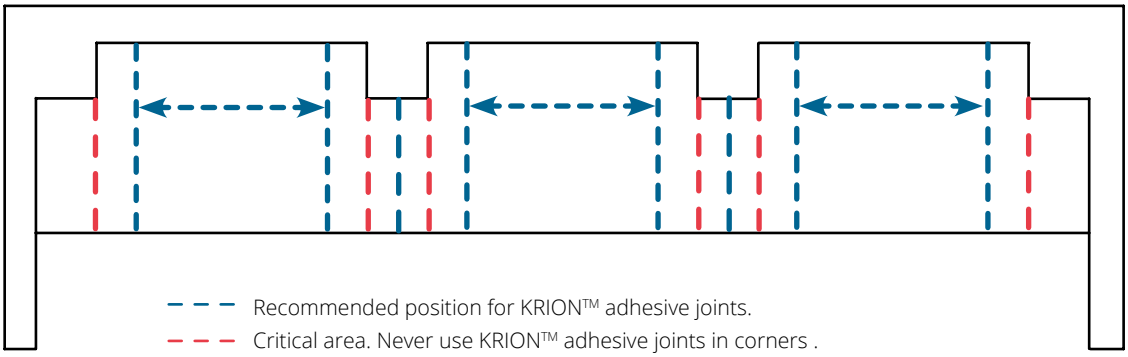
ΔT ↓ -10°C - 20°C= -30 2150 x 0,000035 x -30 = -2,25 mm (contraction central columns)

The results should be rounded up a little higher, leading to a maximum expansion of 10 mm (3/8"), a maximum contraction of -8 mm (11/16"), and a contraction of -4 mm (13/16") between the two middle columns.

The countertop's general design would be as follows:

- For a total expansion of 10 mm (3/8"), a 5mm-thick (3/16") single expansion joint round the whole perimeter of the countertop is required.
- Total length of countertop: 6040 mm (237 13/16"), made at a temperature of approximately 20°C (68 °F).
- A 4mm-thick contraction joint between the KRION™ top surface and supporting frame.

Joints made of KRION™ adhesive must always be used in places not subject to stresses. Do not use them in the corners of columns.




Another possibility is to create perpendicular intermediate expansion joints and thus reduce the expansion joint around the perimeter of the countertop, although aesthetically it will look better with a single 5mm-thick (3/16") expansion joint between the perimeter of the countertop and the walls and columns.

Given the countertop's 6-metre (1/4") length, this design almost verges on the need for intermediate expansion joints so as to avoid possible breaks.

### 6.11.3. THICKNESS BY APPLICATION

The selection of the correct format for creating a project allows technical and economic performance to be optimised and improved. Krion has a wide range of formats and thicknesses, all of the same quality. However, not all colours are available in each format. The following table shows the available formats and thicknesses of each KRION™ series.

| THICKNESSES | FORMATS | SNOW WHITE EAST | COLORS SERIES | COLORS+ SERIES | LIGHT SERIES | NATURE SERIES | STAR SERIES | ROYAL SERIES | ASTEROID SERIES | ROYAL+ SERIES | TERRAZZO SERIES | LUXURY SERIES | ART VEINS SERIES | OPALE SERIES | MATERIA SERIES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 mm · 1/8" | 2500 x 760 mm · 98 7/16" x 30" | ✓ | | | | | | | | | | | | | |
| | 2500 x 930 mm · 98 7/16" x 36 5/8" | ✓ | | | | | | | | | | | | | |
| 6 mm · 1/4" | 2500 x 760 mm · 98 7/16" x 30" | ✓ | ✓ | ✓ | ✓ (2) | ✓ | ✓ | | | | | ✓ | | | |
| | 2500 x 930 mm · 98 7/16" x 36 5/8" | ✓ | ✓ (1) | | ✓ (2) | | | | | | | | | | |
| | 2500 x 1350 mm · 98 7/16" x 53 3/16" (*) | ✓ | ✓ (1) | | ✓ (2) | | | | | | | | | | |
| | 3680 x 760 mm · 145" x 30" | ✓ | | | | | | | | | | | | | |
| | 3680 x 930 mm · 145" x 36 5/8" | ✓ | | | | | | | | | | | | | |
| | 3680 x 1350 mm · 145" x 53 3/16" (*) | ✓ | | | | | | | | | | | | | |
| 9 mm · 3/8" | 3680 x 760 mm · 145" x 30" | ✓ | | | | | | | | | | | | | |
| 12 mm · 1/2" | 3680 x 760 mm · 145" x 30" | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | 3680 x 930 mm · 145" x 36 5/8" | ✓ | ✓ (1) | | ✓ (2) | | | | | | | | | | |
| | 3680 x 1350 mm · 145" x 53 3/16" (*) | ✓ | ✓ (1) | | ✓ (2) | | | | | | | | | | |
| | 3680 x 1520 mm · 145" x 60" (*) | ✓ | ✓ (1) | | ✓ (2) | | | | | | | | | | |
| 19 mm · 3/4" | 3680 x 760 mm · 145" x 30" | ✓ | | | | | | | | | | | | | |

(1) Only available for the colours FROST WHITE (6101), CREAM (6501), PEARL (6502), LIGHT GREY (6902) and GREY (6903)
(2) Only available for the colour EXTREME LIGHT (4102).

It is important to highlight that not all thicknesses of sheets are suitable for every application and use, each behaving differently. Therefore, certain factors must be taken into account during their selection.

| USE OR APPLICATION | 3 mm (1/8") | 6 mm (1/4') | 9 mm (3/8") | 12 mm (1/2") | 19 mm (3/4") |
|---|---|---|---|---|---|
| Bathroom countertops | ✗ | ✗ | ● | ✓ | ✓ |
| Urban furniture | ✗ | ✗ | ● | ✓ | ✓ |
| Indoor furniture, tables, counters, shelves, etc. | ✗ | ● | ● | ✓ | ✓ |
| Wall coverings (interior) | ✗ | ✓ | ✓ | ✓ | ✓ |
| Wall coverings (exterior) | ✗ | ✗ | ✗ | ✓ | ✓ |
| Decorative elements, lighting | ✓ | ✓ | ✓ | ✓ | ✓ |
| Large surfaces, up to 6m without expansion joints | ✗ | ✗ | ✗ | ● | ● |
| Manufacture of shower trays or customised bathtubs | ✗ | ✗ | ● | ✓ | ✓ |
| Surfaces likely to suffer impacts or thermal shock | ✗ | ✗ | ● | ✓ | ✓ |
| High transit flooring | ✗ | ✗ | ✗ | ✗ | ✗ |
| Covering of small or medium format indoor units | ● | ● | ✓ | ✓ | ✓ |
| Covering of swimming pools | ✗ | ✗ | ✗ | ✗ | ✗ |
| Low transit flooring | ✗ | ✗ | ✗ | ✓ | ✓ |

✓ Suitable
✗ Not recommended
● Suitable, taking the necessary precautions in terms of expansion joints, the support etc.

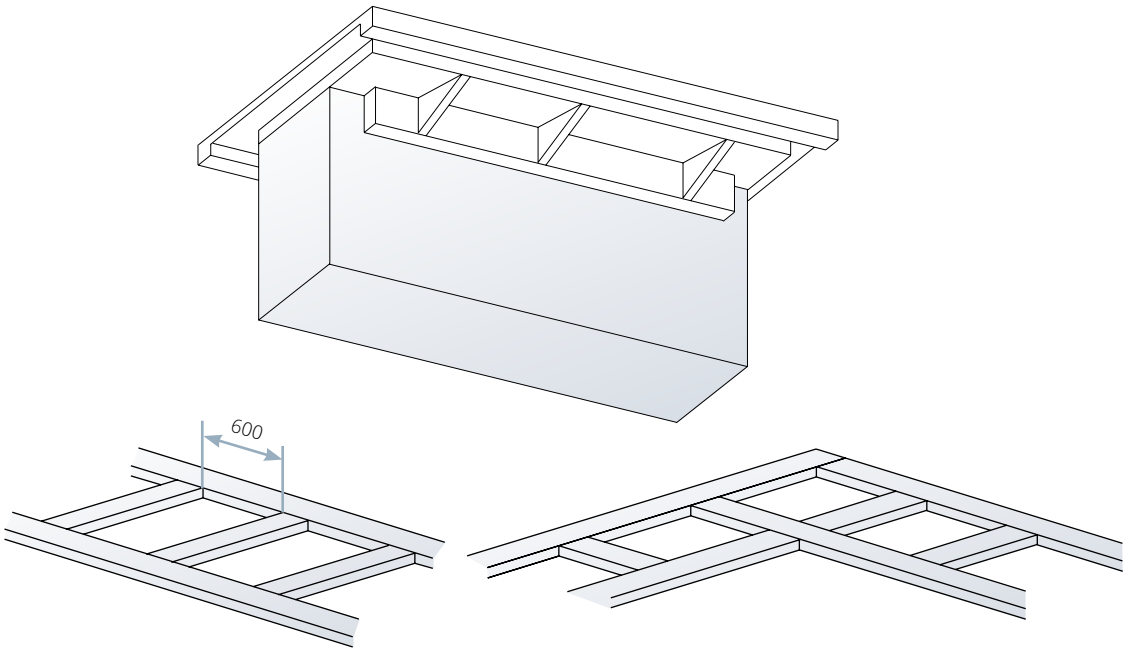
Below is an explanation of the different applications of the different thicknesses of KRION™ sheets.

### 6.11.3.1. BATHROOM COUNTERTOPS

This is one of the most common applications. Not all thicknesses of sheet are applicable as it is a use exposed to high transit, occasional loads, and also installed in wet areas. The use of 3 and 6 mm (1/8 and 1/4") thicknesses is not recommended.

9 mm (3/8") thick sheets are not the most common for this type of application, but can be used depending on the size of the unit and the support designed for it. The simple 9 mm (3/8") sheet supported on its two ends will cause curvature due to weight, therefore it is necessary to install a structure or reinforcement which maintains its planimetry. Thus, when using 9 mm (3/8") to produce bathroom units, take into account the necessary structural calculations to guarantee the resistance and durability of the unit.

12 mm (1/2") thick sheets are most recommended due to their features and performance. In comparison with the 9 mm (3/8") thickness, a reinforced support or structure is not necessary to obtain a stable unit, but it is important for the separation between profiles or structural elements to be a maximum distance of 600 mm ($25^{5}/_{8}$"). Below is an image showing the type of structure recommended for countertops with 12 mm (1/2") thick sheets. Krion recommends always creating countertops with sheets of this thickness, whether for bathrooms or kitchens.




Greater sheet thickness of 19 mm (3/4") is also recommended for this type of application, as it provides greater rigidity and resistance, but is also heavier; therefore, it the load bearing structure must be reinforced. To achieve an optimal final product, Krion does not believe it necessary to use this thickness for this type of application, as it is an oversized product which will require a more resistant structure.

### 6.11.3.2. URBAN OR OUTDOOR FURNITURE

Smaller thicknesses of 3 mm (1/8") and 6 mm (1/4") are not recommended for outdoor furniture. For this type of application units are expected to be exposed to a series of external agents such as great variation in seasonal temperatures, rain, humidity, wind, UV radiation, as well as the risk of unexpected impacts. The colour reference to use, structural calculations, expansion joints, reinforcements, etc. must be calculated to withstand these conditions.

To manufacture with 9 mm (3/8") thick sheets, a previous study must be carried out taking into account the use for which it is intended. This type of format may endure sudden temperature changes provided that the expansion joints of the final product are well calculated and the load bearing structure is a material which behaves well against external agents, such as aluminium. It is a thickness which combined with a well developed support may support the majority of loads; however, this will entail extra costs for structural elements or reinforcements.

A 12 mm (1/2") thick sheet will be adequate for creating any outdoor furniture. A join with this thickness is more resistant, provided that it is well calculated and well made. Additionally, it will not be necessary to increase the structural design as much as with 9 mm (3/8").

The 19 mm (3/4") thick sheet is also recommended for this type of application or use. However, as in other applications, it will entail an additional cost for the project, as it will be oversized. Standard format sheets will be sufficient for outdoor projects.

**IMPORTANT NOTE:** It is not recommended to produce outdoor furniture in dark colours. Always use "1100 Snow White" or other products in light colours. Dark colours must be expected to absorb a greater amount of solar radiation, thereby generating a higher temperature on their surface. The type of reinforced structure will also affect the temperature that the surface may reach.

#### 6.11.3.3. INDOOR FURNITURE, TABLES, COUNTERS, ETC.

It is very risky to undertake indoor furniture projects with 3 mm (1/8") thick sheets. Only coverings can be made, due to it being a thickness which is too fine, it being impossible to make furniture with this thickness without supports. The area to be covered must be continuous, without any overhanging areas, and also without any areas which are not flat, as this will be seen when creating the covering. It is important to highlight that for coverings with this format, a similar force must be used as offered by machines such as hydraulic presses or similar, as it must be ensured that the sheet is well attached to the surface.

With a 6 mm (1/4") thick sheet, functionality will be greater than with the previous type. It is recommended to only use it for coverings, as this format is not designed to bear loads. There will be a lower likelihood of lifting after its adhesion, as it is double the weight and thickness. It is recommended to only cover surfaces which are fully homogeneous, without any visible variation in flatness, as forms or irregularities of the support may be copied.

The 9 mm (3/8") thick format is suitable for covering surfaces, although such precise flatness is not necessary. Structures formed by equidistant profiles may be covered, but with a prior calculation so as not to suffer breakage due to potential loads.

As in the majority of applications, 12 mm (1/2") thick sheets are recommended for making indoor furniture. Depending on the functionality of the unit or project, designs may be obtained with the sheet itself bearing loads. The most common projects are countertops, office tables or shelves. These bear greater loads and are usually in high transit areas (work surface), therefore they must have a structure or support reinforcing them. In comparison with the previous thickness of sheet, the structure can be created with profiles at a certain distance, as this thickness is resistant in overhanging areas.

19 mm (3/4") thick sheets will be suitable with great resistance and less distance between structural profiles, but functionality will be lost due to weight and mobility, therefore it will not be cost-effective, as it will be more expensive.

#### 6.11.3.4. WALL COVERINGS (INTERIOR)

Wall coverings with 3 mm (1/8") sheets are not recommended due to their behaviour. As previously mentioned, great pressure must be applied for attachment.

It is possible to install interior coverings using 6 mm (1/4") format sheets, but as with covering other elements, a completely flat support must be used, without any visible millimetric change of flatness which would be seen in the material. Although it is twice the thickness of the previous sheet, the pressure necessary for resistant attachment must be considered.

There is no experience with 9 mm (3/8") thick sheets, as it is not very common in comparison with the previous format, having three fewer production formats, and therefore fewer options for optimising. Additionally, the join is a butt joint (as in 6 mm (1/4")), therefore the resistance will be the same. Thus, there are fewer formats, less optimization, greater weight and it is less cost-effective.

The 12 mm (1/2") format is most recommended, although the load is greater. A male-female joint can be created, which will provide greater resistance due to there being more surface to bond. It must be taken into account that the surface to cover must be flat, but not to the same extent as in lower thicknesses.

To cover interior walls with a 19 mm (3/4") thick sheet would not be cost-effective, as the project would be oversized.

#### 6.11.3.5. WALL COVERINGS (EXTERIOR)

Sheets 3 (1/8"), 6 (1/4") and 9 mm (3/8") thick are not recommended, as it is necessary to create

a male-female joint for outdoors. Additionally, for outdoors, apart from being able to produce a homogeneous wall or surface covering, ventilated facades can be created on metallic supports, using different attachment elements on the market. Therefore, a minimum thickness of 12 mm (1/2") is necessary for this application, bot to be able to insert attachment elements and to be able to make the male-female joint that provides greater resistance.

Creating an exterior covering with a 19 mm (3/4") thick format would be unnecessarily oversized. Additionally, the variability of formats would be lost compared with the previous format, which would reduce the optimization of the project.

#### 6.11.3.6. DECORATIVE ELEMENTS, LIGHTING

Due to the behaviour of the material with 3 mm (1/8") thickness, there will be limitations for this application. Elements must be created which do not bear any kind of load or which are hanging without any risk of being exposed to accidental impacts.

Decorative elements may be created with 6 mm (1/4") thick sheets. To do so, it is necessary to take factors of use and work into account. The most common examples are products for the kitchen such as coasters, napkin rings, plates, etc., although elements solely for decoration which do not have any specific use may also be created.

12 mm (1/2") thick sheets must be used for projects where resistance is a key requirement, as if it is not necessary to create a resistant element, there is the possibility of oversizing. A greater thickness of 19 mm (3/4") is recommended, but it would not be cost-effective, also due to oversizing of the element to be produced.

#### 6.11.3.7. LARGE SURFACES, UP TO 6M WITHOUT EXPANSION JOINTS

Thicknesses of 3 (1/8"), 6 (1/4") and 9 mm (3/8") are not recommended for surfaces with lengths of up to 6m. Very large surfaces experience significant changes of dimensions due to exposure to sudden temperature changes. The aforementioned thicknesses are less resistant to these changes, therefore it is not appropriate to undertake projects of this nature with them.

12 mm (1/2") thick sheets are recommended, but taking into account that the calculation of expansion joints has been carried out correctly so that the material does not break. A 19 mm (3/4") thick sheet would be oversized for the project, as all applications for large surfaces can be carried out with 12 mm (1/2") thick sheets without any problem.

#### 6.11.3.8. MANUFACTURE OF SHOWER TRAYS OR CUSTOMISED BATHTUBS

Formats with thicknesses of 3 (1/8"), 6 (1/4") and 9 mm (3/8") can be ruled out for creating shower trays. They are exposed to thermal shock and potential heavy loads which they cannot bear. The manufacture of shower trays refers to sheets which are not covering any substructure, recommending only bonding KRION™ ribs on the bottom part for reinforcement. With 12 (1/2") and 19 mm (3/4") thickness sheets, it is recommended to create this type of design. In the case of having to bond any joint, these thicknesses will guarantee resistance, provided that the join is located in the appropriate place.

#### 6.11.3.9. SURFACES LIKELY TO SUFFER IMPACTS OR THERMAL SHOCK

Sheets with thicknesses of 3 (1/8") and 6 mm (1/4") are not recommended for this type of application. Being so thin, insignificant impacts may break the material, even if it is covering a surface.

Undertaking prior studies, projects may be created for surfaces likely to suffer impacts using 9 mm (3/8") thick sheets, but it is recommended to create them with 12 mm (1/2") thick sheets, as tests are carried out to verify their resistance on covered surfaces.

19 mm (3/4") thick sheets increase the resistance, but also increase the weight, therefore cost-effectiveness will have to be calculated.

#### 6.11.3.10. HIGH TRANSIT FLOORING

None of the five thicknesses in which KRION™ is manufactured is recommended for high transit flooring applications. Although the material is regenerable, maintenance will have to be carried out very frequently, therefore it would not be cost-effective. Maintenance of KRION™ flooring will be exactly the same as for wooden flooring.

#### 6.11.3.11. LOW TRANSIT FLOORING

This is a surface which, although experiencing low transit, will bear loads, therefore 3, 6 and 9mm thicknesses are ruled out. Undertaking the installation with the steps indicated by the respective technical note on installation of low transit flooring, it is recommended to use 12 mm (1/2") thick sheets. 19 mm (3/4") thick sheets would be recommended, and even better because they would be much more resistant, but there is the possibility of oversizing, meaning that it is not cost-effective.

#### 6.11.3.12. COVERING OF SMALL OR MEDIUM FORMAT INDOOR UNITS

3 mm (1/8") thick sheets will be used to cover units which do not have any joins and which are not intended as a high transit surface, as this would cause potential lifting of the covering material due to its low resistance. Additionally, being very thin, any impact may cause breaking or cracking.

With KRION™ 6 mm (1/4"), it would be possible to cover small indoor units, but the support would also have to be taken into account; that is, it is important for it to be a firm surface without visible roughness which may be shown in the material.

For 9 mm (3/8") sheets, structures may be covered without the need for being superficial; that is, they may be made up of equidistant profiles. It must be checked how much overhang distance would be possible without causing breaking or cracking.

With 12 mm (1/2") thickness, the same will occur as with 9 mm (3/8"), with the advantage of achieving greater resistance of the material against impacts and potential thermal shocks. It will not be necessary to reinforce the substructure as much due to 12 mm (1/2") having greater capacity for absorbing loads and potential shocks.

19 mm (3/4") thick sheets may be used for this application, although it is not recommended due to excessive thickness. For small or medium units, sheets of this thickness cannot be manipulated or transformed very conveniently, and minimum curve radii cannot be achieved. It would also entail excessive weight for the final product.

#### 6.11.3.13. COVERING OF SWIMMING POOLS

Normally, swimming pools are more than 6m long and have a base area of over 15m$^2$. Therefore, creating this type of project will be complicated due to having to use expansion joints. Additionally, these joins will always be subjected to hydrostatic loads, which would deteriorate their performance. Ultimately, KRION™ is not recommended for this application as it would entail many difficulties.

### 6.11.4. BONDING TO OTHER MATERIALS

KRION™ can be bonded to a multitude of surfaces and materials. Surfaces of methacrylate, wood, metal, glass, concrete, drywall, brick, etc. are perfect candidates for covering with KRION™.

These surfaces must first be levelled. It is necessary to use an adhesive which is flexible and durable. Butech polyurethane sealant P-404 would be the best option. Other elastic polyurethane chemical

sealants are acceptable and provide good results.

Use sealant P-404 to attach KRION™ to walls only when the support requirements are not very high. For example, do not use for panelling facades.

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# Applications and uses

07

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# Applications and uses

## Kitchen

07.1

# 7. APPLICATIONS AND USES

## 7.1. KITCHENS

The following details explain how to build a perfectly assembled kitchen.

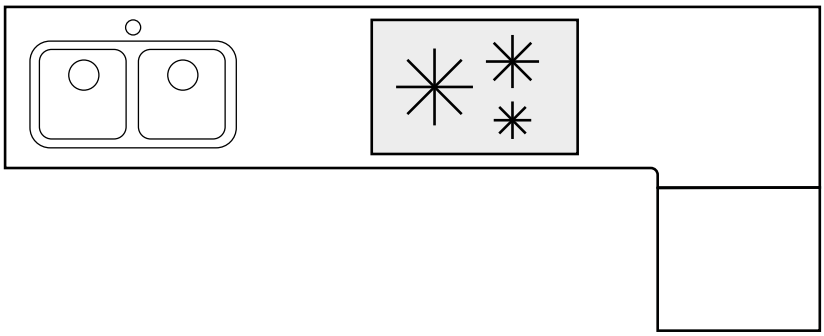
### 7.1.1. PREPARATION OF THE COOKING HOB HOUSING

Cooking hobs, grills, hot plates, fryers, etc. are integrated elements which generate a certain temperature around them.

To install these elements it will be essential to respect the following instructions when manufacturing the countertop.

Always take the precaution of not positioning KRION™ adhesive joins in the open hole for the housing of the cooking hob or sink, or in points subject to continuous stress or thermal shock.

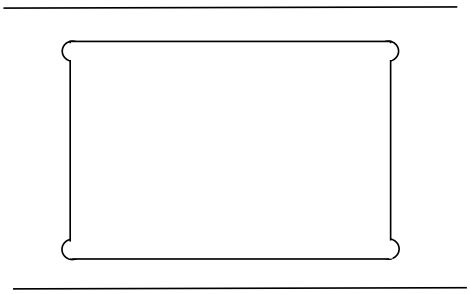
It is important for joints to a minimum of 70 mm (2 $^{2}/_{3}$") away from points of heat (ovens, dishwashers, grills, fryers, etc.). Respect a minimum distance of 100 mm (3 $^{15}/_{16}$") between different open holes of the countertop.

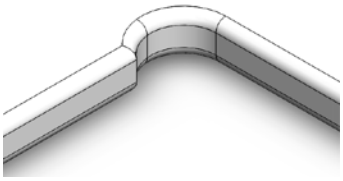


To cut and empty the hole that will house the cooking hob, use a router and template of the size of the hole for the hob to be installed. Clearing the hole can also be carried out with the CNC.

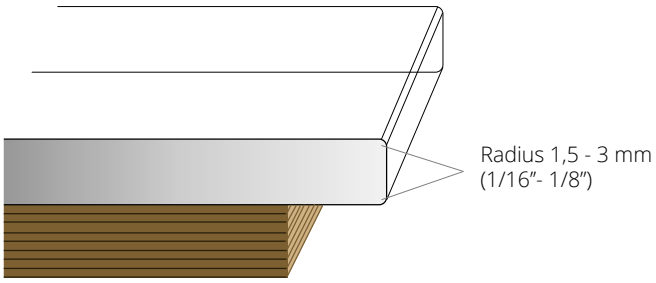
Do not cut this hole with a saw or circular saw, as these produce micro cracks which may later break the surface.

Do not produce corners without radii or with small radii. The angles of the hole must be finished with a minimum radius of 12 mm (1/2") to thereby reduce tension on the corners, as indicated in the following diagram.



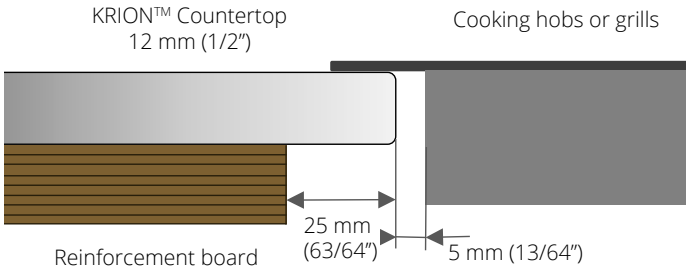


The milled hole must be uniform, without edges or different levels. Eliminate edges in the hole by rounding them with a radius of 1.5 mm to 3 mm (1/16 to 1/8"). This can be carried out using a small router or simply by sanding the edges to this radius. It is recommended to finish sanding the area of the hole with the same sanding finish as the countertop.



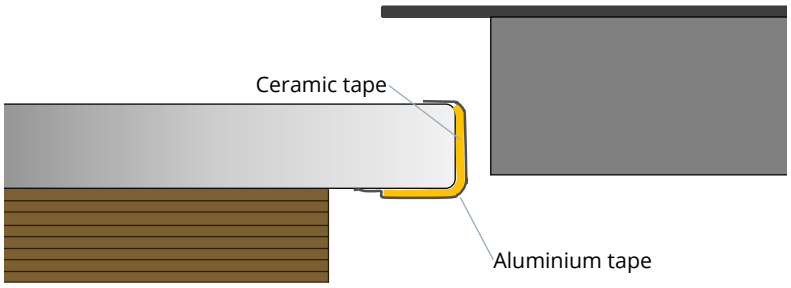

The measurements of the hole depend on the dimensions of the cooking hob. Between the casing of the hob and the edge of the KRION™ there must be a minimum distance of 5 mm (13/64") around the whole perimeter.

If we reinforce the area with a support board, this must not be at the edge of the hole, it will be integrated at least 25 mm (63/64") from the hole, as indicated in the following image.



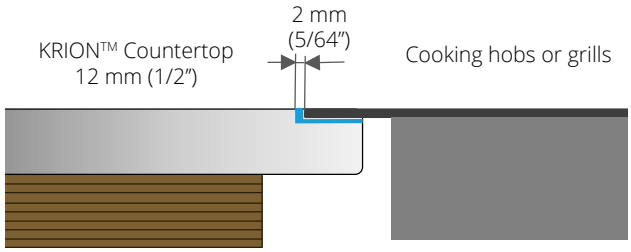
After sanding the edge of the hole, the area must be thermally insulated and protected.

To do so, we will first attach ceramic fibre tape which will thermally insulate the edge. Next we will cover this tape with aluminium tape, as shown in the following image.



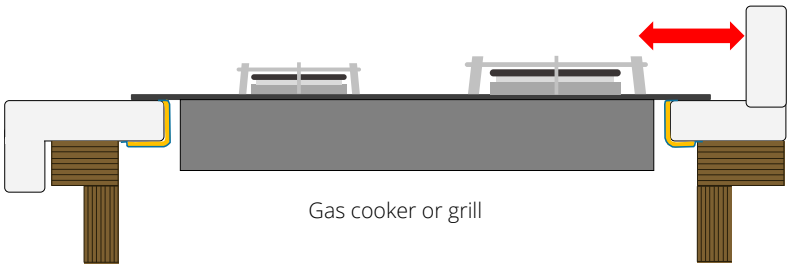

It is not recommended to embed the cooking hob on the level of the countertop, as there is the risk of creating tension.

If it is ultimately integrated in this way, it will be essential to leave a 2 mm (5/64") join around the perimeter of the hob, sealing this space with a flexible single component polyurethane sealant, such as Butech P404 or similar. Do not use fillers or rigid sealants.

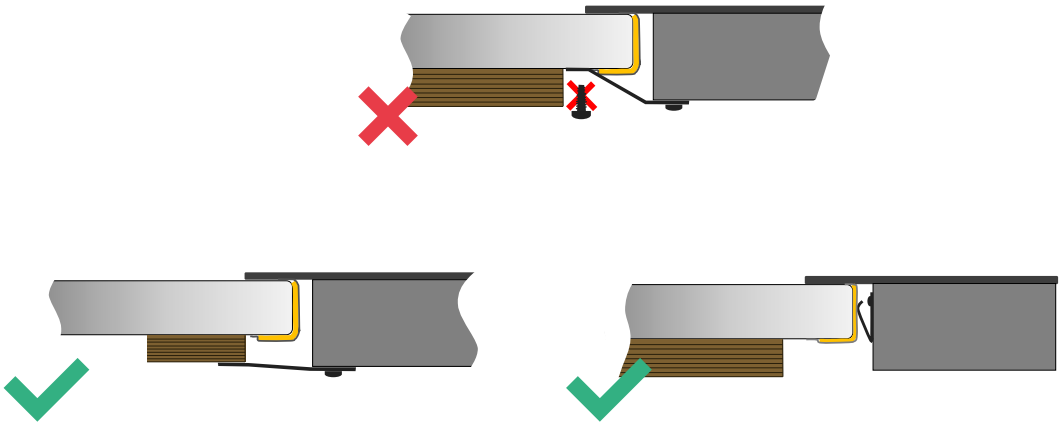



Maintain a safe distance between the position of gas hob rings and the wall trim of the countertop. It is very important that the flame from large diameter burners does not reach the position of the trim.

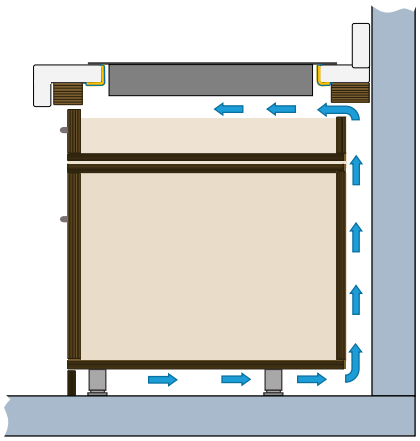
A stainless steel sheet covering the wall area next to the hob may help to protect the area.



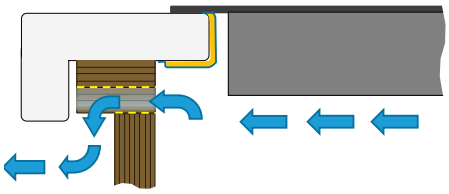
Never block cooking hobs or grills by screwing them directly to the KRION™ surface. If the installation of any support or anchoring with screws is required, they must be attached to a perimeter frame installed under the countertop, never directly to the KRION™.



To reduce the temperature in hot areas, it is necessary to ensure aeration of the interior part of the countertop through open spaces between the different modules which support the KRION™ surface.



Open aeration channels on the front of the countertop in areas where there are cooking hobs, grills, embedded ovens or other elements which may generate high temperatures. This will improve the aeration of the hot areas, thereby reducing the stress of the surface.

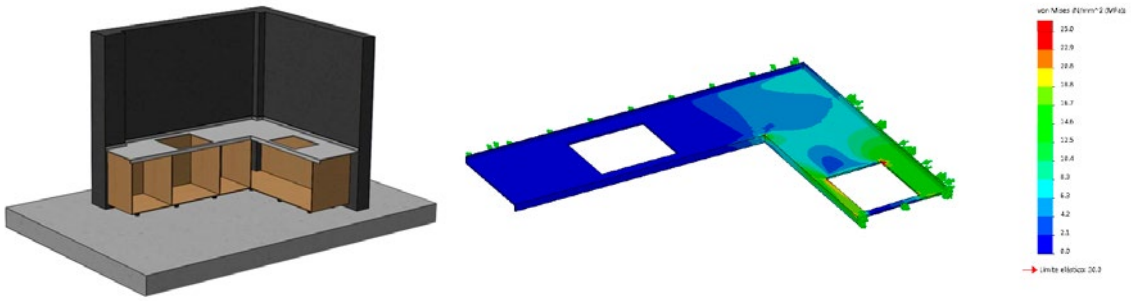


The perimeter cancellation of the countertop may generate tensions on the surface with the resulting risk of fracture.

Avoid structural obstruction on the perimeter of the countertop which may cause it to move.

Considering that there are points of heat installed, it is foreseeable that there will be a minimal expansion of the KRION™ surface at times when they are operating.

Apply a certain safety margin between the countertop and the walls or perimeter pillars.



### 7.1.2. REINFORCEMENTS

It is recommended to reinforce the lower part of the countertop with marine board. This must be bonded to the KRION™ with flexible sealant, silicone or single component polyurethane sealant such as Butech P404. It is not recommended to use MDF board for this purpose, as this easily absorbs water and moisture, and can deform, creating tensions on the countertop.

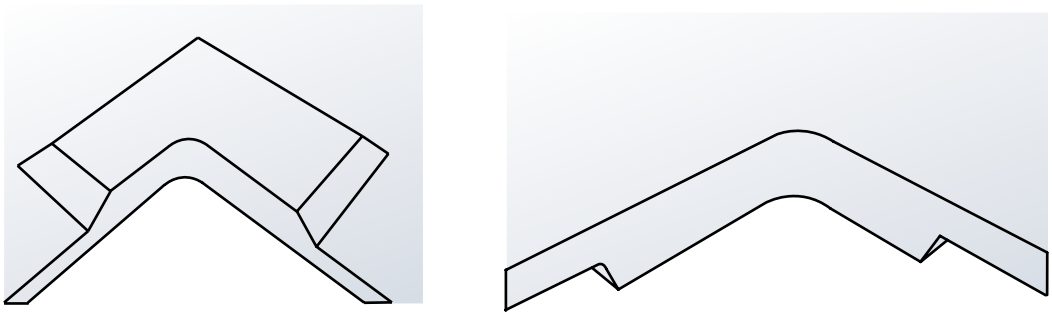
It is also possible to reinforce the countertop with strips of wood or KRION™.

When reinforcing the base of the KRION™ covering with a wooden board or any other support, always take the precaution of maintaining a perimeter distance of 4 mm (5/32") between the reinforcement board or support and the vertical gables.

This space will function as an expansion-contraction joint, thereby reducing potential tension on the surface. This space must not be kept empty, and will be filled with a flexible sealant such as silicone or a polyurethane base elastomer such as Butech P404.


In the case of not installing a reinforcement board, The whole perimeter of the gap left for the hob must be reinforced using, for example, a 10 mm-thick (3/8") wood strip with a width of at least 50 mm (2"), sealing it at all times with flexible adhesive (type P404).

The gap left for the hob can also be reinforced with KRION™, always mitering the edge at a 45º angle (see close-up).



Bottom and top view of the gap reinforced with a 100x100mm (3 $^{15}/_{16}$" x 3 $^{15}/_{16}$") piece of KRION™, with an edge mitered at a 45º angle, bonded with KRION™ adhesive. Reinforce the 4 corners of the gap in the same way.

The reinforcement of the hole with KRION™ may also be carried out completing the whole perimeter in this way.

Minimum radius of 12 mm (1/2") to thereby reduce tension on the corners. Before installing the ceramic fibre tape, ensure that the milling of the hole is uniform and without edges or different levels.

### 7.1.3. INSERTION OF SINKS

As has been emphasised in this manual, in addition to producing sheets, KRION™ manufactures sinks for installation in kitchen countertops. This section will explain the different series that KRION™ offers its fabricators and will indicate the correct way to install them.

#### 7.1.3.1. SINKS MADE BY CASTING

Through a process of casting in moulds, Krion offers an extensive catalogue of sinks and washbasins for installation in sheets. These are made of the same material as the sheet and will be attached to it with KRION™ adhesive.

As mentioned in Point 3. "Receipt and inspection" they must be reviewed, checking their proper state of repair, and confirming the planimetry of the surface for bonding with the countertop (rectify its planimetry if necessary before assembly).

On the interior of each basin, you will receive a leaflet with instructions for use and maintenance. Keep and issue this document to the end client once the countertop has been installed. The leaflet is shown in the image below, containing important information for its maintenance and care.

#### 7.1.3.1.1. BONDING OF KRION™ SINK

Having checked the proper state or repair of the sink, a small recalibration of the area to be bonded with the sheet must be carried out. The upper flange of the sink arrives calibrated, but may have a series of slightly noticeable parallel lines, related with the calibration process carried out at the factory.

To obtain an imperceptible join, it is recommended to sand the whole flange evenly until eliminating these lines or marks, at the same time checking that the area for bonding is fully flat.

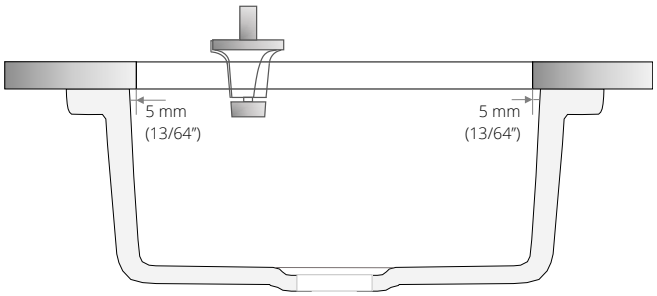
With the sink facing down and the flange in contact with the grinding belt, move it laterally and in circles until eliminating the lines.

It is also possible to carry out this work with the CNC, planning the flange of the sink with a cutter. When deciding on its location, take into account whether the sink may disturb certain important elements of the countertop such as drawers, reinforcements, gables or other elements.

Sand the lower face of the sink in the area where the sink will be bonded with P120 or P150 grain sandpaper. This will facilitate cleaning of the surface before application of the adhesive.

If an opening or hole is created prior to bonding, take into account that it is smaller than the real hole of the mouth of the sink (a margin of 5 mm (13/64") on each side is sufficient).

It is recommended to undertake it in this way to later finish the integration of the sink using a special 6° cutter with copying bearing.



Open the hole using the router and template or with the CNC. It is important to follow the instructions previously mentioned in point 7.1.1 "Preparation of the cooking hob housing", ya que la apertura de huecos en la encimera debe cumplir ciertas pautas y distancias a puntos críticos.

Place the sink in its correct position on the lower face of the countertop and bond some blocks on the perimeter of the flange, which will serve to centre the position of the sink.

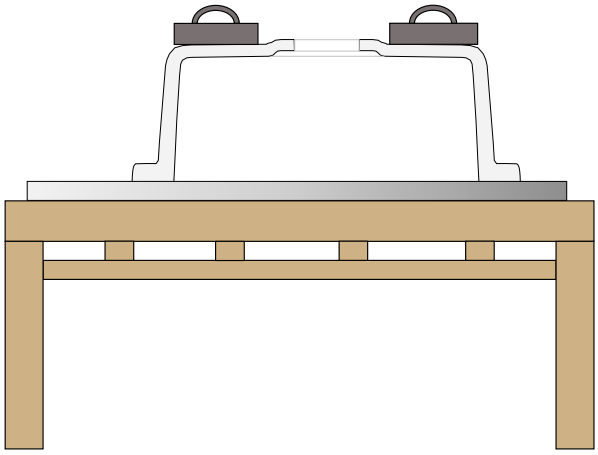
Before applying the adhesive, clean the flange of the sink and the surface of the sheet where it will be bonded.

The KRION™ adhesive applied must be sufficient to fill the whole surface in contact, and overflow. A thick line of adhesive near the edge of the flange and another zigzag line next to it will ensure the proper bonding of the sink.

It is recommended not to apply extreme force to the tightening system of the sink, as there is the risk of fracturing it or obtaining an irregular join. The tightening system must exert the same pressure on the whole flange of the sink.

For smaller sinks, with the drain orifice at the centre or near the centre, it is possible to use the following tightening process. Through the drain hole, using a screw and chipboard of a certain thickness, in this way we will create a tourniquet type tightening. Do not use low density wooden boards which may deform their planimetry when tightened.

For larger sinks, we can use the most common form of tightening, which consists of exercising pressure with loads of weight distributed all over the base of the sink. For this method to work properly, it is important to undertake it on a table or firm, levelled support which does not deform its planimetry when applying the tightening load.



In case of having to install a sink which is not KRION™, it must be bonded with an elastic polyurethane adhesive similar to Butech P-404. Never install the sink by screwing it directly to the KRION™ countertop.

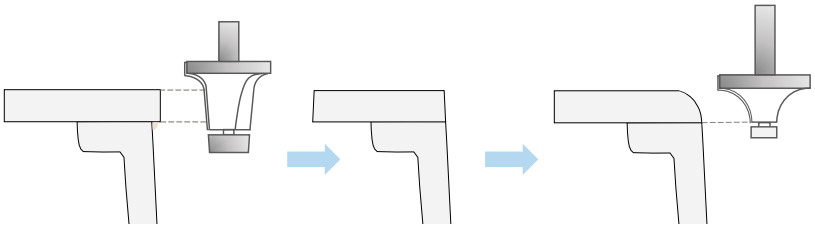
### 7.1.3.1.2. SINK FINISH

The surface of the basin of sinks made of cast KRION™ have a finish of approximately P350-P400. After completing integration, the surface of the basin must be sanded with a progression of sandpaper, ending with a minimum of P400.

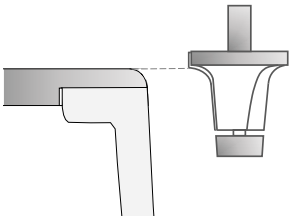
It must be understood that the sides of KRION™ sinks made by casting have a gradient of approximately 6°. Thus, once the adhesive is dry, the integration process must be completed by finishing the edge with a certain radius or with a chamfered angle. To do so, it is recommended to first use a cutter with a cutting edge of 6° with a copying bearing; this way the sanding and finishing process of the basin will be easier.

It is not recommended to leave sharp edges which do not have radii, as there is a greater risk of breaking due to potential impacts. Different forms or suggestions of finishes on the edges of KRION™ sinks once installed are shown below.

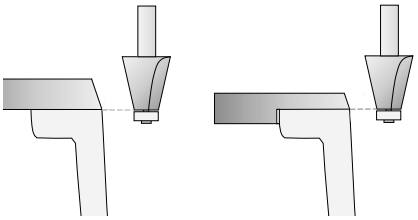
DULL FINISH, 12 mm (1/2") RADIUS



MONOLITHIC APPEARANCE,
6 mm (1/4") RADIUS



CHAMFERED FINISH 12°- 15° at 12 mm (1/2") / 6 mm (1/4")



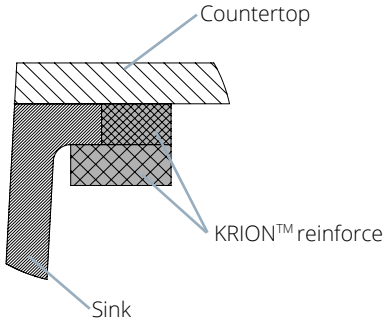
This final chamfered finish is the best option for concealing a potential change of tone between the sheet and the sink.

Due to the manufacturing method of sheets and sinks, there may be a slight difference in tone between them; it is therefore recommended to check the tone between the sink and sheet before installation.

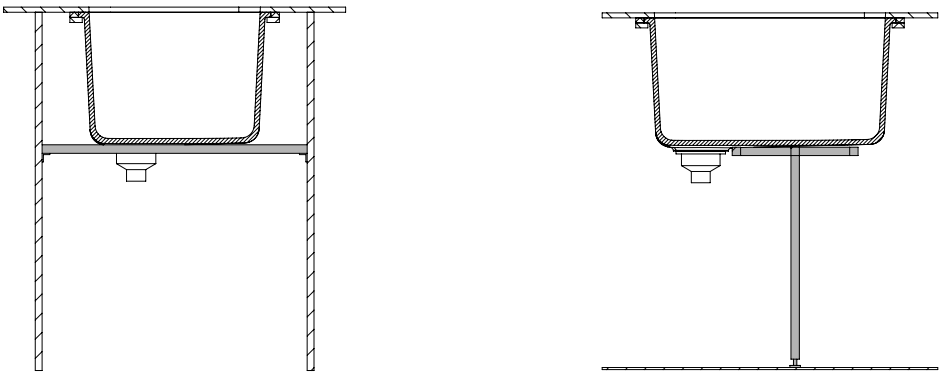
### 7.1.3.1.3. REINFORCEMENT OF SINKS

It is important to plan the installation of a reinforcement for the sink. Krion suggests two different types of reinforcement.

Reinforcement by blocks of KRION™ sheet bonded with the adhesive of the material. This reinforcement can be carried out when the sink is in its final position and with the tightening system blocked (see image).




Additional reinforcement on the base of the sink, supporting its load and the elements which may be placed inside it. Recommended system for large volume sinks.



### 7.1.3.1.4. OVERFLOW ASSEMBLY

The sinks include the overflow adaptor to connect the overflow to the siphon pool. The assembly of this is optional, depending on the model of siphon that is going to be installed finally in the siphon.

The overflow connector must be stuck to the surface of the siphon using Butech adhesive P404 or similar. Do not use silicone, KRION™ adhesive, hot glue or any other type of sealant that does not have elasticity or that does not offer guarantees of adhesion and durability.

Sand the area with a P120 or P150 grade and clean with denatured alcohol before gluing.


If you want to make a drainage, check point 8.4. "Drainage".

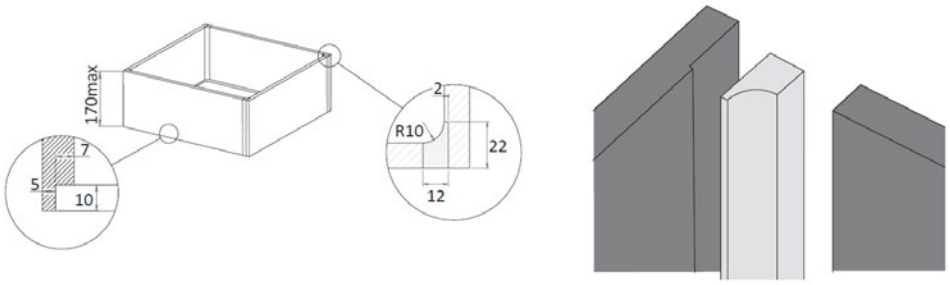
#### 7.1.3.2. LINKING SINK BASES

LINKING stainless steel sink bases were designed so that KRION™ sinks can be fabricated in a multitude of different colours. Are available in different sizes, they consist of a stainless steel base which is bonded to the bottom of a basin made of a KRION™ sheet of the chosen colour (see the list of colours recommended for this purpose).

Inside the packaging, an instruction leaflet will be found, explaining how the installation should be carried out and the way to clean and use it. It protects the Linking base during the whole production process, avoiding risks and damage to the stainless steel base.

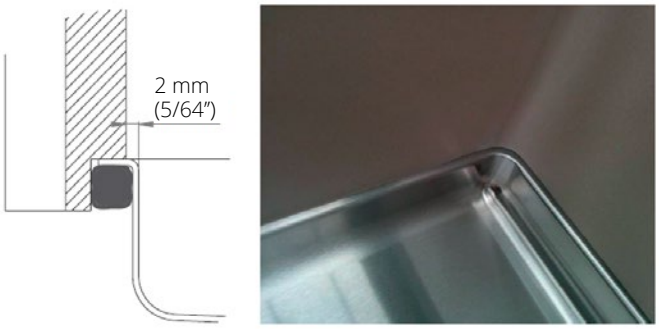
##### 7.1.3.2.1. MANUFACTURE OF THE KRION™ BASIN

The four angles of the basin must be manufactured with an interior radius of 9.5mm (23/64") to 10mm (25/64"), in a similar way as if a sanitary trim was being created, being made up of the same pieces. Take into account that the creation of this type of curve is affected by the colour used; that is, it is recommended only to use 90° colours. After bonding the four corners, each one must be lowered by 10x7mm (25/64"x9/32") (, as shown in the following image.

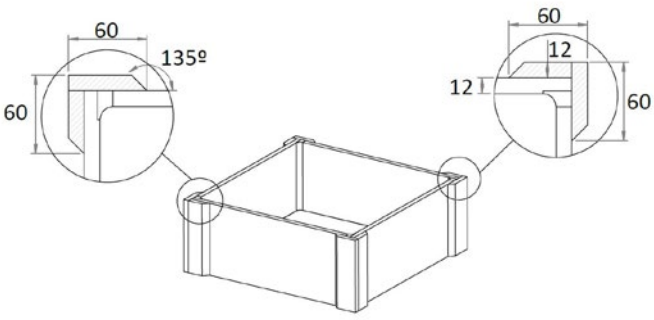



This rabbet should be cut in each of the basin's four panels before they are bonded together, although it is still possible to do so afterwards.

Before proceeding to bond the stainless steel base to the basin, check the flatness of the rabbet. Place the stainless steel base on the KRION™ basin and check that, when centred, it juts out by 2 mm (5/64") around the whole perimeter of the basin's four walls.

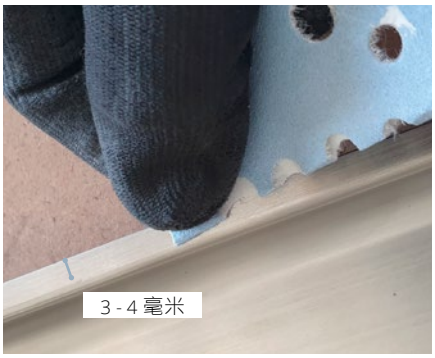



The rear of each of the basin's corners must be reinforced with 12 mm (1/2")-thick KRION™ strips, as shown in the following diagram. These strips must have the same height as the basin and they must be cut at a 45º mitred angle on the outside.

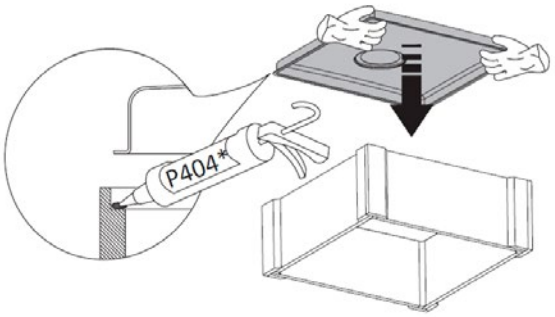



### 7.1.3.2.2. BONDING LINKING STAINLESS STEEL SINK BASES

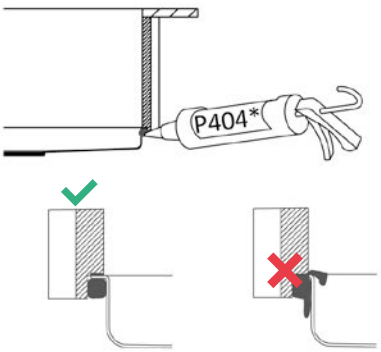
The base should be bonded to the KRION™ basin using a single-component elastic polyurethane sealant, such as Butech P404 or similar. Do not use silicon for this purpose. Place the basin upside down. Before proceeding to apply the sealant, it is necessary to sand both the surface of the KRION™ and 3-4 mm of the top and bottom of the stainless steel flanges of the sink with P120 sandpaper.


Make sure that the surfaces to be bonded are clean, dry and free from oil or grease. Use denatured alcohol to clean these surfaces. Squeeze a bead of sealant along the inner edge of the rabbet (taking care not to apply too much, so as to avoid any surplus sealant).




Place the base onto the basin and exert pressure onto the sealant beading until both objects are firmly in contact. Fill the remaining gap in the rabbet as shown in the diagram. The polyurethane sealant might need more than 24 hours to dry. To find out the exact cure time, see the technical specifications published by the sealant's manufacturer. Keep the basin upside down until the sealant has fully dried.



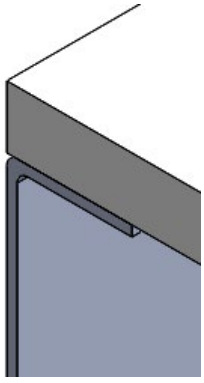

Once the sealant is dry, the basin can be bonded to the countertop.

### 7.1.3.2.3. BONDING TO THE COUNTERTOP

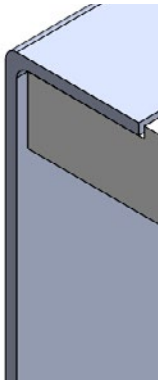
The sink created from KRION™ sheet and stainless steel base will be bonded to the countertop using KRION™ adhesive of the same colour as the sheet. A similar process must be carried out as in the previous case of "sinks made by casting". Do not carry out tightening from the drain hole, as the stainless steel base may be deformed by the pressure. It is recommended to exercise pressure using loads of weight on its whole perimeter.

### 7.1.3.3. STYLE SINKS

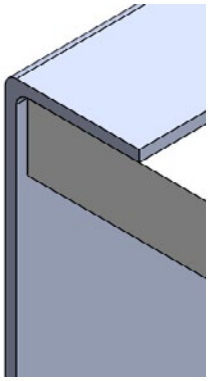
Sinks from the Style series can be fitted in KRION™ countertops in three different ways. The different ways of installing the sink are shown below.



Under-mounted installation



Flush-mounted installation



Countertop installation

#### 7.1.3.3.1. MAKING THE SINK CUT-OUT

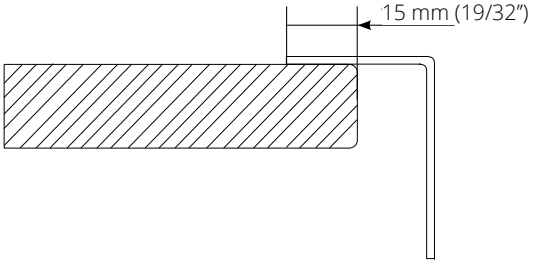
The Style sinks also incorporate an instruction leaflet explaining the different ways that the sink must be installed and how to do so. Additionally, information is provided on how the hole that must be opened for installation must be.

To open the hole, the instructions set out in point 7.1.3.1. "Sinks made by casting" of this manual must be followed.

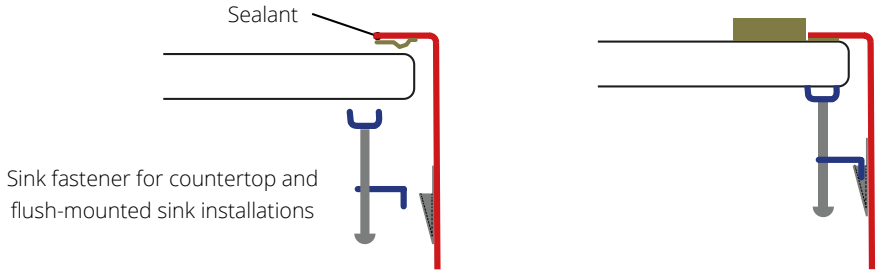
#### 7.1.3.3.2. STYLE INSTALLATION ON THE COUNTERTOP

For installation on the countertop, a template must be made from a wooden board, from the paper template in the box of the sink. The resulting hole must have the measurements for this type of assembly specified on the paper template. There is also the possibility of downloading the ".dxf" files from the website.

Open the hole and sand and finish the surface before installing the Style sink, as there is the risk of damaging the stainless steel if we sand it afterwards.




For countertop or flush-mounted sink installations, the sink fasteners supplied with the sink must be used.



Position and centre the sink and glue some blocks round it to keep it centred. These blocks can be made of wood, stuck with a little hot-melt glue.

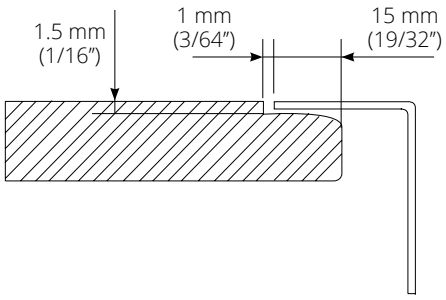
They will be removed once the sealant for bonding the sink has dried. Exert uniform pressure on the rim of the sink so that the sealant spreads evenly. Screw the sink fasteners in place, without over-tightening them.

Once the sealant has dried, remove the centring blocks and clean away any surplus sealant, taking care not to scratch the countertop or sink.

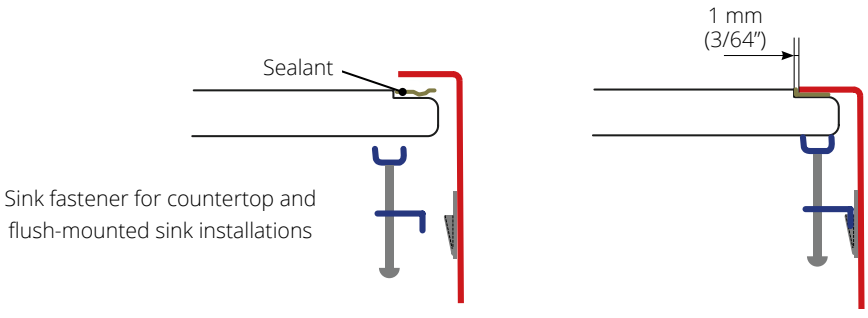
#### 7.1.3.3.3. FLUSH-MOUNTED SINK INSTALLATION

For flush-mounted sinks, two templates must be cut, one for the sink cut-out and the other so that 15 mm (19/32") of the sink's perimeter rim rests flush with the countertop. .dxf files can also be downloaded. The depth cut down to integrate the flange of the sink must be 1.5mm (1/16").

It is recommended that once this reduction has been made put the sink in place, centre it and check that there is a 1mm perimeter gap between the rim and rabbet.




It is important to round the upper and lower edges of the hole for embedding before installing the sink. Sand the inside edge of the cut-out so that it has the same finish as the countertop will have. The area of the countertop close to the sink should be fully sanded before the sink is fitted.

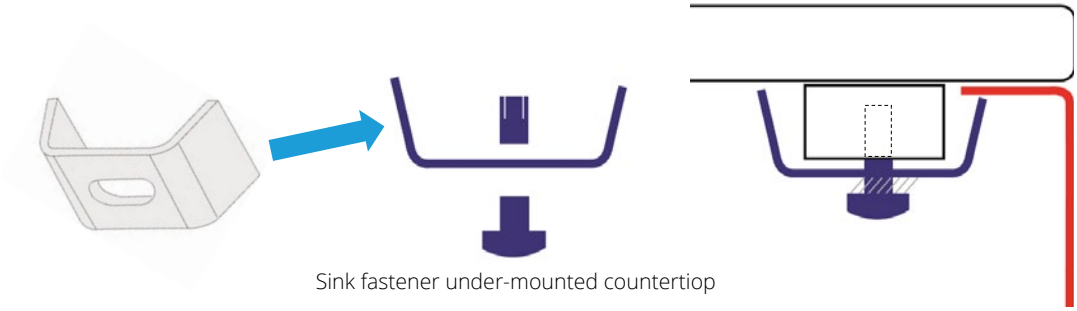



#### 7.1.3.3.4. UNDER-MOUNTED INSTALLATION

To under-mount the sink, make a wood template to ensure that the cut-out is the right size for this type of installation.

In such cases, the sink fasteners supplied with the sink must be fitted. Depending on the size of the sink, either one or two will be required on each side of it.

In such cases, the sink fasteners supplied with the sink must be fitted. Depending on the size of the sink, either one or two will be required on each side of it.The sink fasteners are made up of a stainless steel clip to be screwed to a 12 mm(1/2")-thick 20x30 mm (25/32"x 1 $^{3}/_{16}$") KRION™ block (not supplied with the sink).



Sink fastener under-mounted countertiop

Each sink fastener comprises a steel clip with a 6.5x8.3 mm (1/4"x11/32") expandable insert for an M5 bolt, an M5 bolt and grooved nut.

A hole up to 8.5 mm (11/32") deep must be made in the 20x30 mm (25/32"x $1^{3}/_{16}$") KRION™ reinforcing block, using a 6.5mm (1/4")-diameter milling or drill bit. The sink fastener's expandable insert must be centred above the hole and integrated into the block so that it does not jut out. Screws for KRION™ can be used.

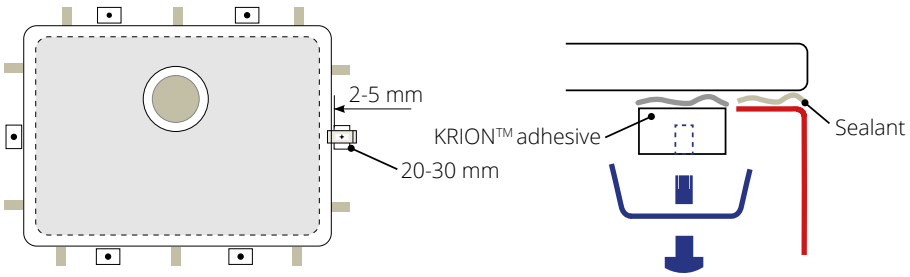
The KRION™ reinforcing block for the sink fastener must be bonded to the KRION™ sink with KRION™ adhesive.

Once the cut-out has been made in the countertop (using a CNC milling machine or router + template), position the sink under the counter and check that the hole is the right size.

Remove any sharp edges from the cut-out by fabricating a uniform minimum 2mm radius for the top surface and minimum 1mm radius for the lower one. Sand the inner side of the hole so that it has the same finish as the countertop will have.

Position and centre the sink, glue some blocks in place to keep it centred. These blocks will be removed once the sink's bonding material is dry. The said blocks can be made of wood, plastic or KRION™ and they can be glued in place with cyanoacrylate or a hot-melt adhesive.

The KRION™ reinforcing blocks should be fixed in place with KRION™ adhesive, more or less in the positions shown in the diagram. Leave a space of 2 (5/64") to 5 (13/64") mm between the blocks and rim of the sink.




### 7.1.3.4. CONTRACT SINKS

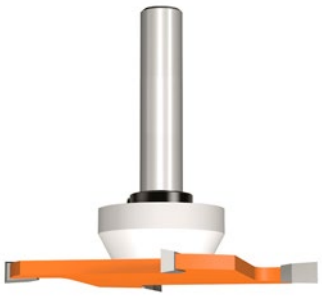
CONTRACT sinks can only be installed in undermount format. For their installation, follow the same steps indicated in the point 7.1.3.3.4. "Under-mounted installation".

### 7.1.4. SINK REPLACEMENT

There may be three different cases leading to the replacement of the sink: the user wanting a larger sink than they have; wanting to replace the sink they have with one the same size; or replacement with a smaller sink.

In the first case it will only be necessary to make the hole to carry out subsequent bonding. It must be kept in mind that the hole must be made as indicated in Point 7.1.3.1. "Sinks made by casting".

In the second case, one sink must be replaced by another. To do so, the type of cutter shown in the following image will be used.



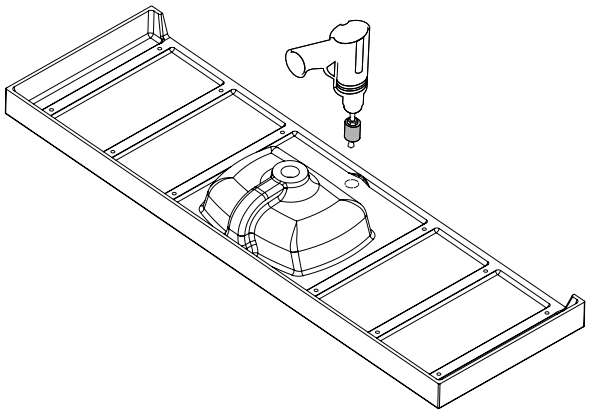
This will consist of passing the cutter over the bonding joint between the sink and the sheet. This cutter has a bearing which will mark the entry limit of the groove to be made. Once the groove has been made around the whole edge and the sink has been extracted, check the state of the sheet. In case of the countertop being in good condition for bonding the new sink, it will only be necessary to clean and bond it; if not, the area must be rectified for subsequent bonding.

In the third case, the hole of the old sink must be covered with sheet from the same batch, as a different batch will have a slightly different tone. From there, the hole will be opened as mentioned in 7.1.3.1. "Sinks made by casting".

### 7.1.5. TAPS

Using a drill bit or core bit make the hole for the tap, as specified in the installation manual. If the tap has screwon parts like nuts or fastening screws, make sure that the diameter of the machined holes is 2 mm bigger than the screw or piece to be fitted.

Never reinforce the base of the tap with wood or materials that are not waterproof or damp-resistant. KRION™ is a good material for reinforcing this area.



### 7.1.6. KITCHEN USE AND CLEAN

In addition to cleaning the KRION™ surface, certain recommendations of use should be followed to keep it in optimum condition for longer.

AVOID EXCESSIVE HEAT
KRION™ can withstand high temperatures, but extreme heat can damage any surface. Do not expose it to extreme heat or sources of extreme heat. Make sure that cooking pots and frying pans do not overhang the edge of cooking hobs.

PLACE OBJECTS THAT HAVE BEEN TAKEN OFF THE HOB OR OUT OF THE OVEN ONTO A HEAT RESISTANT MAT
In the case of kitchen countertops, put objects that have been taken off the hob or out of the oven onto a heat resistant mat or similar particularly if they are made of cast iron.

DO NOT SLIDE HEAVY OR SHARP OBJECTS ACROSS THE SURFACE
KRION™ is a very hard material. However, as with any surface, be careful not to slide hard, heavy or sharp-edged objects across surfaces with a satin or glossy finish. Always use a chopping board to cut or chop food.

PREVENT OBJECTS FROM KNOCKING THE EDGES OF COUNTERTOPS.
KRION™ has a high resistance to impacts, thanks to its combination of raw materials. Nonetheless, the edges of KRION™ countertops should not be knocked. If they are, they can always be repaired by a KRION™ fabricator.

DO NOT POUR BOILING LIQUIDS DIRECTLY INTO THE SINK/BASIN
Although KRION™ is resistant to thermal shocks, boiling liquids should not be poured directly into the sink/basin. Wait until they cool or run the cold water at the same time. Do not leave hot recipients on the surface of the sink/basin. Leave them to cool first.

DO NOT USE TAPS THAT DISPENSE VERY HOT WATER
Avoid the use of taps that provide instant supplies of very hot water. Such a high change in temperature might burn the person handling the taps and damage the sink/basin. Any damage by these taps to the KRION™ product is excluded from the warranty.

DO NOT SPILL NOXIOUS CHEMICAL PRODUCTS ONTO IT
Avoid the use of noxious chemical substances, like drain cleaners or paint stripper. If any such liquid is spilled onto the surface, clean it up as promptly as possible using plenty of soapy water to avoid damage. Do not expose KRION™ surfaces to strong chemical products for prolonged periods of time. Be particularly careful with solvents, acetates, oven cleaners, methyl chloride and drain cleaners. In the event of the surface's accidental exposure to these products, rinse with plenty of water.

With regard to cleaning and maintenance, the steps of point 9. "cleaning and care" of this manual must be followed.

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# Aplications and uses

## Countertops and work surfaces

07.2

## 7.2. COUNTERTOPS AND WORK SURFACES

An application where KRION™ is widely used is for work surfaces or high transit surfaces, such as kitchen or bathroom countertops, work tables, etc. Being functional, these areas bear loads of people or objects, and may even be used in non-functional ways, having to be prepared for this. The following sections will set out recommendations for the material to deal with these potential loads.

### 7.2.1. STRUCTURES

As recommended in this manual, the whole work surface made with KRION™ must be made with 12 mm (1/2") thick material, but this must be reinforced with another type of material to withstand potential occasional loads and bear their weight.

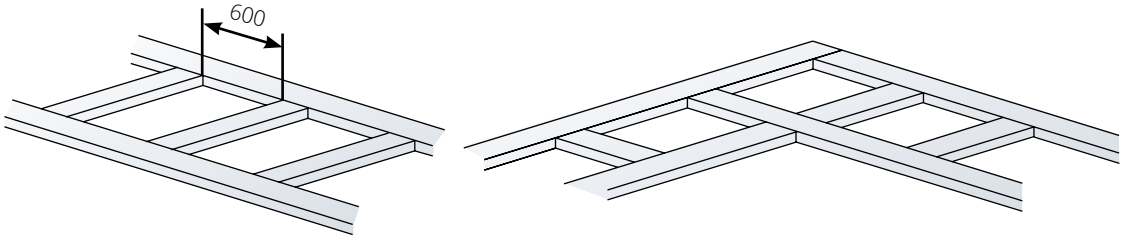
It is recommended to use different materials for the manufacture of these structures, but the use of this surface or the area where it will be installed must be taken into account. Different materials with which this type of structure may be created are set out below.

WATERPROOF MDF
Recommended for work surfaces installed in wet areas which do not have direct contact with water. This is a wood which is excellently manipulated due to its stability and resistance.

FLAME RETARDANT MDF
Recommended for areas where the work surface will be subjected to hot spots at high temperatures, this wood is resistant to heat and has very low flammability.

ALUMINIUM
The only support material recommended for outdoor structures. The material withstands temperatures which cause its expansion and contraction, therefore aluminium is the metal which behaves most similarly to KRION™ outdoors.

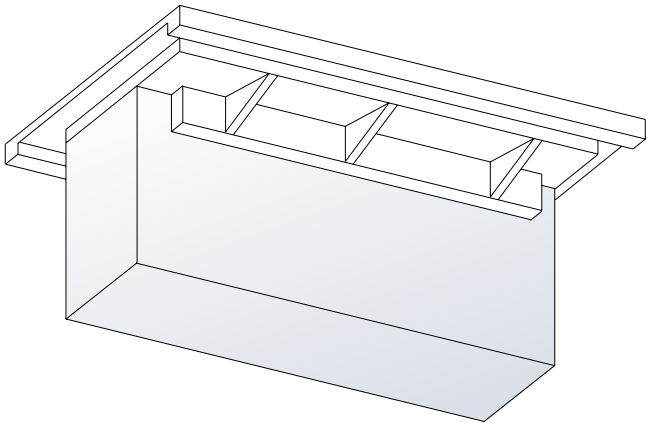
In the case of needing to reinforce a surface several metres long, it is recommended to make a constructed structure through the stairway method; that is, through struts on its transversal section to be able to control the inertia of the material. The recommended separation between struts is approximately 600 mm ($23^{5}/_{8}$")(see image).




An alternative to the above structure is to transform the surface so that its whole edge is reinforced through a gable or rib of KRION™, creating a double thickness reinforcing the join on bonded joints and holes between reinforcements and edges, introducing another resistant, inexpensive, light weight material (wood). At the time of introducing the reinforcement of another material, the expansion of the two materials must be taken into account.

### 7.2.2. OVERHANGING AREAS

Due to designs or final requirements, on many occasions it is necessary to create overhanging areas on countertops or units. These are eye-catching, distinctive areas, but require certain reinforcements so that they work correctly. It is recommended to design overhanging areas without reinforcement and with material of standard thickness, having to install reinforcements at a distance of 100mm form them.



There are different types of reinforcements such as brackets which work similarly to a corbel or the use of a double thickness of another material which fulfils the proper function of the material. These brackets must be separated in accordance with the previous section, approximately every 600mm. Additionally, placing bonded joins in these areas must be avoided, as they have a lower resistance than the material itself.

KRION™ has a technical office specialised in all kinds of supports and structures which work with the material. It has a free client service for all kinds of calculations and consultation on transformation. In case of doubt when creating any kind of structure for a critical point in the installation of the material, it is recommended to contact the technical service.

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# Aplications and uses

## Bathrooms

07.3

## 7.3. BATHROOMS

KRION™ is a non-porous material due to its composition, preventing bacteria from accumulating and proliferating, and is therefore a perfect material for installation in bathrooms.

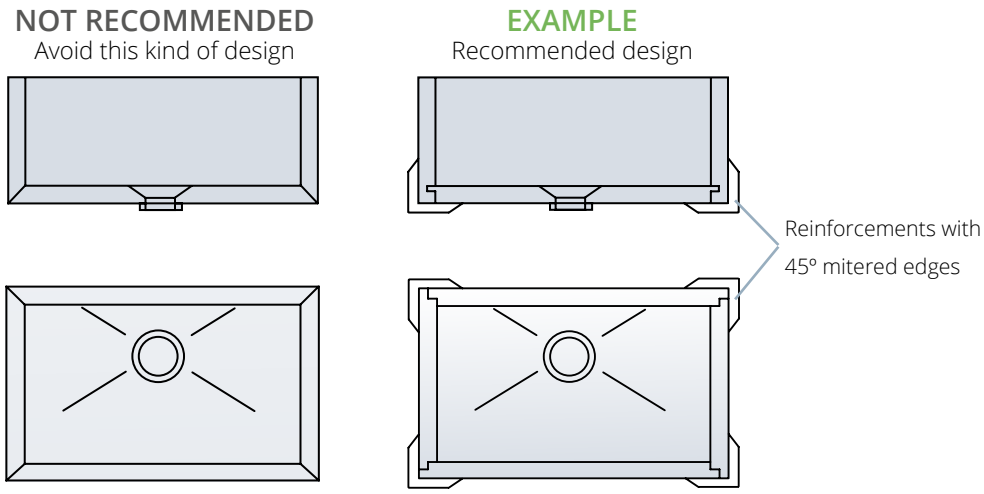
### 7.3.1. COUNTERTOPS

As in kitchens, the material can be installed as a bathroom countertop, as its properties make it suitable for this. It is therefore recommended to follow the transformation instructions provided in point 7.1. "Kitchens" of this manual to carry out installations of bathroom countertops.

#### 7.3.2.1. WASHBASINS MADE BY SHEET

A series of tips and warnings for fabricators on properly creating washbasins are provided.

- If washbasin designs are created for manufacture with sheets, never design the mitre joints at 45º. Always remember that washbasins can sometimes be subject to thermal shocks.




- Reinforce the seams with KRION™. Reinforcements subject to thermal shocks should always have 45º mitered edges.
- The base slopes down to the drain valve so that water drains away properly (with a minimum slope of 1 to 1.5º).
- The drain hole is made so that the drain trim is flush with the bottom of the basin or slightly below it.
- Make sure that the underside where the drain outlet goes has a flat surface. A 6 mm-thick (1/4") section of KRION™ can be used to ensure a flat surface.

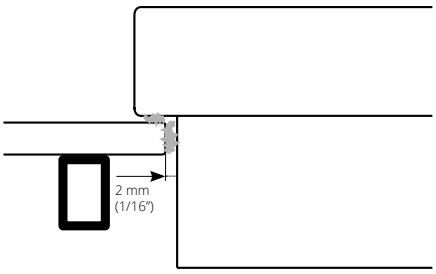
### 7.3.2. KRION™ WASHBASINS MADE BY CASTING

Krion has several series of washbasins made by casting, which are available in three types; recessed, semi-recessed and On Top.

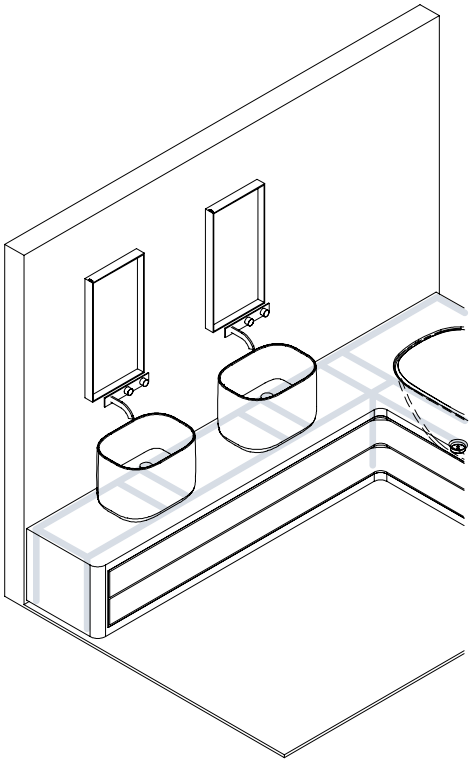
In the case of semi recessed and on-top washbasins, always use a P404-type elastic sealant or similar to bond the washbasin to the countertop. KRION™ adhesive must not be used to bond these models.

Reinforce the lower perimeter of the washbasins. With the semi-recessed model, make sure there is a gap of 2 mm (1/16") between the washbasin itself and the hole in the countertop.

Apply the sealant making sure that the seal is perfectly waterproof, to prevent water dripping down inside the unit (clean and remove any visible remnants of sealant around the edge of the washbasin).

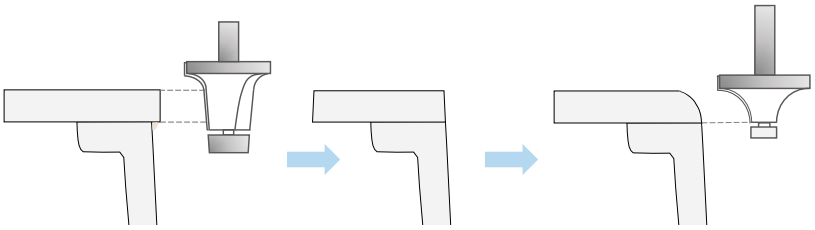



When the worktop assembly is configured with On Top model sinks, it is necessary to reinforce the part of the chassis that coincides with the position of the sinks.



The technique for integrating the wash basins into the KRION™ sheets is similar to that of the wash sinks in the kitchen countertops. Reviewing the processes 7.1.3.1.1. "Bonding of KRION™ SINK" y 7.1.3.1.2. "Sink finish"

As with sinks, the inside slope of the vessel in most basins is about 6°. It is therefore possible to integrate it with the help of a router bit with the 6° cutting edge with copying bearing.



Except for some specific models where the slope angle of the vessel is more pronounced. Below are some models where the sides are at different angles.

In these cases it is possible to complete the integration with the help of a small router that has an adjustable angle base. With this router and a straight cutter with copying bearing, you can adjust the required milling angle for each basin model (pictures of the process are shown below).

### 7.3.3 SHOWER TRAYS

Shower trays are occasionally subject to thermal shocks (hot and cold water) and to loads of up to 100 kg on their top surfaces. As a result a series of precautions must be taken when designing and fitting shower trays.

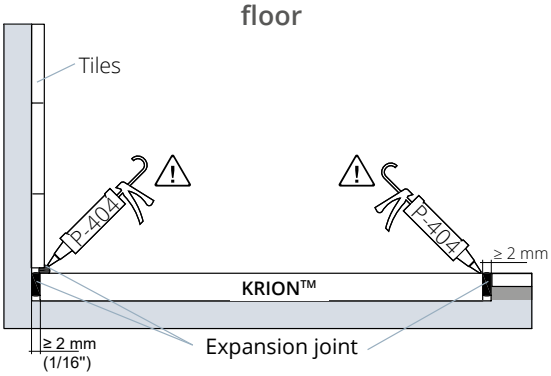
For the sake of brevity, we will not list all the possible shapes and designs, but we will provide a series of tips and warnings so as to ensure a successfully fitted KRION™ shower tray.

The example shower tray shown in this section is inspired by the RAS shower tray from the Krion

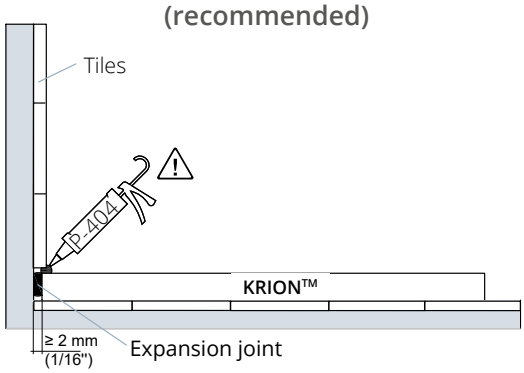
catalogue. Read this section carefully and take note of all indicated warnings.

- Visit the worksite to check the measurements of the tray to the made and the conditions of the shower area (the available space, possible columns, position of the drain, available depth etc).
- The shower tray can be fitted between walls, recessed in the floor, semi-recessed or surface mounted on the finished floor. Make sure accurate measurements and notes are taken of the area and design required by the customer, always leaving a margin of 2 (1/16") or 3 mm (1/8") around the perimeter of the tray for the expansion joint (otherwise the tray might break).

**Recessed/integrated into the floor**

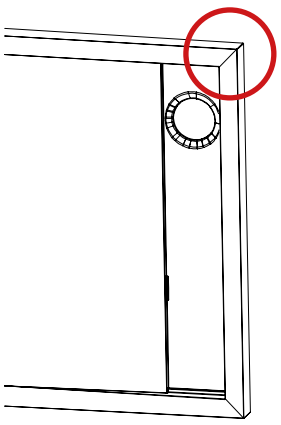



**Surface mounted on the finished floor (recommended)**

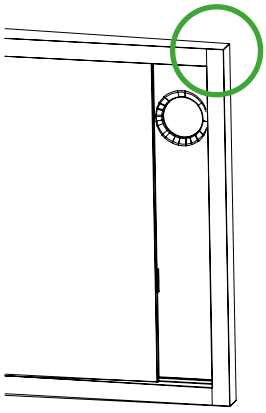



- The recessed installation method is dependent on the available depth of the floor and on the length of the final design. Bear in mind that the basin area of the shower tray should have a minimum slope of 1 to 1.5º so that water drains away properly.
- The size of the drain valve and height of the downpipe can also limit the possibility of this kind of installation system. It is always better to design a shower tray with a bigger diameter drain valve (90 mm for instance) so that water drains away faster.
- Never position seams close to corners mitered at a 45º angle.

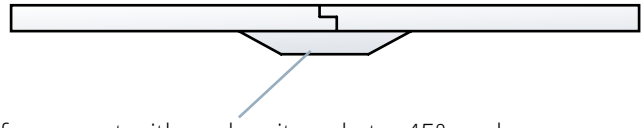
**NOT RECOMMENDED**



**RECOMMENDED EXAMPLE**

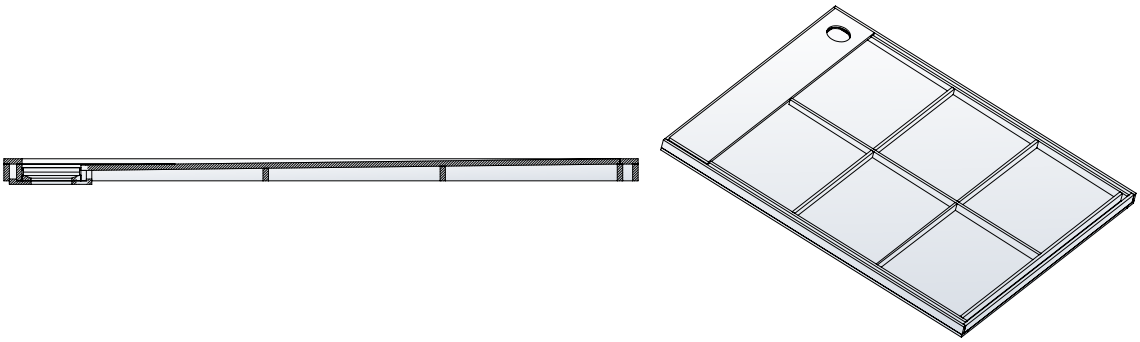


- Reinforce the KRION™ seam, mitering the edges of the reinforcement strip at a 45º angle.

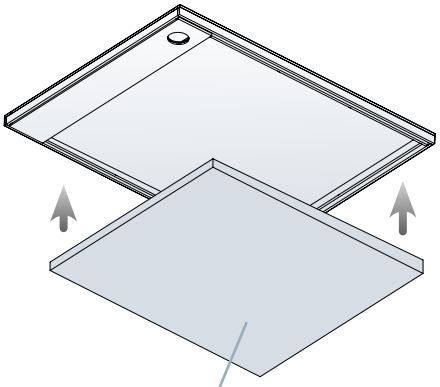


Reinforcement with ends mitered at a 45º angle

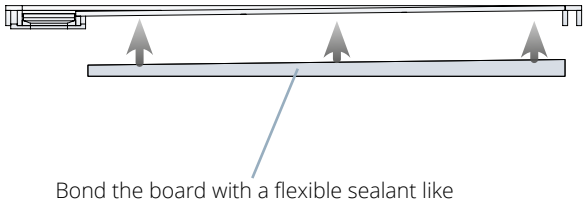
- As a general rule, when a shower tray is being designed, avoid too much of a difference in the thicknesses of sections exposed to thermal shocks (cold/hot water). Reinforcement points are necessary and they lead to differences in the thickness of the tray. Do not forget to miter the edges at a 45º angle, particularly if they are situated in areas subject to thermal shocks.
- Reinforce the load-bearing area of shower trays with supporting crosspieces that rest on the levelled base.



Another way of stabilizing the load-bearing area is to use high-density waterproof polyurethane board, adapting it to the size of the gap underneath the tray and levelling it until the tray rests on top of it.

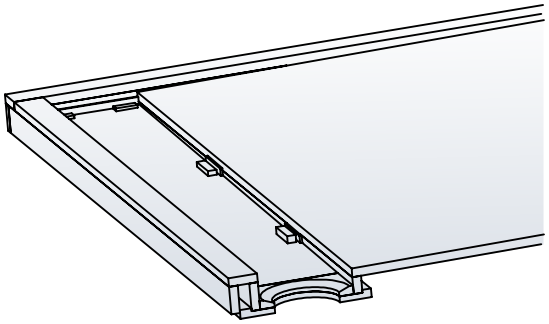


Bond the board with a flexible sealant like P404 by Butech.



Bond the board with a flexible sealant like P404 by Butech.

- The drain hole should be made in such a way that the valve is flush with the surface so that water drains away properly. It is always preferable to design the tray so that it includes a larger diameter drain valve (for instance 90 mm ($3\ ^{9}/_{16}$”)) so that it has a bigger drainage capacity.
- Do not make the drainage hole in such a way that the gluing joints in the hole coincide.



It is recommended to test the transformed plates with plate against thermal shocks before delivery to the end user.

### 7.3.4. UNIQUE SERIES

The new Unique series was developed to make the most of KRION™ as a material for the contract market. The products in the series can be installed in numerous different ways and adapted to fitin with endless different styles and user requirements.

#### 7.3.4.1. UNIQUE SHOWER TRAY

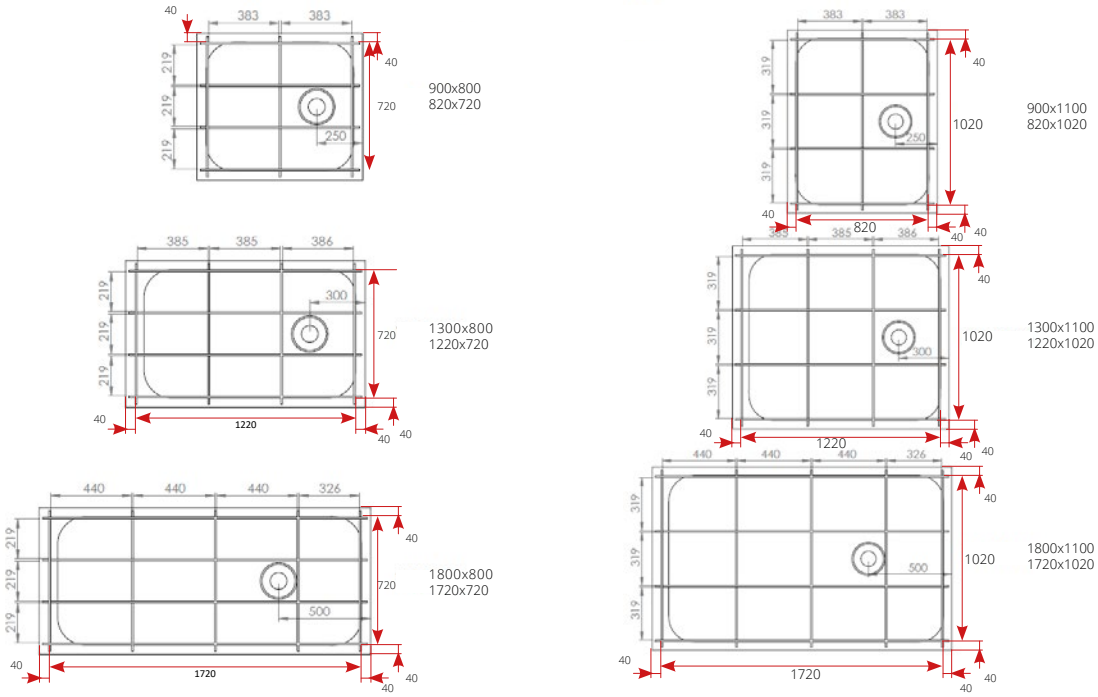
The shower trays are available in different sizes, all with a 90 mm (3 $^{9}/_{16}$") drain diameter (including a drain trim cover in KRION™ Snow White, not including the syphon-valve). All of the shower trays have support points on their entire base, and are ready for installation on firm, level surfaces.

##### 7.3.4.1.1. SIMPLE INSTALLATION (ORIGINAL OR REDUCING ITS SIZE – CUTTING)

Any of the shower trays in the Unique Series can be installed with their original sizes or be trimmed to ensure a perfect fit. The Unique shower trays can be trimmed down by a maximum of 40 mm (1 $^{9}/_{16}$") on each of their sides. It is very important not to break or cut any of the support points on the bottom of the shower trays.

If you need to reduce the size of a shower tray, cut and profile the edges using a manual milling machine or CNC machine. Do not use jigsaws to cut the shower tray as this may cause cracks. The edges of the cut must be rounded to a radius of 1 (1/16") or 2 mm (1/8"), and sanded using P320 grain sandpaper.

Below is an image showing in red the cutting points and the maximum distance each Unique series tray can be cut.

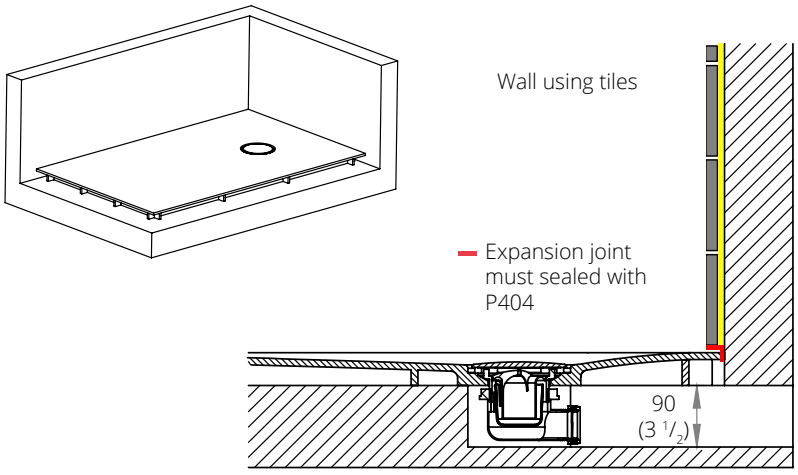


### 7.3.4.1.2. SIMPLE INSTALLATION: PRECAUTIONS

Shower trays made of KRION™ must be installed paying special attention to a series of precautions. Depending on its application and use, a shower tray may be exposed to extreme water temperatures ranging from 3ºC (37,4ºF) to 65ºC (149ºF), although the usual temperature range is between 15ºC (59ºF) and 40ºC (104ºF).

Extreme temperature variations may cause the material to shrink and expand slightly (the expansion coefficient of KRION™), and so the following precautions must be taken into account:

- All of the support points under the shower tray must be placed on a solid, level surface.
- The shower tray must never be attached to the floor or walls using cement adhesive or any other non-elastic type of bonding product.
- If the shower tray is recessed into the floor or between walls, a minimum expansion joint of 2 mm (5/64") must be left around its entire perimeter.
- This expansion joint must be sealed with P404 from Butech or similar (a single component polyurethane based elastic sealant). Never use a non-elastic sealant or cement adhesive.
- The walls of the shower can be finished using tiles or any type of stone. If the bottom part of the wall covering rests on the KRION™ shower tray, leave an open joint of 2mm (5/64") between the wall covering and the shower tray. This joint must also be sealed with P404 or similar; do not use cement adhesives or non-elastic products.

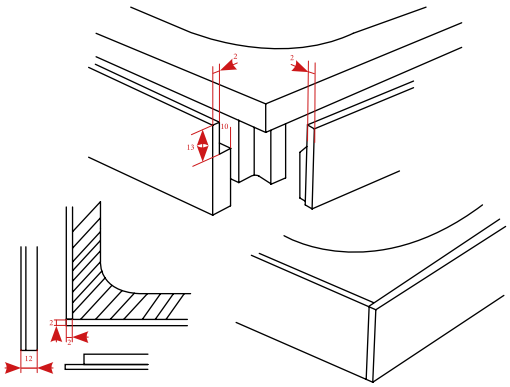



The person installing the shower tray must be aware of and follow these installation instructions. For this reason it is very important to provide the person carrying out the work with a copy of the Technical Data Sheet for installation. This sheet is included with every shower tray from the Unique Series, or if you prefer you can print it from the KRION™ Affinity website or from this manual.

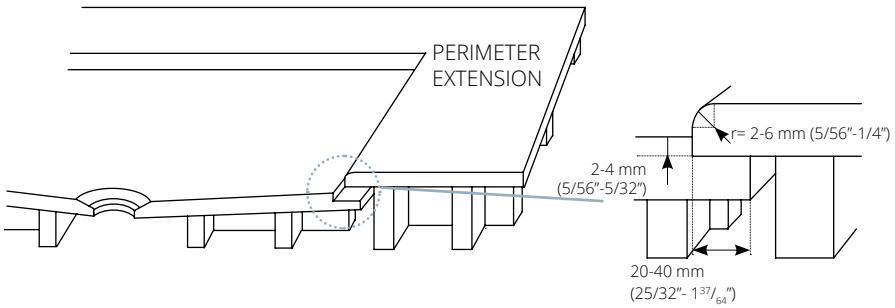
### 7.3.4.1.3. FABRICATION TOGETHER WITH OTHER KRION™ ELEMENTS

- All Unique shower trays must be installed on a solid, completed floor surface.
- The front part of the shower tray will be open, and it can be closed with the same KRION™ colour (Snow White 1100) or combined with another colour reference from the KRION™ Lux series.
- Bear in mind that there could be a slight difference in shade between the panel of Snow White 1100 and the Unique elements. As a result, the joints and seams should be finished in a way that conceals any possible change in shade between the panel and the Unique shower tray.
- To obtain an invisible joint, the outer edges of the shower tray should be milled before attachingthe panels.

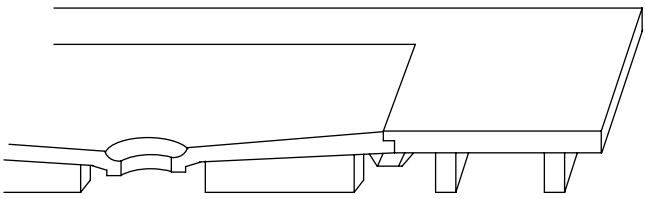
- The following diagram shows a design for panelling the shower tray with one front panel and one side panel, machining a rebate in the seam to a thickness of 2 mm (5/64").



To increase the surface of the shower tray, its edge should be machined, attaching the perimeter section with a rounded finish. The extension should always be added above the height of the shower tray, as this will improve waterrun-off from the shower, and will help to reduce any possible difference in shade between the shower tray and the Snow White (1100) panel.




The surface of the shower tray can also be extended by bonding an outer perimeter to it at the same height.

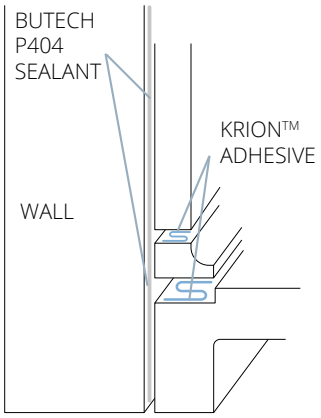


Bear in mind that this method may result in a slight difference in shade being visible between the Unique shower tray and the panel used for the perimeter. The outer perimeter must be fabricated with correctly levelled support points in contact with the floor. The recommended distance between the support points is 300 (11 13/16") – 350 mm (13 25/32"), and should never be any more than 400 mm (15 3/4"). The shower tray and the outer perimeter extension must be supported on a solid, level surface to prevent any stresses that may damage the structure or surface of the shower ensemble.

### 7.3.4.1.4. EXPANSION JOINT

When fabricating the shower ensemble, make sure that there is a minimum gap of 2 mm (5/64") around the entire perimeter of the KRION™ and the walls or floor where it is to be installed. This gap will act as an expansion joint and must be sealed with P404, a polyurethane product from Butech or similar. Do not use non-elastic sealants or cement adhesives. Before installing the ensemble, make sure that the supporting surface is solid and level.

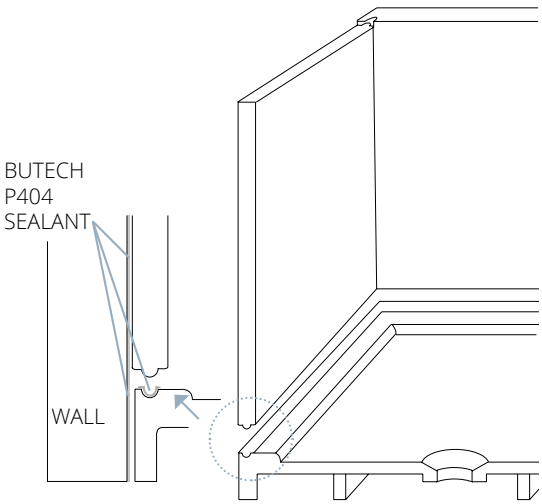
The walls can be covered in several different ways, but it is important to always respect the expansion joints between the shower tray and the panels used to cover the walls.




In this case, a rounded joint with a radius of 10 mm (25/64") has been used.

Bear in mind that in order to obtain invisible seams, the sections must be machined with the right tools, and cleaned throughout the entire process of applying KRION™ adhesive. Check these procedures in the Official Fabricator's Manual.

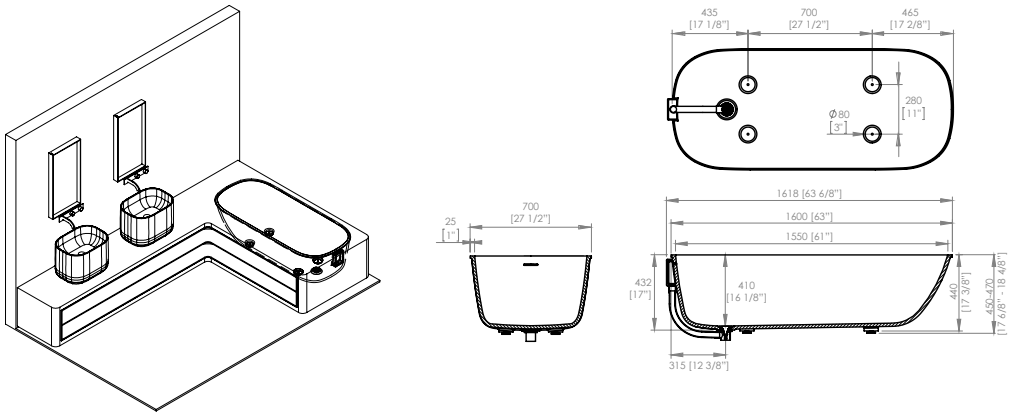
The recommended surface finish for the shower tray to ensure an improved non-slip effect is P180 to P240.



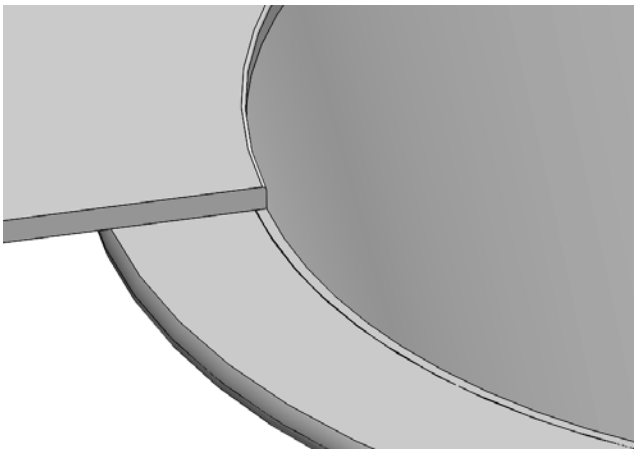

In this other example, the Unique shower tray and the panels used to cover the walls have been machined with a tongue-and-groove joint, and the seam between them has been sealed with P404 or similar (a polyurethane single-component elastic sealant). P404 is a sealant with excellent properties that ensure perfect insulation and water resistance. Use the same P404 sealant to attach the panels to the walls being covered.

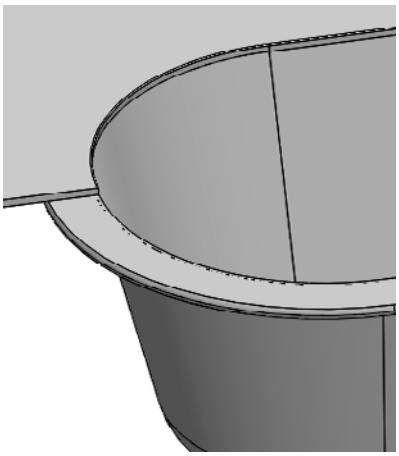
### 7.3.4.2. UNIQUE BATH

The UNIQUE bath measures 1550 x 650 cm (61 $^{1}/_{32}$"x 25 $^{19}/_{32}$"), and is made of KRION™ Lux Snow White (1100). The bath has an overflow ready for connection, together with four support points with adjustable feet.

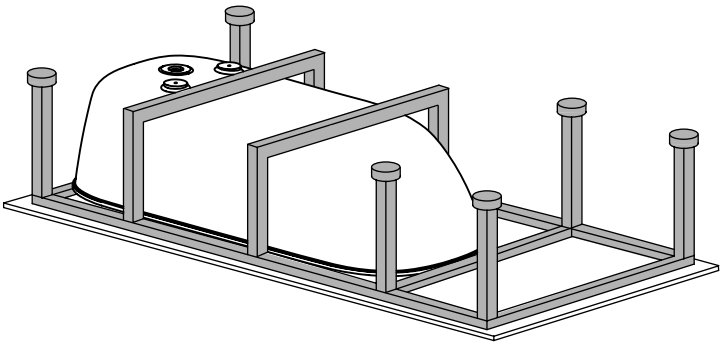



As with the Unique shower tray, there may be a slight difference in shade between the bath and theKRION™ 1100 panel. To achieve a smoother integration between the bath and surface, we suggest milling a radius of 15".



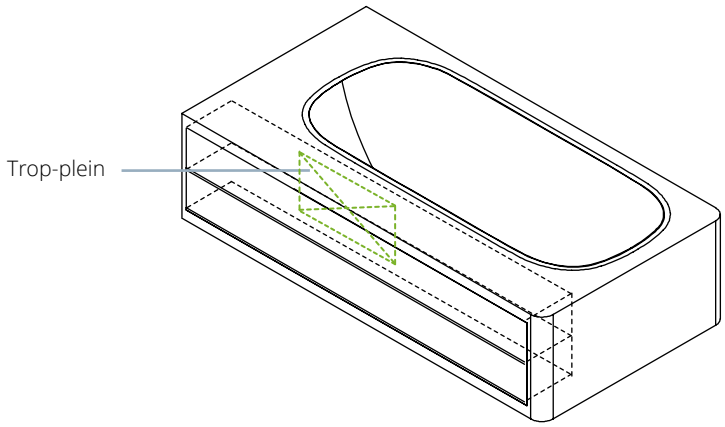


It will be necessary to calculate and manufacture a metallic frame or structure to support the weight of the ensemble, taking into account the volume of the water in the bath and the weight of the customer when using the finished product. Bear in mind that humidity levels are generally higher in bathrooms. If you are planning to use wooden boards as an accessory for the support together with the frame (between the frame and the KRION™), then this must be phenolic plywood board, marine plywood or similar. Use P404 sealant from Butech or similar to bond the board and/or the frame to the KRION™ panels.

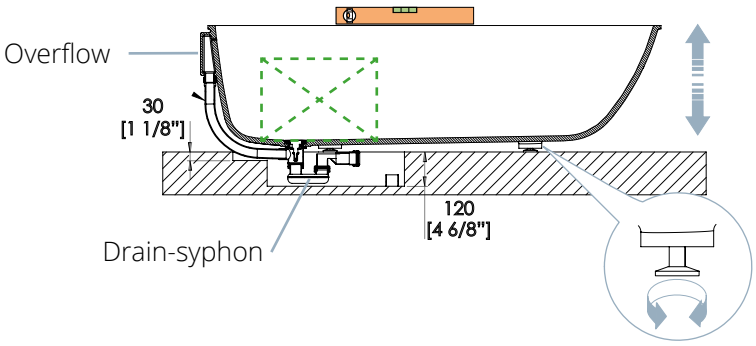


### 7.3.4.2.1. ACCESS PANEL

Include an access panel when fabricating the bath ensemble, to provide access to the drain syphon if anymaintenance work needs to be carried out in the future.




We can also use this panel to adjust the level of the bath's 4 supporting feet. It is very important that the 4 feet are positioned on a solid surface, to prevent any excess stress on the seam between the bath and its perimeter extension.



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# Aplications and uses

## Coverings

# 07.4

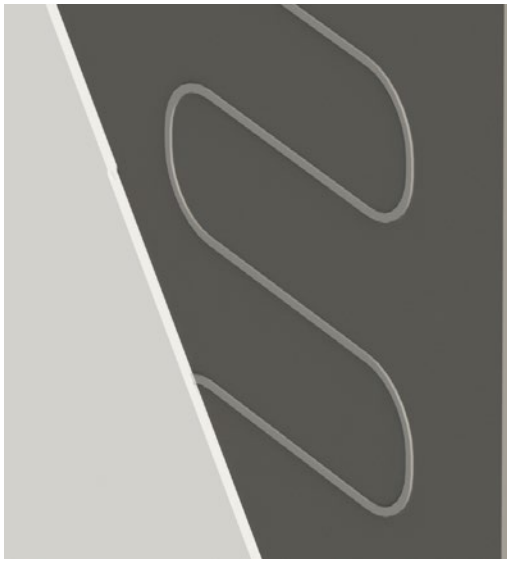
## 7.4. COVERINGS

The unique properties of KRION™ and its different thicknesses make it perfect for covering any structure in any geographic area of the world. This section will explain the areas where this material is most used as a covering. It must be taken into account that the surface may be attached to the support using an elastic polyurethane sealant such as Butech P-404; when installing coverings over 3m above the ground, mechanical anchorings must always be used.

### 7.4.1. WALLS

6 (1/4") or 12 mm (1/2") KRION™ sheets are ideal for many different types of wall coverings. They are easy to install and can be attached to nearly any type of solid substrate:

- Waterproof plasterboard.
- Water resistant plywood.
- Phenolic plywood.
- MDF.
- Solid tiling.
- Plasterboard.



Take the following factors into account when installing wall coverings:

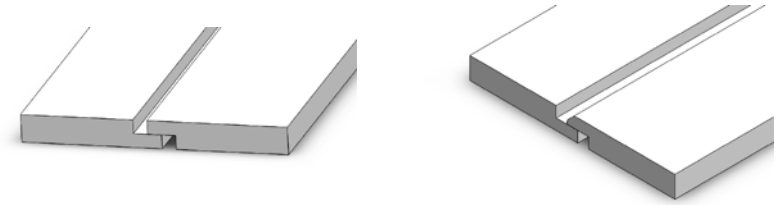
- Ensure that the support to which the sheets will be attached can bear the material. Any type of paint which may become unstuck will have to have some type of primer applied to it.
- Cut the sheets to cover the walls and check if the dimensions are correct. Leave a gap of at least 3 mm (1/8") for expansion (1.5 mm-1/16" per linear metre). Remember to also leave a gap in the corners at the top and bottom of the sheet.
- Clean the back of the KRION™ sections with denatured alcohol and white paper without pigmentation.
- Apply a continuous strand of adhesive at a distance of 25 mm (1") from the edge around the perimeter.
- Apply beads of silicone of approximately 30 mm (1 $^{3}/_{16}$") at a distance of approximately 200 mm (7 $^{7}/_{8}$") from each other on the sheet. Apply a continuous strand of silicone 20 mm (13/16") from the edges of any openings (for plugs and other elements).
- Make sure that the supporting wall is clean from dust, grease and other substances that may affect the structural integrity of the panelling.
- Avoid using KRION™ to panel walls or surfaces with humidity or water leaks. This will cause a wide range of problems: incorrect adhesion, bulging of the wall, breakage of the seams (we recommend P-404 polyurethane sealant from Butech).
- You can use double-sided adhesive tape, silicone or hot wax to attach the KRION™ sections to the substrate until the adhesive dries (P-404).

- Push the KRION™ panels firmly in place against the wall to make sure that the adhesive spreads correctly, using your hands, shoulders, body, head and feet.
- Do not lift large panels of KRION™ without help. Lift with a minimum of two people to work safely.
- KRION™ panelling must not touch the floor. Use wood blocks or wedges to keep the panels raised by around 4 mm (3/16"). Fill this 4 mm (3/16") gap with silicone.

#### 7.4.1.1. EXPANSION JOINTS

It is necessary to include expansion joints every 10-15m$^2$ (393 $^3/_4$ - 590 $^5/_8$ in$^2$) and every 6-7 (236 $^3/_4$"-275 $^5/_8$") linear meters. These can be located on corners, at points where different material meet, on ceilings, etc. It is recommended to leave an expansion joint of one millimetre for each metre constructed with KRION™.

The expansion joints should not always be filled with polyurethane elastic adhesive; gaps may instead be left, creating some kind of finish which will be a decorative element of the whole covering. Here are some suggestions offered by Krion.



#### 7.4.1.2. SEAMS

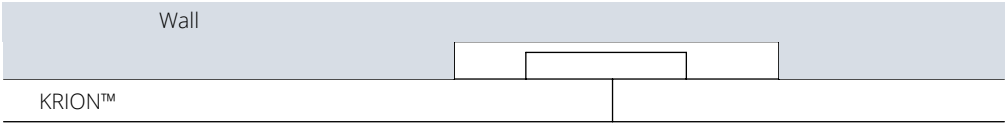
It is important to correctly study the number and position of the seams for several reasons:

- Seams close to heat sources are potential breakage points.
- Minimising the number of seams means leaving less room for error and results in a more resistant structure.
- Carrying out a thorough study before beginning the project reduces the amount of work and material involved, which is important when quoting prices for projects and being competitive.

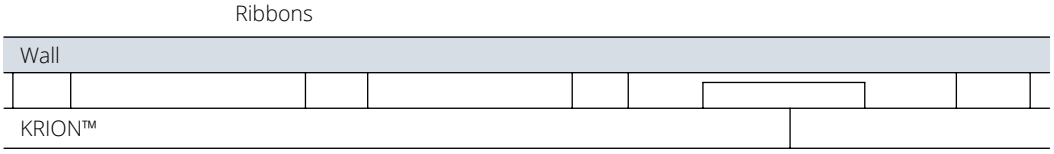
#### 7.4.1.3. SEAM REINFORCEMENT

The seams must be reinforced from behind to ensure a correct bond.

You may need to cut a groove into the supporting wall so that the reinforcement strip fits.




Also, if you use strips to level the wall, you can use the gaps between them to position the reinforcement strips.



### 7.4.1.4. LEVELLING WALLS

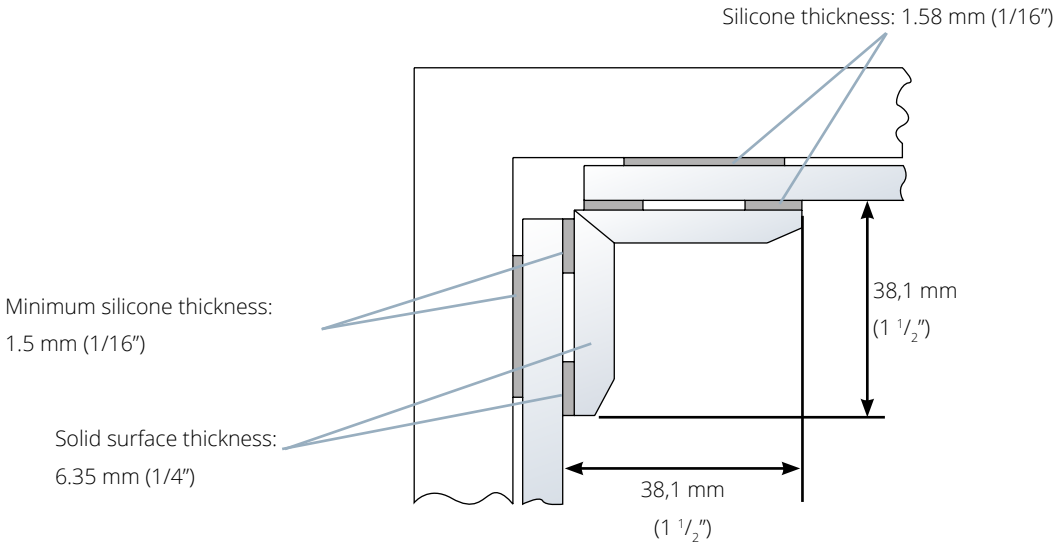
If the supporting wall is not perfectly flat, this must be done by the installer. Use wooden strips or waterproof plywood boards to achieve a straight, flat substrate for panelling. This will take longer, but if the substrate is not suitable, the resulting work will not be high-quality.

### 7.4.1.5. INTERNAL CORNERS

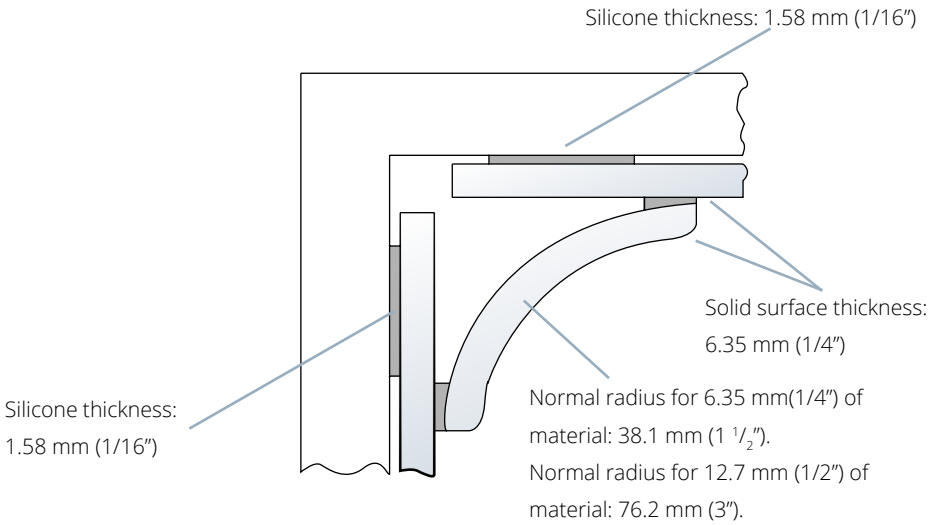
There are several solutions available to create internal corners and also leave a gap for the KRION™ to expand. Use silicone to fill in the gaps, which will allow the material to expand. Make the corner section and cut it to the required size. Finally, attach it in place and bond it to the walls of the KRION™ using silicone.

Different options for making wall corners are shown.

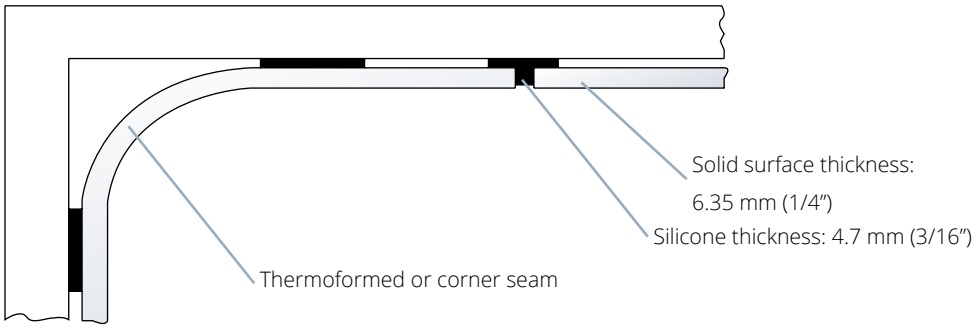
Option 1: Create a corner by connecting two strips using a mitered corner.



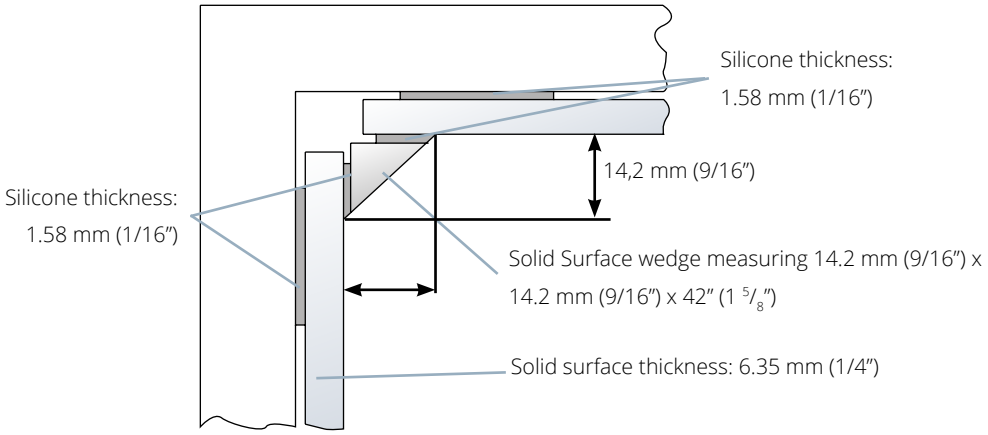

Option 2: Thermoform a section with the correct radius.



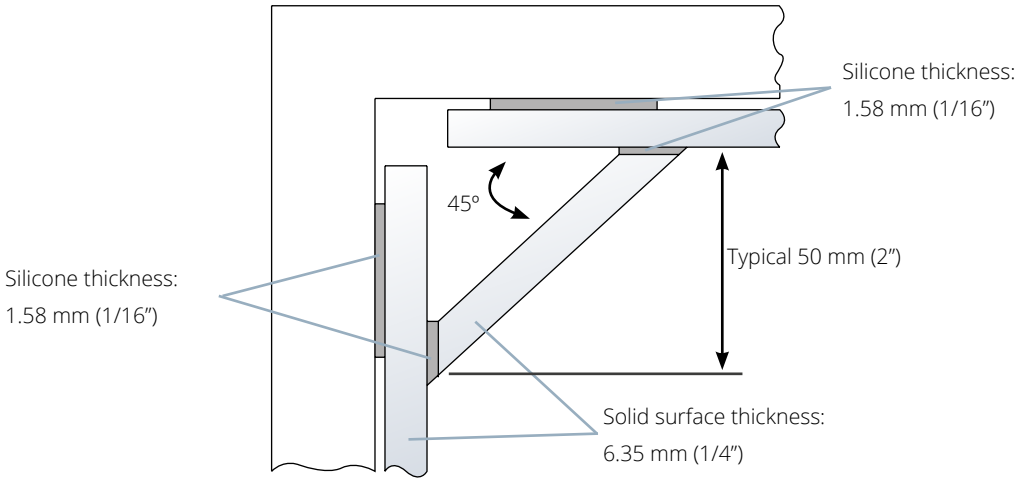
Option 3: A variation of the previous option is to thermoform a large section and to position the expansion joint far from the corner.



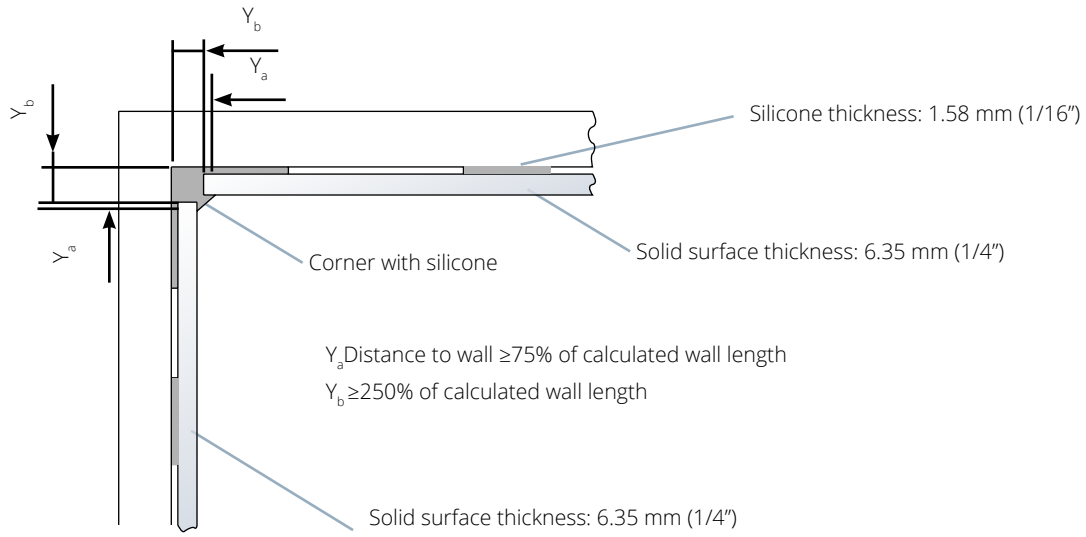

Option 4: Make a solid 24 mm (15/16") strip joining two 12 mm (1/2") strips together, and bevel to 45°.



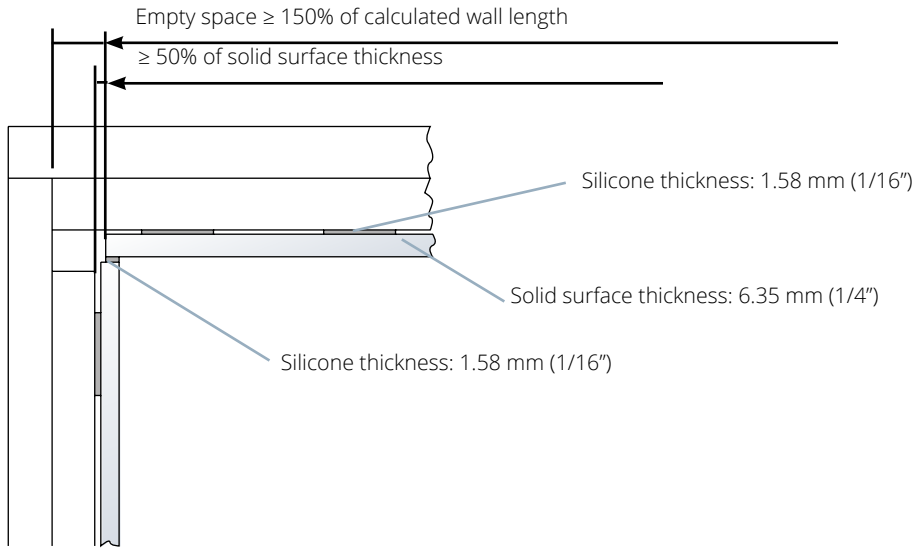

Option 5: Use a strip of KRION™ and bevel the edges to 45°.



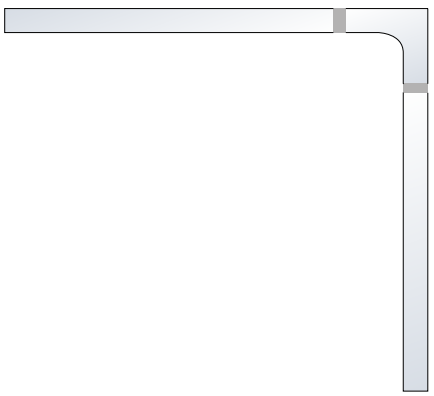
Option 6: Fill in the corner with silicone without adding KRION™ sections.




Option 7: Overlay one KRION™ wall over another and fill the space with silicone.




Option 8: Make a 24 mm (15/16″) strip by connecting two 12 mm (1/2″) strips and mill a quarter round.



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# Aplications and uses

## Flooring

07.5

## 7.5. FLOORING

In addition to other applications, KRION™ can be installed on the floor. Its properties mean it can be installed on floors where easy cleaning is required, which do not accumulate bacteria or dirt, and which do not have visible joins. This section will explain everything you need to know to correctly install the flooring.

### 7.5.1. INSTALLATION CONDITIONS

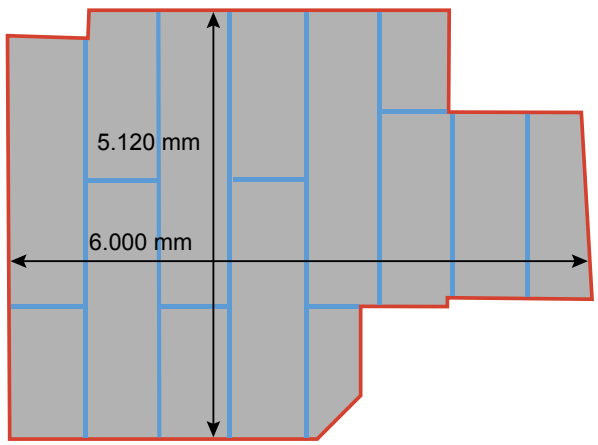
- KRION™ should only be used on indoor floors subject to low traffic.
- Do not create seamless floor surfaces of over 50 $m^2$ (538 $^{13}/_{64}$ $ft^2$) or more than 8 linear metres (314 $^{61}/_{64}$").
- For larger surfaces or distances, plan the insertion of intermediate expansion joints.
- Lay the KRION™ as a floating floor on a 3 to 5mm (1/8 to 3/16")-thick elastomeric membrane that will provide thermal and sound insulation and contribute to the stability of the floor. The KRION™ should not be bonded or screwed to the substrate.
- A perimeter expansion joint must be incorporated between the KRION™ floor and bottom of any walls or other vertical surfaces in contact with it.
- Always use 12 mm (1/2")-thick KRION™ for flooring in one of the recommended colours for this application. (See the list of colours for use on floors).
- KRION™ is considered to be a non-structural building material. It should never be used as a primary waterproofing material for floors. If waterproofing is required, waterproof the substrate before the KRION™ is laid.
- The substrate should be firm, flat and completely level. Any unevenness or defect in its surface finish should be rectified before the KRION™ flooring is laid.
- Never lay KRION™ on floors already covered in wood, parquet, laminate flooring or any other kind of surface that might become deformed or deteriorate in contact with water or any other kind of liquid.
- The seams between the pieces of KRION™ used to lay the floor should be given a tongue and grooved joint to ensure maximum resistance and to make it easier to align the floor. Never lay the pieces of KRION™ with straight aligned edges or with a rabbeted joint.
- Use the right progressive succession of grits to sand and finish off the KRION™ floor, ending with an S400 or S500 sponge sanding pad.

### 7.5.2. INSTALLATION

#### 7.5.2.1. PREPARING THE SUBSTRATE

Check the condition of the substrate and carry out any repairs, if required, to ensure a flat, even, firm surface. Any imperfection in the substrate might affect the KRION™ floor covering and so it is essential to make sure that the surface is in perfect condition before proceeding to lay the KRION™. The substrate should also be waterproofed because KRION™ does not carry out this function.

Plan the position of the seams in the flooring across the whole substrate. Decide the direction in which the KRION™ sheets should be laid so as to reduce the number of seams and make optimum use of the KRION™ sheets. By doing so, the handling time will be reduced and thus the final cost.



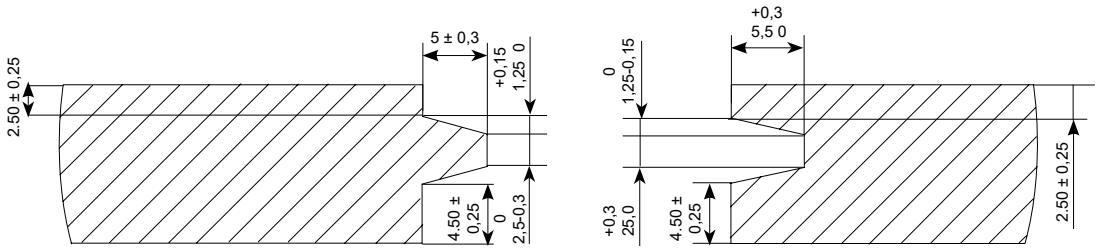

Calculate the expansion of the KRION™, depending on the variation in temperature (based on the anticipated minimum and maximum temperatures), so as to work out the

size of the expansion joints. Plan the layout of the pieces of KRION™ that will be needed, leaving a gap around the perimeter the size of the calculated expansion joint. This expansion joint around the perimeter can later be concealed with skirting panels. In this way, a seamless floor surface can be planned.

Bearing in mind that KRION™ should only be laid indoors where there is a moderate variation in temperature, a standard perimeter expansion joint of between 6 and 10 mm (1/4 and 3/8") can be taken into consideration between the KRION™ and the bottom of any walls or other vertical surfaces in contact with it.

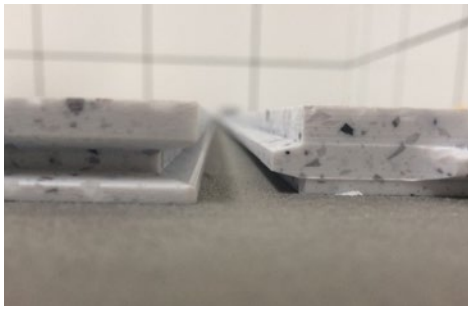
### 7.5.2.2. MOUNTING

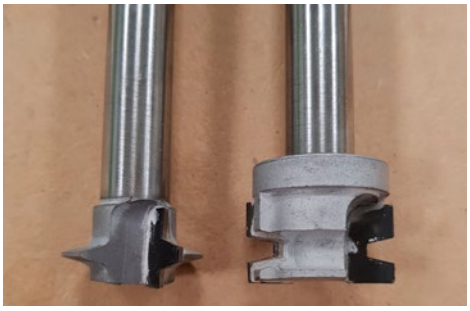
Cut the KRION™ sheets to the required size for them to all fit together. To do so, machine the edges to create tongue and grooved joints for gluing and locking the pieces together. This type of glued seam ensures a high degree of resistance, as well as helping to calibrate and align the surface. It will also help to improve the sanding of the seams and final finish of the whole floor surface.




All the sheets for the flooring must be from the same manufacturing batch. They should all be laid in the same way, with the top surface that comes covered in protective plastic film facing upwards. Be particularly careful when machining them as the top and bottom surfaces are not symmetrical.

There might be millimetric differences in the thickness of sheets from the same batch. To machine them properly and align the surfaces of all the pieces, use a CNC router, placing the side with the plastic film face down against the CNC work bench.





Make sure that the machined tongue and grooved edges of the sheets fit together perfectly so as to ensure a seamless appearance.

Reference sample pieces with machined tongue and grooved edges should be made to check that each subsequent machined piece coincides with the sample.

Once the machined pieces of KRION™ have been checked, protect the edges of each one to prevent them from getting chipped or broken during transportation to the work site.

Fix the 3 to 5mm ( 1/8 to 3/16")-thick elastomeric membrane to the whole substrate using double-sided bonding tape. Keep the area clean and free from dust and residues to ensure a good bond when the KRION™ seams are glued.

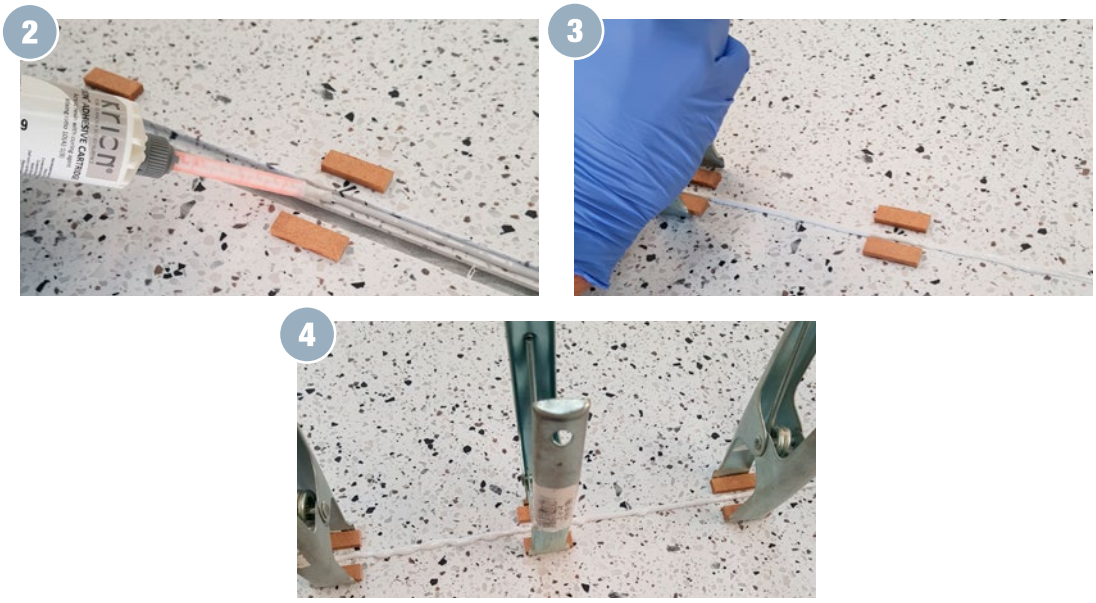
Clean the tongue and grooved edges of each piece of KRION™ very carefully, using methylated spirit, before laying them on the floor ready for bonding.

Lay the pieces of KRION™ in place to check that they all fit together (using suction pads to handle them safely).

Before proceeding to apply the adhesive, clean the accessible part of the tongue and grooved edges once again. Use the right colour KRION™ adhesive for the colour of the sheets. Pay careful attention to the amount of adhesive that is applied, making sure that it fills the whole seam and flows out when the pieces of KRION™ are joined to create a bead on top at least 2mm (5/64") thick.

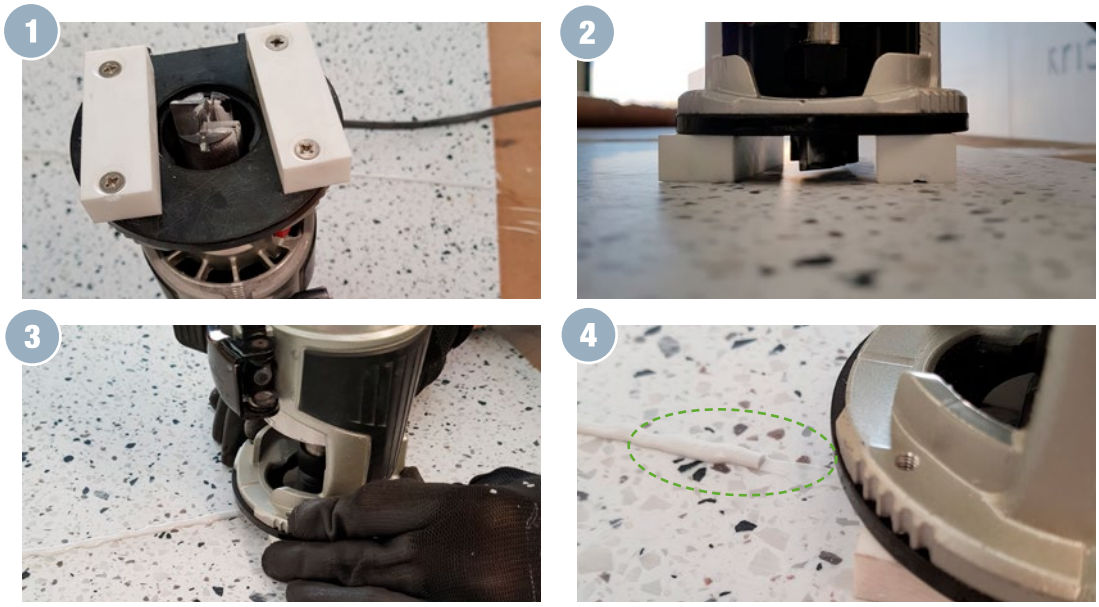
1

2




Once the adhesive is dry, remove the spring clamps and squaring blocks. Be very careful not to scratch the surface with anything sharp or pointed during the installation process. To grind down the surplus bead of adhesive, use a medium or small-sized router fixed to a stable, level support. In this way, the base of the router can be raised and a distance of 0.3 mm (1/64") set between the milling cutter and the surface.

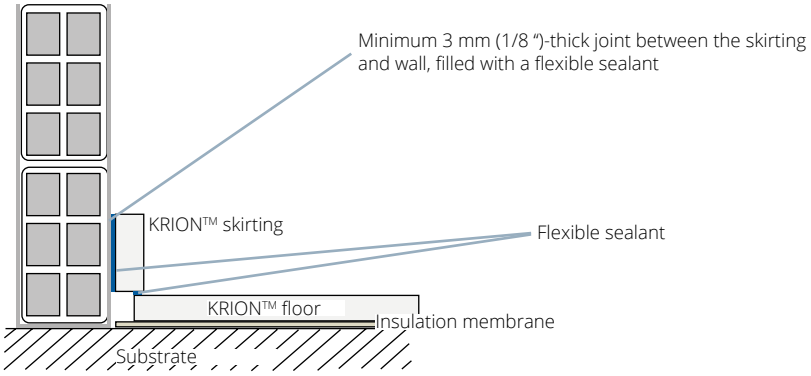
By grinding down the bead of adhesive with the router, time can be saved on the sanding process. It will also avoid any unevenness if the surface is badly sanded during the first sanding phase.



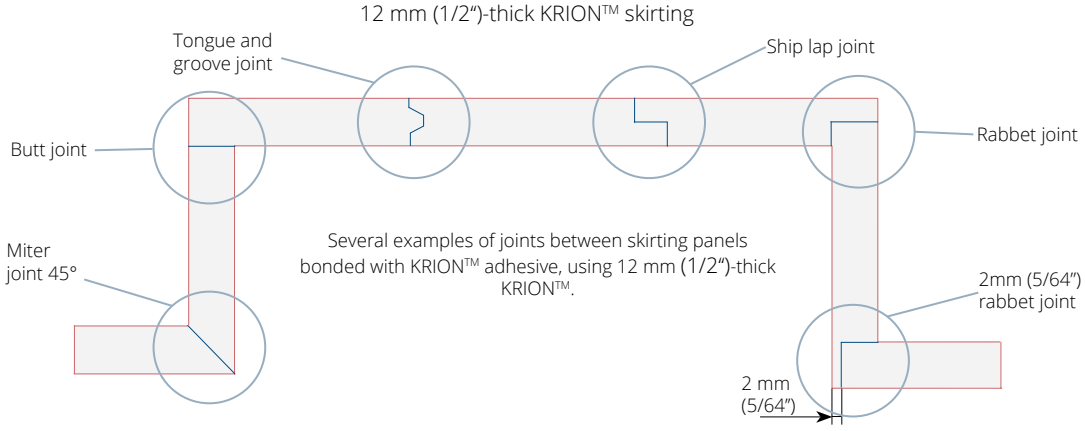
Always remember that the sheet's finish when the protective film is initially removed cannot be used as the final finish. It will always need to be sanded to ensure a uniform looking surface. A S400 or S500 sponge sanding pad must be used for the final finish of KRION™ flooring, having first sanded it with the right succession of abrasives. All the KRION™ sheets should be sanded with a P180 grit before they are cut and milled, using a work bench or support so that the sheets can be laid flat at the right height for the fabricator to stand while sanding them.

### 7.5.2.3. SKIRTING PANELS (JOINT CONCEALERS)

The skirting panels used to conceal the perimeter joint can also be made of KRION™. Do not use KRION™ adhesive to bond the skirting to the KRION™ floor. Use a flexible silicon or polyurethane-based sealant, such as Butech P404.



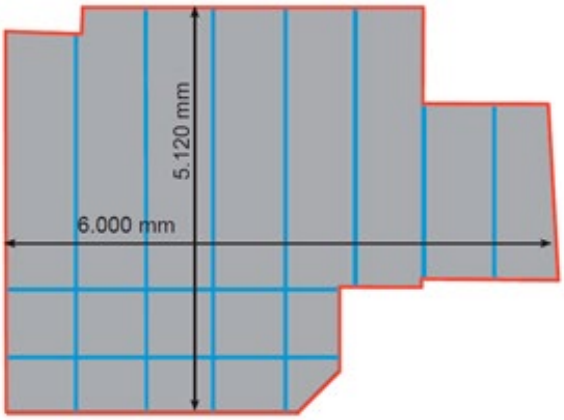

The same colour KRION™ or another colour can be used to make the skirting. Wood or other materials can also be used for it. The KRION™ or other material used to make the skirting must be bonded to the KRION™ floor with an elastic sealant. The skirting must have a minimum thickness of 12 mm (1/2"). The flexible sealant used to bond the KRION™ skirting to the wall must have a minimum thickness of 3 mm (1/8").



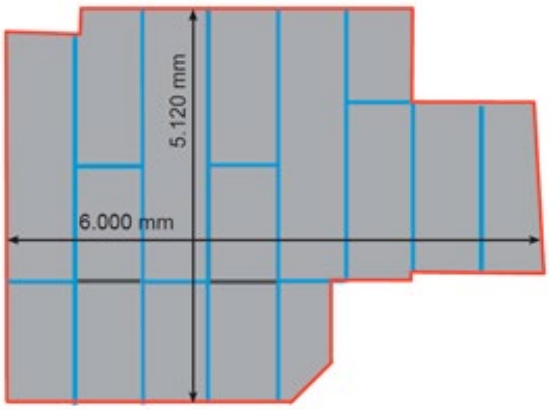

A tongue and grooved or rabbeted joint can be used to bond each KRION™ skirting panel in line with the next one. In inner corners, one skirting panel can overlap the other or else a rabbeted joint can be used. For outer corners, a 2mm (5/64") rabbeted joint should be used or alternatively a 45º one.

### 7.5.2.4. EXAMPLE OF FLOORING LAID IN A HOME

Here is one possible layout for the seams.




This alternative layout distributes the stress more evenly in situations of higher temperature changes.




The KRION™ should not be bonded or screwed to the floor, since it must be allowed to expand or contract freely, like a floating floor. The perimeter gap left as an expansion joint can be sealed if required. In such an event, use an elastic silicon or polyurethane-based sealant. Once the whole surface has been sanded and given its final finish, protect it with a blanket or foam sheets to prevent it from getting damaged until
it is put into service.

Do not move heavy machinery or lifting platforms across the KRION™ floor. If necessary, protect the whole area with MDF boards on top of foam sheets. The KRION™ floor should be laid before the carpentry of doors at floor level is completed. Likewise, the KRION™ floor should be laid after any possible plumbing, heating, electricity and paintwork or finishing off of walls or ceilings etc.

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# Aplications and uses

## Furniture

07.6

## 7.6. FURNITURE

As mentioned in this manual, the KRION™ solid surface is often used as a covering for any kind of structure in order to achieve some kind of functional element. Whether for indoors or outdoors, furniture is one of the main uses of the material; therefore, there must be certain assumptions for developing resistant furniture with good finishes.

- It must be understood that the thickness to use for each element to be produced is important, therefore the point 6.11.3. "Thickness by application" section is offered in this manual. It must be consulted if any doubts arise.
- It is important to know the type of structure to be used, its material and form.
- Take into account the potential expansions or contractions of the material, bonding it with Butech P-404 type elastic adhesive is important.
- The elements to be used to press the bonded materials is a key aspect so that there is no potential ballooning of material when there are sudden temperature changes.
- If any doubts arise in transformation, consult points 6.11.3.3 "Indoor furniture, tables, counters, etc." and 6.11.3.12. "Covering of small or medium format indoor units" of this manual.

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# Finishes

08

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# Finishes
# Trims

# 08.1

## 8. FINISHES

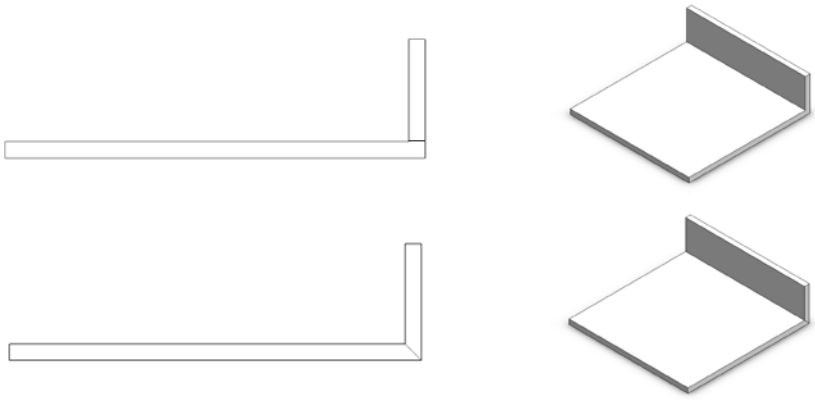
This refers to all finishes carried out in different installations in order to achieve functional use. Often, depending on the installation to be made, some finishes have to have a certain form or defined geometry to be functional when used. Possible finishes in specific areas which may be offered to the end client are listed and described below. To create these finishes, it is necessary to follow the cutting and bonding instructions set out in this manual.

### 8.1. TRIMS

This is a finish usually given to countertops, whether in the kitchen, bathroom or other surface where intense work is carried out. Its function is to prevent water and dirt being transferred to other areas of the place where it is installed. There are ways of making a trim which will be explained in this section. Their common factor is that the bonding of the pieces of which they are composed will result in the form of a 90º piece, always being the visible face of the inside corner.

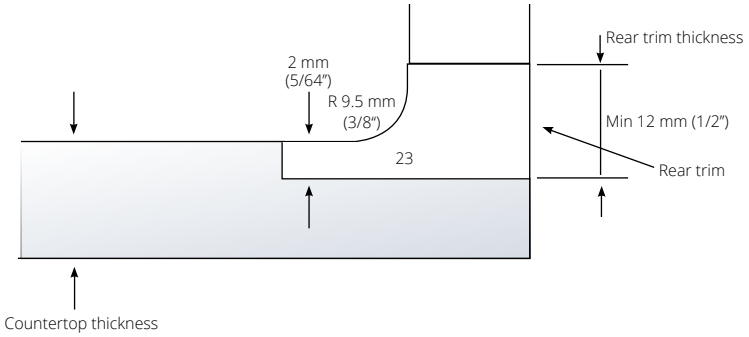
#### 8.1.1. STRAIGHTNESS

This involves bonding two surfaces so that their finish leaves the inside corner and exterior of the piece completely straight. It can be carried out through a 90º butt joint or through a mitre joint, either way being valid. Below is an image showing the two options for creating straight trims.



#### 8.1.2. CURVES

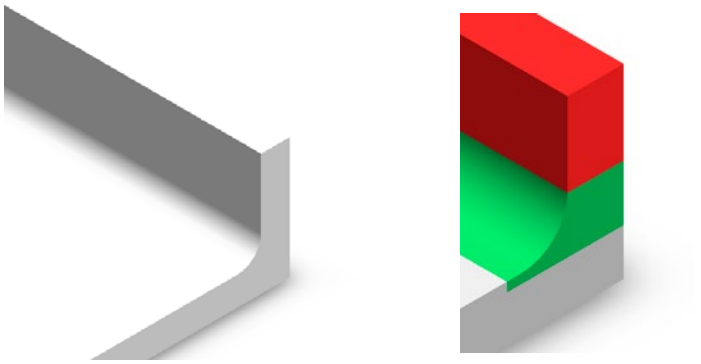
To create this type of trim, it is necessary to create an assembly of three pieces, two similar to those of the curved trim, and one which will provide an inner rounding at its point of connection. Below is an image in which the three pieces are differentiated.




It can be observed how one piece with a curved cut is added between the two fixed pieces. A cut/groove of approximately 2 mm (5/64") is made on the countertop to insert the curved piece. Once

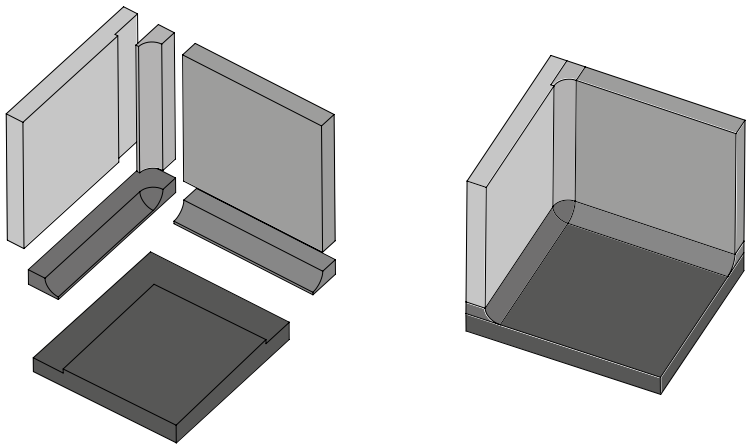
carried out using KRION™ adhesive, the surface will be bonded with the curved piece. After drying, the excess adhesive may be sanded, or you may wait to sand everything together. Having defined the connection of the two pieces, the third piece is now bonded. The order of bonding and sanding does not alter the quality of the product, but if sanding between bonding care must be taken to avoid rounding the edges of the joins that will be visible.

An image is shown of

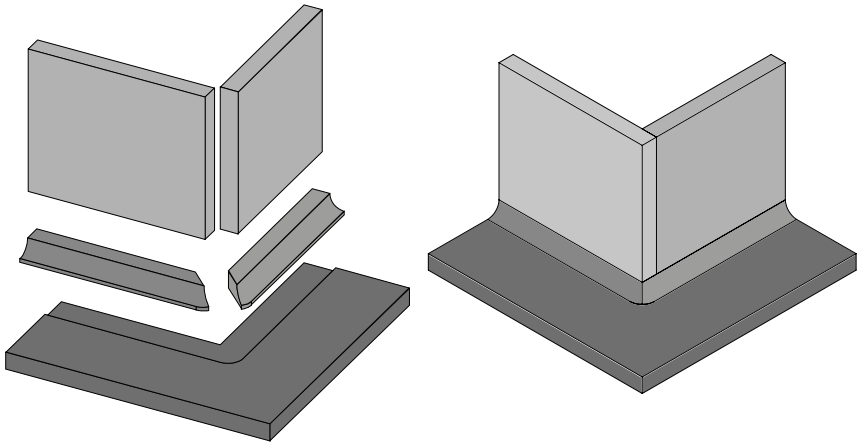


By using curved trims, it is also possible to make inside or outside corners that are very useful for saving columns (see picture).

INNER CORNER TRIM



OUTER CORNER TRIM



### 8.1.3. 45º COLOURS

The creation of trims through colours with chips or veining is described in section 6.10. “Colours with veins and particles (chips)”.

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# Finishes

## Skirt

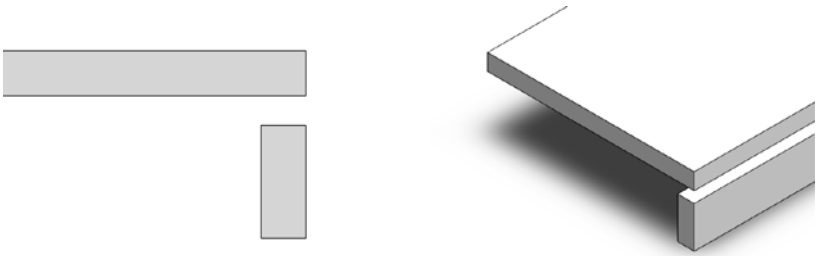
# 08.2

## 8.2. SKIRT

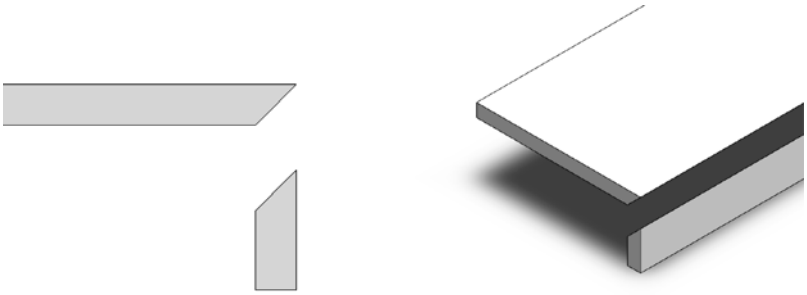
This is a possible finish that can be given to a worktop or furniture front that works in such a way as to protect it from possible knocks or accidental loads. In this section we will show you the different skirts that can be made.

### 8.2.1. FRONT SKIRT

BUTT JOINT

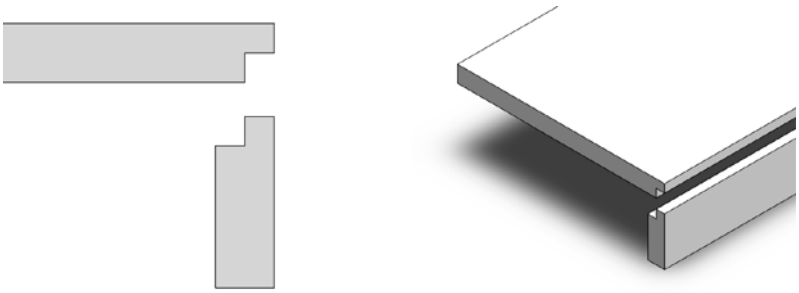


MITER

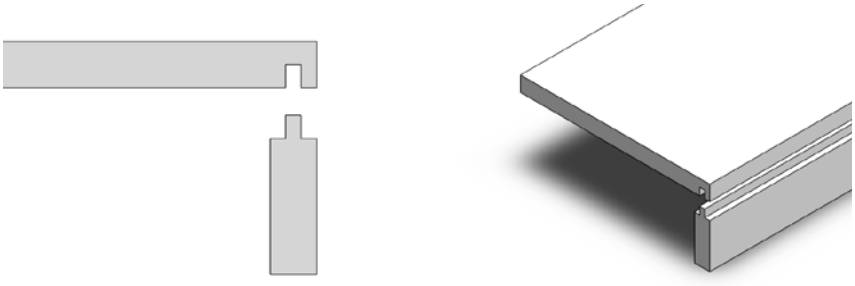


### 8.2.2. REINFORCED

RABBET JOINT

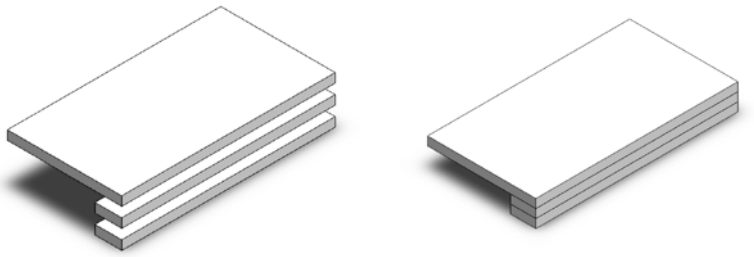


TONGUE AND GROOVE



### 8.2.3. STACK

To make stack skirts, cut two or more strips of KRION™ of the same width and stack them until reaching the required thickness. The type of colour used for this must be taken into account, as with 45º colours a change of veining may be observed. Additionally, upon creating a stack, the application of the adhesive is vital so that when rectifying or cutting there are no gaps or spaces without adhesive.

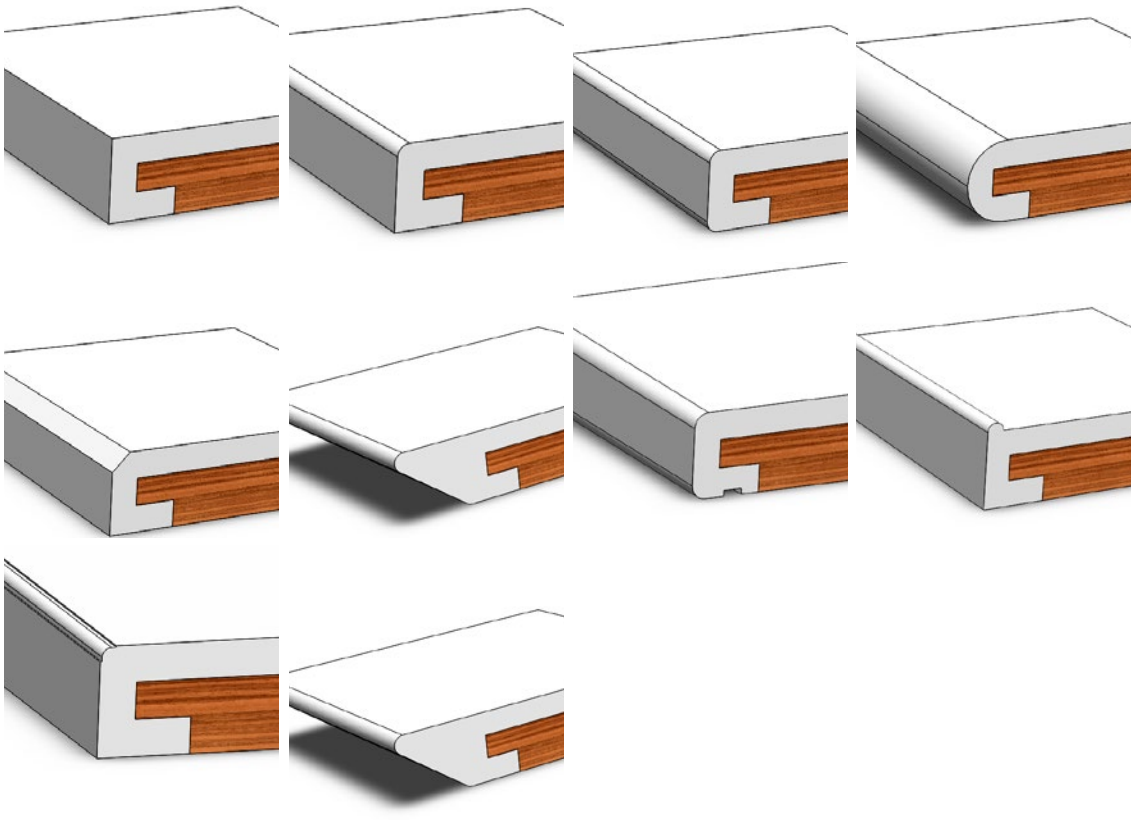


### 8.2.4. LARGE SKIRT

It is considered a large skirt when the cut piece measures over 200 mm (7⅞"). To create this type of gable it is recommended to use a large bracket, with a cut on its exterior corner so that the excess adhesive from bonding does not reach it and cause potential contamination.

### 8.2.5. VARIETY OF DESIGNS

There are a wide variety of designs for the manufacture of gables.



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# Finishes

## Corners / edges

# 08.3

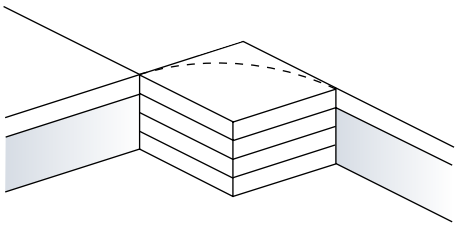
## 8.3. CORNERS / EDGES

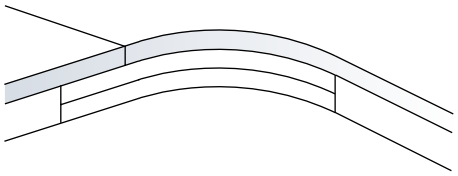
As usually occurs in all materials, potential changes of flatness or discontinuities caused by the creation of corners, whether interior or exterior must be addressed. This section will explain the different corners to be created and how to do so.

### 8.3.1. INTERIOR CORNERS

It is recommended to create the corners with a radius equal to or greater than the thickness of the sheet. This operation must be reinforced to guarantee the useful working life of the countertop.

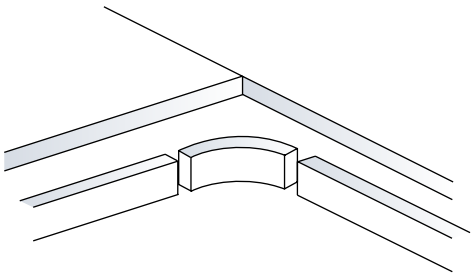
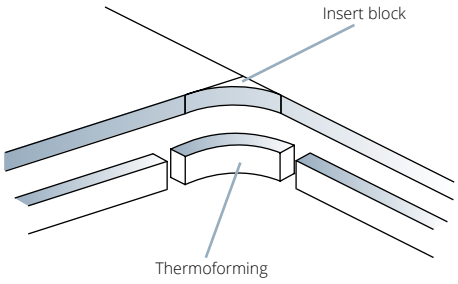
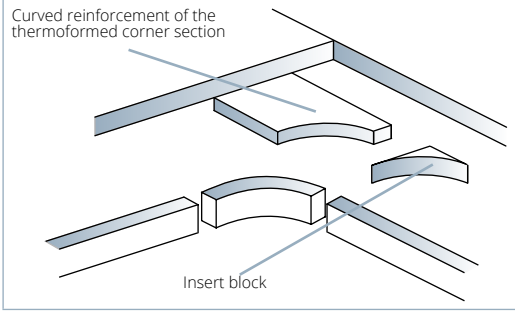
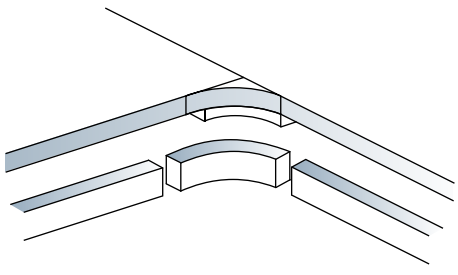
The construction method consists of creating a front "stack" with a square central piece which takes up the whole area of the corner. Next, the edge will be milled by the curve radius (use template) and the gables of the adjacent areas will be installed.



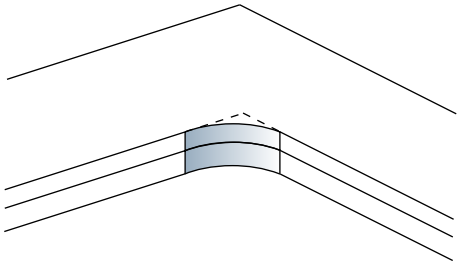


### 8.3.2. THERMOFORMED CORNERS

Another option for creating an interior corner with rounding is by thermoforming. Below it is explained how to create thermoformed corners.

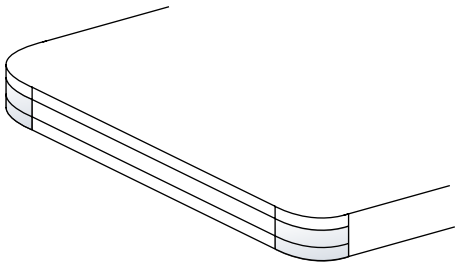
| | |
|---|---|
| The skirt must be made with the required radius. | Then you will have to make a connecting piece between the countertop and skirt. |
|  |  |
| To end the process of making parts, make a reinforcement for the lower area. | Attach the reinforcement and filling sections using the normal methods. |
|  |  |

Attach the skirt and connect it to the adjacent skirts.



### 8.3.3. EXTERNAL CORNERS

As far as possible, the external corners must also be rounded to avoid stresses that may cause breakage. If making a structure such as the one shown in the diagram, several strips of KRION™ must be used, and once the adhesive has dried, shaped with the router.



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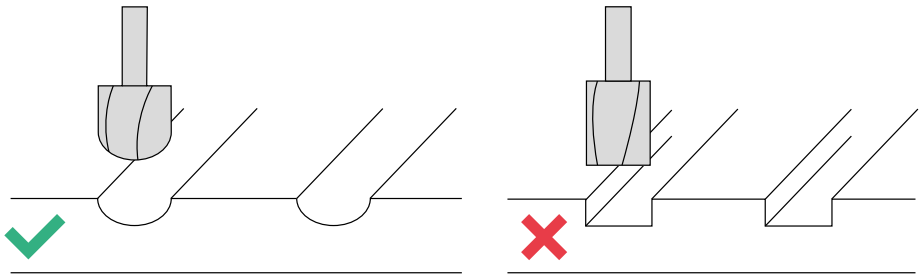
# Finishes
# Drainage

# 08.4

## 8.4. DRAINAGE

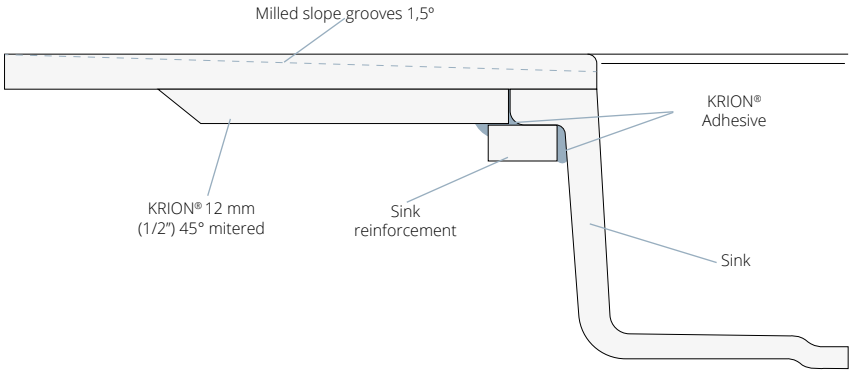
One of the possibilities offered by the properties of the material is the creation of drainage. KRION™ is full mass, therefore it is possible to mill its surface to create drainage grooves. Take into account that with products of the "LUXURY" or "ART VEINS" series, the appearance of veining will vary depending on the depth of the groove milled.

The cutter for making the drainage grooves must be round, with a certain radius. It is not recommended to make these grooves with a straight cutter due to the difficulty of sanding and cleaning of interior angles produced by this type of cutter. Additionally, the angles and sharp edges produced with straight cutters are more likely to break due to impact or tension in this area.



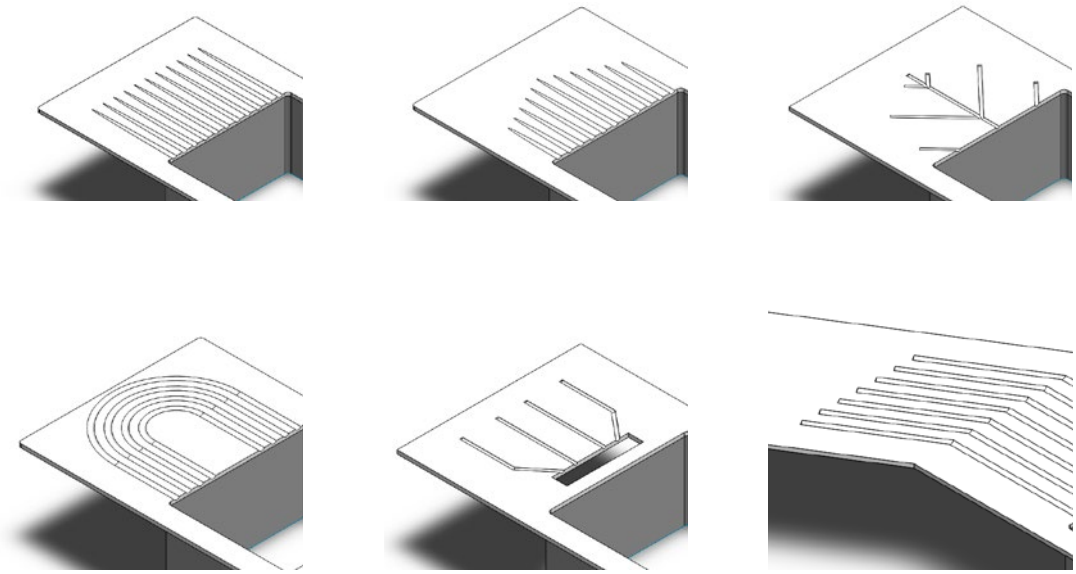
The KRION™ 12 mm (1/2") surface may lose resistance in this area after having created the drainage grooves. Reinforcing this area with wooden board alone is insufficient.

It is recommended to reinforce by bonding another 12 mm (1/2") sheet of the same colour on the lower side of the reduced area with KRION™ adhesive. The edge of the Krion reinforcement must be cut with a 45° mitre joint.




With a router, a template and imagination, different drainage designs can be created which are valid and functional. It is recommended to make the grooves from point zero (on the surface) with a progressive gradient toward the sink of 1.5°.

Below are a series of designs which will give the countertop added value.



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# Finishes

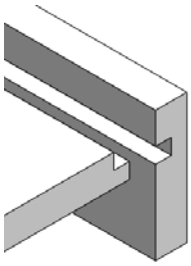
## Non-spill edge

08.5

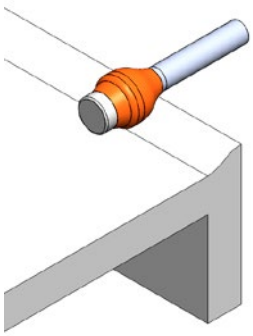
## 8.5. NON-SPILL EDGE

This is a finish which will prevent the spillage of liquids. It is usually use don surfaces for handling food, restaurants and kitchen countertops in general. This section shows several forms of production.

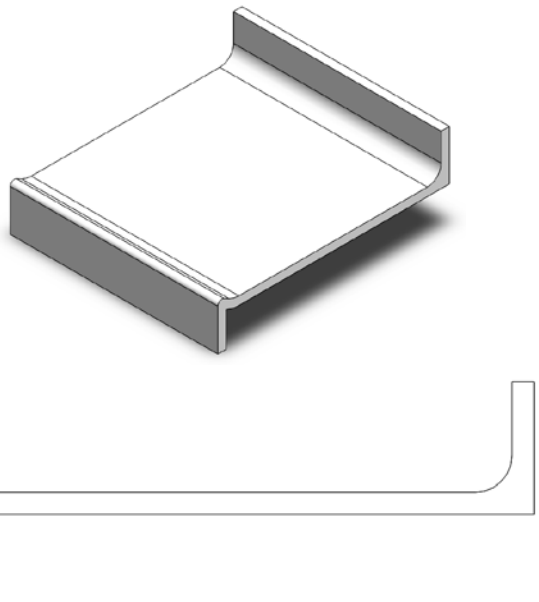
OPTION 1
To create a non-spill edge, the front skirt must be bonded using a tongue and groove joint higher than the upper edge of the countertop, as shown in the diagram.



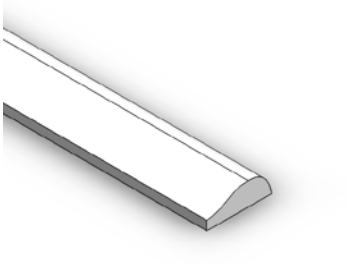
Once the adhesive has dried, mill the edge horizontally to achieve the required finish.

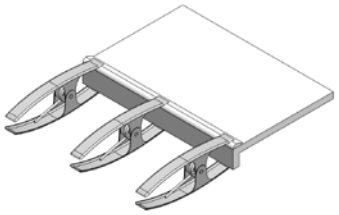


OPTION 2
You can also create a non-spill edge by slightly curving the edge of the sheet upwards.

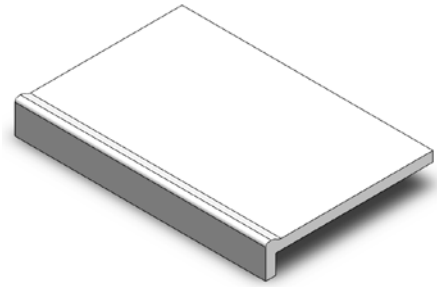


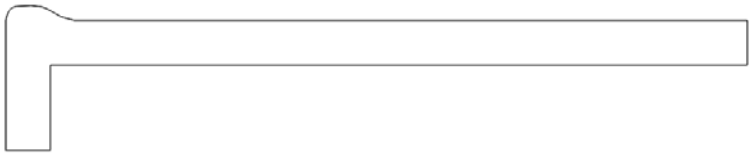
OPTION 3
Manufacturing a piece with the form shown in the left image. Bonding it to the edge of the countertop and sanding it when the adhesive dries.



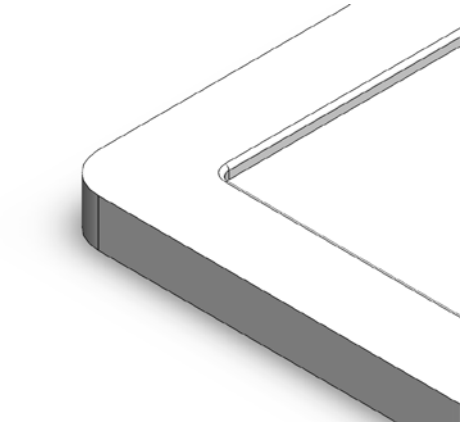


Sand until the adhesive has been removed and add the skirt chosen by the customer.





OPTION 4
Rebate the edge 20 mm (13/16") from the edge to create a depression.



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# Finishes
# Templates

# 08.6

## 8.6. TEMPLATES

As mentioned in some of the sections of this manual, to make cuts or open holes of common forms and measurements, it is recommended to create template for cutting using a router. In case of having a CNC, this will not be necessary, but otherwise, templates are very useful for working correctly.

In general, they are usually made from wood as it is a light weight, low cost material that is easy to store. It is recommended to keep each of the templates that will be used, as it offers the possibility of working with sinks of different measurements.

In case of not having a template, a valid hole or a cut may be made with four strips of wood or KRION™.

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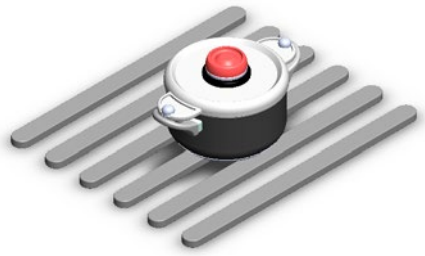
# Finishes

## Stainless steel bars

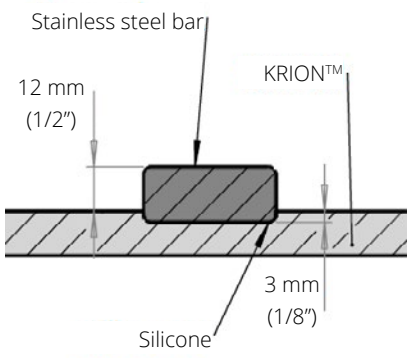
08.7

## 8.7. STAINLESS STEEL BARS

To achieve better protection against extreme heat (pots, items removed from the oven, etc.) you can add steel bars or balls. DO NOT use iron bars or materials containing iron, as these will damage the countertop.



Through a 3 mm (1/8") cut of the countertop, the inlay may be carried out using silicone for adhesive. It is recommended to round the ends so that they have the same radius as the shaft. 12 mm (1/2") diameter is a suitable measurement for this purpose, but other sizes may also be valid. It is important to carry out tests to set the dimensions of the bars. A separation of 50-100mm (2 - 3 $^{15}/_{16}$") between bars will be sufficient for the technique to be functional.




Remember that steel also expands, leave a margin of 2 mm (1/16") to avoid damaging the KRION™ countertop when its temperature increases.

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# Cleaning and care

09

## 9. CLEANING AND CARE

All places, whether public or private, require cleaning and care, with the subsequent cost in human effort and cleaning materials for households, companies or public bodies.

A cutting-edge material mainly formulated with natural materials using high-tech manufacturing processes, KRION™ helps to keep places where it has been fitted clean, aseptic and in perfect condition. This is due to its nil porosity, which prevents bacteria from spreading and allows for the creation of seamless surfaces with no joints or inaccessible corners. As a result, only minimum care is needed to keep the material in optimum condition.

As well as being easy to clean, KRION™ can swiftly be repaired on site. This is a huge advantage when compared with other materials, allowing you to keep your home or work facilities in perfect condition.

KRION™ is an easy-to-clean material. Nonetheless, this does not mean that no cleaning is required. Although KRION™ does not absorb liquids due to its lack of pores, stains should be cleaned away immediately when they are swifter and easier to remove. Whenever the surface is cleaned, it must be dried thoroughly afterwards to prevent lime scale from building up or the remains of detergents and cleaning products.

The following is a detailed procedure to achieve effective cleaning of any kind of stain and it will help to keep the KRION™ surface as the first day:

### 9.1. SHEET CLEANING

#### 9.1.1. REGULAR CLEANING

This should be done with a cloth, sponge or microfibre cleaning towel and a cleaning agent, such as hot water or a surfactant household cleaner.

Dampen the cloth, sponge or microfibre cleaning towel and the KRION™ surface with the cleaning agent, and rub the whole surface uniformly, using circular movements.

When you have finished cleaning it, dry the surface well with a paper, cleaning towel or soft dry cloth. In this way, any remains of the cleaning product will be removed.

#### 9.1.2. IF STAINS CANNOT BE REMOVED AS INDICATED IN POINT 9.1.1.

Follow the above procedure again, but this time use a different cleaning product, such as a cream-based one with slightly abrasive microparticles. The cleaning product should be applied directly to the stain and then it should be rubbed in circular motion with the cleaning towel, cloth or sponge without applying pressure.

When the stain has disappeared, the cleaning product can be applied to the whole KRION™ surface and it can be uniformly cleaned.

Afterwards, remember to rinse the surface with water and dry it well with a paper, cleaning towel or soft dry cloth so that no remains of the cleaning product are left.

#### 9.1.3. TO REMOVE STAINS THAT PERSIST AFTER STEPS 9.1.2.

A cleaning product specifically conceived to remove that particular type of stain should be used, together with a white microfibre scouring pad.

Apply a suitable amount of the cleaning product to the stain and to a white microfibre scouring pad. Rub the stain, using circular movements, until it disappears. If necessary, apply some pressure to the scouring pad until the stain is removed.

Rinse away any remains of the cleaning product with plenty of water and dry the surface well with a

paper, cleaning towel or soft dry cloth.

Optionally, for more uniform results, after this more specific cleaning process has been applied to the whole KRION™ surface, clean it all again by rubbing the surface in circular motion with a white scouring pad and the cleaning product from point 9.1.2. Then rinse the cleaning product away with plenty of water and dry the surface with a paper, cleaning towel or soft dry cloth.

| Nº | Type of stain | Cleaning element | Cleaning product | Alternative cleaning product |
|---|---|---|---|---|
| 1 | Common stain or everyday cleaning | Cloth, sponge or microfibre cleaning towel | Hot water | Surfactant household cleaner |
| 2 | Tough stain | Cloth, sponge or microfibre cleaning towel | Cream-based cleaner with slightly abrasive microparticles | |
| 3 | Specific persistent stains | | | |
| 3.1 | Oil, wine, coffee, milk, tomato, ketchup, sauces, curry, remains of food, tea, juice, fizzy drinks, alcoholic drinks | White microfibre scouring pad that does not scratch | Surfactant household cleaner | Cream-based cleaner with slightly abrasive microparticles |
| 3.2 | Lime scale, soap, toothpaste | White microfibre scouring pad that does not scratch | Cream-based cleaner with slightly abrasive microparticles | Detergent for removing chalk, or apple vinegar |
| 3.3 | Dye, iodine, pencil, indelible pen, lipstick, cigarette burns, ink, nail varnish | White microfibre scouring pad that does not scratch | Cream-based cleaner with slightly abrasive microparticles | Alcohol or acetate |
| 3.4 | Mould, remains of food, and food stains from point 3.1 that have not been cleaned away for a long time | White microfibre scouring pad that does not scratch | Detergent containing sodium hypochlorite or bleach | Cream-based cleaner with slightly abrasive microparticles |
| 3.5 | Uncommon stains, shown in this list | White microfibre scouring pad that does not scratch | Cream-based cleaner with slightly abrasive microparticles | |

## 9.2. CLEANING KRION™ SINKS AND BASINS

The following is a detailed procedure to achieve effective cleaning of any kind of stain and it will help to keep the KRION™ surface as the first day. Method only suitable for white basins and sinks.

### 9.2.1. THOROUGH CLEANING

To keep your washbasin/sink in optimum condition, it should be thoroughly cleaned from time to time. For this purpose, using circular movements, rub it with a damp cloth and a creambased cleaner with slightly abrasive microparticles. For more persistent stains, rub it in circular motion with a cream-based cleaner with slightly abrasive microparticles and a white microfibre scouring pad. Finally, dry the surface thoroughly and your washbasin/sink will be as good as new.

### 9.2.2. DEPTH CLEANING

Once a month your washbasin/sink should be given a total clean. For this purpose, apply a cream-based cleaner with bleach to the whole of the surface and leave it overnight (approx. 12 hours). Next day, rinse it with plenty of water and rub it with a damp cloth. Finally, dry the surface thoroughly and your washbasin/sink will be as good as new. Do not leave the bleach in contact with the surface for longer than indicated as it may leave marks on it.

For sinks/basins made from KRION™ sheets, follow the cleaning instructions in the point "9.1. Sheet cleaning"

## 9.3. NOTES AND PRECAUTIONS ABOUT CLEANING

Do not use strong acid-based cleaners like hydrochloric acid or drain cleaners. Neither should acetate-based or industrial cleaning products or solvents be used. If one of these products is accidentally spilt onto the KRION™ surface, rinse it off immediately with plenty of water and clean the washbasin/sink thoroughly to avoid damage. In the event of damage, the washbasin/sink can always be restored to its former condition through special repair methods.

## 9.4. REGENERATION

Due to its composition, KRION™ is a regenerable material, which means that it is all mass, all equal in all its thickness. By producing any line, no matter how deep it is, through a correct sanding process, the same finish can be obtained as if it were a part just received from the factory.

The regeneration procedure to be followed according to the marks is explained below.

### 9.4.1. MARKS OR LIGHT SCRATCHES

This is a type of mark where they can only be seen if the surface is seen in light colours or they are not very pronounced marks in colours with strong pigments. The most recommendable is to make a pass with an eccentric sander of small orbit with circular movements and a sanding step equal or inferior to the one that the plate is finished. Make a pass during the affected area and clean the dust with a microfiber cloth. If the marks do not disappear, repeat the work mentioned above. If the marks persist after several sanding passes, reduce the sanding pass being worked on over the entire surface and, when no marks remain, go back up to the desired pass.

In the of dark colors, as it is normal that it has a superior finish to the matt, it is recommended to reduce enough steps to raise gradually as indicated in the point 6.4.3. "Sanding process".

### 9.4.2. MARKS OR DEEP SCRATCHES

These are much more striking scratches, which do not need to be viewed in the light to be seen or have been made by means of a sharp element. In these cases, it is advisable to descend to a P180 sandpaper

step using an eccentric sander with a more aggressive orbit, making an incision in the area of the line. Every thirty seconds approximately, clean with a microfiber cloth to see if the mark has disappeared. Carry out the process as many times as necessary until it is observed that the marks no longer exist.

Once the mark has disappeared, sand a good piece of the surface with a sanding machine with a smaller orbit and go up steps so that the entire surface is as homogeneous as possible, without showing water marks between areas.

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# Comments and care instructions

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## 10. COMMENTS AND CARE INSTRUCTIONS

It is recommended to keep a piece of the sheet with which the kitchen is made so that there is no change of tone in case of a potential repair.

Your client must be issued the leaflet of instructions and use and maintenance inside each basin. Among other aspects, it is recommended not to pour boiling water directly onto the KRION™ basin, as the thermal shock may cause the area of the join or the drain to break. The user of the basin must wait for the water to cool, or turn on a cold tap when pouring away boiling water.

Do not overtighten drains, taps and other items as the expansion produced may cause breakage.

Never stand on a structure made of KRION™ (countertops, units, countertops etc.) as your weight may cause it to break.

If your customer asks for a project made of KRION™ that does not comply with the measurements and precautions detailed in this manual, write a document explaining the construction details that are not being respected and send copies by certified mail to the customer (or their architect), to Krion and the Porcelanosa showroom you work with.

If they decide to go ahead with the project, inform them that the job will be carried out at the customer's responsibility.

See our website – **https://www.krion.com/krion-affinity/** - for updates of our technical data sheets and to consult details of new additions to the KRION™ range, the minimum radius for thermoforming, recommended bonding angle and compatibility of different adhesives.

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# Customer satisfaction

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# 11. CUSTOMER SATISFACTION

## 11.1. GUARANTEEING CUSTOMER SATISFACTION.

PROVIDE INFORMATION ABOUT MAINTENANCE
Always leave your customers a copy of the "KRION™ Maintenance Guide" which details cleaning methods, care tips, how to remove minor scratches and other advice to guarantee a long life for the newly fitted product.

USE VACUUM CLEANERS
Try not to fill the whole of the customer's home with dust when working with KRION™. Portable vacuum cleaners will help you to clean up the dust produced when cutting, sanding and polishing.

LEAVE EVERYTHING CLEAN WHEN YOU HAVE FINISHED
Remove your tools, paper and waste material before leaving the customer's home. Sweep up areas where there is dust, and try to leave the area as you found it.

USE BLANKETS OR CARDBOARD
Remember that your customers have paid significant amounts of money for the floor they feel most comfortable with (tiles, parquet, marble, etc.).

Avoid scratching it when dragging elements made of KRION™ (countertops, furniture or structures), when leaving machinery in place or moving KRION™ elements over it by using blankets. This will allow you to move heavy elements with less efforts, protecting your customers' floors at no cost to you.

MAINTENANCE MANUAL
Always provide your customers with a copy of the KRION™ maintenance manual and explain the essential points to them.

## 11.2. CODE OF CONDUCT

- Always address the client in an appropriate manner.
- Wear clean clothing.
- Take care of your personal image and hygiene.
- Use appropriate language.
- Do not smoke in the customer's house.
- During lunch breaks, do not eat in the customer's house.
- Behave in a polite, friendly manner.
- Do not consume drugs or alcohol.

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# Not available color

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## 12. NOT AVAILABLE COLOR

| NOT AVAILABLE COLOUR | SERIES | COLOUR | COLLECTIONS | PROPERTIES | | | | | | FINISH | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MARKS | THERNAL BENDING | UV RESISTENCE | TRANSLUCENCE | MINIMUM RADIUS | GLUING ANGLE | M | S | G |
| | Colors | 6203 Senape | | | | | | 50 mm | 45 | ✓ | ✓ | ✓ |
| | Colors | 6508 Cotto | | | | | | 50 mm | 90 | ✓ | ✓ | ✓ |
| | Colors + | 6907 Deep purple | | | | | | 60 mm | 90 | ✗ | ✓ | ✓ |
| | Star | 7201 Golden Star | | | | | | 40 mm | 45 | ✗ | ✓ | ✓ |
| | Star | 7501 Greggio Star | | | | | | 30 mm | 45 | ✗ | ✓ | ✓ |
| | Star | 7903 Deep purple Star | | | | | | 50 mm | 45 | ✗ | ✓ | ✓ |
| | Royal | 8909 Black Mirror | | | | | | 220 mm | 45 | ✗ | ✓ | ✓ |
| | Asteroid | A502 Asteroid Brown | | | | | | 100 mm | 90 | ✗ | ✓ | ✓ |
| 2019 | Asteroid | A505 Asteroid Taupe | | | | | | 260 mm | 90 | ✗ | ✓ | ✓ |
| | Asteroid | A901 Asteroid Grey | | | | | | 260 mm | 90 | ✓ | ✓ | ✓ |
| | Royal + | 9506 Mocha Concrete | | | | | | 90 mm | 90 | ✓ | ✓ | ✓ |
| | Royal + | 9508 Sand Copper | | | | | | 220mm | 90 | ✓ | ✓ | ✓ |
| | Royal + | 9907 Grey Gold | | | | | | 200 mm | 90 | ✓ | ✓ | ✓ |
| | Luxury | L503 Siracusa | | | | | | 150 mm | 45 | ✓ | ✓ | ✓ |
| | Luxury | L901 Segesta | | | | | | 200 mm | 45 | ✓ | ✓ | ✓ |
| | Luxury | L902 Erice | | | | | | 200 mm | 45 | ✓ | ✓ | ✓ |
| 2021 | Terrazzo | T901 Graffite Classico | | | | | | 260 mm | 45 | ✓ | ✓ | ✓ |

* For bending the Luxury series, temperatures of 140ºC (284 F) to 160ºC (320 F) are required. It is very important to heat in the same way, both the parts to be thermocurved and the straight parts that will go next to them.

### PROPERTIES

The following icons are a basic guide to important aspects of the properties of KRION™ to take into account when choosing a colour for your project.

THERNAL BENDING

- Good potential for thermal bending, the material can be 2-dimensionally bent up to the minimum radius of curvature shown in the fabricator's manual.
- High potential for thermal bending, allowing for the creation of 3-dimensional shapes, although in the case of extreme designs, a slight whitening might be noticeable near curved sections.
- A high potential for thermal bending, allowing for the creation of 3-dimensional shapes. Extreme designs can be made with no noticeable whitening near curved sections.
- Tests in process.

* The thermoforming rating shown here is applicable as from batch no. UC01. La classification de thermoformage qui est présentée est apte à partir du lot UC01.

MARKS

- Noticeable slight marks after heavy use.
- Slight marks after heavy use, noticeable in specific lighting conditions.
- Minor marks after heavy use, slightly noticeable in specific lighting conditions.
- Tests in process.

RECYCLED CONTENT

- Colour containing some recycled material.

RESISTANCE TO UV RAYS

- Colour change of over ΔE=10 in 10 years.
- Colour change of ΔE=5 to ΔE=10 in 10 years.
- Colour change of less than ΔE=5 in 10 years.
- Tests conducted over a long period of time. No conclusive results available as yet.

TRANSLUCENCE

- Colour with a higher translucence when backlit.

### COLLECTIONS

Krion™ is suitable for all kind of applications due to it´s exclusives qualities, however it has been identified by collections the color´s adequacy relating an excellent behavior on three possible frequently used applications with excellent performance and low maintenance.

Bathrooms · Kitchens · Work surfaces · Ventilated façades

- For further information on the above points, see the Technical Data Sheets. The appearance and colour of the models may vary slightly with regard to the originals. The described recommended uses are merely indicative, and they may be subject to future changes.

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# Warranty

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Unlimited Surfaces

# WARRANTY CERTIFICATE FOR KRION® MATERIALS FITTED INDOORS

version: 17.06.19

**KRION® Solid Surface** is a cutting-edge material that complies with all the required quality criteria and standards relating to solid surfaces. It is made in a rigorously controlled manufacturing process. The quality of the KRION® is monitored throughout the whole production process as per the quality management requirements of the ISO 9001 standard, the environmental management requirements of the ISO 14001 standard and, above all, those established by KRION® Solid Surface. KRION® is sold in the form of KRION® sheets or cast KRION® items. In the event of a problem of any kind during the period of validity of this warranty, please read this document carefully.

## COVER

KRION SOLID SURFACE S.A. provides the following limited warranty for KRION® materials used to make end products fitted indoors. This warranty is applicable worldwide, with the pertinent national legislation prevailing in all cases. At its discretion, the company will **solely and exclusively** repair or replace the KRION® materials free of charge under the following terms and conditions, providing that they have been fabricated and fitted by a GOLD or PLATINUM-level **KRION ASSOCIATE FABRICATOR** who holds this level at the time of the fabrication.

## TERMS & CONDITIONS

1.- This point contains the terms and conditions of the warranty covering KRION® materials in the event of manufacturing defects.

- **KRION® Sheets**
  KRION SOLID SURFACE S.A. provides a 10-year limited warranty for KRION® materials (sheets) used to make end products. This limited warranty covers the repair or replacement of manufacturing defects in the KRION®, free of charge and at the manufacturer's discretion, depending on the time that has elapsed since the purchase date and providing that the materials were fabricated and fitted by a **KRION ASSOCIATE FABRICATOR**. The prior written agreement of KRION SOLID SURFACE S.A. shall be needed for all repair or replacement work and it must be carried out by the person(s) designated by KRION SOLID SURFACE S.A. From the first to the third year, KRION SOLID SURFACE S.A. shall cover the cost of 100% of the materials and 100% of the labour. From the fourth to the sixth year, KRION SOLID SURFACE S.A. shall cover the cost of 75% of the materials and 50% of the labour. From the seventh to the ninth year, KRION SOLID SURFACE S.A. shall cover the cost of 50% of the materials and 25% of the labour. The tenth year it shall cover the cost of 25% of the materials and none of the labour costs. These percentages shall apply in all cases, provided that the fault is attributable to a manufacturing defect in the KRION® materials made by KRION SOLID SURFACE S.A.

- **Cast KRION® items**
  KRION SOLID SURFACE S.A. provides a 24-month warranty for all cast KRION® items that it sells. This limited warranty covers the repair or replacement of manufacturing defects in the KRION®, free of charge and at the manufacturer's discretion during the period of validity of the said warranty.

All the said installed fittings and/or products made of KRION® must have been manufactured and fitted in accordance with the *Fabricator's Manual*. They must have been used and cared for in accordance with the *Guide to Use, Cleaning and Care available* on the web page www.KRION.com. This warranty shall become valid as from the date when the product was first installed. Unless otherwise proven, this shall be the date shown on the end customer's sales invoice.

2.- Our limited warranty for **KRION® materials** does not cover defects, damage or mistakes made by the fitter, user or any other person in the following cases:

- Damage caused during the transportation process.
- Damage or defects caused by a faulty design.
- KRION® used in saunas, steam baths or as flooring.
- Damage or defects due to faulty fabrication.
- If adhesives by other manufacturers were used in the fabrication process.
- A faulty installation process or non-compliance with the instructions in the *Technical Notes, Fabricator's Manual and Sales Guides* drafted by KRION SOLID SURFACE.
- KRION® not located in the original place where it was installed.
- Damage caused by optional equipment not supplied by KRION SOLID SURFACE S.A.
- Modifications made subsequent to the installation of the end product for any reason which were not authorized by KRION SOLID SURFACE S.A. (Including those made in order to comply with Local Legislation).
- Negligent use and/or misuse, whether physical, chemical or mechanical.
- (Residential or commercial) use, improper or insufficient care, and marks caused by normal wear and tear to the materials.
- Extreme heat as a result of insufficient insulation or temperatures of over 75ºC for prolonged periods of time.
- Boiled liquids spilled onto it, without running cold water at the same time.
- Acts of God (lightning, earthquakes, floods, hail etc.).
- Fires.
- Force majeure. Wars. Vandalism.

3.- In the case of cast basins and sinks, a slight difference in colour is permissible between the basin or sink and the countertop made of KRION® sheets (i.e. of an ΔE less than or equal to 2), provided that they are both the same colour model and have been fitted as indicated in the Fabricator's Manual.

4.- The manufacturer's liability is limited to the repair or replacement, free of charge and at the manufacturer's discretion, of manufacturing defects in the KRION® materials, excluding any handling, fabricating, replacement or installation costs. If KRION SOLID SURFACE S.A. deems that it is not able to repair or replace the defective KRION® materials covered by this warranty, it shall be solely limited to returning the original amount paid for the KRION®. The owner shall accept any additional bonding joints or slight colour variations that might be necessary as a result of the repair process. This warranty shall not include the cost of any required work prior or subsequent to the repair, replacement or maintenance of the KRION® because easy access to its different parts has not been envisaged.

5.- This warranty only covers the KRION® materials (*KRION® sheets and cast KRION® items*). The adhesive used to bond the KRION®, and the related assembly system and installation process are not covered by it.

6.- Under no circumstances shall this warranty cover possible direct or indirect damage to persons or things that is not attributable to manufacturing defects in the KRION® materials. If faulty KRION® has been fabricated or fitted, any financial compensation shall be excluded unless the express written authorization of KRION SOLID SURFACE S.A. has been given. Neither shall this warranty cover losses of commercial profits, the interruption of business activities, or any other loss, whether or not it is the outcome of a manufacturing defect by KRION SOLID SURFACE. S.A. and even if KRION SOLID SURFACE. S.A. was warned of the possibility of such damage. KRION SOLID SURFACE. S.A. cannot be held liable for the choice of KRION® materials, related design, and engineering calculations needed to carry out projects.

7.- Marketing samples of KRION® materials that you may have seen before buying KRION® are only representative. They are not an exact replica of what will be fitted in your project. Slight variations in colour and shade are common with solid surfaces. This does not affect the performance of the product and neither can it be deemed to be a defect.

8.- Claims for and the notification of possible defects must be made in the store where the materials were purchased within a maximum of two months of their appearance by submitting the warranty and proof of purchase. If you are unable to contact the store where it was purchased, you should contact any official distributor, a KRION ASSOCIATE FABRICATOR, in the final instance, KRION SOLID SURFACE. S.A.

9.- If any repair or replacement is made under this warranty, the period of validity of the said warranty shall continue from the original installation date and not from the date of the repair or replacement.

10.- KRION SOLID SURFACE S.A. is the only authorized body able to certify and confirm fabricators as being **KRION ASSOCIATE FABRICATOR.**

## LEGAL FRAMEWORK

This certificate, together with the sales invoice, is the only valid warranty given by KRION SOLID SURFACE, S.A. for KRION® materials used in all fittings installed as from 01/01/2016. No amendment to the warranty shall be accepted. In the event of a dispute in the interpretation and/or application of this warranty, the Law Courts of Vila-real (Castellón, SPAIN) shall be the only competent body for its legal settlement.

# WARRANTY CERTIFICATE FOR SOLID-COLOURED KRION® MATERIALS FITTED OUTDOORS

version: 17.06.19

**KRION® Solid Surface** is a cutting-edge material that complies with all the required quality criteria and standards relating to solid surfaces. It is made in a rigorously controlled manufacturing process. The quality of KRION® is monitored throughout the whole production process as per the quality management requirements of the ISO 9001 standard, the environmental management requirements of the ISO 14001 standard and, above all, those established by KRION® Solid Surface. KRION® for outdoor use is sold in the form of KRION® sheets. In the event of a problem of any kind during the period of validity of this warranty, please read this document carefully.

## COVER

When KRION® is used outdoors, it can be affected by important factors not attributable to the material itself. As a result, this warranty only covers KRION® that is used outdoors when it has been handled by a GOLD or PLATINUM-level KRION ASSOCIATE FABRICATOR, since these specialists have the infrastructure, experience and necessary knowhow to carry out projects that take into account the above factors in such a way that the latter do not affect the KRION®.

KRION SOLID SURFACE S.A. provides the following limited warranty for KRION® materials used to make end products installed outdoors. This warranty is applicable worldwide, with the pertinent national legislation prevailing in all cases. At its discretion, the company will **solely and exclusively** repair or replace the KRION® materials free of charge under the following terms and conditions, providing that they have been fabricated and fitted by a GOLD or PLATINUM-level **KRION ASSOCIATE FABRICATOR** who holds this level at the time of the fabrication. This warranty covers the Snow Series, Colors Series, Colors+ Series, and Light Series

## TERMS & CONDITIONS

1.- This point contains the terms and conditions of the warranty covering KRION® materials in the event of manufacturing defects.

KRION SOLID SURFACE S.A. provides a 10-year limited warranty for KRION® materials (sheets) used to make end products. This limited warranty covers the repair or replacement of manufacturing defects in the KRION® materials free of charge, at the manufacturer's discretion, providing that the KRION® was fabricated and fitted by a GOLD or PLATINUM-level **KRION ASSOCIATE FABRICATOR**.

All the said installed fittings and/or products made of KRION® must have been manufactured and installed in accordance with the Fabricator's Manual. This warranty shall apply from the date on which the product was first fitted. Unless there is evidence to the contrary, this date shall be that shown on the end customer's sale invoice.

2.- Our limited warranty for **KRION® materials** does not cover defects, damage or mistakes made by the fitter, user or any other person in the following cases:

- Damage caused during the transportation process.
- Damage or defects caused by a faulty design.
- KRION® used in saunas, steam baths or as flooring.
- Damage or defects due to faulty fabrication.
- If adhesives by other manufacturers were used in the fabrication process.
- A faulty installation process or non-compliance with the instructions in the Technical Notes, Fabricator's Manual and Sales Guides drafted by SYSTEM- POOL S.A.
- KRION® not located in the original place where it was fitted.
- Damage caused by optional equipment not supplied by KRION SOLID SURFACE S.A.
- Modifications made subsequent to the installation of the end product for any reason which were not authorized by KRION SOLID SURFACE S.A. (Including those made in order to comply with Local Legislation).
- Negligent use and/or misuse, whether physical, chemical or mechanical.
- Residential or commercial use, improper or insufficient maintenance and care, and marks caused by normal wear and tear to the materials.
- KRION® materials can be subject to a certain amount of wear and tear or marks during normal use. This is not deemed to be a defect.
- Extreme heat as a result of insufficient insulation or temperatures of over 75ºC for prolonged periods of time.
- Boiled liquids spilled onto it, without running cold water at the same time.
- Colour changes in KRION® materials of less than the **Δ**E shown in the KRION® Technical Note on Resistance to UV Rays.
- Uneven exposure to climatic conditions.
- Acts of God (lightning, earthquakes, floods, hail etc.).
- Fires.
- Force majeure. Wars, vandalism.

3.- KRION® materials are highly stable when exposed to sunlight. Even so, with the passage of the years, there can be a slight change in colour. Changes in colour are measured in ΔE units, as specified in the *KRION® Technical Note on Resistance to UV Rays*. For colours included in the collection for façades, KRION SOLID SURFACE S.A. guarantees that no signs of delamination, flaking or lumps shall appear during the 20 years following the material's initial installation. These colours are described in the *Technical Note on Colours in the Collection for Façades*.

4.- The manufacturer's liability is limited to the repair or replacement, free of charge and at the manufacturer's discretion, of manufacturing defects in the KRION® materials, excluding any handling, fabricating, replacement or installation costs. If KRION SOLID SURFACE S.A. deems that it is not able to repair or replace the faulty KRION® covered by this warranty, it shall be solely liable for returning the original amount paid for the said material. The owner shall accept any additional bonding joints or slight colour variations that might be necessary as a result of the repair process. This warranty shall not cover the cost of any required work prior or subsequent to the repair, replacement or maintenance of the KRION® because easy access to its different parts has not been envisaged.

5.- This warranty only covers KRION® materials (*KRION® sheets*). The adhesive used to bond the KRION®, and the related assembly system and installation process are not covered by it.

6.- Under no circumstances shall this warranty cover possible direct or indirect damage to persons or things that is not attributable to manufacturing defects in the KRION®. If faulty KRION® has been fabricated or fitted, any financial compensation shall be excluded unless the express written authorization of KRION SOLID SURFACE S.A. has been given. Neither shall this warranty cover losses of commercial profits, the interruption of business activities, or any other loss, whether or not it is the outcome of a manufacturing defect by KRION SOLID SURFACE. S.A. and even if KRION SOLID SURFACE. S.A. was warned of the possibility of such damage. KRION SOLID SURFACE. S.A. cannot be held liable for the choice of KRION® materials, related design, and engineering calculations needed to carry out projects.

7.- Marketing samples of KRION® materials that you may have seen before buying the product are only representative. They are not an exact replica of what will be fitted. Slight variations in colour and shade are common with solid surfaces. This does not affect the performance of the product and neither can it be deemed to be a defect.

8.- Claims for and the notification of possible defects must be made in the store where the materials were purchased within a maximum of two months of their appearance by presenting the warranty and proof of purchase. If you are unable to contact the store where it was purchased, you should contact any official distributor, a KRION ASSOCIATE FABRICATOR or, in the final instance, KRION SOLID SURFACE. S.A.

9.- If a repair or replacement is made under this warranty, the period of validity of the said warranty shall continue from the original installation date and not from the date of the repair or replacement.

10.- KRION SOLID SURFACE S.A. is the only authorized body able to certify and confirm fabricators as being **KRION ASSOCIATE FABRICATOR**.

## LEGAL FRAMEWORK

This certificate, together with the sales invoice, is the only valid warranty given by KRION SOLID SURFACE, S.A. for KRION® materials used in all fittings installed as from 01/01/2016. No amendment to the warranty shall be accepted. In the event of a dispute in the interpretation and/or application of this warranty, the Law Courts of Vila-real (Castellón, SPAIN) shall be the only competent body for its legal settlement.

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