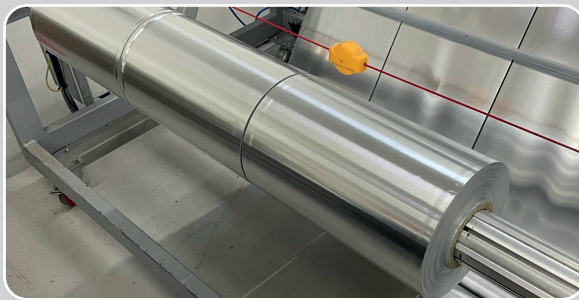


CORROSION PREVENTION PACKAGING



Benefits

- Eliminates corrosion
- Reduced desiccant requirement
- No need to use preservation methods that require cleaning
- Eliminates odour transfer
- Reduces the need to invest in modified atmosphere storage
- Outer packaging cleanliness
- Enhanced storage time
- Tear and puncture resistant

Differentiators

- Replicated manufacturing facilities in the UK and USA
- 24hr turnaround focusing on quality and on-time delivery
- No minimum order quantities
- No limitation on size, shape or style
- ISO 9001:2015 certification
- ISO 14001:2015 certification
- Materials are manufactured in BRCGS accredited facilities
- 600+ years of collective experience within the industry
- Experienced in serving all sizes of business from owner-operated enterprises to multi-national corporations
- A Carbon Neutral certified business
- On-site laboratory for the testing of laminate and product performance
- In-house R&D capabilities including bespoke laminate structure development

Prolonging Product Life



Established in Manchester in 1988, the company has grown to become a worldwide leading designer and manufacturer of climatic packaging solutions.

Protective Packaging's expertise is in the design, manufacture and supply of barrier foil packaging for all industries. Specialising in corrosion prevention, we manufacture a range of Aluminium Barrier Foil, 2D and 3D Bags and Liners, to suit any application where deterioration of the packaged product may take place.

Our vapour barrier laminate range protects against moisture ingress, eliminating the risk of product damage. Fabricated using a buried layer of aluminium, barrier foil products offer the highest level of protection from corrosion and moisture damage. As a result, our corrosion protection products can be used to protect goods of a highly sensitive nature, including machinery, electronics, automotive parts, engineering equipment, scientific instruments, defence equipment and telecommunications.

With a combination of our barrier bag and a calculated amount of desiccant, the relative humidity (RH) will be maintained well below 38%, the starting point for corrosion.



Protection Against

- Moisture Vapour Ingress
- Oxygen Ingress
- UV Light
- Extreme Temperatures
- Odour Transfer
(in and out of the package)
- Mould and Fungi Growth
- Grease and Oils
- Chemicals

Typical Applications

- Export Packers
- OEMs
- Automotive
- Aerospace
- Military and Defence
- Electronics
- Machinery





Manufacturing Facilities

Protective Packaging's expertise is in the design, manufacture and supply of a range of barrier foil packaging for all industries.

Our in-house manufacturing facilities consist of hand fabrication and automated manufacture, as well as on-site laboratory testing.

All of our key products are manufactured to ISO 9001:2015 standards in ISO 14001:2015 certified facilities.

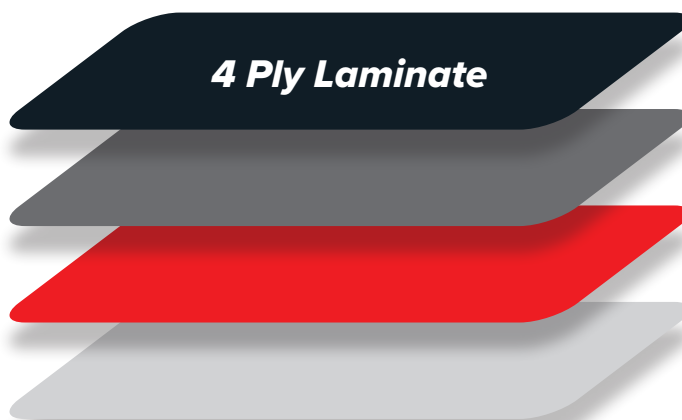
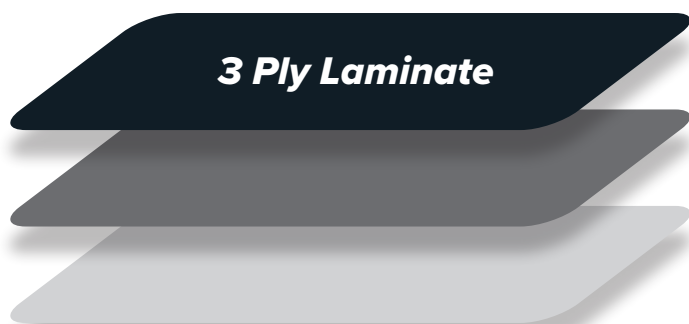
- Material creation and bespoke laminate structures to suit individual requirements.
- Smart features such as tear notching, zipper pouches, valves and windows or clear panels.
- On-site laboratory for the testing of laminate and product performance.
- On-site engineering team, repair service for heat sealers available.

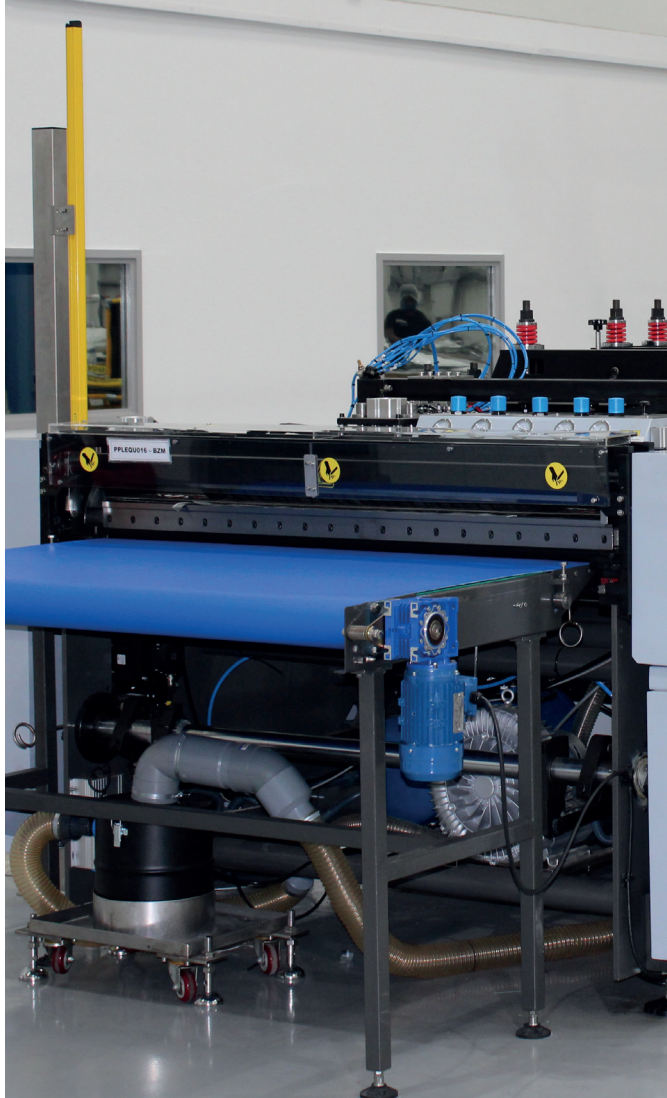


Aluminium Barrier Foil - A Typical Construction

Aluminium barrier foils are constructed of different polymers, including a layer of aluminium, that are bonded through a lamination process, to create a flexible barrier material. We provide a range of specifications but typically our laminates are comprised of 2 (duplex), 3 (triplex) or 4 (quadplex) layers of materials, bonded together with adhesive or extruded polyethylene to create a strong construction.

The generic construction of materials includes layers of Polyester, Aluminium and Polyethylene, but this is dependent on application and customer requirements.





Ultimate Barrier Properties

An indication of the performance of aluminium barrier foils is provided by their Water Vapour Transmission Rate (W.V.T.R.), which at $<0.01 \text{ gm/m}^2/24\text{hr}$ for the virgin laminate itself and less than $<0.05 \text{ gm/m}^2/24\text{hr}$ for converted laminate, is lower than any known flexible packaging material.

By comparison, polyethylene, with for example a thickness of $125\mu\text{m}$, allows water vapour to diffuse at a rate of up to $4 \text{ gms/m}^2/24\text{hr}$ (80 times faster).

Oxygen transmission rate, (OTR) is the steady state rate at which oxygen can permeate through a material. The OTR of aluminium barrier foil is $< 0.001 \text{ cc/M}^2/24\text{hrs}$ for virgin laminates and $< 0.006 \text{ cc/M}^2/24\text{hrs}$ for converted laminates, which is lower than any known flexible packaging material.

Within the heat sealed Aluminium Barrier Foil Bag, a calculated amount of desiccant can be added to ensure the relative humidity (RH) remains well below 38% - the starting point for corrosion.

Polyester

Each layer serves a vital purpose - the outer layer is usually polyester which resists high temperature, has good mechanical strength, waterproofs the material and protects the aluminium layer.

Aluminium

The buried layer of aluminium, acts as a barrier to prevent water vapour, oxygen and aggressive gasses from entering the pack. This is the key to the Aluminium Barrier Foil's performance in preventing deterioration of products.

The Barrier layer also performs the same protection in reverse - retaining odours/flavours inside the sealed bag, which is important in food packaging.

Polyethylene

Finally, a layer of polyethylene allows the barrier foil to be heat sealed into a range of shaped bags and liners.

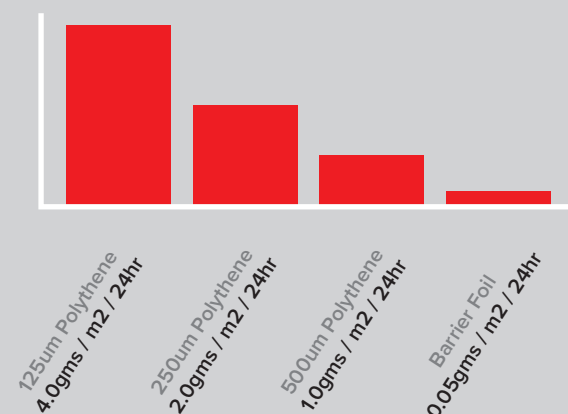
There are many possible variations to the laminate construction to satisfy our customer's technical and commercial requirements.

Nylon

A layer of Nylon can be added to enhance both the gas barrier and puncture resistance.

Polypropylene

Polypropylene when used as a cast material has a particularly high melting point. When included in the construction of a laminate, this enables the foil to be exposed to temperatures above $120^\circ \text{ Celsius}$ for sterilisation or boiling.

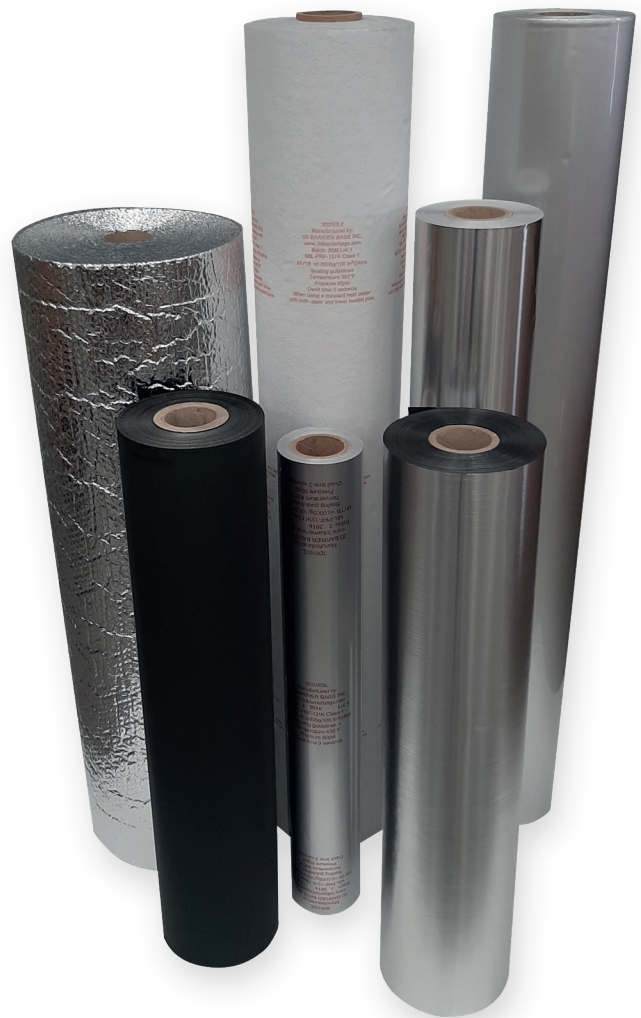


Products & Solutions

Laminate Grade Options

Multiple aluminium and polymer combinations to provide different characteristics of strength and application performance, including;

- FDA and European Pharmacopoeia approved
- Military approved (MIL-PRF-131L Class 1, DEF STAN 81-147, NF H 00310, DIN 55 531)
- NATO Green
- Static dissipative
- Hot-fill
- Retortable
- Metallised duplexes
- Transparent high-barrier duplex



3D Barrier Bags

Our custom-made 3D barrier bags are an effective and efficient way of packaging products that are moisture sensitive and susceptible to corrosion.

Based on the outer dimensions of the item to be packaged and the inner dimensions of the shipping crate, 3D barrier bags are available in any size and quantity.

Complete the corrosion prevention solution with the correct amount of desiccant, which we can calculate to BS1133 section 19. We can integrate the desiccant into the bag or supply it in a loose format.

All of our 3D barrier bag styles can be fitted with a wide range of Smart Features.

- 3D zipper closure for access and re-use
- Transparent high barrier film, viewing window/full panel
- Humidity indicators for RH monitoring
- Correctly calculated desiccant which can be incorporated into the seal



Re-sealable Zipper Pouches

- Easy and convenient way to open and close the pouch, making it simple to access the product inside. Improving the overall user experience and customer satisfaction
- Ensure retention of your products original characteristics
- Protects the product from environmental factors
- Extends shelf life during use
- Tamper-evident

Flat Bags & Pouches

When it comes to the packaging of products where the process or dimensions dictate that the most appropriate format is a flat bag or pouch rather than a 3-D bag, our 3-side sealed bags and pouches are available in any size.

For multiple-use applications, we also provide re-sealable zippered packaging solutions.

The barrier foil laminates that Protective Packaging offer are approved to the relevant food standards, are suitable for sterilisation by gamma irradiation and ensure your products retain their original characteristics. We also have static dissipative laminates available, which safeguard from static discharge.

Our wide range of flat bags and pouches are ideal for both corrosion prevention and dried product protection applications across a myriad of industries.



Barrier Foil Tubing

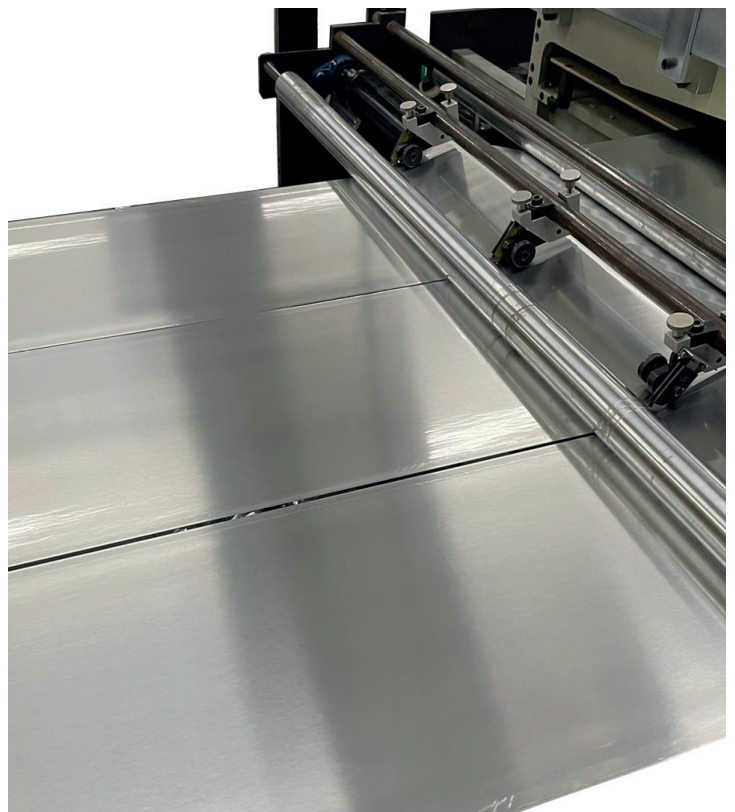
Available in single wound pleat and gusseted. Suitable for the manual packaging of products and form-fill-seal applications.

Lay Flat Tubing is perfect for packing items with the same width but different lengths. It is a continuous roll bag allowing you to cut it to the desired length and package your item.

Gusseted Tubing has a pleat on each side that allows it to accommodate large or bulky items. The expanding capabilities of the design allow different sized items to be packaged within the same roll of material.

Form, Fill, Seal (FFS). All the above formats are available for use with all vertical and horizontal FFS machines for better-quality packaging.

Bespoke Individual Sheets available with no limitation on size.



Packing Process

Step by step

- 1.** The base sheet is laid on the case base. Desiccant is added and the 3D bag is placed over the machine.
- 2.** The bag is sealed to the base sheet with a hand-held heat sealer, leaving a gap for vacuuming.
- 3.** Just prior to the final seal, any excess air is extracted with a vacuum.
- 4.** The bag is now ready to provide protection from all climatic conditions.
- 5.** Finally, the wooden case is added to provide the physical protection and the shipment is ready!

Typical Application - Machinery

Aluminium Barrier foil can be supplied tailor made as flat or 3D bags. The following is a typical example for the packaging method using a barrier foil bag. "One Layer - Total Climatic Protection".



3



4



5



DO

- Create the required hermetic seal using a handheld heat-sealer
- Ensure the storage environment is suitable to protect the product and the outer packaging
- Seek advice on the most appropriate barrier foil laminate for your requirement

DON'T

- Over extract air from the packaging when pulling a vacuum
- Seal with unapproved adhesives or tapes, as they will compromise the integrity of the packaging
- Re-use barrier foil packaging following its primary intended purpose

Desiccant & Indicators



Up to 80 times reduction in desiccant when used with a barrier foil versus polyethylene 125µ

Desiccant

A desiccant is a product that has a very high affinity to the adsorption of moisture vapour. Our desiccant bags can provide you with measurable pack performance when used in conjunction with our barrier foil packaging.

Desiccant is required to remove any **residual water vapour** inside the aluminium barrier foil bag and to neutralise the small amounts of water vapour, which will subsequently pass into the bag from the atmosphere. We use the **BS1133 Section 19** desiccant calculation to work out how much desiccant you require for your application and via our in-house manufacturing team, have the capability to integrate the desiccant into the barrier bag.

Our range of desiccant packs are appropriate for both commercial and military applications together with food and pharmaceutical.

Available in a variety of sizes ranging from 1/2g sachets to 1KG bag.

Desiccant types include activated clay, silica gel and molecular sieves.



Humidity Indicators

A humidity indicator is a device used to measure and display the relative humidity (RH) level in the surrounding environment. Intended for assisting in monitoring the air's moisture content, which holds crucial importance for specific products and materials. The device typically consists of a small, colour changing card or strip that is sensitive to changes in humidity levels.

Humidity indicators help to ensure that products are stored in **optimal conditions**, which can help to maintain their **quality** and **prolong their shelf life**. This is particularly important for products that are sensitive to moisture, such as electronics, pharmaceuticals, and certain types of food.

An **affordable** method for monitoring RH levels, ensuring that products are stored under suitable conditions.



Humidity indicators are used to monitor the internal humidity.

ProDriPole Desiccant Pole

ProDriPole® is a unique desiccant system developed specifically to protect the contents of ISO 20' and 40' containers from the detrimental effects of humidity and the phenomenon known as container rain. It is fully REACH and CLP compliant.

Using anhydrous Calcium Chloride as the desiccant, ProDriPole® is designed to work in relatively open environments as opposed to silica gel, which must be contained within a controlled atmosphere such as a foil bag in order to be effective.

The unique design of ProDriPole® allows the absorptive qualities of the anhydrous Calcium Chloride to be maximised.

Generally, 4-6 poles are required for 20' containers and 6-12 poles for 40' containers. The number varies according to the length of transit, prevailing conditions and type of cargo.



- **Tear resistant**
- **Resists U.V. degradation**
- **100% waterproof**
- **Helps prevent product damage**

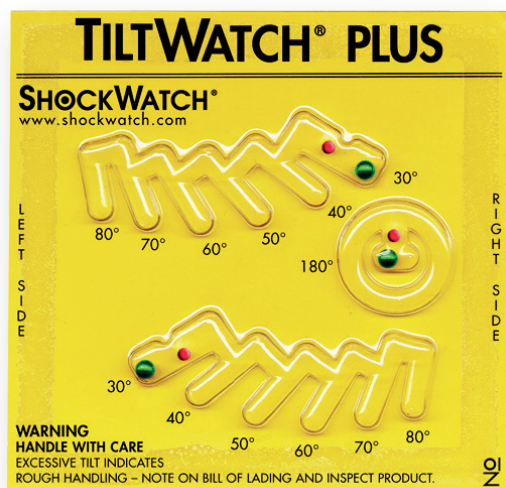
Blue Woven Cross Case & Lid Lining

Our case and lid lining material is a cross-laminated high-density polyethylene tarpaulin traditionally supplied as rolls of 1.83M x 200M. Ideal for lining the lid or walls of your crate to prevent the ingress of water whether that is rainwater, ocean water or the phenomenon of "container rain". Our case lining is a cost-effective alternative to the more traditional materials that you might use for lining your cases.

When storing items in environments that are exposed to the weather, our case and lid lining can be used as a traditional tarpaulin.

Damage Detection Indicators

ShockWatch, **TiltWatch** and additional indicators provide a valuable means of determining the condition of the goods at every stage of the distribution chain. Mishandling or damage to the transit packaging / goods is automatically signalled by the indicators, helping to promote careful handling at all times.



Skid-mate Pallet Cushions

Designed to replace pallet runners, **Skid Mates** offer a quick and cost effective answer to the packaging problems caused by shock and vibration. The doughnut-shaped units are easily bolted through the pallet or case base.

Heat Sealing Equipment

Protective Packaging offer a range of heat sealing equipment which can be used to achieve effective seals on both Aluminium Barrier Foil and thermoplastics. The sealers are offered in a range of different formats suitable for a broad spectrum of operations, from the small user right up to large-scale manufacturing operations. Sealers can be purchased or offered under a rental agreement.



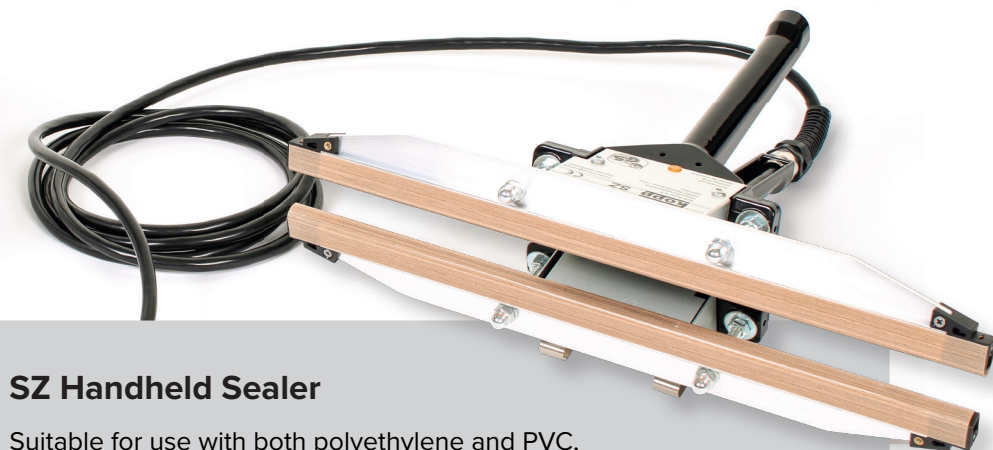
HZ Handheld Sealer

The sealer provides accurate temperature control, plus a ribbed jaw surface for easy identification of seal integrity. This hand sealer is compatible with all grades of Barrier Foil. It has a sealing width of 12mm and is available in jaw lengths of 20, 30, 40 and 50cm.

- Ergonomic and lightweight design
- One-man operation
- Minimal heat transfer to handles
- Easy to see 12mm ridged seal
- Easily adjustable temperature gauge to accommodate the requirements of the material being sealed



We also provide a maintenance and repair service.



SZ Handheld Sealer

Suitable for use with both polyethylene and PVC, this hand held impulse sealer has a highly accurate timer. It has a sealing width of 3mm and the jaws are available in lengths of 20, 30, 40, 50 and 60cms.



Self-Adhesive Cushioning Material

Self-Adhesive Cushioning Material – adheres directly to rough sawn timber, plywood and cartons to provide a firm cushion between the packing case and its contents. This quick and easy to use material is available in standard 5cm and 10cm width rolls. Used as a cushion for blockings and cradles, it is quick and easy to use and provides an ideal substitute for felt, polystyrene, bubble foam or non-adhesive polyethylene foam.



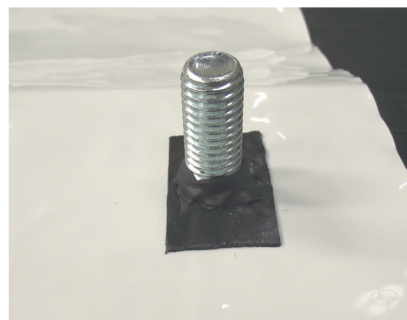
Benefits

- Labour saving
- Does not require gluing or stapling
- Instant adhesion to a wide range of different surfaces
- Easily applied from roll
- Improved quality
- Product protection
- Cost effective

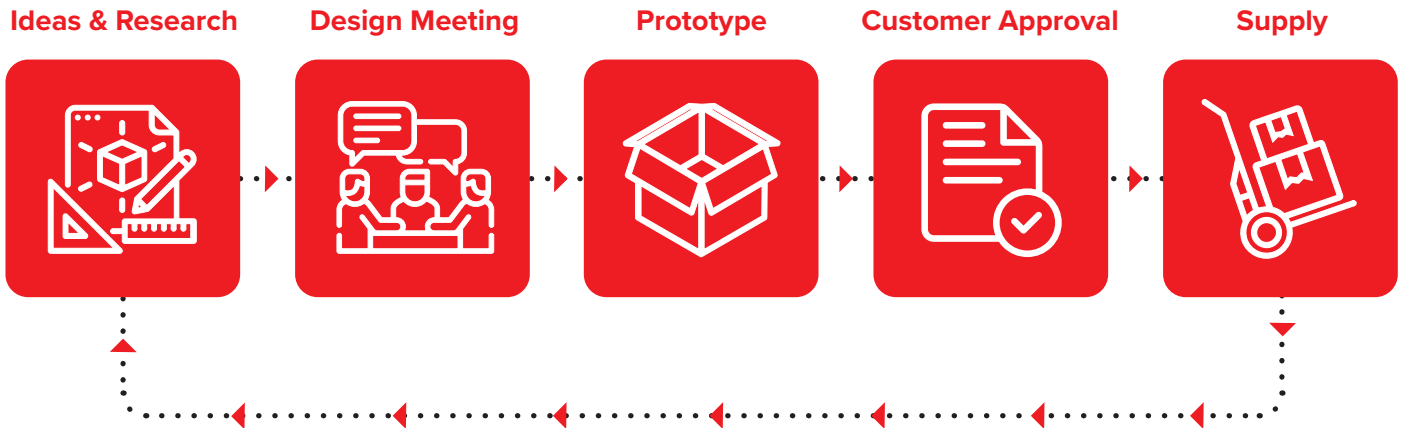
Kwikstick

Kwikstick is a butyl sealant and is used to 'seal' up bags for applications where it is impossible to use a heat sealer. For use as an alternative when electrical currents are prohibited.

Kwikstick sticks directly to the barrier foil bag and when the seal is ready to be made, the backing strip is peeled off. It can also be used on boltholes to act as a seal.



Research & Development Process



Management Systems & Accreditations

We believe that quality is crucial to the success of our business, which is why we are proud to be certified to ISO 9001:2015. Protective Packaging was accredited to BS5750 (predecessor to ISO 9001) in November 1991 and have been continuously quality accredited since then.

ISO 9001:2015 is a globally recognised standard for quality management systems that helps organisations to consistently meet the needs and expectations of their customers and other stakeholders. Our ISO 9001:2015 certification demonstrates our commitment to quality and our willingness to go above and beyond to meet the needs of our customers. It also allows us to continually improve our processes and systems to ensure that we are providing the highest level of quality possible.

By implementing a rigorous quality management system, we are able to monitor our processes and identify any areas for improvement. This allows us to make changes to our processes, systems, and products to ensure that we are meeting the needs of our customers and delivering the highest level of quality possible.

ISO 9001:2015 also helps us to ensure that our employees are well trained and capable of performing their roles to the best of their abilities.

By providing ongoing training and development opportunities, we are able to continually improve the skills and knowledge of our staff, which in turn helps us to provide better products and services to our customers.

We are also an ISO 14001:2015 Environmental Management System accredited business. The environment has always been a topic close to our hearts at Protective Packaging; we have been working towards our goal of 14001 certification following our carbon neutral status. This is a further step in our efforts of reducing our environmental impact and striving for a more sustainable future. We prioritise any advancements that contribute to the well-being of the environment and aid in the planet's recovery. Being acknowledged for our efforts in this direction brings us great joy and motivation.

The element of continual improvement that is integral to the ISO 14001 requirements is used to help our business to move from smaller, specific improvements towards greater enhancements in our organisational processes. Through these systematic processes, we achieve the added benefits of 14001 in assisting our employees to find new and improved ways to reduce our environmental impact and save time and resources as we improve our processes.



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