KRAIBURG RELASTEC

ANTI-SLIP MATS FOR SECURING LOADS

FOR THE TRANSPORT OF GOODS ON ROAD, RAIL AND SEA

KARGOTEC®

EN #1 | 2022

Made in Germany

BE ON THE SAFE SIDE WITH KARGOTEC® ANTI-SLIP MATS!

THE RIGHT SOLUTION FOR EVERY LOAD

RESPONSIBILITY FOR THE SECURING OF THE LOAD

THE LEGAL SITUATION IS CLEAR

§

Requirements for properly secured cargo

VDI 2700 and DIN EN 12195
Recognised fundamental work on load securing: They describe which forces act on a load during transport and how the load should basically be secured on road vehicles. The requirements for anti-slip mats are also defined here.

§ 22 StVO
Every load must be secured in such a way that it can be held safely on the vehicle even in extreme situations such as emergency braking, strong evasive manoeuvres, accidents or poor road surfaces.

Responsibility for securing the load

§ 22 StVO
According to public law, the driver, the loader and the forwarder are obliged and responsible for securing the load. The vehicle owner is obliged to equip the vehicle according to § 31 StVZO.

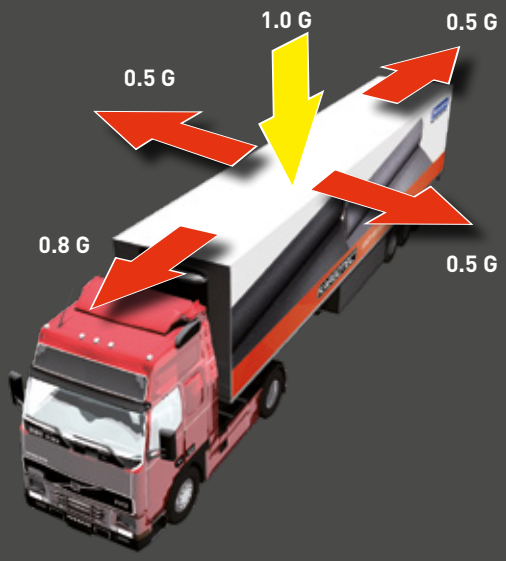
§ 412 HGB
According to commercial law, the consignor and the carrier are obliged to secure the load. The consignor is responsible for safe loading. The carrier is responsible for safe loading.

Principles of securing a load

Counteracting of acceleration forces. These values must be satisfied.

1.0 G = Weight of load
The load during truck transport, according to applicable regulations, must be secured with 50% of the weight toward the sides and back and with 80% of the weight toward the front. For transport by rail and ship, the values are accordingly higher.

High-quality anti-slip mats can greatly assist in the task of complying with these specifications.



Kinetic friction coefficient: practical calculation value

The kinetic friction coefficient (after deduction of the safety margin) of our anti-slip mats of up to μ=0.9 were determined by an independent testing institute and thus exceed the kinetic friction coefficient of μ=0.6 usually applied in the VDI guidelines under optimal test conditions and different material pairings. However, in practice or in VDI 2700, Sheet 15 and DIN EN 12195, a kinetic friction coefficient of μ=0.6 is generally assumed, as this is influenced by numerous factors (temperature, condition of the material surface, moisture, dirt). In order to achieve the highest possible anti-slip effect, the loading surface and the loading unit must be free of negative influences such as sand (broom clean), frost, ice, snow, oil and grease.

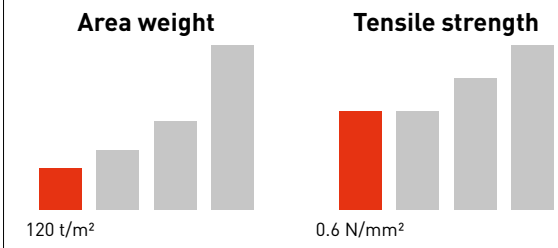
KARGOTEC® basic

THE VERSATILE ANTI-SLIP MAT

The anti-slip mat KARGOTEC® basic was developed to cover a wide range of safety requirements and transport conditions. Great importance was attached to a high kinetic friction coefficient of at least μ=0.7. (practical calculation value: μ=0.6; details on page 3).
A selection of various material thicknesses offers very good maximum surface load values ranging from 100 to 120 t/m², allowing exact adaptation to your individual load securing requirements.

As with all KARGOTEC® anti-slip mats, KARGOTEC® basic can be re-used many times until they reach the replacement state of wear.

Standard product for a very wide range of loads



Material	PU-bound recycling rubber granules
Formats	Panels: on request (± 1.5 %) Rolls: L (on request) x B 1,250 mm (± 1.5 %)
Thicknesses	3, 4, 5, 6, 8, 10, 12, 20 mm (± 0.5 mm)
Max. permissible surface load (at max. 30% compression in acc. with VDI 2700 Sheet 15)	ca. 100 t/m² at 3 mm thickness ca. 120 t/m² at 8 mm thickness
Friction coefficient μ	**Tested value**: 0.7* at 3, 4, 5, 6, 8, 10, 12, 20 mm thickness (* Friction partners: Euro pallet, non-slip floor, dry) **Practical calculation value**: 0.6 (details on page 3)
Elongation at break	min. 60% (DIN EN ISO 1798)
Tensile strength	min. 0.6 N/mm² (DIN EN ISO 1798)

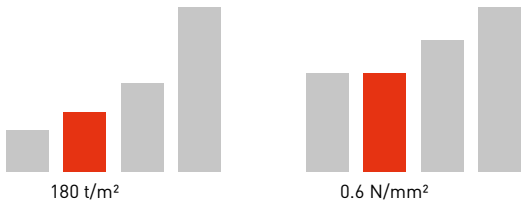
KARGOTEC® spezial plus

VERSATILE ANTI-SLIP MAT WITH GREATER SURFACE LOAD CAPACITY

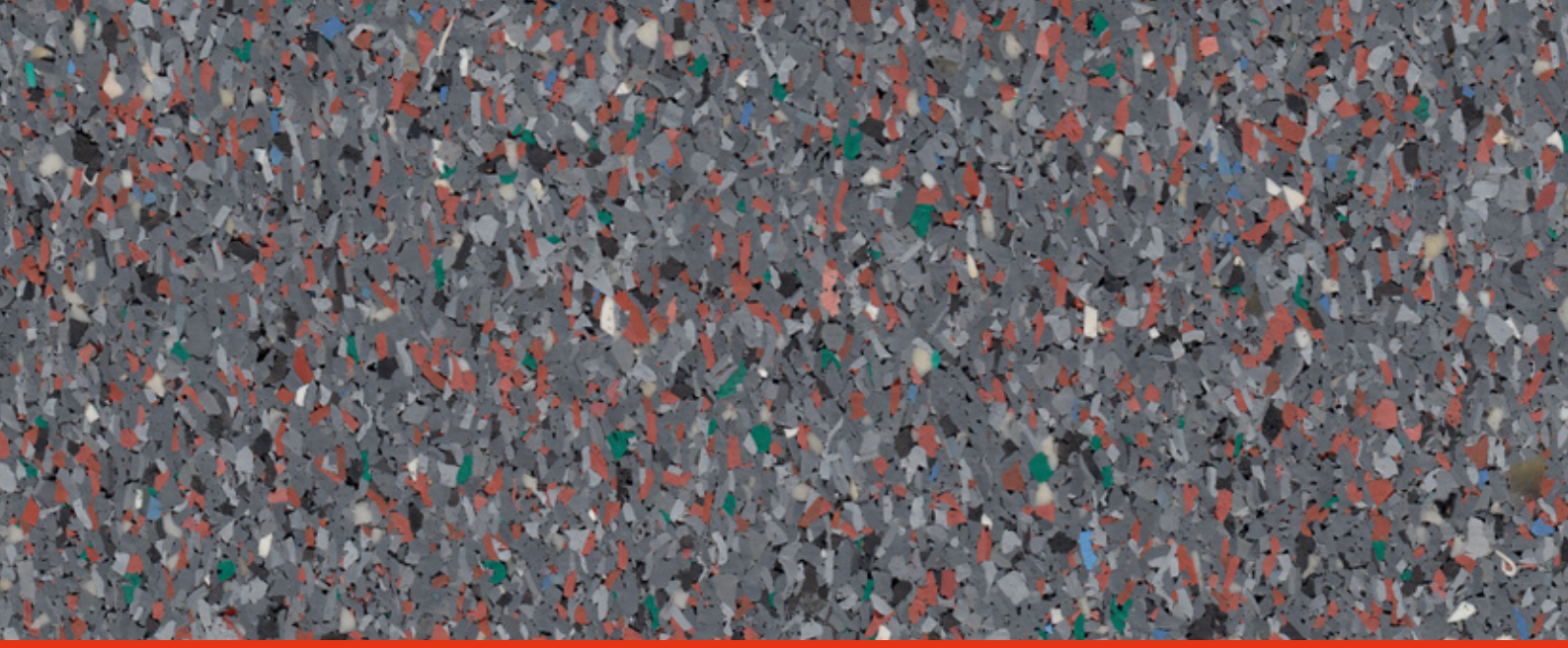
KARGOTEC® spezial plus is the anti-slip mat for heavier loads. The combination of a high surface load capacity (max. 290 t/m²) and an excellent kinetic friction coefficient of at least μ=0.8 (practical calculation value: μ=0.6; details on page 3) makes this product the first choice when it comes to securing loads of medium weight.

KARGOTEC® spezial plus can also be re-used many times until they reach the replacement state of wear.

Standard product for loads of medium weight



Material	PU-bound recycling rubber granules
Formats	Panels: on request (± 1.5 %) Rolls: L (on request) x B 1,250 mm (± 1.5 %)
Thicknesses	3, 4, 5, 6, 8, 10, 15, 18, 20 mm (± 0.5 mm)
Max. permissible surface load (at max. 30% compression in acc. with VDI 2700 Sheet 15)	ca. 180 t/m² at 3 mm thickness ca. 290 t/m² at 8 mm thickness
Friction coefficient μ	**Tested value**: 0.8* at 3, 4, 5, 6, 8, 10, 15, 18, 20 mm thickness (* Friction partners: Euro pallet, non-slip floor, dry) **Practical calculation value**: 0.6 (details on page 3)
Elongation at break	min. 60% (DIN EN ISO 1798)
Tensile strength	min. 0.6 N/mm² (DIN EN ISO 1798)



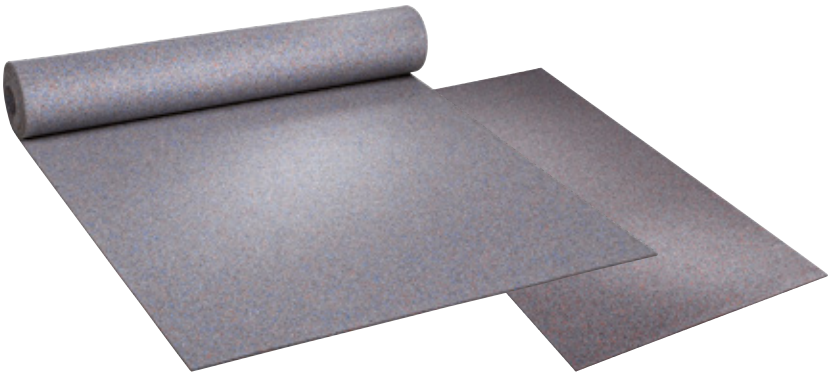
KARGOTEC® protect

ANTI-SLIP MAT WITH EXTREMELY HIGH KINETIC FRICTION COEFFICIENT

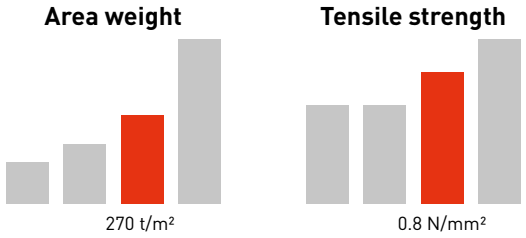
Our anti-slip mat KARGOTEC® protect, with an extremely high kinetic friction coefficient of at least μ=0.9 (practical calculation value: μ=0.6; details on page 3), is the ideal solution, because it optimally counters any horizontal movement of the load (sliding).

Due to the especially homogeneous distribution of the granules, KARGOTEC® protect also provides maximum flexibility, with excellent adaptation to loads that have complex contours and prevention of staining on many substrates. The large range of available thicknesses ensures especially effective and economical securing of loads.

As with all KARGOTEC® anti-slip mats, KARGOTEC® protect can be reused many times until they reach the replacement state of wear.



Standard product for high friction coefficients *



Material	High-specification coloured PU-bound recycling rubber granules
Formats	Panels: on request (± 1.5 %) Rolls: L (on request) x B 1,250 mm (± 1.5 %)
Thicknesses	3, 5, 6, 8, 10 mm (± 0.5 mm)
Max. permissible surface load (at max. 30% compression in acc. with VDI 2700 Sheet 15)	ca. 270 t/m² at 3, 8 mm thickness
Friction coefficient μ	**Tested value**: 0.9* at 3, 5, 6, 8, 10 mm thickness (* Friction partners: Euro pallet, non-slip floor, dry) **Practical calculation value**: 0.6 (details on page 3)
Elongation at break	min. 120% (DIN EN ISO 1798)
Tensile strength	min. 0.8 N/mm² (DIN EN ISO 1798)

KARGOTEC® secure

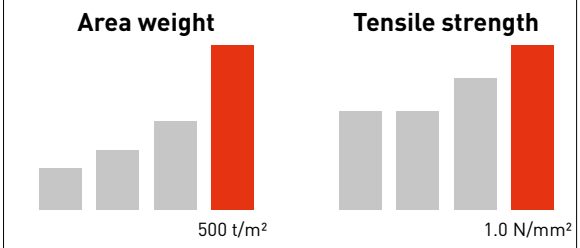
ANTI-SLIP MAT FOR EXTREMELY HEAVY LOADS

KARGOTEC® secure is the anti-slip mat for heavy loads. The combination of an exceptionally high surface load capacity (max. 500 t/m²) and an excellent kinetic friction coefficient of at least μ=0.8 (practical calculation value: μ=0.6; details on page 3) makes this product the first choice when it comes to securing extremely heavy loads.

Registered, protected colour coding:
KARGOTEC® secure likewise features a colour coding system protected by German legislation. The blue and white granulate colour particles are the sign of an original KARGOTEC® secure anti-slip mat.

KARGOTEC® secure anti-slip mats can also be re-used many times until they reach the replacement state of wear.

Standard product for high loads (heavy-duty transport)



Special feature	Protected and registered colour code (black with blue and white colour particles)
Material	PU-bound recycling rubber granules
Formats	Panels: on request (± 1.5 %) Rolls: L (on request) x B 1,250 mm (± 1.5 %)
Thicknesses	8, 10 mm (± 0.5 mm)
Max. permissible surface load (at max. 30% compression in acc. with VDI 2700 Sheet 15)	ca. 500 t/m² at 8, 10 mm thickness
Friction coefficient μ	**Tested value**: 0.8* at 8, 10 mm thickness (* Friction partners: Euro pallet, non-slip floor, dry) **Practical calculation value**: 0.6 (details on page 3)
Elongation at break	min. 80% (DIN EN ISO 1798)
Tensile strength	min. 1.0 N/mm² (DIN EN ISO 1798)

SECURING OF LOADS ON ROAD VEHICLES

BY VDI 2700 AND DIN EN 12195

General

VDI 2700 and DIN EN 12195 are recognised as the fundamental guide to the securing of loads, and as repositories of the recognised technical rules involved. They describe the forces that affect a load while driving and the basic methods for securing loads on road vehicles.

These directives are used for supervision measures by the traffic police, but also in court disputes.

VDI 2700, Sheet 15 – Requirements for anti-slip mats

VDI 2700 Sheet 14 - Determination and documentation of kinetic friction coefficients for anti-slip materials (RHM) for securing loads on road vehicles

Sheet 15 of VDI 2700 defines the requirements for anti-slip mats. In order to guarantee quality and strength, an anti-slip mat should have a tensile strength of at least 0.6 Newton per square millimetre (N/mm²) and an elongation at break of at least 60%. Furthermore, according to sheet 15, a kinetic friction coefficient of at least μ=0.6 is usually applied. This is also the practical calculation value. Kinetic friction coefficients of anti-slip materials (RHM) or anti-slip mats should be determined by an independent testing institute according to VDI 2700 Sheet 14 and may then be used until they are ready for discard.

The term "replacement state of wear"

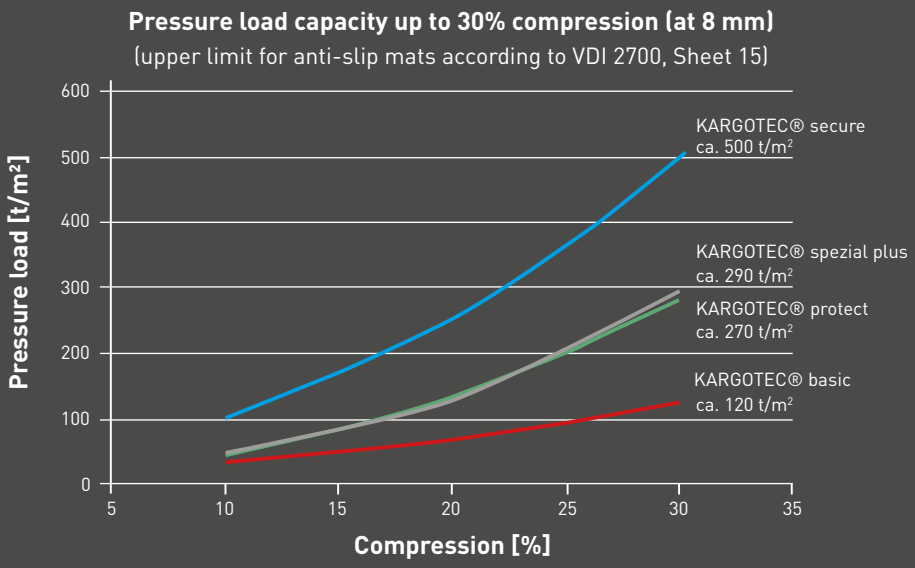
KARGOTEC® anti-slip mats can always be re-used many times. However, there are criteria that rule out their continued use. These criteria are defined in VDI 2700 Sheet 15 and must be checked before every use of the anti-slip mats. If any of the following statements apply to the anti-slip mats, it has reached the "replacement state of wear" and may no longer be used:

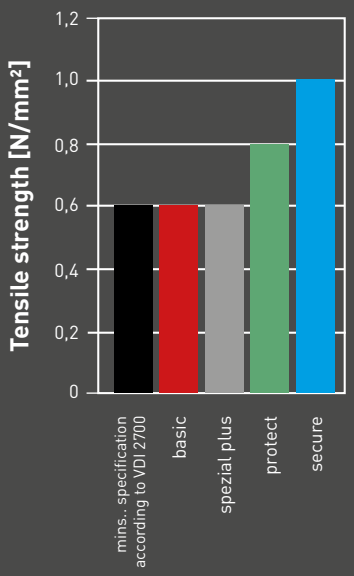
Embrittlement | Tears | Surface abrasion | Holes

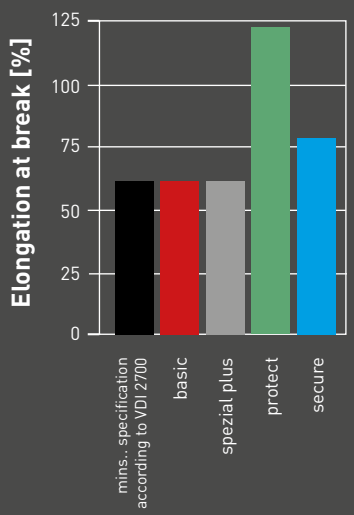
Swollen areas | Damage due to contact with aggressive substances | Permanent deformations or compression marks | Soiling that affects the function of the mats

KARGOTEC® ANTI-SLIP MATS

THE ADVANTAGES AT A GLANCE







Our KARGOTEC® anti-slip mats stand for compliance with the highest quality and environmental standards. Our products are produced exclusively in Germany and undergo strict internal or external product tests. It goes without saying that they comply with all legal standards.
The following icons show you the most important advantages of the products.

Wear-resistant, durable, re-usable

Durable solution

Tested safety, high quality

High kinetic friction coefficient

Fast and easy to handle

Cost-saving through reduction of need for lashing straps

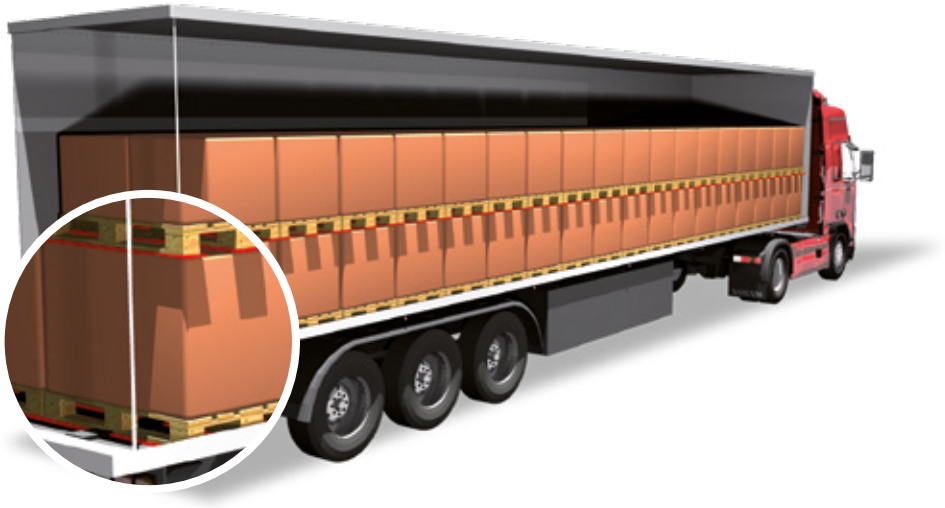
Made of recycled material

KARGOTEC® anti-slip mats

TYPICAL APPLICATIONS

Pallets and lattice boxes

The use of KARGOTEC® anti-slip mats under pallets or lattice boxes substantially increases the friction between the loading surface and the load. This significantly reduces the number of lashing straps needed.

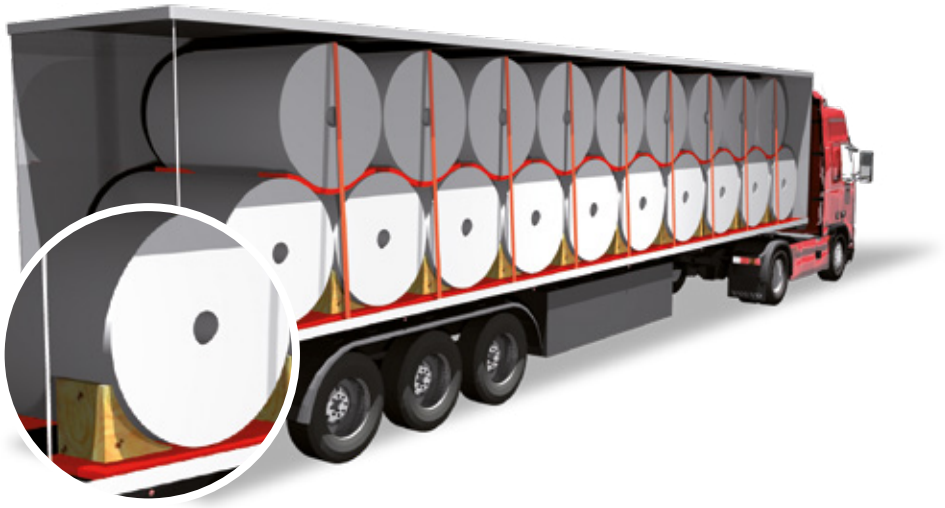


Metal rod-coils

Ideally, metal rod-coils should be transported in coil troughs. To prevent the danger of slipping and subsequent shifting of the centre of gravity, KARGOTEC® anti-slip mats should be placed between the coils and the trough.

Paper coils

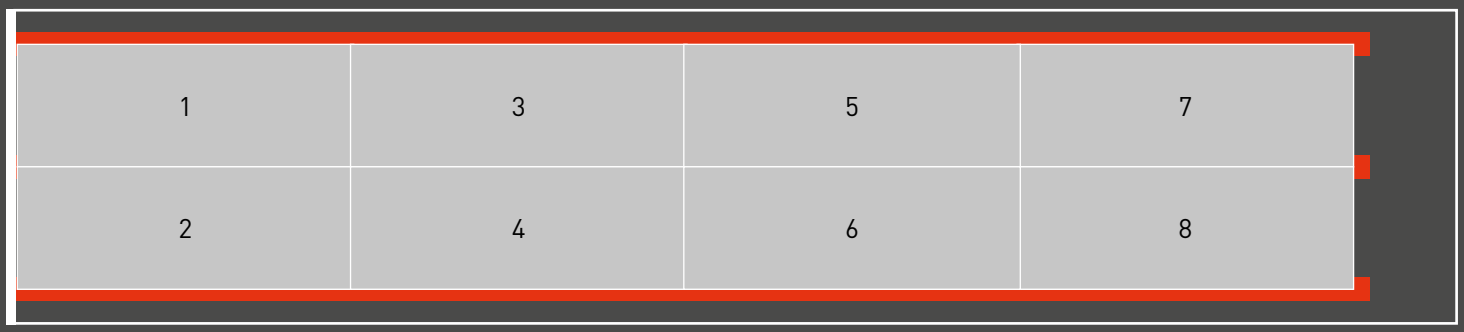
The flexible, robust and tear-resistant KARGOTEC® anti-slip mats secure heavy loads such as transversely loaded paper coils on smooth loading surfaces of transport vehicles and this prevents them from slipping laterally. Placed underneath and between the paper coils, the anti-slip mats support and balance the coils. They also significantly reduce the number of lashing straps needed.



Pipes

If the pipes are loaded lengthwise on the semi-trailer, it is especially important to prevent slipping both lengthwise and laterally. The use of KARGOTEC® anti-slip mats under the wedges and under the pipes provides the necessary protection in both directions.

Example 1: Loading surface area (curtainsider L) + load (MDF panels, 8 packages)



DO YOU STILL BELT UP, OR DO YOU SIMPLY JUST DRIVE OFF?

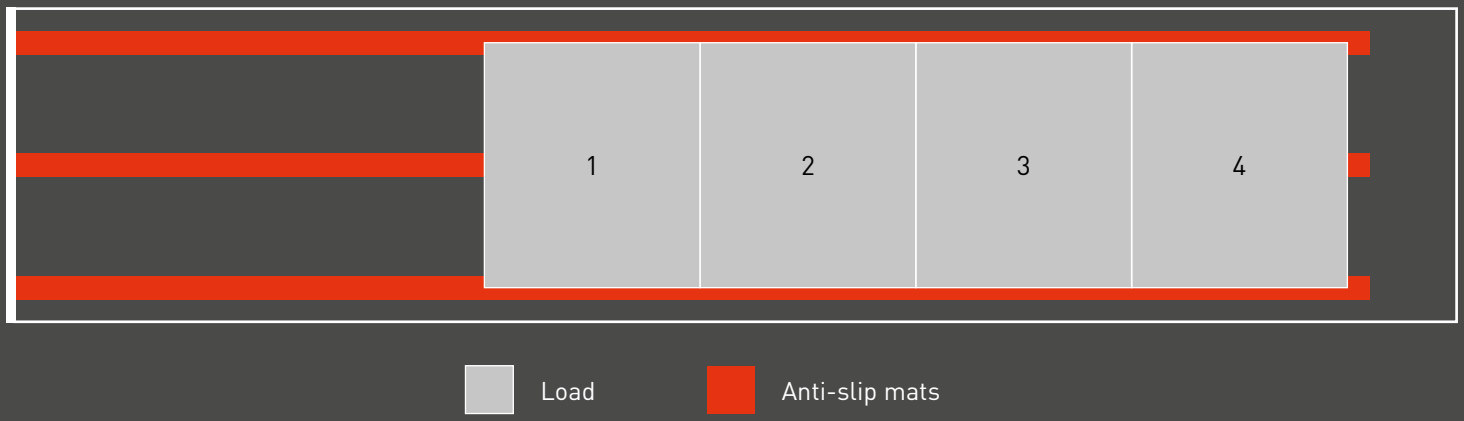
COST SAVING WITH ANTI-SLIP MATS

- Payload weight, 24,400 kg MDF sheets divided up and bundled into 8 packages
- Vehicle layout: Curtainsider L
- Friction partner smooth fiberboard/ MDF sheet on non-slip floor μ = 0.2
- Required lashing straps: 48 units with a preload force of 500 daN
- Lashing angle α = 80°
- Positive connection at the front

Loading without anti-slip mat

Costs without anti-slip mat (μ=0.2) (calculation in acc. with DIN EN 12195)	**Costs**	**Costs with anti-slip mat (μ=0.6) (calculation in acc. with DIN EN 12195)**	**Costs**
48 lashing straps per transport operation (6 straps in each pack) Procurement: €10 / unit = €480: 250 days = **€1.92** per transport operation	**€1.92**	16 straps per transport operation (2 straps in each pack to prevent lifting) Procurement: €10 / unit = €160: 250 days **= €0.64** per transport operation	**€0.64**
Truck downtime = **€80/hr.** **= €218.40** per transport operation (168 mins.) Fitting time per strap approx. 2 mins. **=** 48 straps / transport operation **96 mins.** Removal time (incl. rolling up) of each strap 1.5 mins. **=** 48 straps per transport operation **72 mins.** At labour rates of €30 / hr. **= €84** per transport operation	**€302.40**	Truck downtime **= €80/hr.** Fitting time per strap approx. 2 mins. = at 16 straps per transport operation approx. **38 mins.** Removal time (incl. rolling up) of each strap 1.5 mins. **=** 16 straps per transport operation **24 mins.** At labour rates of €30 / hr. = **€30** per transport operation	**€110.00**
Edge protection brackets per transport operation, 96 units = 96 brackets x €0.50 = €48 per annum = €48: 250 days **= €0.19** per transport operation	**€0.19**	Edge protection brackets per transport operation, 32 units = 32 brackets x €0.50 = €16 per annum = €16: 250 days = **€0.06** per transport operation	**€0.06**
		Costs anti-slip mats (15 strips, each 6 mm x 200 mm x 2500 mm) **€75** per truck for an average of 10 transport operations	**€7.50**
		Laying out the anti-slip mats per transport operation approx. 5 mins. At labour rates of €30 / hr. **€2.50**	**€2.50**
Costs per transport operation	**€304.51**	Costs per transport operation	**€120.70**
Costs per annum (250 working days)	**€76,127.50**	Costs per annum (250 working days)	**€30,175.00**
		Saving for one truck per annum: approx. €45,953	

Example 2: Load surface area (curtainsider L) + 4 coils (aluminium coils on timber)



- Payload weight, 4,100 kg aluminum coils on timer (4 coils)
- Vehicle layout: Curtainsider L
- Friction partner smooth fiberboard/ MDF sheet on non-slip floor μ = 0.3
- Required lashing straps: 16 units with a preload force of 350 daN
- Lashing angle α = 60°
- No positive connection

Loading without anti-slip mat

Costs without anti-slip mat (μ=0.2) (calculation in acc. with DIN EN 12195)	**Costs**	**Costs with anti-slip mat (μ=0.6) (calculation in acc. with DIN EN 12195)**	**Costs**
16 lashing straps per transport operation (4 straps per coil) Procurement: €10/unit = €160: 250 days = **€0.64 per** transport operation	**€0.64**	8 lashing straps per transport operation (2 straps per coil to prevent lifting) Procurement: €10/unit = €80: 250 days = **€0.32** per transport operation	**€0.32**
Truck downtime **= €80/hr.** = €80 per transport operation Fitting time per strap approx. 2 mins. **=** 16 straps per transport operation **32 mins.** Removal time (incl. rolling up) for each strap 1.5 mins. **=** 16 straps per transport operation **24 mins.** At labour rates of €30 / hr. **= €30** per transport operation	**€110.00**	Truck downtime **= €80/hr.** = €40 per transport operation Fitting time per strap approx. 2 mins. = 8 straps per transport operation approx. **16 mins.** Removal time (incl. rolling up) for each strap 1.5 mins. **=** 8 straps per transport operation **12 mins.** At labour rates of €30 / hr. **= €15** per transport operation	**€55.00**
Edge protection brackets per transport operation, 32 units = 32 brackets x €0.50 = €16 per annum = €16: 250 days = **€0.06** per transport operation	**€0.06**	Edge protection brackets per transport operation, 16 units = 16 brackets x €0.50 = €8 per annum = €8: 250 days **= €0.03** per transport operation	**€0.03**
		Costs anti-slip mats (6 strips, each 6 mm x 200 mm x 2500 mm) **€30** per truck for an average of 10 transport operations	**€3.00**
		Laying out the anti-slip mats per transport operation approx. 3 mins. At labour rates of €30 / hr. **= €1.50**	**€1.50**
Costs per transport operation	**€110.70**	Costs per transport operation	**€59.85**
Costs per annum (250 working days)	**€27,675.00**	Costs per annum (250 working days)	**€14,962.50**
		Saving for one truck per annum: approx. €12,712.50	

KARGOTEC® TECHNICAL SERVICE

WE CAN PROVIDE YOU WITH COMPREHENSIVE ADVICE

KARGOTEC® anti-slip mats are subjected to comprehensive production and product monitoring. Also, all incoming raw materials needed in the manufacture of our anti-slip mats are subject to a stringent incoming goods inspection.

Needless to say, Quality Assurance and Product Monitoring are separate departments from Production. After carrying out the relevant quality test, e.g. determining the friction coefficient, the elongation to break and tensile strength values or the applicable surface load capacity, it is possible when required to produce an internal acceptance test certificate.

These quality assurance measures are conducted on all of our products, always with due reference to the currently valid standards and regulatory publications. This end-to-end in-house monitoring guarantees the assurance of product features and also enables us to produce seamless documentation, from raw material to end product.

Customer service

Over and above quality assurance and product monitoring, we offer our customers a range of different tests to suit customer requests. These include determining the friction coefficient of customer-specific pairs of materials in conjunction with KARGOTEC® anti-slip mats.

We shall be pleased to put together a sample pack for you, for training purposes, further training or for test purposes. Please advise us of the quantity of samples and their intended purpose and we shall send you an appropriate pack of samples.

FAQ - KARGOTEC® securing of loads

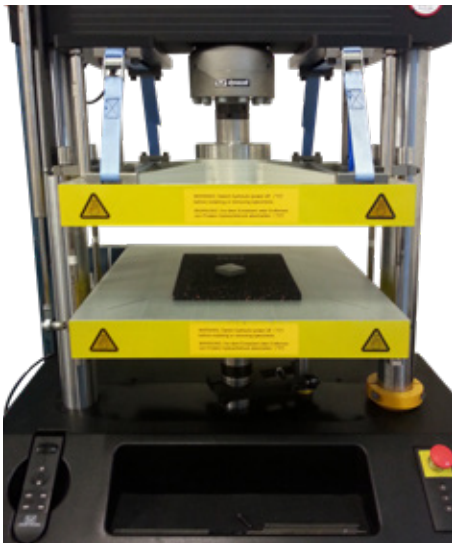
Scan the QR code to obtain answers to FAQs relating to the securing of loads.

KARGOTEC® SECURING OF LOADS - PRODUCT INSPECTIONS

TENSILE STRENGTH, ELONGATION TO BREAK, DISTORTION CHARACTERISTICS

Tensile strength and elongation to break

Determining of friction coefficient



Distortion characteristics

Use our technical service!
Either on location or over the phone, our KARGOTEC® Application Technology team will be pleased to advise you, and can skilfully assist with the planning and implementation of your products.

Telefon: +49 (0) 3901 8304-63
Mobil: +49 (0) 151-42 65 60 57
Fax: +49 (0) 3901 8304-463
technik-kargotec@kraiburg-relastec.com

Scan the QR code to save our KARGOTEC® Applications Technology details as a direct point of contact.

ENVIRONMENTAL MANAGEMENT AT KRAIBURG RELASTEC

FROM OLD TYRES TO TOP-QUALITY FINISHED PRODUCTS

Recycling of 85.000t old tyres

Every year, we process and recycle about 85,000 tons of old tyres, closed-cell rubber and rubber production scrap.

Fully recyclable products

All products are fully recyclable and are returned to the production process without any loss of quality.

CO_2 savings

In Germany alone, 400,000 tonnes of CO_2 can be saved annually by using used tyre granulates instead of new rubber materials.

Environmentally friendly production

We invest in innovative and environmentally friendly production methods and technologies. There is a PV system on our administration building.

Control of suppliers

Our suppliers are subject to constant monitoring with regard to environmental protection.

Environmentally friendly way of working

All employees of KRAIBURG Relastec undertake to implement sustainable practices in their daily work and to protect the environment wherever they can.

Review of the products and further development

Our products are subject to continuous quality testing and further development, whereby environmental concerns are given priority. We are always on the lookout for even more environmentally friendly alternatives that enable us to further reduce emissions and protect resources.

Environmental protection as a main strategic task

We are convinced that sustainable growth is only achievable, if we meet our responsibilities towards the environment. KRAIBURG Relastec has therefore adopted a very simple policy: Protecting the environment is part and parcel of what we do every day!

Member of NEW LIFE initiative

The declared aim of NEW LIFE is to demonstrate the advantages of recycled products from End-of-Life Tires (ELT) to the media, politicians and the general public and to motivate them to act sustainably.

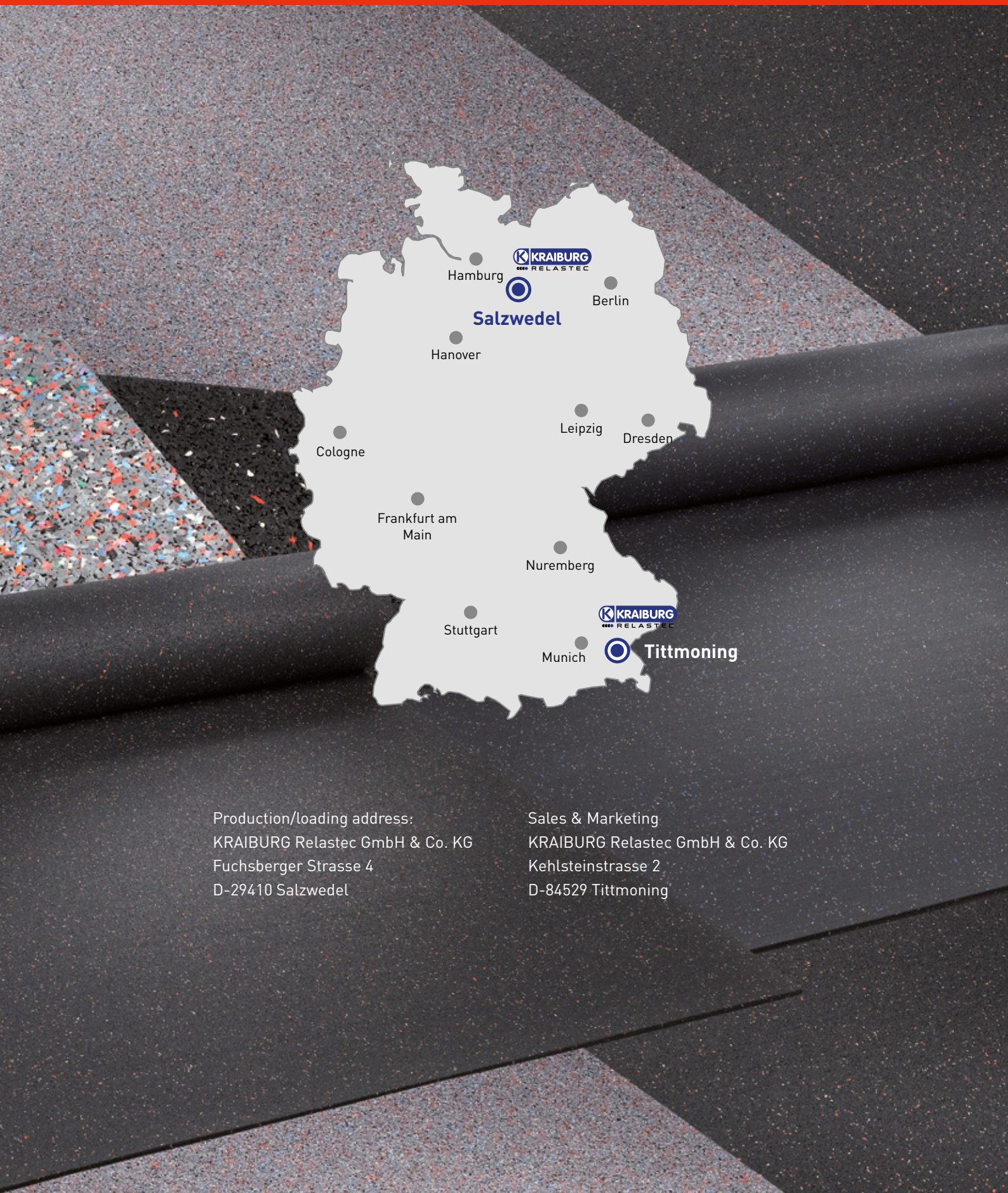
More information:
www.initiative-new-life.de/en

Notes

or write directly to:
kargotec@kraiburg-relastec.com

Please do not hesitate to contact us for

- Product samples
- Product data sheets
- Test certificates
- Brochures for other KARGOTEC® load securing systems



Production/loading address:
KRAIBURG Relastec GmbH & Co. KG
Fuchsberger Strasse 4
D-29410 Salzwedel

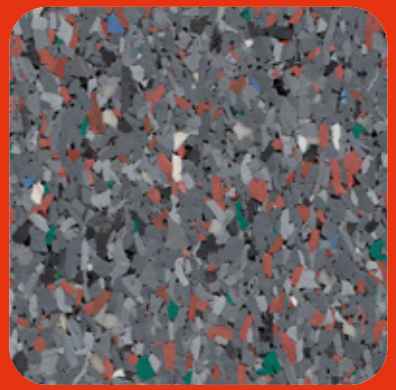
Sales & Marketing
KRAIBURG Relastec GmbH & Co. KG
Kehlsteinstrasse 2
D-84529 Tittmoning

KARGOTEC® basic

Technical data
Standard product for a very wide range of different loads
Material PU-bound recycling rubber granules
Formats Panels: on request (± 1.5 %) Rolls: L (on request) x B 1,250 mm (± 1.5 %)
Thicknesses 3, 4, 5, 6, 8, 10, 12, 20 mm (± 0.5 mm)
Max. permissible surface load (at max. 30% compression in acc. with VDI 2700 Sheet 15) ca. 100 t/m² at 3 mm thickness ca. 120 t/m² at 8 mm thickness
Friction coefficient μ **Tested value**: 0.7* at 3, 4, 5, 6, 8, 10, 12, 20 mm thickness (* Friction partners: Euro pallet, non-slip floor, dry) **Practical calculation value**: 0.6 (details on page 3)
Elongation at break min. 60% (DIN EN ISO 1798)
Tensile strength min. 0.6 N/mm² (DIN EN ISO 1798)

KARGOTEC® spezial plus

Technical data
Standard product for loads of medium weight
Material PU-bound recycling rubber granules
Formats Panels: on request (± 1.5 %) Rolls: L (on request) x B 1,250 mm (± 1.5 %)
Thicknesses 3, 4, 5, 6, 8, 10, 15, 18, 20 mm (± 0.5 mm)
Max. permissible surface load (at max. 30% compression in acc. with VDI 2700 Sheet 15) ca. 180 t/m² at 3 mm thickness ca. 290 t/m² at 8 mm thickness
Friction coefficient μ **Tested value**: 0.8* at 3, 4, 5, 6, 8, 10, 15, 18, 20 mm thickness (* Friction partners: Euro pallet, non-slip floor, dry) **Practical calculation value**: 0.6 (details on page 3)
Elongation at break min. 60% (DIN EN ISO 1798)
Tensile strength min. 0.6 N/mm² (DIN EN ISO 1798)



KARGOTEC® protect

Technical data
Standard product for high friction coefficients *
Material: High-specification coloured PU-bound recycling rubber granules
Formats Panels: on request (± 1.5 %) Rolls: L (on request) x B 1,250 mm (± 1.5 %)
Thicknesses 3, 5, 6, 8, 10 mm (± 0.5 mm)
Max. permissible surface load (at max. 30% compression in acc. with VDI 2700 Sheet 15) ca. 270 t/m² at 3, 8 mm thickness
Friction coefficient μ **Tested value**: 0.9* at 3, 5, 6, 8, 10 mm thickness (* Friction partners: Euro pallet, non-slip floor, dry) **Practical calculation value**: 0.6 (details on page 3)
Elongation at break min. 120% (DIN EN ISO 1798)
Tensile strength min. 0.8 N/mm² (DIN EN ISO 1798)

KARGOTEC® secure

Technical data
Standard product for high loads
Material PU-bound recycling rubber granules
Formats Panels: on request (± 1.5 %) Rolls: L (on request) x B 1,250 mm (± 1.5 %)
Thicknesses 8, 10 mm (± 0.5 mm)
Max. permissible surface load (at max. 30% compression in acc. with VDI 2700 Sheet 15) ca. 500 t/m² at 8, 10 mm thickness
Friction coefficient μ **Tested value**: 0.8* at 8, 10 mm thickness (* Friction partners: Euro pallet, non-slip floor, dry) **Practical calculation value**: 0.6 (details on page 3)
Elongation at break min. 80% (DIN EN ISO 1798)
Tensile strength min. 1.0 N/mm² (DIN EN ISO 1798)

KARGOTEC®

Anti-slip mats for the securing of loads
made of recycled rubber granules

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