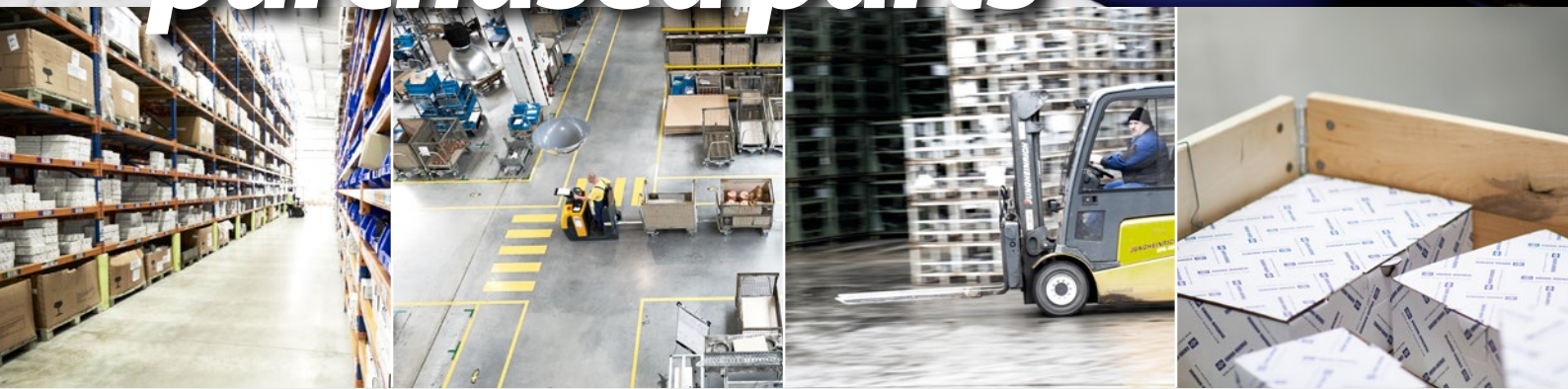




Knorr-Bremse Packaging Manual for purchased parts



VERSION 2014

KNORR-BREMSE



FOREWORD**KNORR-BREMSE IS THE WORLD'S LEADING MANUFACTURER OF BRAKING, DOOR AND AIR CONDITIONING SYSTEMS FOR RAIL VEHICLES.**

As a technology pioneer in this field, for over 100 years Knorr-Bremse has been driving progress in development, production, marketing and service. Our close, trust-based relationship with our suppliers is a significant factor contributing to our successful market position.

Purchasing has expanded its focus beyond cutting costs and ensuring that global production locations are supplied with materials. By partnering with innovative suppliers, a modern purchasing organization contributes significant value to the growth of the company and plays a key role in the quality of the end product.

This last factor is especially important at Knorr-Bremse. As a manufacturer of systems that are critical to vehicle safety, quality is our top priority in addition to the requirements in the area of environmental protection and industrial safety.

As a strategic partner of Knorr-Bremse, the supplier shall therefore take on, meet and implement the requirements defined by Knorr-Bremse Rail Vehicle Systems in the areas of quality, environmental protection and industrial safety.

These activities shall be implemented in accordance with the laws of the countries in which they take place. Furthermore, Knorr-Bremse has undertaken to abide by the ten principles of the UN Global Compact and expects all stakeholders in the supply chain and delivery to observe the very same undertaking.

To meet these requirements, the selection of the appropriate packaging for production material plays a significant role:

It is an important aspect for optimizing the total cost approach in the context of a supply chain from the supplier to Knorr-Bremse and finally also to the end customer.

This brochure serves as a guide and a specification to the application of delivery packaging at Knorr-Bremse Rail Vehicle Systems. In order to follow our Knorr-Bremse Excellence, this guide also documents our goal of continuously improving our purchasing organization and suppliers.

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				KNORR-BREMSE PROTECTION REQUIREMENTS				
Knorr-Bremse Packaging Specifications*	Dimensions of parts			Surface Protection		Additional Protection Packaging		
	small	medium	large	Bulk goods	Individual goods Surface protection required	Anti Corrosion Protection particularly sea freight and long transport/ storage times	ESD-protection	UV-protection
A/B	x	x		x				
A/B/VC	x	x		x		X		
A/R/VC	x	x		x		X		
A/B/UV	x	x		x				X
A/R/UV	x	x		x				X
E01/B to E17/B	x	x			X			
E01/R to E17/R	x	x			X			
F/B	x	x			X			
F/R	x	x			X			
F/B/VC	x	x			X	X		
F/R/VC	x	x			X	X		
D/B	x	x			X			
D/R	x	x			X			
AL/B	x	x			X		X	
AL/BL	x	x			X		X	
AL/R	x	x			X		X	
AL/RL	x	x			X		X	
G/B	x	x			X			
G/R	x	x			X			
H/B	x	x			X			
H/R	x	x			X			

*If requires to ensure packaging is secure and conveniently transportable, packaging accessories are to be independently selected and applied by the supplier.

CONTENTS

KNORR BREMSE RECOMMENDATION				
Internal/ Individual Packaging		Anti-Corrosion/ UV-opaque Packaging	External Packaging	
Bag/ plastic pouch	Chapter 4.1.1		Cardboard/ Corrugated cardboard box	Chapter 4.2.2
Bag/ plastic pouch	Chapter 4.1.1	VCI-film/ anticondesation bag	Cardboard/ Corrugated cardboard box	Chapter 4.2.2
Bag/ plastic pouch	Chapter 4.1.1	VCI-film/ anticondesation bag	Small load carriers	Chapter 4.2.1
Bag/ plastic pouch	Chapter 4.1.1	White, non-transparent, UV-opaque/ antistatic bag	Cardboard/ Corrugated cardboard box	Chapter 4.2.2
Bag/ plastic pouch	Chapter 4.1.1	White, non-transparent, UV-opaque/ antistatic bag	Small load carriers	Chapter 4.2.1
KB plastic insert tray Typ 01 - Typ17	Chapter 4.1.2		Cardboard/ Corrugated cardboard box	Chapter 4.2.2
KB plastic insert tray Typ 01 - Typ17	Chapter 4.1.2		Small load carriers	Chapter 4.2.1
Netting	Chapter 4.1.4		Cardboard/ Corrugated cardboard box	Chapter 4.2.2
Netting	Chapter 4.1.4		Small load carriers	Chapter 4.2.1
Netting	Chapter 4.1.4		Cardboard/ Corrugated cardboard box	Chapter 4.2.2
Netting	Chapter 4.1.4		Small load carriers	Chapter 4.2.1
KB specialised partadjusted inlays	Chapter 4.1.3	VCI-film/ anticondesation bag	Cardboard/ Corrugated cardboard box	Chapter 4.2.2
KB specialised partadjusted inlays	Chapter 4.1.3	VCI-film/ anticondesation bag	Small load carriers	Chapter 4.2.1
ESD bags	Chapter 4.1.5		Cardboard/ Corrugated cardboard box	Chapter 4.2.2
ESD bags	Chapter 4.1.5		ESD cardboard	Chapter 4.1.5
ESD bags	Chapter 4.1.5		Small load carriers	Chapter 4.2.1
ESD bags	Chapter 4.1.5		ESD container	Chapter 4.1.5
Bubble wrap/ bag	Chapter 4.4		Cardboard/ Corrugated cardboard box	Chapter 4.2.2
Bubble wrap/ bag	Chapter 4.4		Small load carriers	Chapter 4.2.1
Foam	Chapter 4.4		Cardboard/ Corrugated cardboard box	Chapter 4.2.2
Foam	Chapter 4.4		Small load carriers	Chapter 4.2.1

PART PROTECTION CODE (MM03)	DESCRIPTION
A	Plastic bag
B	Cardboard/ Corrugated cardboard box
C	Wrapping paper
D	Sorting board/ KB plastic insert tray
E	Tray
F	Netting tube
G	Bubble wrap/ bag
H	Foam
I	Stretch wrap
J	Styrofoam protection
K	Cardboard cover
L	ESD protection
R	Small load carriers
S	Paper packaging
UV	UV protection
Z	Specialised packaging
VCI	VCI film

CONTENTS

***Knorr-Bremse Packaging Specifications:**

Additional Protection
Packaging

3

External Packaging

2

Internal/ Individual
Packaging

1

KBRail / xx / xx / xx

x = Part Protection Code pursuant to MM03

1 | INTRODUCTION

The following guidelines and specifications of Knorr-Bremse Rail Vehicle Systems and its subsidiary companies create the basis for the supply of parts (production materials and commodities) to Knorr-Bremse's European locations. These guidelines and specifications serve as a supplementary contractual agreement to the General Terms and Conditions of Purchasing and Ordering.

This Knorr-Bremse packaging manual is distributed to potential Knorr-Bremse suppliers together with the requisite quote documentation.

1.1. OBJECTIVE OF THE PACKAGING MANUAL

This packaging manual provides certain information about packaging specifications of Knorr-Bremse. Using these specifications as a framework for the development of an optimised packaging system, the objective is to guarantee a smooth flow of materials between the supplier and Knorr-Bremse, which incorporates all qualitative, ecological and financial considerations.

Furthermore, the purpose of the packaging manual is to serve as a guide for the purchasing process at Knorr-Bremse. This allows Knorr-Bremse to advise their suppliers and provide support for the selection and application of optimal delivery packaging, and, as far as it is financially justifiable, to minimise any potentially harmful environmental effects.

The target is the continuous development of the logistical chain as well as the cooperative usage of the thereby resulting optimized potential.

1.2. SCOPE OF THE PACKAGING MANUAL

This packaging manual applies to all Knorr-Bremse suppliers delivering parts at Knorr-Bremse locations listed in Appendix 1.

Queries which are related to packaging at Knorr-Bremse are handled by the relevant contact person of the Purchasing and Quality departments.

1.3. GLOSSARY OF TERMS

PARTS

All purchased materials which are used or applied in the production process, as well as commodities and replacement parts.

ITEM

Parts with the same item number.

PACKAGED GOODS

Parts that need to be packaged.

FOREWORD

PACKING COMPONENTS

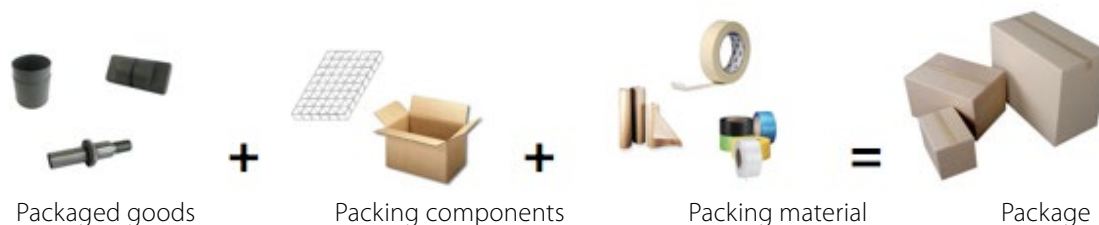
The container(s) in which the packaged goods are placed. The range of packaging components includes: plastic insert tray, box, bag, SLC, netting tube etc.

PACKING MATERIAL

These accessories are used for sealing and securing the packages, packaging components or unit loads as well as for protecting the packaged goods (e.g. stretch wrap, anti-corrosion paper, strapping tape).

PACKAGE

Unit for transport or storage.

**PACKAGING**

Complete or partial physical envelopment of packaged goods for the purpose of limiting the quantity of goods or for protecting the goods. The packaging should protect the packaged good itself as well as other goods from damage, while also preventing injury to any persons handling the goods.

INTERNAL / INDIVIDUAL PACKAGING

Smallest packaging unit. This may only contain one item (parts with the same part number). The function of internal packaging is to provide padding or secure parts according to their fragility within the external packaging.

EXTERNAL PACKAGING

Combines several internal / individual pieces of packaging. The function of external packaging is to withstand the internal and external forces (pressure, inert forces etc.) acting against the package.

DISPOSABLE PACKAGING

Packaging intended for one-off use, i.e. it cannot be reused. After use, it is recycled.

REUSABLE PACKAGING

Packaging intended for repeated use, i.e. it can be reused.

LOAD CARRIER

Vehicle for carrying packages to allow their integration into one unit load, e.g. pallets, mesh pallets and wooden boxes. The function of the load carrier is to protect the package during transportation and to ensure its secure transport and storage.

UNIT LOAD

A unit load includes the load carrier (e.g. pallets, mesh pallets etc.) and the package.

LOAD

The total number of unit loads.

RESY (RECYCLING SYSTEM)

Standardised label indicating the extent to which utilised packaging components and packaging accessories can be recycled.

PRESERVATION

The purpose of preservation is to guarantee protection against harmful influences during a temporary, limited period of time. In doing so, the packaged good is kept in good condition at the time that preservation is implemented.

ELECTROSTATIC DISCHARGE (ESD)

Electrostatic discharge is a spark or sudden release of charge between two insulating materials with a large difference in electrical potential, causing a powerful pulse of electrical current. The difference in electrical potential is usually caused by a buildup of static electricity.

ESDS (ELECTROSTATIC DISCHARGE SENSITIVE) DEVICE

Components and devices are regarded as electrostatically sensitive if they are likely to be damaged or destroyed by electrostatic fields, uncontrolled electrical charges, spikes in operating voltage, or other similar phenomena.

GENERAL PACKAGING REQUIREMENTS

2 | GENERAL PACKAGING REQUIREMENTS

The supplier is obligated to accept responsibility for ensuring that all delivered parts are correctly and adequately preserved, protected and packaged in order that they safely reach their destination at a Knorr-Bremse location.

The supplier has to observe the packaging manual specifications, while also taking into account the existence of potential national or international specifications.

Knorr-Bremse demands the application of recyclable materials for both non-reusable and reusable packaging / load carriers; however reusable packaging and load carriers are the preferred option.

For this reason, it is the waste management goal of both Knorr-Bremse and its suppliers to adhere to environmental legislation according to the ecological principle prevention before reduction before recycling. Employing this policy will result in a consistent contribution to the reduction of waste.

▶ **Packaging waste prevention**

Keep the quantity of packaging waste to a minimum.

▶ **Packaging reduction**

All reusable and non-reusable packaging have to be defined according to their ecological and economic impact; packaging should only be used if it's really necessary.

▶ **Packaging recycling**

Reusable and non-reusable packaging must be compatible with an environmentally compliant recycling process.

Independently of the packaging format selection, deliveries do also have to fulfil the following requirements:

- Damage-free delivery of parts
- Delivery exclusively within clean packaging
- Economically and efficiently constructed unit loads
- Efficient use of space
- Stackability
- Stability in terms of state, form and volume
- Smooth unloading via forklift trucks
- Secure transport
- Observation of predetermined dimension specifications
- Easy removal of parts / optimum handling in assembly
- Correct identification through use of standardized labelling
- Recyclable materials
- Guaranteed anti-corrosion protection

2.1. PROVISION OF PACKAGING

Based on the requirements of the Knorr-Bremse packaging manual, the decision of the individual packaging is made by the supplier. It is therefore the supplier's obligation to accept responsibility for the appropriate implementation of the specifications defined by the packaging manual.

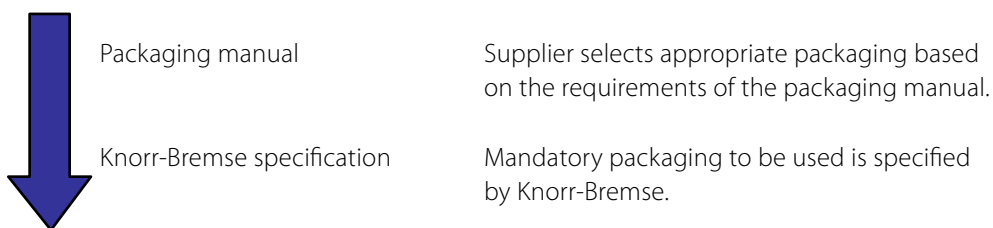
However, Knorr-Bremse is still allowed to specify the mandatory use of any additional required packaging at any times. E.g. this might be the case for any fragile parts with particular protection requirements.

Nevertheless the responsibility for the undamaged delivery of parts to the required Knorr-Bremse location remains with the supplier.

In case of a non-fulfillment of these additional packaging requirements or if the packaging manual specifications in general are ignored, Knorr-Bremse reserves the right to charge the supplier an administration fee for any additional costs arising from handling, repackaging or waste disposal. The supplier is liable for any quality damages resulting from inadequate or soiled packaging of parts. Under certain circumstances, irregularities (e.g. alternative packaging for production run start-up) must be punctually agreed upon with the respective Knorr-Bremse location, and the appropriate comment ("Alternative Packaging") has to be included on the delivery receipt.

Packaging specified or approved by Knorr-Bremse in the standard production process may be changed by Knorr-Bremse at any point following first receipt of delivery.

For the choice of the right packaging the following procedure is possible:



In general the principle of packaging selection is to comply with the properties of the individual parts, the protection requirements, the transport format and the supplier conditions.

GENERAL PACKAGING REQUIREMENTS

2.2. SAFETY AND THE ENVIRONMENT

For the delivery of all goods from a supplier to a Knorr-Bremse location, it is a minimum requirement that the respective valid legal provisions regarding packaging, transport, storage and components are fulfilled. In addition to that, the application of the environmental, electric and electromagnetic provisions existing in the countries of production and operation is compulsory.

2.2.1. HAZARDOUS MATERIALS

Hazardous materials are substances that pose an actual danger to humans, animals, the environment or general public safety & order when being transported through the public domain.

For the delivery of hazardous materials, it is essential that all local provisions concerning the marking and transportation of hazardous materials are observed. Knorr-Bremse must be supplied with safety data sheets concerning this prior to delivery.

Labelling is carried out according to the internationally recognized Hazardous Materials Code.















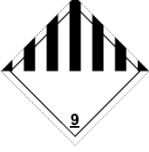
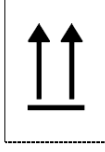
			
Explosives	Flammable gases	Non-flammable, non-poisonous gases	Poisonous gases
			
Flammable liquids	Flammable solids	Spontaneously com- bustible materials	Materials that produce flammable gases upon contact with water
			
Materials that may cause combustion (oxidisers)	Organic peroxides	Poisons	Biological hazards
			
Radioactive materials	Corrosive materials	Miscellaneous hazardous materials and objects	This way up (observe on storage and opening)

Figure 2.1: Hazardous Materials Symbols

2.2.2. PERMITTED AND NON-PERMITTED PACKAGING MATERIALS

In order to keep the logistical costs of the separation and collection of material types to a minimum, and to achieve an optimum recycling procedure, only certain pre-defined recyclable materials are permitted for use.

All non-returnable packaging should be produced by using eco-friendly materials that are globally accepted as being recyclable. The use of compounds and loose filler materials, such as packaging chips, is to be kept to a minimum.

The fundamental objective is the use of reusable packaging.

Table 2.1 offers an overview of the permitted packaging materials at Knorr-Bremse.

Material	Permitted Materials	Prohibited Materials
Compounds	–	Compounds are not permitted
General plastics • Non-returnable • Reusable	PE, PP, PS, PET Labeled according to DIN6120 PE, PP, PET, ABS Labeled according to DIN6120	PVC, PC, Styropor (exceptions only according to prior agreement) PVC, PC, Styropor (...)
Plastic packaging components • Film • Bags and sacks • Protective/insulating caps • Thermoformed insert • Foam	PE PE PE PE, PP, PS, PET, ABS PE (PP also reusable)	–
Paper and paper board	Labelling and management according to RESY.	Paper with water-insoluble layer (e.g. wax, paraffin, bitumen, oil, masking tape)
Strapping	PP, PET	Steel strapping, Polyamide tape, Polyester tape
Anti-corrosion paper	Only VCI paper verified as recyclable with paper/ cardboard	Incompatible waterproof or soaked paper (e.g. bitumen, oil and wax paper)
Wood	In accordance to IPPC standard, high-density fiberboard-sheets/ -pallets	Waterproof, varnished, coated wood; wood shavings
Filler materials	Corrugated cardboard, paper, foam compound	Chips (plant-based); Styrofoam chips or part-adjusted block

Table 2.1: Permitted and prohibited materials

GENERAL PACKAGING REQUIREMENTS

In exceptional circumstances, a supplier may be permitted to use bitumen, wax, paraffin and oil paper, as well as styrofoam. However, a written approval from Knorr-Bremse is required in advance.

The packaging material should not affect the clean condition of parts.

PROHIBITED MATERIALS

Packaging materials should not exceed the cumulative concentration limit of 100 ppm for lead, cadmium, mercury and chromate, as described in the EU Packaging and Packaging Waste Directive (94/62/EG).

Furthermore, the supplier has to observe the trade-specific list of "prohibited ingredients" (so-called "black list") and the "notifiable substances" list (so-called "grey list") in all future orders, parts production and packaging selection.

LITHIUM BATTERIES

The regulations regarding packaging, labelling, handling, accompanying documents and transport of lithium-batteries and/or equipment containing lithium-batteries described in the chapter 2.8.3 of this packaging manual should be applied.

2.2.3. REQUIREMENTS FOR WOOD AND WOOD-BASED MATERIALS

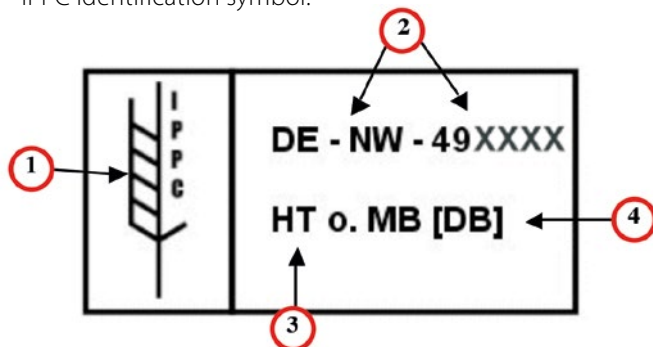
It is essential that packaging materials made from solid wood are handled and labelled according to the IPPC (International Plant Protection Convention).

IPPC labelling requires the following information:

- ① IPPC symbol,
- ② Company license number with the country ISO code and regional identifier,
- ③ Treatment method (HT for heat treatment or MB for gassing with methyl bromide),
- ④ If applicable, DB for debarked wood (not required by IPPC standard).

Examples:

IPPC identification symbol:



Example stamp:

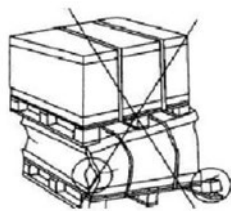


GENERAL PACKAGING REQUIREMENTS

If packages do not completely cover the load carrier, they should be arranged to allow an even weight distribution and to prevent them from slipping out of position.

2.5. UNIT LOAD STACKABILITY

One of the most important properties of a unit load is its stackability. This should guarantee that pallets etc. can be securely piled on top of each other (stacked) with or without any stacking support.



Incorrect



Correct

If unit loads are not stackable due to the condition of their packaged goods, they have to be labelled accordingly.

2.6. GENERAL ANTI-CORROSION PROTECTION

Corrosion is the process of damage or deterioration of materials through chemical or electrochemical reactions taking place with other surrounding materials. Corrosive agents involved – substances within the immediate proximity of the parts, e.g. dirt, gases, salts or dust – have an impact on the material and cause corrosion.

All parts susceptible to corrosion, as well as all worked and smoothed surfaces (particularly worked castings and forgings), require specific protection and therefore protective steps have to be taken to prevent corrosion.

Preventative protective measures consist of material anti-corrosion protection and protection against corrosion through adequate packaging.

The format, nature and timing of anti-corrosion protection depend on the following:

- ▶ required protection according to Knorr-Bremse specifications and drawings,
- ▶ susceptibility of technical surfaces to corrosion and other harmful factors (dust, stains etc.),
- ▶ transport conditions and duration of transport,
- ▶ storage conditions and duration of storage,
- ▶ subsequent treatment,
- ▶ subsequent usage.

MATERIAL ANTI-CORROSION PROTECTION

If no other agreement is reached, the supplier has to implement the anti-corrosion measures required by Knorr-Bremse, according to the valid specification / drawings. Parts delivered without the agreed anti-corrosion protection are considered as unsatisfactory and will be reported to the supplier.

Only preservatives permitted by Knorr-Bremse (Knorr-Bremse In-House Standard N12005) are allowed to used.

ANTI-CORROSION PROTECTION FOR PACKAGING

Irrespective of any material anti-corrosion protection applied, delivery has to ensure that parts are protected against corrosive agents and surface damage during transport and storage.

Appropriate materials for the protection of parts are caps, film, stoppers and covers. If considered as necessary, anti-corrosion film (e.g. VCI film or VCI paper) compatible with normal film / paper recycling procedures have to be used.

ANTI-CORROSION FILM / VCI FILM

Anti-corrosion film contains chemical substances (VCI) which gradually evaporate. They form a protective layer over the surface of the packaged parts which displaces oxygen. It is usually sufficient for the parts to be enveloped by the protective film; however, the gap between anti-corrosion film and part should not exceed 30 cm.

Although airtight packaging is not necessary, the VCI film has to be within an enclosed package in order to ensure that the anti-corrosion protection takes effect. The anti-corrosion film must be adjusted to match the respective parts and/or their composition. In the case of components of varied composition, it is possible that only some of the parts will be protected against corrosion. Under such circumstances, it is advisable that a drying agent is used to achieve the best protection.

DRYING AGENT

Drying agents can be used to avoid incidences of corrosion and moisture damage, as well as mold infestations, during sea and air-freighting. Drying agents are managed in drying agent units; the absorption degree of a drying agent is governed by the quantity of these units.

A sufficient quantity of drying agent bags must be arranged for the packaged goods. For this purpose, attention has to be paid to the correct positioning of the bags and to ensure that the packaging is tightly sealed. The drying agent should not come into direct contact with the parts, as the moisture in the drying agent can cause corrosion.

Prior to delivery to Knorr-Bremse, it must be ensured that all parts susceptible to corrosion are correctly preserved, wrapped or sealed, and packaged.

GENERAL PACKAGING REQUIREMENTS

IN THIS CONTEXT, CORRECT IS DEFINED AS:

- Implementation of material anti-corrosion protection according to the determined specifications
- External protection against corrosive agents
- External protection against surface damage / abrasion of the anti-corrosion protection
- External protection against damage to appearance or function

The selected anti-corrosion packaging should not damage the appearance or function of the parts.

2.7. PACKAGING REQUIREMENTS FOR GLASS PANES

With regard to the packaging of glass panes, the following requirements need to be satisfied unless other specifications are stated in the purchase order:

- Usage of transport frames or wooden boxes (screwed, to be opened on the front)
- Usage of a soft underground (e.g. rubber, felt, carton, plastic, etc.)
- Lateral securing of the glass panes to prevent tilting over (e.g. belts, plastics, etc.)
- Storage during transport upright or slightly tilted

2.8. PACKAGING REQUIREMENTS FOR ELECTRONICS

Electrostatic discharge can shorten the lifespan of electronic components without this being apparent, and destroy particularly sensitive components completely. Choosing the correct type of packaging for these components can help minimize the risk of electrostatic discharges; conversely, inappropriate packaging can make such faults much more likely to occur. For example, certain plastic packaging materials (e.g. packaging chips, bubble wrap, stretch film, etc) are particularly good electrical charge carriers and are therefore liable to cause strong discharges. These types of packaging should be avoided in favor of packaging that is made of antistatic or static-dissipative materials (e.g. coated corrugated cardboard) which prevent dangerous discharges and so guarantee the safe transport and storage of electronic components.

The guidelines and measures outlined below are intended to help avoid handling errors when packaging and transporting electrostatic discharge sensitive devices (ESDS devices).

2.8.1. ESD PROTECTION

Preventive measures to avoid electrostatic discharges are required whenever ESDS devices are being handled or assembled. Most active electronic components and integrated circuits are at risk if improperly handled, transported, assembled (e.g. when soldering in circuit boards), or touched.

Electrostatic discharges can be prevented or safely dissipated for a device by ensuring potential equalization (e.g. the grounding of individuals). This requires that at least the following preventive measures are taken:

- Packaging made of antistatic or static-dissipative materials
- Conductive workplaces (e.g. chairs, flooring, table mats, people, etc.)
- Grounding tape
- Tools with static-dissipative handles
- Shock and vibration protection
- etc.

When transporting ESDS devices by sea, the increased risk arising from the high levels of moisture have to be taken into account. Suppliers should select a packaging type that will protect the components against moisture.

2.8.2. SHIPPING OF ELECTROSTATIC DISCHARGE SENSITIVE DEVICES

All packaging materials should be made exclusively of conductive materials, and in special cases, of materials that prevent the buildup of static electricity. Packaging must be completely sealed, i.e. the components have to be protected from direct contact. Devices should not become statically charged inside the packaging and must be enclosed on all sides by a conductive material which acts as an electrical shield similar in principle to a faraday cage.

Non-conductive plastic bags (PVC), styrofoam, or other similar insulating materials are not permitted. Conductive foams or domestic aluminum foil should also be avoided – repetitive use of these types of products can leave residues of conductive material on the component, which can in turn cause short circuits.

To protect against damage during shipping, devices should be secured only using padding materials that prevent the buildup of static charge (e.g. cardboard with a conductive external coating).

The standard packaging types permissible when shipping ESDS devices to Knorr-Bremse are described in chapter 4.1.5.

ESDS LABELING

It is essential that any ESDS devices shipped to Knorr-Bremse are appropriately labeled. This is the only way to avoid unnecessary risks due to improper handling. ESDS devices must be clearly labeled to differentiate them from non-ESDS devices.



The ESD label must be positioned so that it can be easily seen before the package is opened (e.g. by using it to seal the package).

Hazard label for electrostatic discharge sensitive devices

GENERAL PACKAGING REQUIREMENTS

2.8.3. LITHIUM BATTERIES

From 1 January 2009 there are new regulations regarding packaging, labeling, handling, and documentation of lithium-based batteries, rechargeable batteries, and button cell batteries.

The regulations and additional information are contained in the following documents: Transport by air is subject to the rules set out in the relevant packaging instructions of the Dangerous Good Regulations (DGR) in part 1 of IATA (International Air Transport Association). Transport by road within Europe is governed by the rules of the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR); transport by sea comes under the International Maritime Dangerous Goods (IMDG) Code for the carriage of dangerous good by ship.

Major changes are:

- Distinction between lithium ion batteries & cells and lithium metal batteries & cells.
- The transportation regulations (exempt/dangerous goods) to be applied are decided by:
 - The watt-hour rating for lithium ion cells and batteries.
 - The lithium content in grams for lithium metal cells and batteries.
- Distinctions according to the way the battery was packed

UN NR.	SHIPPING	DEFINITION
UN 3480	Lithium ion batteries	Secondary Lithium ion batteries (rechargeable)
UN 3481	Lithium ion batteries packed with equipment	
UN 3481	Lithium ion batteries contained in equipment	
UN 3090	Lithium metal batteries	Primary Lithium metal batteries (non-rechargeable)
UN 3091	Lithium metal batteries packed with equipment	
UN 3091	Lithium metal batteries contained in equipment	

To qualify for “exempted” transportation (without having to meet in full all the provisions set out in the Dangerous Good Regulations), packages sent from 1 January 2009 must satisfy the following conditions:

TRANSPORT BY AIR:

- Lithium ion cells and batteries: Cells with watt-hour rating of not more than 20Wh, batteries with a watt-hour rating of not more than 100Wh.
- Lithium metal cells and batteries: Cells with not more than 1g lithium content, batteries with a total lithium content of not more than 2g
- Packaged items must be capable of withstanding a drop test from 1.2m without any damage to contents.
- Inner packaging must completely enclose the battery or cell.
- Batteries and cells must be protected to prevent short circuits.
- Batteries and cells must be protected against direct contact with conductive materials.

- Each packaged item (with the exception of items with no more than four cells or two batteries installed in the equipment) must be labeled externally with a special handling label for lithium batteries (including a telephone number for more information).



Label for
UN 3480 / UN 3481



Label for
UN 3090 / UN 3481

The size and format of these labels must adhere strictly to the IATA guidelines. The labels must be printed in color. Size: 120 x 110 mm.

Each shipment (with the exception of items with no more than four cells or two batteries installed in the equipment) must have an accompanying document (e.g. an airway bill) indicating that:

- the package contains lithium ion or lithium metal batteries or cells;
- the package has to be handled with care and that a fire hazard exists if the package is damaged;
- there are special procedures that must be followed if the package is damaged, including inspection and repacking if necessary;
- indication of a telephone number for additional information.

TRANSPORT BY ROAD OR BY SEA:

- Lithium ion cells and batteries: Cells with watt-hour rating of not more than 20Wh, batteries with a watt-hour rating of not more than 100Wh.
- Lithium metal cells and batteries: Cells with not more than 1g lithium content, batteries with a total lithium content of not more than 2g
- Packaged items must be capable of withstanding a drop test from 1.2m without any damage to contents.
- Inner packaging must completely enclose the battery or cell.
- Batteries and cells must be protected to prevent short circuits.
- Batteries and cells must be protected against direct contact with conductive materials

Each package (with the exception of items with no more than four cells or two batteries installed in the equipment) must be clearly labeled to indicate that:

- the package contains lithium ion or lithium metal batteries or cells;
- the package must be handled with care and that a fire hazard exists if the package is damaged;

GENERAL PACKAGING REQUIREMENTS

- there are special procedures that must be followed if the package is damaged, including inspection and repacking if necessary;
- indication of a telephone number for additional information.

The size and format of the labels are not compulsory.



Label for lithium ion batteries



Label for lithium metal batteries

If the shipment requires to be labeled, the shipper/driver must be issued with a document containing the same information as stated on the label. This information can be provided on a separate sheet or included on the packing list or delivery note.

2.9. PACKAGING REQUIREMENTS FOR RUBBER AND RUBBER COMPOSITE PARTS

Parts made out of rubber must be protected against the negative effects of e.g. heat, light, ozone, oxygen, moisture, or mechanical stresses and contamination through e.g. oils and solvents. Inadequate protection can result in decomposition reactions such as hardening, softening, breaking, cracking, or other types of surface degradation. For this reason, and depending on the type of rubber involved, there are certain basic requirements that must be met when transporting, storing, and especially when packing these components. International standard ISO 2230 "Rubber products – Guidelines for storage" describes these basic conditions and provides general instructions on the storage, packaging, and preservation of rubber-based parts.

With regard to the packaging of rubber and rubber composite components, the supplier must comply with the rules set out in the ISO 2230 standard and/or DIN 7716.

2.10. PACKAGING REQUIREMENTS FOR CASTED AND FORGED PARTS

Casted and forged parts are differentiated by the packaging relevant processing state „raw“ and „machined/finished“.

RAW CASTED AND FORGED PARTS

It is preferred that raw casted and forged parts are packed into euro mesh pallets, wooden boxes or corrugated cardboard boxes on euro pallets or non-returnable pallets.

For parts which need a surface protection, the usage of reusable pallet frames is only possible in agreement with Knorr-Bremse.

MACHINED AND/OR FINISHED CASTED AND FORGED PARTS

For machined and/or finished casted and forged parts a surface protection is mandatory. The adequate surface protection has to be selected by the supplier himself depending on the weight, size and material of the parts.

Independent from the processing status an anti-corrosion protection can be necessary depending on the constitution of the parts. In these cases a reasonable anti-corrosion protection has to be used according to Chapter 2.6. The utilized anti-corrosion protection has to be protected from edgy packaged goods by padding material (e.g. wrapping paper).

Smaller casted and forged parts can be packed into small load carrier (SLC) or cardboard / corrugated cardboard boxes.

GENERAL PACKAGING REQUIREMENTS

2.11. PACKAGING REQUIREMENTS FOR PAINTED PARTS

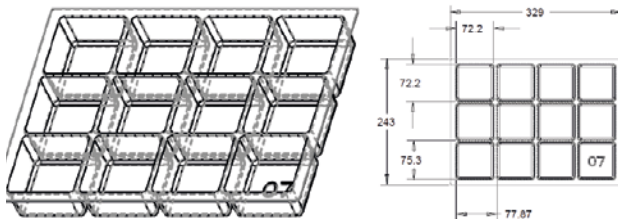
To prevent surface damages painted parts may not contact each other or any other hard objects. For that the most significant requirement for the packaging of painted parts is to ensure the surface protection.

Further significant requirements concerning the packaging of painted parts are:

- Parts may only be packed in "dry to handle" state
- Parts and internal packages need to be protected against moisture (if necessary, parts need to be covered)

For smaller to midsize painted parts it is recommended by Knorr-Bremse to use the KB plastic insert trays (see chapter 4.1.2).

Example:



Bigger parts should be packed into euro mesh pallets with adequate dividers. The usage of corrugated cardboard for separation is recommended by Knorr-Bremse. Due to the risk of damages on the painted surface the usage of plastic dividers is not recommended. The usage of plastic separators is only possible in agreement with Knorr-Bremse.

Requirements concerning the usage of dividers are:

- Dividers need to overtop the packed part
- Dividers need to be packed as close as possible to prevent a possible movement of parts (if necessary free spaces need to be filled with packaging accessories)
- The usage of foam film as padding material is preferred. Air bubble film may not contact the parts directly due to the enclosed plasticizer
- The usage of reusable dividers is recommended

Example:



For parts of special sizes, which do not fit into euro mesh pallets, special packages need to be used. The packages need to fulfil the protection needs from above at least.

Examples: Doors



Frames:

Frames need to be secured from shifting and may not overtop the load carrier (e.g. pallets). A minimum spacing of 50mm/1.97inch (per side) is mandatory.



LABELLING / ACCOMPANYING INFORMATION

3 | LABELLING / ACCOMPANYING INFORMATION

The clear and systematic labelling of packages and unit loads, coupled with the transfer of the required accompanying information, is essential for the quick and clear identification of the delivered parts.

3.1. LABELLING

Each individual package containing an item must be clearly and visibly labelled on its top face.

All external packages must be labelled at least at one visible side to guarantee a quick, clear identification of each package.

To avoid any confusion of parts during the procedure, only the current label may be on the package. This must be clearly and visibly attached to the package. All old labels, including adhesive tags, must be removed.

The label should contain at least the following information:

- ▶ Knorr-Bremse item number
- ▶ Knorr-Bremse item description
- ▶ Quantity

The supplier must ensure that any lettering on any external or internal packaging, as well as packaging accessories (including cardboard containers, adhesive tapes, plastic bags, sealing films, stickers), together with the corresponding data sheets, manuals, software and other parts documents, is only data pertaining to the supplier or the original manufacturer and is positioned where legally required for the transport of parts.

The external and internal packaging may otherwise only contain the name, trademark or other identification of Knorr-Bremse. If this is not possible, it must – insofar as is legally permitted – carry no indication of origin. Exceptions are only possible with the express approval of Knorr-Bremse.

3.2. DELIVERY DOCUMENTATION

As a minimum requirement, the following delivery / freight documentation must be enclosed with each delivery:

- ▶ Delivery receipt
- ▶ Hazardous materials data sheet (if necessary)

Goods batches will only be accepted when accompanied by complete delivery / freight documentation. Any additional delivery documentation required by Knorr-Bremse (e.g. quality documents) must be enclosed in an envelope separate to the delivery and should not be attached to the delivery receipt.

3.2.1. DELIVERY RECEIPT

A delivery receipt (goods issue receipt) is a document providing information on the delivered parts, including quantity, description, weight etc. The delivery receipt is preferably to be deposited within the package (above the parts). However, attachment of this document to the outside of the package using a self-adhesive delivery receipt wallet is also acceptable.

The following list details the most important contents of a delivery receipt:

- ▶ Delivery receipt number
- ▶ Name & address of sender
- ▶ Name & address of recipient
- ▶ Delivery receipt date
- ▶ Name or signature (optional) of packer
- ▶ Gross weight, net weight
- ▶ Delivery receipt position
- ▶ Name of buyer (contact person)
- ▶ Order number
- ▶ Order date
- ▶ Order position
- ▶ Knorr-Bremse item number
- ▶ Knorr-Bremse item description
- ▶ Supplier item number
- ▶ Delivery quantity (per order item) in quantity units
- ▶ Knorr-Bremse quantity unit
- ▶ Type of load carrier (if required)
- ▶ No. of empty containers
- ▶ Production date, expiration date (if required)
- ▶ Batch number (if required)

In order to ensure the quick identification of delivered parts and to avoid errors in incoming goods collection, delivery receipts should (where possible) be supplied with a barcode. If requested, the delivery receipt must be supplied with a barcode corresponding to Knorr-Bremse requisite specifications.

3.2.2. BARCODE

The barcode to be applied conforms to Code Type 128 pursuant to DIN EN799.

BARCODE CONTENTS

The Knorr-Bremse-specific barcode must contain the following information and be structured as followed :

1. Supplier delivery receipt number
2. Knorr-Bremse order number (without purchase group code)
3. Knorr-Bremse order position (not delivery receipt position)
4. Delivery quantity in Knorr-Bremse quantity units (without details of unit quantity)

LABELLING / ACCOMPANYING INFORMATION

This data must be printed on the barcode in this order, separated by a #. The data must additionally appear as legible text underneath the bar code.



Figure 3.1: Format and appearance of a Knorr-Bremse-specific barcode

Figure 3.1 displays an example Knorr-Bremse-specific barcode. This contains, in sequence, the supplier delivery receipt 41089, the Knorr-Bremse order number 4630074632, the Knorr-Bremse order position 10 and the delivery quantity 4.

BARCODE FORMAT AND POSITION

The font type "Univers Condensed" must be used for the text. The font size is determined by the bar width / gap parameters, which are defined below.

The barcode is to be printed in black and white. Its height must be 9-10 mm. The bar-gap width ratio sequence is 6, 12, 18, 24 (B-Parameter/S-Parameter in ESC sequence).

If the delivery receipt number is alphanumeric, capital letters must be used. Within this information, spaces and symbols (except #) are permitted. The delivery receipt number may reach a maximum of 16 characters (including spaces and symbols). Spaces and symbols are not permitted in any fully numerical barcodes.

No character may be printed before the first or after the last piece of data (delivery receipt number/delivery quantity). The gap separating the outer ends of the barcode field from borders, other bars and characters should be at least 6.4 mm.

The following additional requirements apply to Knorr-Bremse-specific barcodes

Order position information should not exceed five digits. It is not necessary to print leading zeros.

Decimal separation within quantity information must be carried out using a comma, while thousands separators are not permitted. The quantity field is restricted to 17 digits.

For each delivery receipt position, the barcode must be printed on the corresponding delivery receipt position line below the position description.

3.3. HANDLING INSTRUCTION SYMBOLS

If a packaged good requires particular package handling, this must be clearly and visibly indicated on the outside of the packaging. The internationally standardized handling symbols for packages are specified in ISO R 780 and DIN 55 402.

These self-explanatory symbols must not be omitted under any circumstance, as they serve to avoid language-barrier issues arising from international transport. The most important symbols are summarized in Table 3.1:



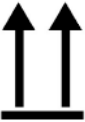













	Fragile, Handle with care		Use no hooks
	This way up		Keep away from heat
	Protect from heat and radioactive sources		Sling here
	Keep dry		Centre of gravity
	No hand truck here		Stacking limitation
	Clamp here		Temperature limitations
	Do not use fork lift truck here		Electrostatic sensitive device
	Do not destroy barrier		Tear off here

Table 3.1: Package markings in accordance with DIN 55402 and ISO R 780 standards

STANDARDIZED PACKAGING

4. STANDARDIZED PACKAGING

Knorr-Bremse demands the application of recyclable materials for both non-reusable and reusable packaging / load carriers, although reusable is greatly preferred to non-reusable.

In order to keep packaging component costs as low as possible and to avoid the high expense incurred by disposable packaging, the repetitive use of standardized packaging is preferred.

Standardized packaging is divided into specific Knorr-Bremse standardized reusable packaging (e.g. KB plastic insert trays, part-adjusted inlays/ inserts etc.), which is normally the property of Knorr-Bremse; as well as generally established standardized packaging (e.g. cardboard, corrugated cardboard, netting tubes etc.).

Knorr-Bremse separates packaging into 3 types:
internal packaging, external packaging and load carriers:

- The function of the internal packaging is to provide padding or to secure parts within the external packaging, depending on their level of fragility.
- The function of the external packaging is to withstand the internal and external forces (pressure, inert forces etc.) acting against the package.
- The function of the load carrier is to protect the packaged good during transport and to ensure its secure transport and storage.

The selection of the packaging format is determined by the part properties, protection requirements, transport format and supplier location conditions.

Various aids are required to guarantee a smooth, secure transport. These can include packaging accessories (e.g. stacking frame, edge support etc.) or padding, used to better secure the parts (e.g. bubble wrap or packaging paper etc.). In addition, a number of forms of anti-corrosion packaging (e.g. VCI film and VCI paper) may be used to counteract any possible corrosion, which may take place during transport itself.

Standardized packaging is designed in such a way that, if correctly used, it will meet all the requirements of handling, storage and transport. It therefore offers a full range of qualities including the protection of the packaged good, protection of the space surrounding the packaged good, simple and secure package handling, ease of storage and guaranteed safety and simplicity in handling the packaging either by hand or using a forklift truck.

The supplier assumes responsibility for ordering all non-reusable and reusable packaging provided by Knorr-Bremse.

Suppliers will be charged for any costs incurred by the unauthorized disposal of Knorr-Bremse reusable packaging..

Internal / External Packaging, Inserts
Bag / plastic pouch, ESD bag, ESD wrap
Cardboard / corrugated cardboard packaging, ESD cardboard
Netting tube
KB plastic insert tray
KB specialized part-adjusted inlay (produced by Knorr-Bremse)
Protective dividing inlay, Divider
ESD foam
External Packaging
Cardboard / corrugated cardboard packaging
Reusable container, SLC, ESD container
Wooden box
Load Carriers
Euro pallet
Non-reusable pallet
Euro mesh pallet
Wooden box
Packaging Accessories
Fold-away stacking frame
Stretch wrap / shrink wrap / sheet cover
Strapping using synthetic tape
Loading support
Edge support / corner support
Padding
Bubble wrap
Air bags
Packaging paper
Foam
Anti-Corrosion Packaging
VCI film, VCI paper
Anti-condensation bags

STANDARDIZED PACKAGING

4.1. INTERNAL / INDIVIDUAL PACKAGING

In order to ensure the protection of parts and smooth handling, the packaging of a number of parts requires internal or individual packaging.

Internal / individual packaging is the smallest packaging unit, and may only contain one item (parts with the same item number).

This packaging can be

- ▶ reusable, or
- ▶ manufactured from non-reusable materials.

Reusable internal packaging includes:

- KB plastic insert trays
- KB specialized part-adjusted inlays
- Plastic dividers or protective dividing inlays

Parts may only be packaged within clean reusable packaging. Any stained reusable packaging must be cleaned by the supplier before use. Any costs incurred by this are to be borne by the supplier.

Used reusable packages may only be reused if they are able to fulfil the same standard requirements and protection of parts as brand new reusable packaging.

Non-reusable internal packaging includes:

- Bags / plastic pouches
- Corrugated / cardboard packaging
- Netting tubes
- Inserts, inlays or pre-cut fiberboard

If not stated in the Knorr-Bremse packaging manual or otherwise specified by Knorr-Bremse, the responsibility for establishing the need for internal packaging and managing its implementation is assumed by the supplier. However, Knorr-Bremse retains the right to monitor this procedure.

4.1.1. BAGS / PLASTIC POUCHES

For bulk goods or small parts requiring no particular surface protection, the use of bags or plastic pouches is recommended. This allows the packaged goods to remain in direct contact with each other.

Properties	Bag / Plastic Pouch
Dimensions	Dependent on weight and volume of packaged good.
Closure	Includes zip, heat seal, adhesive tape
Usage	Bags are not permitted as stand-alone load. They must be transported in a stable container or be placed on a load carrier. This packaging format is mainly used for bulk goods, particularly small parts such as screws, washers etc.
Conditions of use	Permitted bags must not contain rips, holes, leaks or deficient zips.
Special case	Use of VCI bags for items susceptible to corrosion. Use of white, non-transparent UV-opaque / antistatic bags for extra sensitive elastomer composites with undesired "crumbs development" on the surface (through increasing leakage of ozone protection wax). Stocking is regarded as DIN 7716. Size is determined by quantity delivered.

Examples of use:

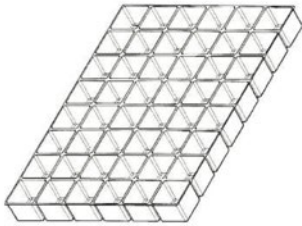
White, non-transparent,
UV-opaque/ antistatic bag



Example of incorrect use:
Opening requires the use of a cutting tool, causing danger of injury or damage.

STANDARDIZED PACKAGING

4.1.2.KB PLASTIC INSERT TRAYS



For small to medium-sized parts requiring specialized packaging protection against the possibility of transport damage, Knorr-Bremse recommends the use of KB plastic insert trays. This not only ensures delivery of undamaged parts, but also improves the material flow from supplier to Knorr-Bremse by providing optimum handling, easy removal of parts, stackability, stability and optimum space usage.

Knorr-Bremse recommends the plastic insert trays in view of the following aims:

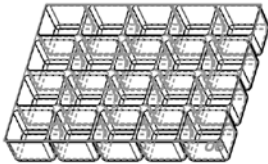
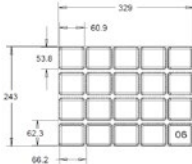
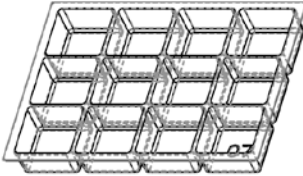
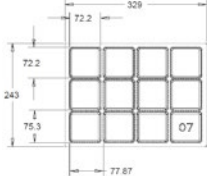
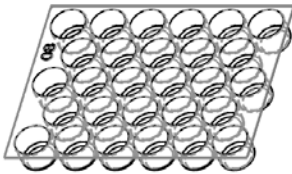
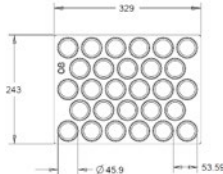
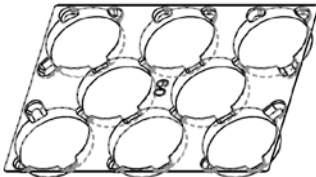
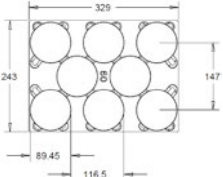
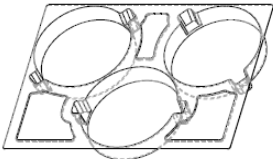
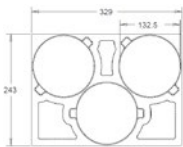
- ▶ Defect-free delivery of parts
- ▶ Stability in terms of state, form and volume
- ▶ Optimum space usage
- ▶ Stackability
- ▶ Easy removal of parts / optimum handling in assembly

Properties	KB Plastic Insert Tray
Dimensions	All plastic insert trays measure 329 x 243 mm and have a material density of 0.7 mm. Compartment size varies according to plastic insert tray type.
Permitted total weight	-
Requirements	Plastic insert tray must be carefully chosen with consideration given to compartment size and dimensions of packaged goods. Parts may not exceed the height of the insert trays. Easy removal and optimum space usage must both be ensured.
Stackability	Plastic insert trays must be completely stackable without modification.
Usage	Plastic insert trays are used as non-reusable and reusable packaging. Use when dealing with parts with specific protection or handling requirements. Plastic insert trays should be filled fully (no. of compartments = no. of parts) and for optimum use (compartment dimensions > part dimensions).
Conditions of use	Do not use damaged plastic insert trays (e.g. crushed, cracked or crumpled trays). Trays cut to size may not be reused.

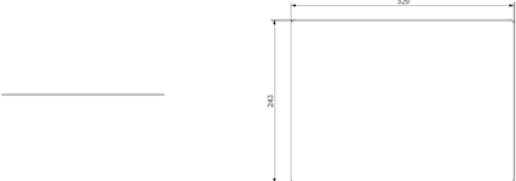
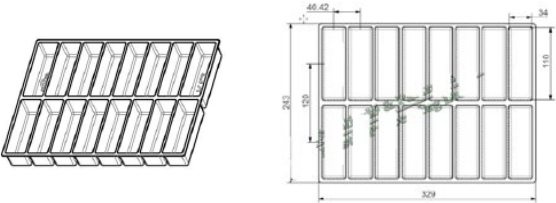
FOLGENDE KB KUNSTSTOFFEINSÄTZE WERDEN EINGESETZT:

Typ 01			
	Length:	27.9 mm	
	Width:	26.8 mm	
	Depth:	15 mm	
	Compartments:	88	
	Material density:	0.7 mm	
Typ 02			
	Length:	37.8 mm	
	Width:	37.8 mm	
	Depth:	15 mm	
	Compartments:	48	
	Material density:	0.7 mm	
Typ 03			
	Length:	37.8 mm	
	Width:	37.8 mm	
	Depth:	30 mm	
	Compartments:	48	
	Material density:	0.7 mm	
Typ 04			
	Length:	62.2 mm	
	Width:	27.5 mm	
	Depth:	35 mm	
	Compartments:	40	
	Material density:	0.7 mm	
Typ 05			
	Length:	104.21 mm	
	Width:	27.51 mm	
	Depth:	20 mm	
	Compartments:	24	
	Material density:	0.7 mm	

STANDARDIZED PACKAGING

Typ 06			
		Length:	60,9 mm
		Width:	53,8 mm
		Depth:	47 mm
		Compartments:	20
		Material density:	0,7 mm
Typ 07			
		Length:	72,2 mm
		Width:	72,2 mm
		Depth:	40 mm
		Compartments:	12
		Material density:	0,7 mm
Typ 08			
		Diameter:	45,9 mm
		Depth:	34,68 mm
		Compartments:	28
		Material density:	0,7 mm
Typ 09			
		Diameter:	89,45 mm
		Depth:	15,50 mm
		Compartments:	8
		Material density:	0,7 mm
Typ 10			
		Diameter:	132,5 mm
		Depth:	27 mm
		Compartments:	3
		Material density:	0,7 mm

STANDARDIZED PACKAGING

Typ 16 (Cover)		
	Length	243 mm
	Width	329 mm
	Depth:	1 mm
	Compartments:	0
	Material density:	0,7 mm
Typ 17		
	Length	110 mm
	Width	34 mm
	Depth:	34 mm
	Compartments:	16
	Material density:	0,7 mm

Knorr-Bremse plastic insert trays may not be used for the packaging and dispatch of parts not intended for Knorr-Bremse.

ORDERING KB PLASTIC INSERT TRAYS

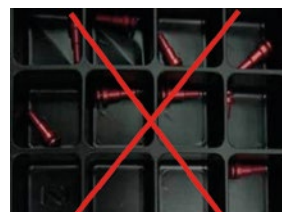
For small or medium-sized parts requiring special protection against damage during transportation, Knorr-Bremse may at any time require the supplier to use KB plastic insert trays.

The supplier is responsible for ordering and collecting the required trays, which must be requested directly from the manufacturer at least 10 working days before they are needed. To facilitate this, Knorr-Bremse will make provide the supplier with an appropriate request form.

EXAMPLES OF USE



Example of incorrect use:



Inappropriate tray type selected
(Over-sized compartments)

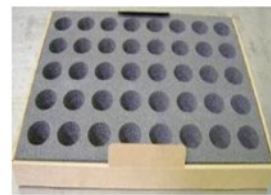
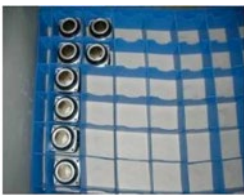
4.1.3. KB SPECIALIZED PART-ADJUSTED INLAYS / DIVIDERS

For transport and storage of parts with a certain finish or geometry (e.g. external thread, specific varnishing etc.) specialized protection is required.

Under such circumstances, part-specific Knorr-Bremse inlays and dividers can be used. To meet the specific requirements of each particular case, Knorr-Bremse and the supplier work together to determine the type of inlay or insert to be implemented carrying out any necessary adjustments.

Properties	Part-Adjusted Inlays / Dividers
Dimensions	Varies according to area of use. Individually adjusted to fit the packaged goods.
Permitted total weight	Dependent on insert type and packaged good
Requirements	All inlays and dividers must guarantee sufficient transport and stacking stability, and must be shock-resistant and able to withstand direct contact with other objects. Must guarantee protection of part.
Stackability	Inlays and dividers must be stackable without cause for modification.
Usage	Inlays and dividers are used as individual / internal packaging. For parts with particular protection or handling requirements.
Conditions of use	Do not use damaged (e.g. structural cracks), stained or incomplete inlays / dividers. Lifting capacity and protection must be guaranteed at all times.

EXAMPLES OF USE:



STANDARDVERPACKUNGEN

4.1.4. NETTING TUBES

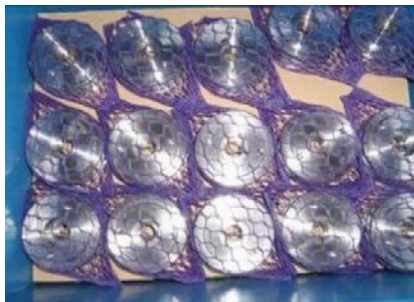
Netting tubes are used for those parts requiring particular protection (e.g. external thread, material etc.), but whose dimensions, shape or weight render them unsuitable for packaging in KB plastic insert trays.

This form of material protection offers a simple and cost-effective alternative to KB plastic insert trays.



Properties	Netting Tubes
Dimensions	A variety of sizes and material strengths are available. The netting tube applied varies according to part type and surface protection required.
Cut	Adjustable as required.
Usage	Netting tubes are used as individual packaging. This form of packaging is mainly used as part protection for light to heavy parts with variable contours.
Conditions of use	Netting tubes must not contain rips, holes or stains.
Special case	Can also be used as a protective dividing inlay.

EXAMPLES OF USE:



Example of incorrect use:

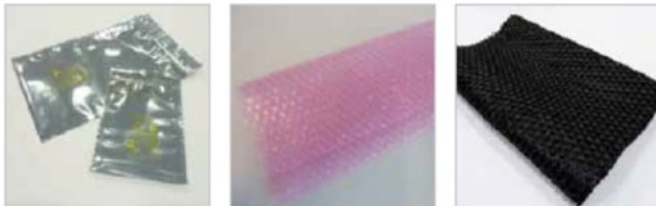


Higher handling costs
(each part packed individually)

4.1.5 INTERNAL AND INDIVIDUAL PACKAGING FOR ELECTRONIC COMPONENTS

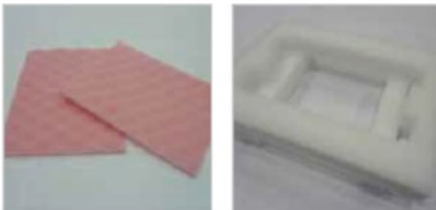
ESD BAGS, ESD WRAP

ESD bags and ESD wraps help to protect electrostatic sensitive components against ESD damage. The packaged items may not come into direct contact with each other. Each component must be packaged individually in ESD bags or separated from each other using ESD wrap.



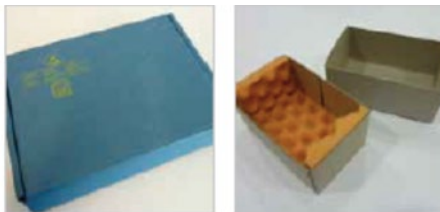
ESD FOAM

ESD foam helps to protect electrostatic sensitive devices against ESD damage while offering physical protection against shocks and vibrations. The packaged items may not come into direct contact with each other. It may sometimes also be necessary to package devices in ESD bags or cover them with ESD wrap before packaging.



ESD CARDBOARDS

ESD cardboards (usually corrugated cardboard) with special protective coatings help to protect electrostatic sensitive components against ESD damage while offering physical protection against shocks and vibrations.



ESD CONTAINERS

ESD containers made of electrically conductive plastics help to protect electrostatic sensitive devices against ESD damage while offering physical protection against shocks and vibrations.



STANDARDIZED PACKAGING

4.2. EXTERNAL PACKAGING

The function of external packaging is to withstand internal and external forces acting against the package (pressure, inert forces etc.)

External packaging can be used both as internal and individual packaging (e.g. corrugated cardboard for bulk goods), or additionally to integrate several pieces of internal and individual packaging.

Internal and individual packaging must be arranged within the external packaging to allow an even weight distribution. The size of the external packaging must correspond to that of the internal and individual packaging. If the internal and individual packaging is smaller than the external packaging, all empty spaces within the package must be filled to ensure that the internal and individual packaging does not slip out of position during transport and handling.

Examples of external packaging include cardboard and corrugated cardboard packaging, reusable containers and small load carriers.



4.2.1. REUSABLE CONTAINERS / SMALL LOAD CARRIERS

Small load carrier (SLC) is the term used for the predominantly standardized container, mainly of plastic manufacture, intended for use in the transport and storage of parts.

The default container utilized is the standardised and combinable VDA Small Load Carrier System (pursuant to DIN 30 820/VDA recommendation 4500). Important: please note that the SLC containers only come in the color RAL 5012 (blue). (Special model with ESD protection in black)



Properties	Reusable Containers / Small Load Carriers
Dimensions	Vary according to type of small load carrier.
(see Table 4.1 "SLC Types")	Manuelles Handling: 20 kg
Permitted total weight	Manual handling: 20 kg
Requirements	See permitted materials list (Chapter 2.2.2) or consult VDA recommendation (authorized SLC manufacturers)
Usage	Reusable containers can be utilized as individual packaging or as external packaging. Parts must be correctly secured within the container to avoid damage or loss during transport and handling.
Conditions of use	Reusable containers must be damage-free, display no evidence of dirt etc. Stability under load must be ensured.

EXAMPLES OF USE

Bulk goods



Individual goods in KB plastic insert tray



Individual goods in netting tube



STANDARDIZED PACKAGING

4.2.2. CARDBOARD / CORRUGATED CARDBOARD BOXES

Cardboard and corrugated cardboard boxes are used both as individual / internal packaging and as external packaging.

Unlike a normal cardboard box, corrugated cardboard possesses greater carrying capacity and is therefore better suited to heavy weights.



Properties	Cardboard and Corrugated Cardboard Boxes
Dimensions	Vary according to area of use. Must be individually adjusted to fit the packaged goods.
Permitted total weight	Manual handling: 20 kg
Requirements	Box must be of sufficient quality to ensure stacking stability and must be shock-resistant. Recommended choice of quality standard is specified pursuant to DIN 55468.
Stackability	Boxes must be stackable without any modification required. Any affected packaging must otherwise be clearly labelled.
Usage	Direct contact should be avoided between boxes and any parts susceptible to corrosion (e.g. using VCI film). To avoid damage and any ensuing costs, special care must be taken to ensure the correct handling and secure transport of parts within the box.
Conditions of use	Boxes must be dry, intact and damage-free (e.g. structural cracks).

EXAMPLES OF USE

Use as external packaging



Use as individual/internal packaging



Examples of incorrect use



4.3 LOAD CARRIERS

The function of the load carrier is to protect the packaged goods during transport and to ensure secure transport and storage.

Examples of load carriers include euro pallets, non-resuable pallets, euro mesh pallets and reusable containers.



4.3.1 EURO PALLETS

Euro pallets must conform to the internationally recognized sizes of 1200 x 800 x 140 mm (euro pallet according to DIN 15146 Part 2) and 1200 x 1000 mm (euro industrial pallet according to DIN 15146 Part 3). These dimensions must be adhered to in order to ensure optimum pallet utilization and module formation. (The euro pallet can carry a maximum of 1000 kg from a single weight source, and 2000 kg if even weight distribution is ensured).



Properties	Euro pallet
Dimensions	1200 x 800 mm x 140 mm
Permitted total weight	1000 kg
Requirements	Euro pallets according to DIN 15146
Stackability	Euro pallets must be placed in a stable position conducive to safe stacking.
Usage	Euro pallets are used to form unit loads. Safe loading using the euro pallet is achieved using packaging accessories (stretch wrap, tape etc.).
Conditions of use	Euro pallet must be in faultless condition.

STANDARDIZED PACKAGING

In order to be considered fit for use, the euro pallet must display the following key features under all circumstances. If not present, it is no longer exchangeable and cannot continue to be pooled with other pallets.

- 1** Brand of European Pallet Association EPAL
- 2** Brand of a European rail company
- 3** Brand of the European Pallet Pool EUR
- 4** Nails conforming to standard
- 5** Bottom edge boards fully attached
- 6** No evidence of mold



Euro pallets displaying any of the following characteristics may not be used again:

- ▶ Splintered bottom edge board or top edge board
- ▶ Necessary identification markings missing (DB, EPAL etc.)
- ▶ Missing or broken board / sections
- ▶ Carrying capacity no longer guaranteed
- ▶ Excessively stained

Bottom edge board missing



Splintered top edge board



Top edge boards missing



4.3.2 EURO MESH PALLET

A mesh pallet is a materials handling loading aid. The dimensions of a mesh pallet are standardized at a length of 1240 mm, a width of 835 mm and a height of 970 mm, while its weight when empty is approx. 84 kg. Mesh pallets can be stacked and euro pallets can be placed on top of them, making them suitable for block storage. The carrying capacity of a euro mesh pallet within the European Pallet Pool totals up to 1500 kg, and it can withstand a load of 6000 kg.



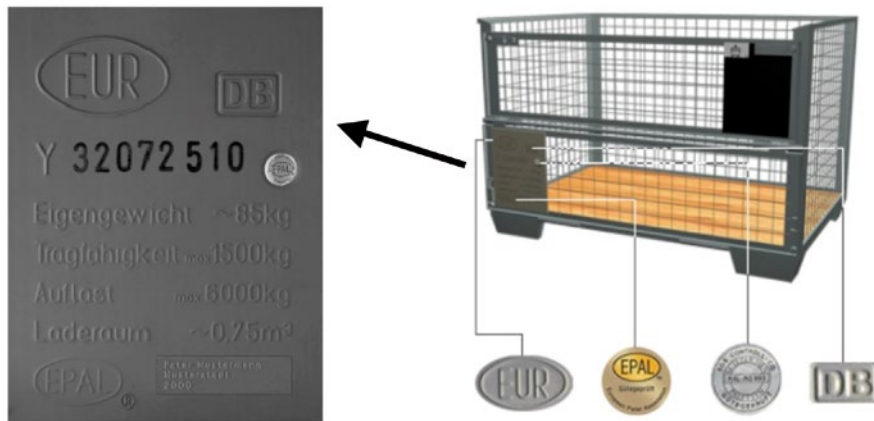
Properties	Euro Mesh Pallets
Dimensions	1240 x 835 mm x 970 mm
Permitted total weight	1500 kg (excluding own weight)
Requirements	Euro mesh pallet according to DIN 15155. Weight must be evenly distributed and secured against slipping out of position.
Stackability	Mesh pallet must be placed in a stable position and be in the correct condition to enable safe, secure stacking.
Usage	Where possible, this unit load should only contain one item.
Conditions of use	Euro mesh pallet must be in faultless condition, displaying no evidence of external damage, e.g. bent frame or mesh, cannot be opened, rust damage, missing parts etc.

In the same manner as the euro pallet, the euro mesh pallet must also display particular information identifying it as suitable for pooling with other mesh pallets:

- ▶ EUR sign
- ▶ Rail company sign (e.g. DB)
- ▶ Own weight in kg
- ▶ Load limit
- ▶ Load space
- ▶ Carrying capacity
- ▶ Code letter "Y"
- ▶ Manufacturer

STANDARDIZED PACKAGING

Example of a permitted mesh pallet suitable for pooling:



Euro mesh pallets displaying any of the following characteristics may not be further used:

- ① Deformed T-square or corner posts
- ② Front end hatches do not open
- ③ Deformed base frame or feet
- ④ Cracked or badly bent steel mesh
- ⑤ Missing or broken board
- ⑥ Missing identification label
- ⑦ Generally shabby condition (e.g. due to rust)



4.3.3. NON-REUSABLE PALLET

A non-reusable pallet or export pallet is a transport pallet specifically intended for one-off use in the transport of parts from the supplier to Knorr-Bremse. Varying according to preference or Knorr-Bremse requirements, this form of load carrier comes in wood, plastic or corrugated cardboard. While there are a variety of pooling systems on the market for the reusable pallet (euro pallet), there is no non-reusable pallet exchange currently in operation. The end-recipient in the delivery chain assumes responsibility for disposal of the pallet.



Properties	Non-reusable Pallet
Dimensions	1200 x 800 mm
Permitted total weight	Permitted total weight varies according to material: Cardboard: up to 800 kg; high-density fiberboard or wood: up to 1000 kg; plastic: up to 1000 kg.
Requirements	Non-reusable pallet made of wood, plastic, cardboard etc.
See chapter 2.2.2 for permitted materials list	Die Palette muss stabil stehen und sicher und gefahrlos zu stapeln sein.
Stackability	Pallet must be placed in a stable position and allow safe, secure stacking.
Usage	Pallets are used to form unit loads. Safe loading using the pallet is achieved using packaging accessories (stretch wrap, tape etc.).
Conditions of use	Pallet must be in faultless condition.

EXAMPLES OF USE

Plastic non-reusable pallet



Pressboard / wooden non-reusable pallet



Cardboard non-reusable pallet



STANDARDIZED PACKAGING

4.3.4 WOODEN BOX

Wooden boxes are mainly used in the delivery of highly valuable parts being transported via sea freight. Prior to approving the use of wooden boxes, please check for the availability of more effective alternative forms of packaging meeting the necessary requirements. Wooden boxes should always be a secondary option.



All wooden boxes must comply with the IPPC standard aimed at minimizing the introduction of injurious organisms into raw wood. Wood packaging components must be obtained from an officially authorized manufacturer and be heat or gas-treated.

Properties	Wooden Box
Dimensions	Box designs vary according to usage need
Permitted total weight	Varies according to box build, max. 1000 kg
Requirements	Wooden box according to DIN 55499. Parts packaged in wooden boxes must be secured to avoid slipping out of position. Only safely stackable wooden boxes displaying no evidence of staining are permitted.
Stackability	Wooden box must be placed in a stable position and allow safe, secure stacking. Non-stackable wooden boxes must be accordingly marked.
Usage	Wooden boxes are used to form unit loads and should only contain one item.
Conditions of use	Wooden box must be in faultless condition.

EXAMPLES OF USE












4.4 PACKAGING ACCESSORIES

Packaging accessories are used to ensure that all packaging materials are completely sealed and to increase package strength, therefore offering greater protection to the packaged good.

Auxiliary packaging materials are divided into packaging accessories, padding and anti-corrosion packaging.



Packaging Accessories	Padding	Anti-Corrosion Packaging
<p>Packaging accessories are used to ensure safe transport and to protect external packaging etc. Examples of packaging accessories include pallet frames, stretch wrap, edge guards, shrink wrap etc.</p>	<p>Padding is used to cushion and secure the packaged good within the packaging, e.g. packaging paper, foam, bubble wrap etc.</p>	<p>Anti-corrosion packaging is used as a safeguard against corrosion. Examples include: VCI film, anti-condensation bags, VCI paper etc.</p>
  	  	  

STANDARDIZED PACKAGING

4.5. CLEANING AND DISPOSAL OF LOAD CARRIERS / PACKAGING COMPONENTS

The operational inspection and disposal of packaging components and load carriers no longer fit for use is effected either prior to return delivery by Knorr-Bremse to the supplier, or prior to repeat use on the part of the supplier.

The repair or, where necessary, the disposal of packaging components and load carriers no longer serviceable is carried out by the proprietor. If ownership cannot be easily determined (e.g. in the case of the pooling system), the party in possession of the packaging components and load carriers is considered responsible for their disposal and replacement.

The supplier is responsible for ensuring that the parts it delivers are packaged in clean packaging components. Any potentially required cleaning (external/internal) before repeat use of the packaging components must be carried out by the supplier or a service provider specified by the supplier. The removal of tags and partially removed tags also falls under the remit of packaging component cleaning.

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