



**PACKAGING HANDBOOK 11/2018**

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## PACKAGING HANDBOOK 11/2018

### 1. Aim of the packaging handbook

The packaging handbook aims to inform the relevant departments at VON ARDENNE and the suppliers about packaging use and ensure a smooth flow of materials and information between VON ARDENNE and the suppliers. In doing so, the goods should be properly and securely protected by appropriate packaging. The supplier is responsible for complying with the requirements, for implementing them, and for making sure they are fulfilled by its subcontractors.

Furthermore, the packaging handbook is intended as a support for the logistics department and the suppliers to guarantee the use of suitable packaging for deliveries made to VON ARDENNE, and simultaneously serves as an aid for departments at VON ARDENNE which carry out staff training sessions.

### 2. Validity

The packaging handbook serves as a guideline for VON ARDENNE, its subsidiaries and suppliers. It must be applied accordingly, taking into account country-specific legislation.

In addition to the guidelines, the handbook also contains aids and addresses. It must be noted, however, that the guidelines listed in this handbook do not exempt the executive departments from liability for damages, e.g. those caused by incorrect packaging or insufficient corrosion protection. The executive departments are also subject to a duty of disclosure for the applicable packaging provisions.

### 3. Further information bases

The "International Standard for Phytosanitary Measures No. 15 (ISPM)" provides an overview of the current import regulations for packaging. (<https://www.ippc.int/index.php?id=13399>)

For the latest information on wood packaging and the HPE packaging directives, see <http://www.hpe.de>.

### 4. Loading units

A loading unit is an item which is handled, transported, stored and stacked as a unit in the transportation, handling and storage process. The loading unit consists of the carrier (e.g. pallets or mesh boxes) and the packaging (transported/stored unit).

The standard pallet dimensions must be observed for loading units comprising smaller containers (e.g. multi-purpose containers and special containers, disposable packaging or katophosphatised electro dip coated (KLT) containers).

#### 4.1. Assembling loading units

The basic dimensions of the loading units are 1200 mm x 800 mm or 1200 mm x 1000 mm, which must not be exceeded by carriers or packages. The loading unit's maximum height of 1000 mm must not be exceeded.

In addition, transportation of loading units by way of industrial trucks or automated conveyors must be guaranteed. When securing the loading unit, the space between the pallet feet must not be restricted, and the packaging must be fastened in such a way that it will not shift during transportation. Plastic straps, shrink hoods or stretch film can be used for this.

Edge protectors must be used to prevent straps from cutting into the cardboard packaging. If parts are taken out of a loading unit, care must be taken to ensure that what is leftover remains stable.

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### 5. Packaging requirements

The aim of packaging is predominantly to ensure optimum protection, storage, loading and transportation of the packaged items, particularly through its structural and technical properties. The packaging must protect the items from mechanical impacts and the elements, and also prevent any loss of content. It should help facilitate item storage, i.e. make it simple, safe and fast. Finally, packaging must be designed in such a way that the items can be moved safely, easily and in a manner which optimizes transport capacity in order to achieve maximum efficiency in terms of transportation, handling and storage.

Higher transportation costs resulting from a change to the shipping type stated in the logistics guideline (see logistics guideline point 6) are only recognised by VON ARDENNE if this type of shipping has been expressly stipulated by VON ARDENNE.

The supplier is also free to insure the deliveries at its own expense. Any insurance costs charged are not recognised by VON ARDENNE.

#### 5.1. Efficient usage of packaging

Packaging must be built, used and fastened in such a way so as to ensure that static or dynamic loads/strains occurring during transportation, handling and storage can be overcome effectively. The packaged item must be shipped and delivered in packaging suitable to its properties.

### 6. Marking and labelling the goods

Precise, systematic, separate labelling of individual packaged items and loading units, as well as communication of item-related information, is imperative in order to ensure that items can be clearly and quickly identified (see logistics guideline point 4).

#### 6.1. Labelling individual parts

Separate labelling of all individual parts, as well as loose parts inside a packaging unit, is essential for clear identification. The label must also be noted on the delivery slip or packing list. The supplier is informed about the required labelling format in the order or in the logistics guideline (see logistics guideline point 4).

#### 6.2. Marking packages

The marking of packages is an important part of information exchange. It is performed either using the marking labels provided by the client or using a stencil with a seawater-proof and light-resistant contrasting colour. If a stencil is used, the letter size must be adapted to the package's dimensions. When marking sliding carriages or unpackaged parts, lettering must be applied directly to the package or, if available, to an associated plywood board. It must always be applied to both longitudinal sides.

The marking regulations are compiled as part of the respective order and are promptly provided to the client.

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### 6.3. Handling symbols

The packaging of items requiring special handling must be labelled clearly and adequately in order to ensure appropriate handling. The following international symbols according to DIN 55 402 must be used:



Keep dry



Fragile



Upwards



Protect from heat/sunlight



Component susceptible, to electric discharge



Centre of gravity



Sling here



Permitted, stacking load



Hooks prohibited



Do not damage, barrier coating

### 6.4. Symbols for hazardous goods

Hazardous goods are substances which pose a threat to humans, animals/the environment or to public safety and order when being transported in public places.

They must be labelled as follows in accordance with the international hazardous goods code.

- ADR for road transport
- RID for rail transport
- IMDG code for ocean shipping
- ADN for the use of inland waterways
- ICAO-TI and IATA DGR for air transport



Nr. 1  
explosiv



Nr. 1.4  
explosiv



Nr. 1.5  
explosiv



Nr. 1.6  
explosiv



Nr. 2.1  
entzündbares Gas



Nr. 2.2  
nicht brennbares  
nicht giftiges Gas



Nr. 2.3  
giftiges Gas



Nr. 3  
feuergefährlich  
entzündb. flüssig.  
Stoff



Nr. 4.1  
feuergefährlich  
entzündb. fester  
Stoff



Nr. 4.2  
selbstentzündlich



Nr. 4.3  
entzündliche Gase  
bei Berührung mit  
Wasser



Nr. 5.1  
entzündend  
wirkender Stoff



Nr. 5.2  
organisches  
Peroxid  
Feuergefahr



Nr. 6.1  
giftig



Nr. 6.2  
ansteckungs-  
gefährlich



Nr. 7A  
radioaktiver Stoff  
Kategorie I

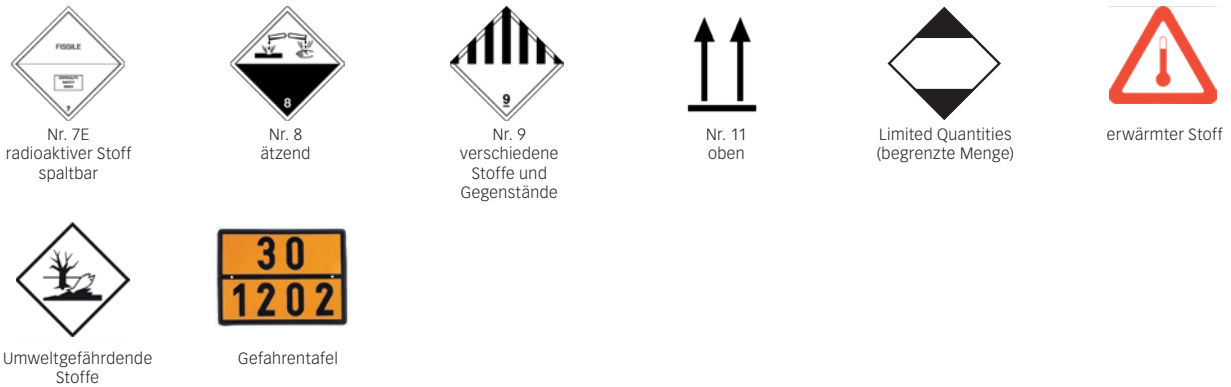


Nr. 7B  
radioaktiver Stoff  
Kategorie II



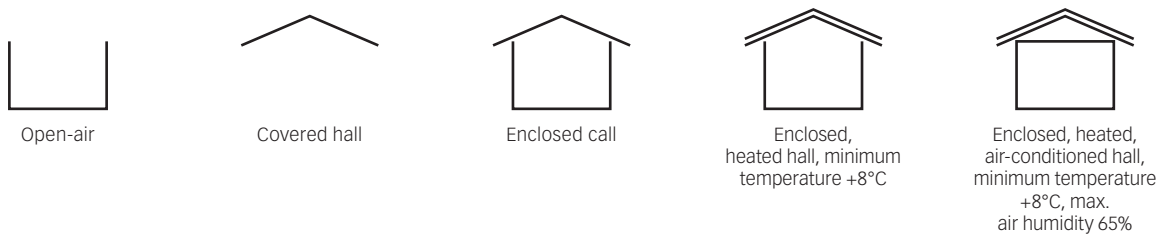
Nr. 7C  
radioaktiver Stoff  
Kategorie III

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**6.5. Storage category labelling**

The permitted storage categories must also be labelled, whereby the most sensitive item determines the classification. If no specific storage symbols are stated in the order, the following storage labels may be used:



**7. Reusable packaging**

Reusable packaging is packaging designed for multiple usage, i.e. it can be reused. They must take preference over disposable packaging. The following types of reusable containers can be used: Poolable usable containers such as europallets, mesh-box pallets or rauboxes, non-poolable reusable containers such as Euro-standard containers and VON ARDENNE usable containers. The last category includes special packaging developed by VON ARDENNE for specific goods. The foldable stanchion shown below (Fig. 1) is one example.



Fig. 1 Foldable stanchion (for long items)

If the customer wishes particular packaging materials to be used, these requirements must be considered and met. Furthermore, packaging materials provided by the customer or, respectively, by VON ARDENNE must be used.

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### 8. Disposable packaging

Disposable packaging is generally designed for one-off use, i.e. it is not reused/refilled.

#### 8.1. Standard disposable packaging: corrugated cardboard packaging

Standard sizes with specific properties (FEFCO types) are stipulated for corrugated cardboard packaging. For more information, visit [www.fefco.org](http://www.fefco.org)

For further information, you can go to [www.fefco.org](http://www.fefco.org)

### 9. Special packaging

#### 9.1. Packaging for sea freight

When transporting items by sea, the specific conditions and impacts must also be taken into account for the packaging, e.g. effects caused by cold, moisture or heat, as well as extreme strains during handling, and corrosion. The packaging should also have a practical, space-saving design, and be suited to being loaded by cranes or industrial trucks. Dimensions and weights must be appropriately adjusted to the transport equipment's measurements and permitted bearing load.

Packing has to be suitable and according to HPE-Standard. Packing has to be seaworthy with a conservation according the requirements of the Buyer (see 13.3.3).

Wooden packing has to be treated and marked according to IPPC rules.

#### 9.2. Packaging for air freight

Space-saving, light-weight, stable packaging which protects the goods from external mechanical impacts, corrosion and the elements – including post-transportation/post-storage – must be used when transporting air freight.

Higher transportation costs resulting from a change to the shipping type stated in the logistics guideline (see logistics guideline point 6) are only recognised by VON ARDENNE if this type of shipping has been expressly stipulated by VON ARDENNE.

The supplier is also free to insure the deliveries at its own expense. Any insurance costs charged are not recognised by VON ARDENNE.

### 10. Types of packaging for sea and air freight

For these sorts of transportation, the sliding carriages, boxes and crates must be adapted for the following factors:

- Item sensitivity, weight and value
- The item's centre of gravity
- Any loads/strains when handling, transporting and storing the item

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### 10.1. Bundles

Bundles are transport units in which several parts are combined securely and appropriately, allowing the items to be stacked, lifted and suspended.

Bundles can only be used for packages which cannot be twisted or bent by machinery or damaged by corrosion, e.g. steel structures or pipes.

Firm bundling of individual packages must be guaranteed. They must be secured with metal sheets or flat iron bars so that no individual parts can slide out of the bundle, even in the event of multiple handling and longer storage. Square, screwed timber clasps must be used as fasteners, with each bundle being secured by at least three clasps. Inlays adapted to the package's weight can also be used. In addition, the pipes on the bottom of the bundle must be externally wedged, and a flat rod inserted between the screw heads above them. Screw connections must be secured. Depending on the individual order requirements, and in consultation with the client, bundles can also be made using wires or steel strapping.

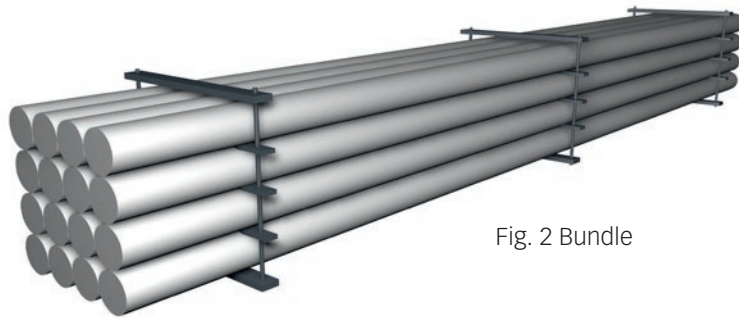


Fig. 2 Bundle

### 10.2. Partial packaging: Sliding carriages, square timber constructions and cladding

Sliding carriages are a type of individual partial packaging comprising a base construction on which the package can be securely fastened and transported, and which is similar to that found on sliding crates or boxes. They are ideal for packaging items sensitive to mechanical impacts and corrosion. If a sliding carriage does not offer adequate protection, constructions made from square timber and/or beams can also be used to partially or fully enclose the item. Cladding, on the other hand, is used if the item only needs to be partly protected. Partial packaging is made from wood or metal.

The packaged items are secured to the sliding carriage either with tension screws or, if this option is not possible, then non-slip, elastically-supported, screwed-in flat-steel straps or square timber clasps can also be used. The flange openings must be closed or covered with blind flanges or seals. Equipment and containers with their own base should be given a thick wooden underlay as anti-skid protection.

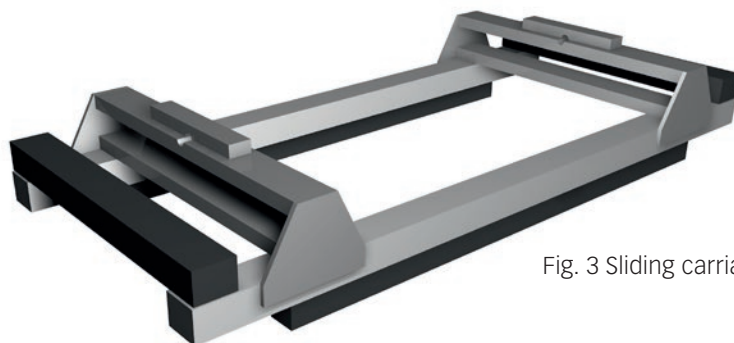


Fig. 3 Sliding carriage



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### 10.3. Crates

Crates are wooden frame constructions developed from a box; their individual sides are not fully boarded up, but instead made from slats or strips, usually arranged diagonally or parallel. The ratio between the open and boarded-up areas is determined by the item's weight and is generally around 1 : 1 or 1 : 2. There are open crates and crates clad on the inside, offering better moisture protection. Crates can be used if the item does not have to be fully protected, but whose packaging must enable stacking, e.g. for packages not suitable for sliding carriages.

A distinction is made between normal crates which use the box structural principle and sliding crates which are easier to transport.

Crates should have the following structure:

A crate has vertical and, if appropriate, horizontal side-wall cladding, as well as internal bracing. To ensure the crate remains stable, the distance between the casing boards must not exceed the average board width. Longitudinal under-runners or diagonal runners should be mounted on the base, as this is particularly necessary for container shipments and shipments to CIS countries. The distance between the longitudinal runners should not be more than 90 cm, measured from the centre of the respective runner. A base panel should also be nailed in. The lid of the crate comprises a longitudinal board which retracts 5 mm over the side and front sections, as well as a diagonal board. The board widths should be between 10 cm and 18 cm. Diagonal compression-wood covers which are supported towards the bottom are applied.

Fastening the packaged item:

The packaged item must be securely fastened to the base of the crate using bolts which penetrate the longitudinal runners, or it must be wedged in such a way that it cannot slide out of the packaging. Items sensitive to moisture or dirt must be protected by a stretch hood. A packaged item should also be fully boarded up on the front side if there is a risk of individual parts sliding out.

In addition, the package must be marked in the designated areas on plywood or chipboard.



Fig 4. Crate

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### 10.4. . Boxes with lining and barrier coating

#### 10.4.1. Plywood boxes

Wooden boxes are mainly used to transport high-quality items. Plywood boxes are made from 5-ply wood laminated for water resistance, and which should have a minimum thickness of 12.5 mm. The base of the box is the most important load-bearing element and should enable lifting using forklifts and cranes. The packaged item must be securely fastened to the base in an anti-skid manner, whereby penetrating screw connections or, in the case of sliding boxes, runners, are used. If this is not possible, it is advisable to use diagonal or longitudinal wooden boards, clamping straps or frames continuously screwed into the base etc.

The package weight should be spread evenly over the base area. The frame, which must be at least 24 mm thick, must be adapted to the specific features and weight of the packed item. Cross beams must be bolted to the longitudinal runners, while compression-wood covers must be diagonal. The side and top pieces are load-bearing components. If necessary, diagonals must be built into its construction. The box lid is used to close the package, and forms a flat area which absorbs loads evenly and which must be able to withstand stacking pressure. In the case of lids comprising more than one sheet, the joins should be sealed with permanently elastic filler. Alternatively, a watertight sheet must be applied.



Fig. 5 Plywood box

#### 10.4.2. Box with PE film

Boxes with a polyethylene barrier coating are suitable for transporting delicate mechanical equipment and simple electrical equipment. They can also be used as packaging for insulated material and fireproof material. Packaging periods should not exceed one year. Packed items are rust-proofed by being shrink-wrapped, upon addition of drying agents. In doing so, the box must bear the marking "Package contains drying agents". If necessary, corrosion-protection agents can also be added. The box must be built in such a way so as to ensure good ventilation.

#### 10.4.3. Boxes with aluminum compound foil

Boxes with aluminum compound foil are suitable for transporting delicate mechanical and electronic equipment. Packaging periods should not exceed one year. Packed items are rust-proofed by being shrink-wrapped in aluminum compound foil, upon addition of drying agents. Other ordered indications incorporated into the barrier coating must be shown on an external package marking. Adjustable metal vents must be used to seal the openings. Otherwise, the boxes must meet the criteria of a lined box.

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### 10.5. Transport bases

Transport bases are suitable for conveying any materials transported to their final destination in containers. The base has longitudinal runners which should not be more than 90 cm apart, measured from the middle of each runner. The runners must also be bolted to front-facing square timbers on the inner top ends. The fully boarded-up base must be capable of being removed from the container using wire-rope slings or mounted ring nuts. The packed item is rust-protected by being shrink-wrapped in aluminum compound foil or polyfoil, upon addition of drying agents.

### 10.6. Cable reels

For cable reels greater than 1 m<sup>3</sup>, it is generally advisable to use ones which are new or in good condition (see KTG standard). These must be tested in accordance with IPPC standards (<https://www.ippc.int/index.php?id=13399>). The cable ends must be carefully rust-protected beforehand.

## 11. Packing aids

Packing aids include all materials which stabilise the packaging or make it more firm/steady, and thus ensure they stay together (e.g. adhesive tape, nails, clamps etc.).

Classification of packing aids:

- Adhesives
- Plastics
- Strapping
- Fillers
- Anticorrosion paper

## 12. Packaging materials

### 12.1. Permitted packaging materials

Packaging material	Recommendation	What to avoid
Wood	Solid wood, plywood, untreated	Coated or painted wood, chipboard, wood shavings
Cardboard boxes	Free from any substances harmful to paper production	Water-insoluble coatings, adhesives
Anticorrosion paper	Verifiably usable VCI paper	Incompatibly impregnated or soaked paper, such as wax, oil or bitumen paper
Plastics	PE, PUR, PP	PVC, PC, polystyrene
Compounds	not recommended	

### 12.2. Prohibited packaging materials

The EU packaging directive (94/62/EC) contains the most important maximum values for lead, mercury, chromium and cadmium concentrations permitted for packaging materials. See: [http://www.rigk.de/fileadmin/documents/downloads/formulare/EUVerpackVO\\_D.pdf](http://www.rigk.de/fileadmin/documents/downloads/formulare/EUVerpackVO_D.pdf).

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### 13. Safety, environmental and quality-based specifications

#### 13.1. Rules for transporting hazardous goods

The ADR and GGVS ordinances apply for the transportation of hazardous goods by road, while the IMDG Code governs the transportation of hazardous goods by ship. The RID is mandatory for rail transportation, and the ICAO-TI/ IATA-DGR handbooks are definitive for air transport.

Hazardous goods must not be enclosed as additional freight and must instead be packaged separately. In doing so, the provisions of the aforementioned hazardous goods ordinances must be complied with. The hazardous goods must be filled into specially designated and verified containers for transportation. Apart from the aforementioned hazardous goods ordinances, it is also necessary to take into account the package's special requirements, joint loading bans and fillers suitable for the hazardous goods.

#### 13.2. Wooden packaging materials

The directives and labelling regulations issued by the IPPC (International Plant Protection Convention) apply for packaging materials made from solid wood and with thicknesses of 6 mm or more. The packaging should undergo the following recognised treatments: at least a 30-minute heat treatment (HT) at a core temperature of 56°C or gassing with methyl bromide (MB).

The packaging should also bear a marking provided by the regional plant health authority, stating:

- ▣ Country ID
- ▣ Regional ID
- ▣ Four-digit registration number

"DB" can also be added for debarked materials. See <https://www.ippc.int/index.php?id=13399>.

For further conditions and information on wood packaging, visit <http://www.hpe.de>.

#### 13.3. Corrosion protection

Corrosion protection is the term given to describe measures seeking to prevent corrosion damage which is caused by seawater, rain, high humidity and/or temperature variations. Corrosion is the destructive chemical or electrochemical reaction of metallic materials to their environment. Corrosion damage can appear in a wide variety of forms (e.g. as surface, pitting, erosion or stress corrosion etc.). The most corrosive substances are water and oxygen. There are many different ways of preventing corrosion damage being caused by these and other substances, including passive or active cathodic corrosion protection, as well as permanent or temporary corrosion protection.

##### 13.3.1. Rust-proofing

During transportation, packaged items can be exposed to particular stresses and wear necessitating additional corrosion protection. Rust-proofing can temporarily protect sensitive items against harmful effects, and thus preserve the quality existing at the time of rust-proofing. In doing so, the rust-proofing method used should be adapted to the item's specific properties and future requirements, e.g. the storage conditions and duration, its later purpose, further treatment etc. However, only the anti-corrosion agents approved by the Conservation, Occupational Safety and Process Engineering departments should be used.

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### 13.3.2. Corrosion protection for individual parts

Anti-corrosion lubricant and cooling additives should be used for individual parts as early as the manufacturing phase. If the item requires longer protection, e.g. because of longer processing times, it is advisable to use VCI paper, protective oils or dewatering fluid, which guarantee permanent corrosion protection. VCI active ingredients are slowly vaporising anti-corrosion agents which form a film on the surface due to be protected, and delay/prevent chemical reactions. VCI paper is particularly recommended for packages susceptible to corrosion damage, as well as packages with longer storage times.

Alternatively, the item can be shrink-wrapped (in vapour-proof plastic films). Further preventive rust-proofing is also possible if there is a risk that the protection may not be guaranteed after longer storage periods. The corrosion protection is normally applied to the materials as a coloured primer, whereby all of the device's external surfaces, except for the terminal pads, are treated. Parts mounted immediately after manufacturing and which are not temporarily stored do not need to be rust-proofed. Plastics with a VCI active ingredient or lids made from special cardboard are used to protect smoothed device surfaces serving as terminal pads.

### 13.3.3. The drying-agent method

The drying-agent method provides reliable protection against corrosion damage caused by air humidity and condensation, as can occur when packaged goods are transported or stored for long periods of time. It involves drying the air contained inside a hermetically sealed foil pouch by adding drying agents which absorb the water vapour, thereby creating a separate microclimate in which corrosion is impossible. This reduces relative air humidity to less than 40%. The necessary drying-agent units must be calculated according to DIN 55474. The drying-agent pouches in the top part of the packaging should also be applied to ensure air circulation. Under no circumstances must there be direct contact between the drying-agent pouches and the packaged item, so as to prevent corrosion from the drying agents' moisture. To further intensify the absorbent effect, several smaller pouches should be used instead of just a few large pouches.

This method is also recommended for protecting units such as switchgears, machinery, electrical devices and other items susceptible to corrosion. Once rust-proofing has been applied on both the inside and outside, it should protect the item for at least 12 months, unless other order-based requirements apply.

## 14. Returning and disposing of the packaging

Reusable packaging is generally given preference over disposable packaging. After usage, the cleanliness and flawless functioning of reusable packaging must be checked. If this cannot be guaranteed, the packaging must be repaired where possible, or replaced if it can no longer be used. Disposable packaging, on the other hand, should be disposed of appropriately after being used once. The contractor is responsible for this. The client can perform an acceptance test on the packaging unannounced.

## 15. Quality assurance and guarantee

At VON ARDENNE, DIN EN ISO 9001:2008 forms the basis for developing and certifying quality-management systems. Applying this standard enables extensive packaging processes extending beyond mere quality assurance to be clearly established.

The guidelines stated in these packaging regulations must be upheld by the contractor. The supplier or executive process must be able to guarantee packaging which meets these quality and safety criteria. Any exceptions or modifications must be approved by the client. The supplier is liable to VON ARDENNE for any damage caused by incorrect packaging design and/or non-compliance with the guidelines described here.