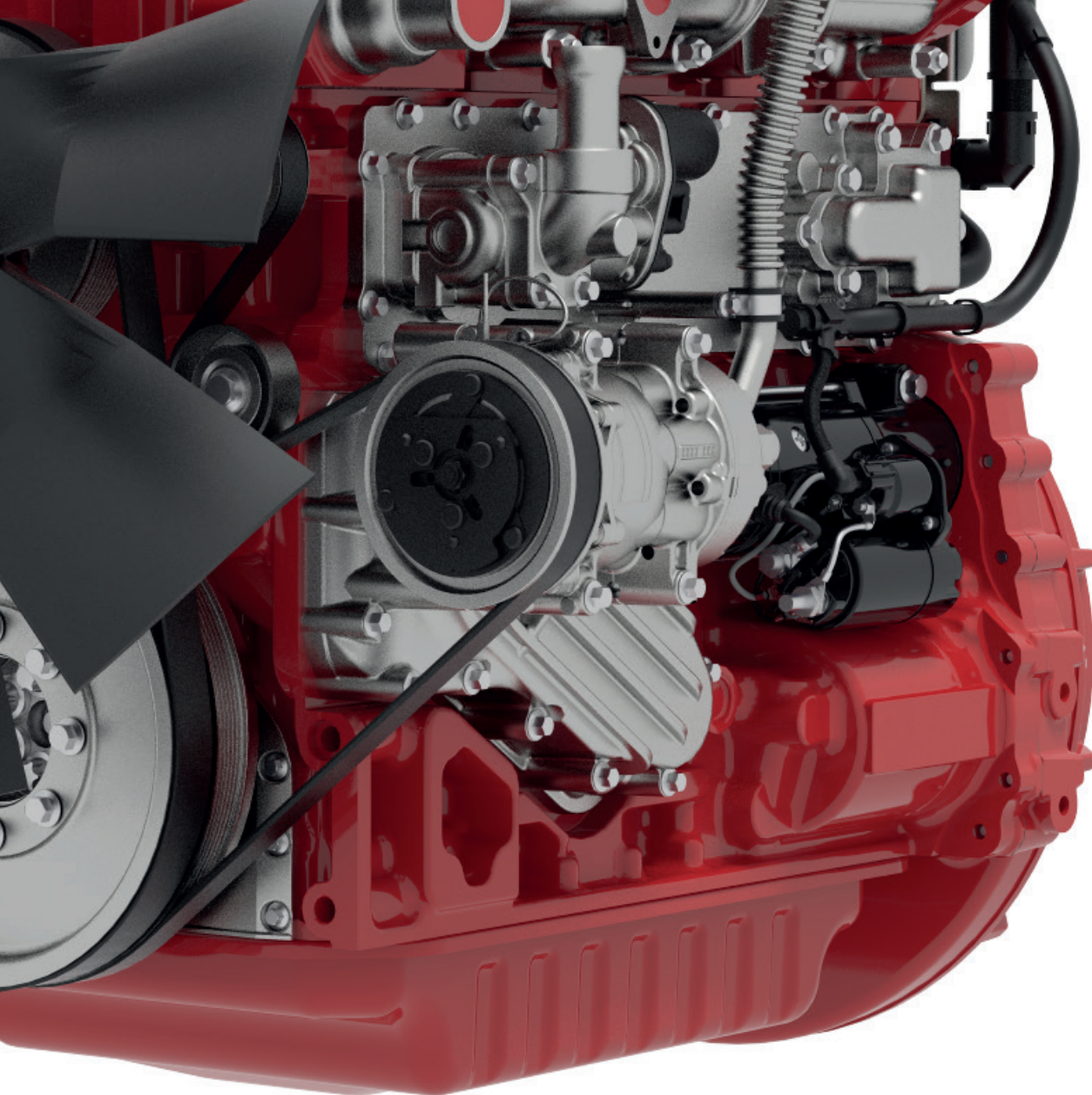


Packing Guidelines

For Sea- And Airfreight For Suppliers from
Outer Europe
Asia-Pacific
Asia
Africa
North and South America





Imprint

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Important Note

ALL packing materials in use made from wood such as boxes, crates, pallets, boards must be

- matching the guidelines of the United Nation's Food and Agriculture Organization (FAO International Standards for Phytosanitary Measures = ISPM 15 / European guidelines No. 2000/29/EG, confirmed by IPPC stamp on woods and IPPC certificate of packing manufacturer
- free of bark
- treated against pest (heat treated)
- free of harmful chemicals

All sendings which do not follow those rules might be blocked by European customs, sent back to suppliers charge or destroyed by order of authorities directly.

1 General Information

1.1 Packing standards

Proper and economical packaging for DEUTZ engine parts and DEUTZ engines is an important component of the logistics chain. The packaging must correspond to the various requirements in respect to quality, production technology, warehousing technology, transport and handling. To this end, the people involved with packing in the various processes continually require information. This information is summarised in this guideline and must be used from the start of negotiations to produce parts up to serial deliveries.

For this purpose, DEUTZ has its own specialist department involved with all aspects concerning the packing of components and engines.

This recognised technical knowledge and the competence of the DEUTZ Packing Planning is presented in a concise way here. The DEUTZ packing will continue to develop in the future as well and form an important element of the economical material supply. This Guideline will consequently be extended further and updated with the aim of providing all technical areas in the logistics chain with the requisite information.

Not all detailed information on the relevant packing of components and engines can be described within the context of this Guideline. Further information such as specifications or handling guidelines, also from other technical departments at DEUTZ Global Logistics, is available for this. Contact at DEUTZ:
packtech@deutz.com

Every component and end product has relevant packing data at DEUTZ in order to ensure an economical material flow corresponding to the requirements of modern logistics. On this basis the following points must be observed:

- Protection of the products
- Retention and improvement of quality
- Delivery in line with assembly and products
- Assurance of occupational safety, cleanliness and order
- Compliance with statutory/official regulations
- Fulfilment of quality requirements
- Packing costs (included in part price)
- Uniformity in the workflows over the entire logistics chain
- Time saving, avoidance of expense
- Rapid material flow
- Ergonomic handling
- Clear, simple and rapid information
- Standardisation

1.2 Packing for large parts

Suitable, solid packing with protection against dust, dirt, moisture and damages.

Packing material:

- Plywood box or solid triple wall corrugated cardboard box
- max. dimensions 120x80x100 cm / 120x100x100cm
- intermediate layers out of corrugated board or dry plywood
- max gross weight 1000kg
- stable, safe 4-way pallet
- wood free of bark and treated against pest
- dry preservation with VCI plastic, VCI pads, VCI paper sheets

Only one kind of part
(partnumber) per box,
DRY & CLEAN parts,
FREE of water, oil, grease,
wax, metalchips

Examples:



1.2 Packing for small parts

Suitable, solid packing with protection against dust, dirt, moisture and damages, cardboard boxes stapled in seafreight-box or stapled on pallets secured with

Freight box (secondary packing) :

- Double wall corrugated cardboard box with solid four way pallet or cardboard boxes stapled on solid four way pallet with shrinking film
- max dimensions 120x80x100cm
- intermediate layers out of corrugated board or plywood
- max gross weight 1000kg
- wood free of bark and treated against pest IPPC certified
- Dry preservation with VCI plastic bag / VCI paper/ VCI pads

Cardboard box (primary packing):

- 53x34 or 32x24cm outer dimensions,
- made out of stable corrugated board or millboard
- parts set up safely, intermediate layers or cushioning with air bubble film
- only one kind of part (partnumber) per box
- max 15-20 kgs per cardboard box

Examples

Primary Packing

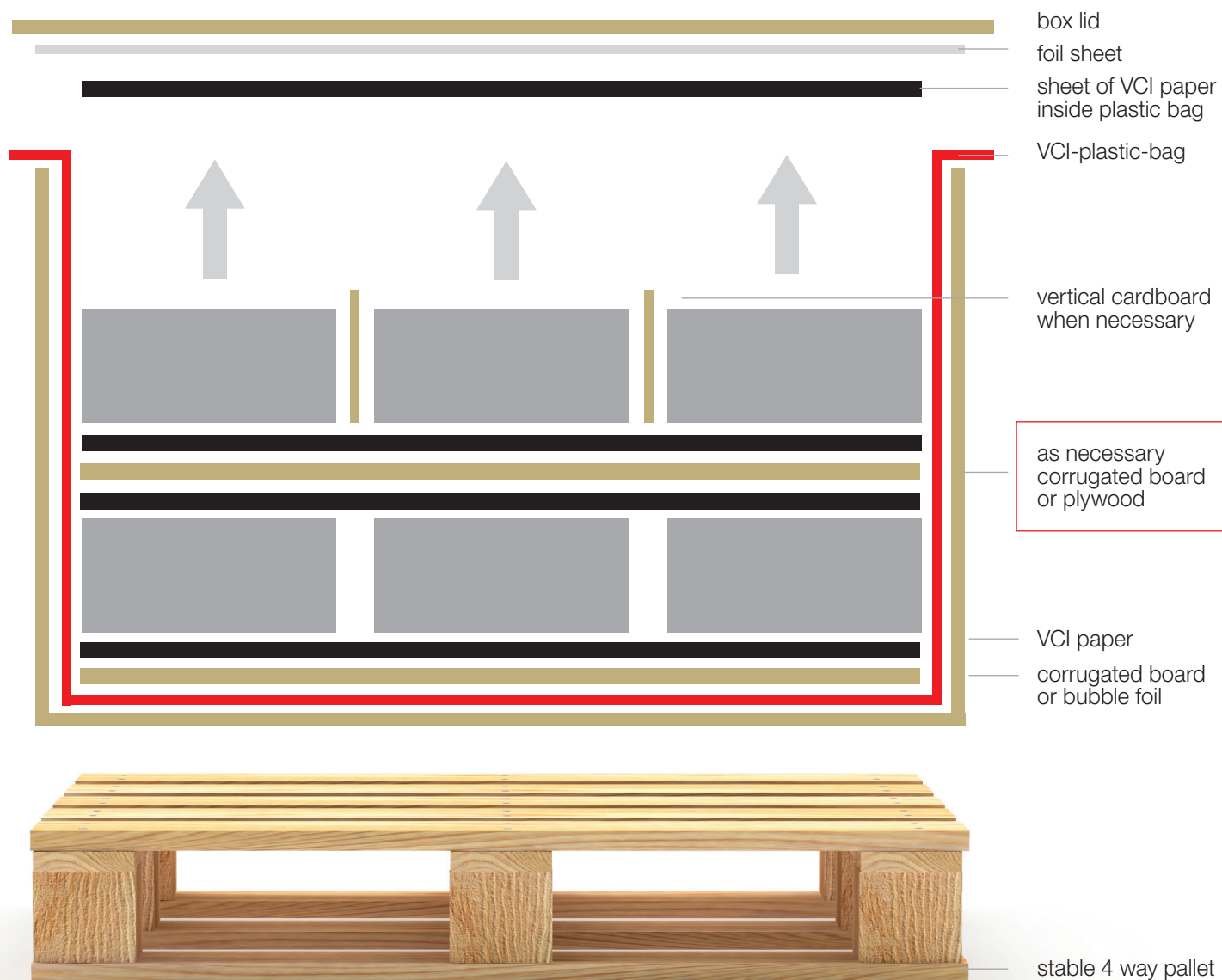


Only one kind of part (partnumber) per box / bag DRY & CLEAN parts FREE of water, oil, grease, wax , metalchips and particles

Secondary Packing



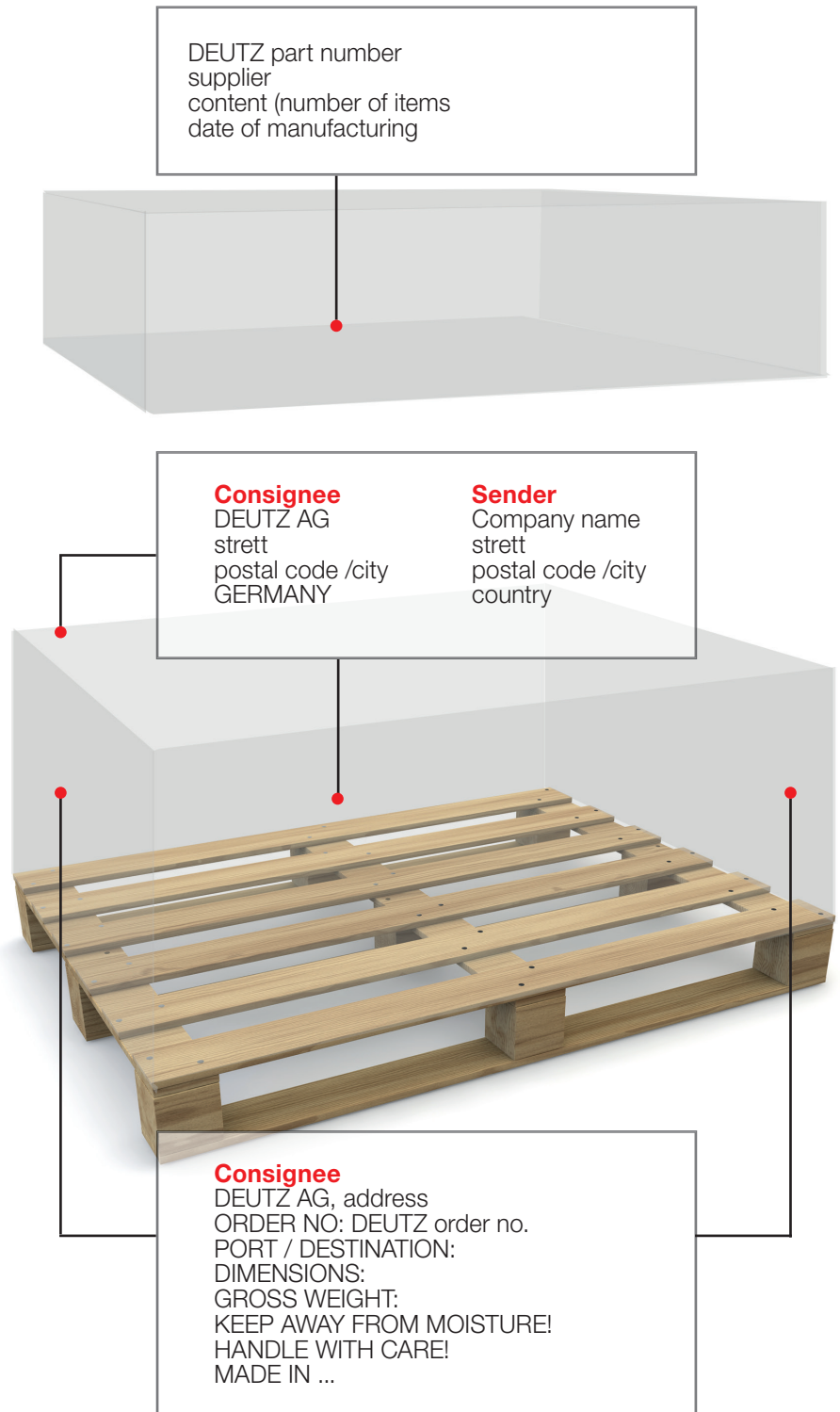
1.3 Scheme packing set up



1.3 Labeling

Labeling sea/ airfreight box,
secondary packing
water-resistant printed

single cardboardboxes , primary packing



Labeling sea/ airfreight box ,
secondary packingwater-resistant printed

Examples of solid packing for sea- and airfreight:



2 Preservation of parts

1. The Problem of Corrosion

Corrosion on components leads time and again to complaints and faults, in particular during the corrosive climate an air pollution in certain regions.

The reasons for corrosion are discussed in detail, analysed and the causal agent is sought depending on the individual case. Finally recurrent errors in the handling of the components and corrosion protection are explained and recorded. At the same time, the corrosion protection is often associated with the transport packing.

However, corrosion protection, which is both a component of the parts quality as well as the parts packing, is crucial. It is often not clear when and how corrosion has resulted, as packing alone is not the cause of corrosion but rather all external factors that give rise to corrosion: Damp, air, pollutants, storage, climate, transport, handling. The search for the causes of corrosion and their avoidance is therefore a general task, which requires a common basis in order to correctly tackle the problem of corrosion.

2. Causes and Formation of Corrosion

Corrosion according to DIN EN ISO 8044: *"Corrosion is the interaction between a metal and its environment which results in changes in the properties of the metal and which may often lead to impairment of the function of the metal, the environment, or the technical system of which these form a part. In most cases this reaction is of an electro-chemical nature; but sometimes it can be also of a chemical or metal-physical nature"*.

Corrosion can be a chemical reaction between a metal and a reactive or unstable gas, liquid or another substance. Corrosion can be caused by an electrical reaction between two different metals.

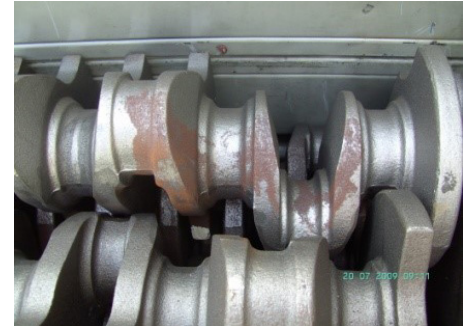
Corrosion can be an electro-chemical reaction between dust or fungi and a metal surface.

Corrosion changes the chemical and physical structure of the metal

3. Types of Corrosion

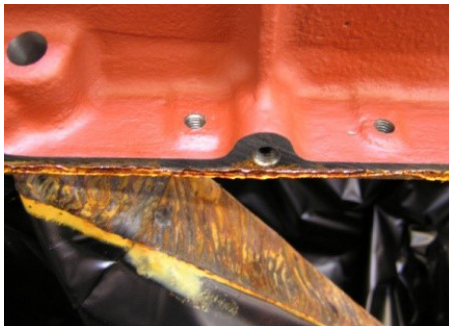
Types of corrosion occurring in practice

Overall corrosion / general rust “flash rust”



The surfaces are discoloured but not damaged. A cleaning or reworking is usually possible.

Pitting corrosion



The surfaces have undergone significant attack and have a rough surface as though “eaten”, usually irreparable

Stress corrosion cracking, crystalline corrosion, crevice corrosion and contact corrosion have so far not been determined as a damage characteristic in the area of transport and packing.

4. Causes of Corrosion, Examples

Processing residues (wash water)

The component was not completely dried after processing and liquid runs out of the bore holes over the component during shipping and storage. Evaporation of the liquid resulted in corrosion.

Cause: Residual moisture

Measures: Drying after processing, blowing out all holes and cavities, additives in the wash water, suitable dry preservation



Incorrect storage (rain water, ice, snow)

The components were exposed to the weather without protection before and during shipping. The short-term preservation was consequently washed off and massive corrosion resulted in a short time due to air and moisture.

Cause: Effects of the weather

Measures: Dry, protected storage and transport



Condensation (climate)

The component packed in a damp environment or (air) humidity from the environment has precipitated on the component due to the climate: dew, "perspiration" condensation

Cause: Air humidity around component over several weeks

Measures: Pack in a dry environment, closed packaging with suitable dry preservation

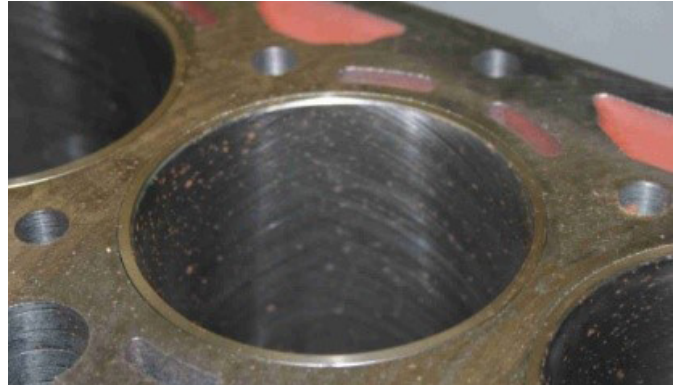


Ambient air & storage time

The components were in the dry store only with short-term preservation over a longer period of time. After the active period of the short-term preservation, corrosion begins evenly on all surfaces.

Cause: Storage too long, incorrect preservation

Measures: Long-term preservation, stock checking



Body fluids

The component was touched with moist hands or sweat dripped on the surfaces. Corrosion results partially at the contact points

Cause: Incorrect handling

Measures: Gloves, suitable clothing, air-conditioned rooms



Damp packaging

Water has penetrated the packaging during transport and the components were in direct contact with water. Corrosion results at the contact points

Cause: Storage or transport during precipitation

Measures: Dry storage, loading and transport in a dry, additional packaging material e.g. film

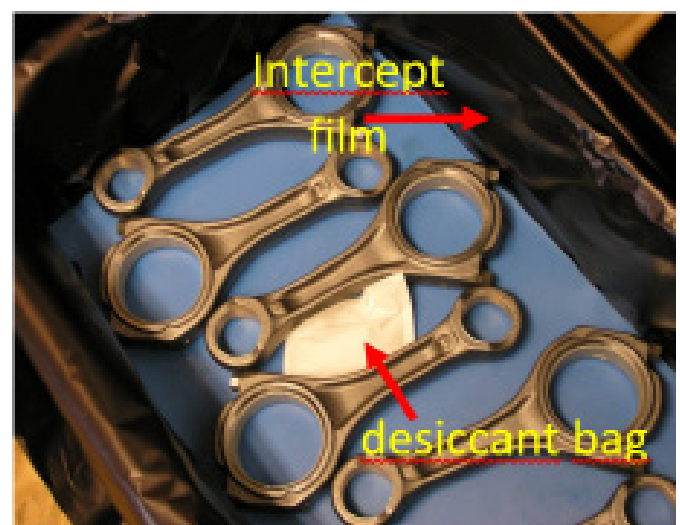
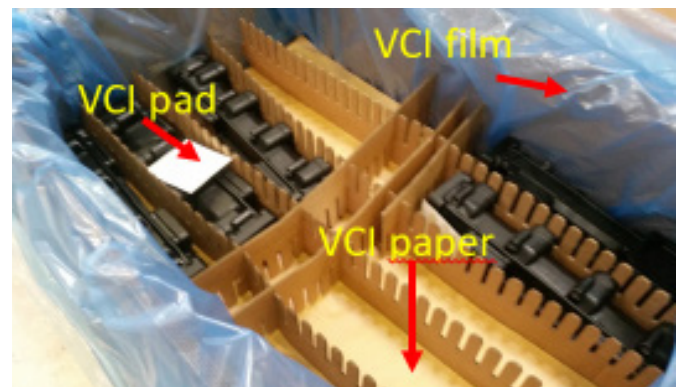


Most recommended protection methods when packing parts

Dry preservation with VCI paper/ VCI film / VCI pads

VCI are volatile corrosion inhibitors contained in various packaging materials such as paper, film or deposits. Gaseous corrosion inhibitors form from air and VCI within a closed VCI packaging. The active agents in the closed packaging form an invisible protective film on metallic surfaces. The VCI saturated ambient air in the closed packaging also displaces air humidity. The VCI corrosion protection volatilises after opening the packaging as soon as the components come into contact with ambient air. The components do not need to be treated before use after unpacking. The corrosion protection is sufficient for medium storage times of up to 12 months and longer (depending on the type of storage and if it is suitable without restrictions for sea, air and road transport. The prerequisite for VCI corrosion protection is the correct application in accordance with the manufacturer's instructions and the packing of dry, residue-free components.

Release for application: VCI packages are generally released at the incoming and outgoing goods. However, the datasheets and technical specifications of the manufacturers of the relevant VCI packaging materials must be available. If this does not involve manufacturers approved by Deutz (Cortec/ Excor, Brangs & Heinrich) individual releases for the relevant application will be necessary.



Dry preservation with Intercept film

Intercept corrosion protection is based on a reaction between particles in the ambient air and the porous copper particles contained in the Intercept film. In contrast to conventional preservation, treatment occurs without further chemicals and the air around the components is free of the agents causing corrosion. Gas emissions and other undesirable side effects do not occur.

Intercept does not have any negative effects on non-metals such as plastic, rubber, fabric. The ultraviolet resistance of the Intercept film is also ensured after years when stored in the open air. The effect of Intercept does not volatilise when opening and closing the package again either.

A guarantee for up to 12 years corrosion protection is given by the manufacturer. For safe packaging, desiccant bags with alumina for absorbing residual moisture within the foil packaging must be used. The number of such bags must be specified.

Release for application: A corresponding warranty declaration and the handling instructions of the manufacturer (Comtrade / Partner) must be available for the relevant application. An internal cost invoice may have to be compiled if the costs vary significantly in comparison to other preservation methods and requirements.

Other protection methods

Treated surfaces

Metallic surfaces are sealed using various methods so that no ambient influences can have a corrosive effect. Materials are brought into direct, permanent contact with the metal here. Galvanisation: e.g. chrome plating, nickel plating, zinc plating, chromating.

Painting: Priming, rust protection coat, paint coat, stove enamel finishing Oil blackening.

Corrosion is possible due to mechanical damage (scratches, cracks, fractures) to the applied surfaces.

Release for application: The surface treatment is clearly specified in the documentation (parts drawing, production specifications, standard) and required by DEUTZ on the construction side.

Additives in cleaning media (wash water)

Components are washed after processing, the wash water containing 2-5% corrosion protection additive. After the components have been completely dried, residues of the additive remain on the components and form a very thin, usually invisible, temporary corrosion protection film.

This protective film protects the surfaces for several weeks against corrosion from ambient influences (air humidity and the harmful materials it contains). The prerequisite for a good effect is storage in heated and closed rooms. Direct contact with water (rain, fog, condensation) removes the protective film as does touching the surfaces.

The components can be used without further cleaning. The corrosion protection is adequate for short storage times < 6 weeks and road transport. Additives and wash water must not have any corrosive constituents and must be applied according to the manufacturer's instructions.

Release for application: The additives in the wash medium are described in the technical description and safety data sheet. All ingredients must be known and corresponding protective measures must be indicated. The release is issued by a note on the design drawing, and/or in the production specifications, or in the order text, as the cleaning media are a component of the production process.

Adhesive corrosion protection agents (oil, grease, wax, paraffin)

Metallic surfaces are sealed with liquid substances so that corrosive ambient influences are countered. Chemicals usually containing oil and/or grease are used for this, these being applied using an immersion bath, spray or brush. Corrosion protection oils are primarily utilised nowadays, with greases and waxes only being used for long-term preservation.

The agents can be applied easily and have to be thoroughly removed before using the component so that the component's function is not impaired. The components have to be dry before application, so that moisture is not trapped and no corrosive joints result. The corrosion protection film is damaged by touching the preserved components. Oils and greases attract particles (dust, cuttings etc.) and packaging (cardboard, film) adheres to the surfaces, thereby causing undesired reactions that are corrosive on the metal surfaces. Likewise, moisture entrapped by oils can lead to corrosion on the surfaces.

Release for application: Only by clear indication on the design drawing for the component.

Desiccant bags

Such agents are not corrosion protection but moisture absorber. Air humidity is absorbed in a package for a limited period of time. Most desiccant bags are produced on a mineral salt basis and can promote corrosion when stored or transported for longer periods. Solid, tear-resistant desiccant bags filled with calcium chloride + modified starch should be preferred.

Release for application: Only to be used when required from Deutz in packing instructions

3 Packing examples

1. Crankcase

Freight Box: Plywood Box

Preservation: One VCI bag per crankcase

Four Cylinder: Three crankcases per layer, two Layers per box max.

Six Cylinder: Two crankcases per layer, two layers per box max.

Intermediate Layer : plywood 12mm



2. Cylinder Head

Freight Box: Plywood Box

Preservation: One VCI bag per cylinder head

Four Cylinder: Four parts per layer, four layers per box max.

Six Cylinder: Two parts per layer, four layers per box max.

Intermediate layer: plywood 12mm, vertical plywood boards



3. Flywheel Housing



Freight Box: Plywood Box

Preservation: One VCI bag per box, VCI paper under and above parts

Four to six parts per layer, five layers per box max.

Intermediate Layer : plywood 10mm

4. Flywheel

Freight Box: Plywood Box

Preservation: One VCI bag per box, VCI paper under and above parts

Four to twelve parts per layer, five layers per box max.

Intermediate Layer : plywood 10mm



5. Crankshaft



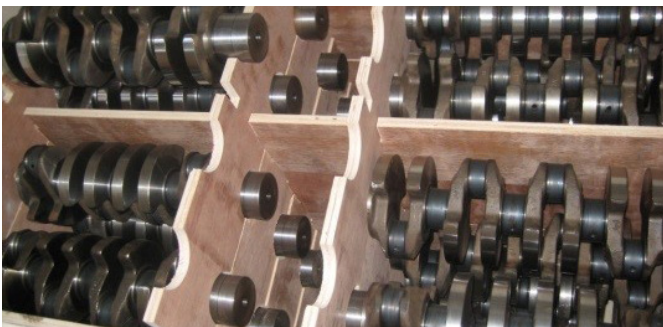
Freight Box: Plywood Box or triple wall corrugated cardboard box

Preservation: One VCI bag per part, VCI paper under and above parts

Single packing with double wall corrugated cardboard box or stacking with plywood support

Four Cylinder: Four parts per layer, four layers per box max.

Six Cylinder: three parts per layer , four layers per box max.



6. Camshaft



Freight Box: Triple wall corrugated cardboard box

Preservation: One VCI bag per part, VCI paper under and above parts

Single packing with double wall corrugated cardboard box or stacking with cardboard support and plastic bubble film for cushioning.

Four Cylinder: six parts per layer, four layers per box max.

Six Cylinder: four parts per layer, four layers per box max.

7. Con Rod



Freight Box: Triple wall corrugated cardboard box

Preservation: One VCI bag per box, VCI paper under and above parts

Up 30 parts per layer, four layers per box max.

Intermediate Layer : cardboard

8. Piston

Freight Box: Double wall corrugated cardboard box

Preservation: One VCI bag per box,

Parts per stacked with layers and honeycomb cardboard, or piston packed with 6-12 in cardboard boxes.

Up to 360 parts per box



9. Turbocharger

Freight Box: Double wall corrugated cardboard box

Preservation: One VCI bag per part

Parts per stacked with layers and honeycomb cardboard

Up to 40 parts per box



10. Oil Suction Pipes / Oil Pipes



Freight Box: Double wall corrugated cardboard box

Preservation: One VCI bag per box

Parts per stacked with layers

Up to 200 parts per box

11. Oil Pan (sheet metal)



Freight Box: Double wall corrugated cardboard box

Preservation: One VCI bag per box, VCI Paper under and above parts.

Parts per stacked with cardboard layers.

12. Exhaust Pipe



Freight Box: Double wall corrugated cardboard box
Preservation: One VCI bag per box, VCI Paper under and above parts.
Parts stacked with cardboard layers and honeycomb cardboard.

13. Charge Air Pipe



Freight Box: Double wall corrugated cardboard box
Preservation: One VCI bag per box, VCI Paper under and above parts.
Parts stacked with cardboard layers and honeycomb cardboard.

14. Generator



Freight Box: Double wall corrugated cardboard box
Preservation: One VCI bag per box, VCI Paper under and above parts.
Parts stacked with cardboard layers and honeycomb cardboard.

15. Pulley



Freight Box: Double wall corrugated cardboard box
Preservation: One VCI bag per box, VCI Paper under and above parts.
Parts stacked with cardboard layers and honeycomb cardboard.

16. Oil Filter / Fuel Filter



Freight Box: Double wall corrugated cardboard box
Preservation: One VCI bag per box
Parts stacked with cardboard layers and honeycomb cardboard.

17. Oilcooler Housing



Freight Box: Double wall corrugated cardboard box
Preservation: One VCI bag per box, VCI Paper under and above parts.
Parts stacked with cardboard layers and honeycomb cardboard.
One plastic bag per part.

18. Control Unit (mech.)



Freight Box: Double wall corrugated cardboard box
Preservation: One VCI bag per box, VCI Paper under and above parts.
Parts stacked with cardboard layers and honeycomb cardboard.

19. Starter



Freight Box: Double wall corrugated cardboard box
Preservation: One VCI bag per box, VCI Paper under and above parts.
Parts stacked with cardboard layers and honeycomb cardboard.

20. Valve Hood



Freight Box: Double wall corrugated cardboard box
Preservation: One VCI bag per box, VCI Paper under and above parts.
Parts stacked with cardboard layers and honeycomb cardboard.

21. Injektor



Cardboard box with plastic trays . Parts closed with plastic caps.

22. Injektion pump



Cardboard box with plastic trays . Parts closed with plastic caps.

23. Bearing Shell



Cardboard box with plastic trays.

24. Piston Ring



Rings rolled with VCI Paper, max. 100 parts per roll.

25. Front Cover / Oil Pump



Freight Box: Double wall corrugated cardboard box
Preservation: One VCI bag per box, VCI Paper under and above parts.
Parts stacked with cardboard layers and honeycomb cardboard.
One plastic bag per part.

26. Control Rod



Freight Box: Double wall corrugated cardboard box
Preservation: One VCI bag per box, VCI Paper under and above parts.
Parts stacked with cardboard layers and honeycomb cardboard.
Parts fastened at honeycomb.

27. Rocker / Rocker arm



Preservation: One VCI bag per box or wrapped with VCI Paper
Parts set on bottom of cardboard box.

28. Oil Cooler



Freight Box: Double wall corrugated cardboard box.
Preservation: One VCI bag per box.
Parts stacked with cardboard layers and honeycomb cardboard.

29. Roller Tappet / Valve Tappet



Cardboard box with plastic trays .
One VCI bag per box

30. Gaskets



Stacked in cardboard box. Secured with padding material

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