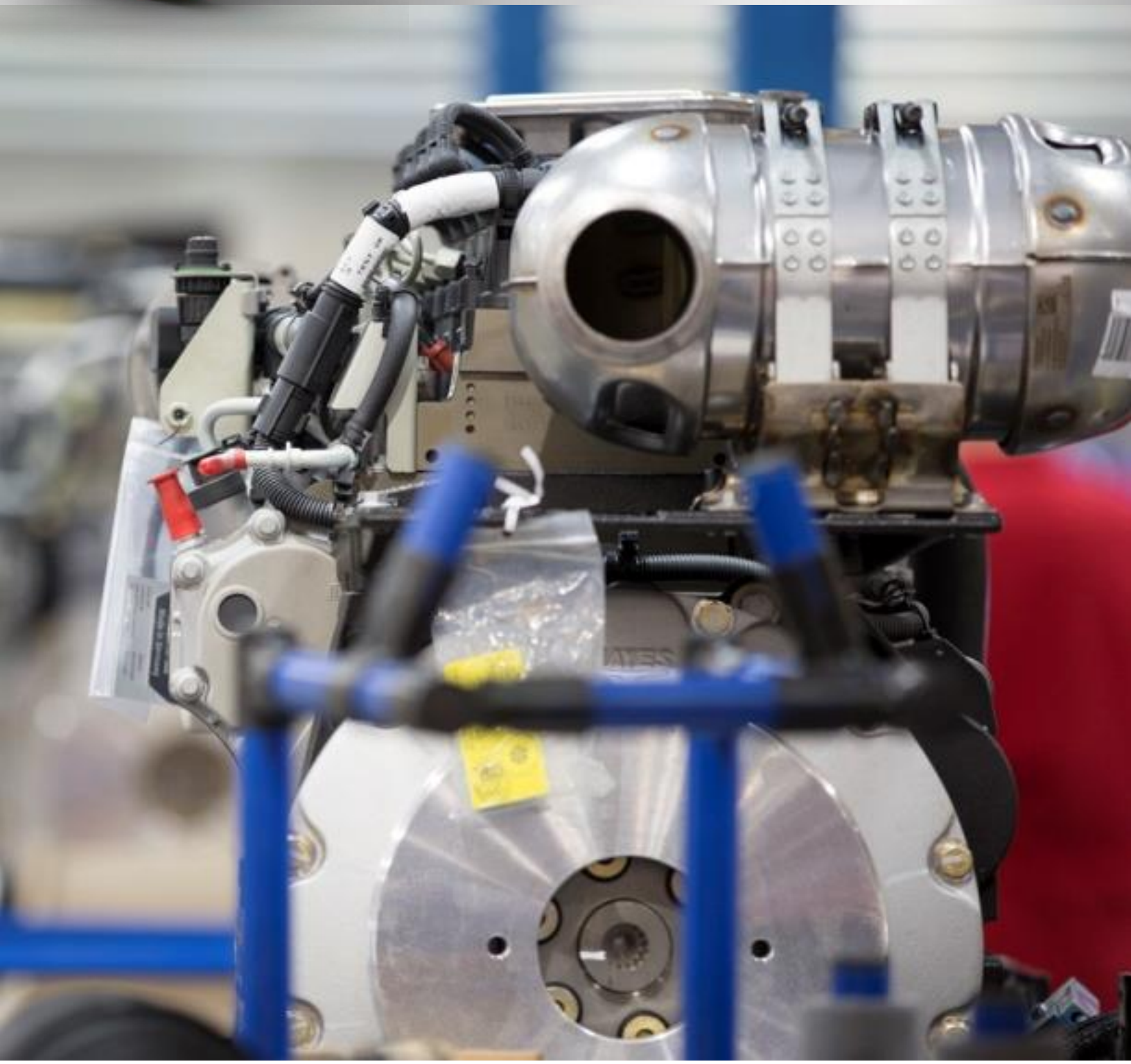
Packaging Requirements

DEUTZ CORPORATION



The engine company.

DEUTZ®

DEUTZ CORPORATION PACKAGING REQUIREMENTS

REVISION:	2
AUTHOR OF REVISION:	LEO STAPPER
DATE OF ISSUE:	8/8/2016

Contents

1. Introduction

This packaging manual is to be used as a reference text for every SUPPLIER of DEUTZ Corporation (DEUTZ). With this manual DEUTZ introduces mandatory packaging requirements to reduce unnecessary waste of resources, to ensure a consistent high product quality, and to make joint processes more efficient. DEUTZ also begins implementation of an approval process for every new packaging from any SUPPLIER. That means that prior to first supply, a SUPPLIER now needs to make a packaging proposal to DEUTZ which will then be reviewed by the designated DEUTZ Packaging Specialist. This will ensure a smoother workflow and reduce packaging caused issues.

Packaging of received goods plays a vital role in our everyday work and can cause major delays, costs and can even affect the quality of our products.

There are several key requirements listed in this manual, which only make sense if they are implemented accordingly. It is part of the SUPPLIER's contract to ship parts "…packed into DEUTZ nominated packaging." For selected parts, separate packaging specifications will be created, which will describe specifically how the packaging should appear.

One of our key objectives is to reduce the unnecessary consumption of resources at our facility as much as possible, which includes the use of workforce, energy, and/or monetary resources. Synchronizing the delivering quantities with the quantities that our workflow requires is one of the major prerequisites in reaching this goal. This is why our required packaging quantities come attached to this manual.

An appropriate and ecological way of packaging is an important part of DEUTZ's logistics chain. Therefore, DEUTZ advocates the usage of returnable and recyclable packaging as much as possible. Even though this manual shows every important requirement for DEUTZ, it will not necessarily highlight every legal requirement that needs to be considered. Correct packaging has been and will continue to be the SUPPLIERS responsibility, but please consider this manual as a convenient guideline to help you plan proper packaging for DEUTZ.

Thank you for your cooperation!

2. Packaging Planning & Approval Process

Every component and end product at DEUTZ has relevant packing data in order to ensure an economical material flow corresponding to the requirements of modern logistics. On this basis the following points are 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
- Fulfillment of customer requirements
- Minimization of packing costs
- Uniformity in the workflows throughout the entire logistics chain
- Time saving, avoidance of expense
- Rapid material flow
- Ergonomic handling
- Clear, simple and rapid information
- Standardization

DEUTZ suggests the following steps for planning your packaging:

Step 1: Classification of the products according to dimensions, value, procurement sources, quantities and quality requirements

Step 2: Selection of the possible packing system taking into account the spatial circumstances (warehouse, production):
-Consideration of DEUTZ provided process quantities
- Development of own containers
- Use of standards
- Use of existing packing systems

Step 3: Calculation / Profitability calculation with determination of packing type and filling volume per material, representative of product groups

Step 4: Presentation in the technical departments internally and externally with meetings and agreements at suppliers, Incoming Goods, Quality Assurance, Warehousing, Production, Purchasing, Materials Scheduling and Controlling.

Step 5: Definition of the packing per product with documentation and specifications

Step 6: Information to all areas involved

Step 7: Monitoring the packing

The DEUTZ supplier contract commits supplier partners to using DEUTZ nominated packaging when shipping goods. DEUTZ nominated means that after packaging for a part is chosen, the SUPPLIER must hand it over for review to the DEUTZ Packaging Specialist (contact provided at the end of this manual). For selected parts, there will be packaging specification which will tell what package to use and how to pack the goods. This chart is showing the approval process:

The packaging proposal has to be submitted at least 30 days prior to the first shipment of the product to ensure there is no delay at our production site.

3. Supplier's responsibility

The supplier is responsible for guaranteeing that the part and packaging are received in the same condition (in terms of corrosion) as they were received from the manufacturer at the suppliers production site for a minimum of ***120 calendar days*** after receiving at DEUTZ.

Therefore, the supplier is responsible for understanding the nature of the product and its potential to rust in high humidity or due to large temperature changes.

Suppliers shipping from a foreign country are committed to pack, label and ship their goods complying to import rules and laws of the respective countries. DEUTZ only reviews packaging for their own requirements and is not responsible for the compliance of supplier packaging with import laws.

4. Packaging Costs

All costs, relating to packaging, labeling, and shipping must be included in the commodity piece price. DEUTZ will not grant any cost increases to suppliers who fail to meet our packaging requirements or with insufficient corrosion prevention. DEUTZ will support you

finding cost saving opportunities e.g. by benefit from our ULINE conditions for packaging materials.

5. Packaging Requirements

5.1 General

We follow specific principles at DEUTZ that we also require our suppliers to follow, as they influence the quality and success of our products. Therefore, it is necessary, that every supplier of DEUTZ complies with our quality standards and we kindly ask that the following points be considered while planning the packaging:

- Packaging has to be as strong and secured as necessary to prevent the parts from being damaged due to any possible situation during delivery
- If possible only use recyclable packaging to reduce the waste of resources and to keep the pricing for packaging as low as possible
- It is better to include too much information on the packing slip and the labeling of your package rather than too little

5.2 Continuity

DEUTZ requires continuity for every aspect of shipment. Always use the same DEUTZ nominated packaging material, the same packing slip layout and most importantly: ***always ship in the same quantity***. The higher the continuity of the supplier's packaging, the more recognizable the package will be for our employees at the receiving, and picking station.

5.3 Packing Slip

The first thing that DEUTZ employees come across when goods are received at our facility is the packing slip. It has to contain very specific information, so that any unnecessary investigation of the package and the contents of the package can be avoided. For DEUTZ the following information must be listed on the packing slip:

- Supplier logo, name, address and contact information
- Packing slip number
- PO-number and line number
- Bill of lading number
- If available: DEUTZ customer part number(s) (JLG)

- DEUTZ part number(s)
- Part description
- Shipped quantity of each part contained

Most important: The PO-number must be visible from outside the box!

Also make sure to use the FULL address, including one line that states if the delivery is for

- ***DC Norcross Service***
- ***DC Prod Parts***

that is stated on the Schedule Agreement or the Purchase Order.

For convenience we created a packing slip template (DPF001) that contains all of the needed information in the best possible layout. There is no need to use the exact layout or the exact content, but the custom packing slip shows which content is important to us and helps us with speeding up our processes. Please also make sure to use barcodes (128 standard) for all numbers that have more than 4 digits.

5.4 Labeling

Especially when many boxes are shipped at one time, it is very important to label each package correctly to help us identify which parts are in which box. Label your boxes from 2 opposite sides. The label content has to have at least:

- DEUTZ Partnumber
- Description
- Included quantity
- Date and time

Just like the packing slip, the labeling should contain barcodes for numbers above 4 digits. If you use BarTender as software for your labeling, please use our DEUTZ standard label.

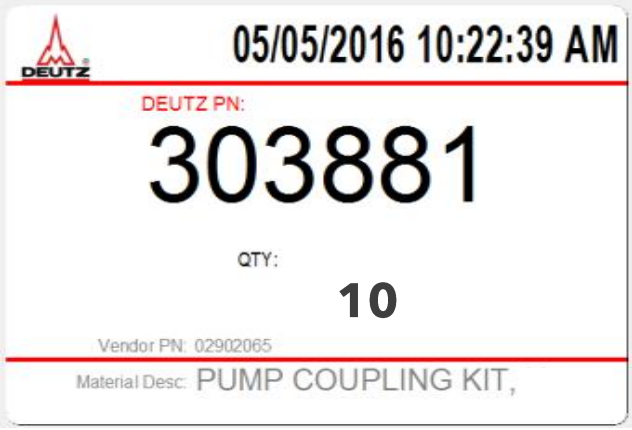


Figure 1"DEUTZ standard label"

5.5 Package Material

DEUTZ distinguishes between four different types of packaging material:

Standard Pallet	Small Box	Big Box	Custom Container/Pallet
Parts that come on a pallet and are secured by straps and/or foil to the pallet	Every box that has dimensions smaller than 24"x16"x11" is considered a small box at DEUTZ	Every box that is at most as big as the maximum pallet size (48"x48") is considered a big box	For parts with special dimensions, custom pallets /containers made out of metal, wood or plastic material
• Pallet must not exceed 48"x48" • Pallet has to be roll-under • Pallet must be undamaged • ISMP-15 certified and stamped (2 visible stamps)	• Should be half-slotted with a lid • Strong cardboard material, 100% recyclable • If weight is greater than 25 pounds, use boxes with handles • If more than 10 boxes per shipments, use pallet	• Must be half slotted with a lid • Lid must not be taped or secured to the box • Strong cardboard • Must be palletized • If shipped by external carrier, use stackable box	TBD separately with DEUTZ packaging specialist

Package material means the material that secures and protects the goods from outer influences and from damages inside the package. When choosing the appropriate package material, factors such as the weight, size and shape of the goods should be considered. Every effort should be made to guarantee the goods will not get damaged under regular shipping circumstances.

When considering cardboard strength, we recommend comparing the prices and the maximum load of the packages. As a reference you can use this graph, which shows the differences between prices of different box sizes with multiple layers of corrugated cardboard:

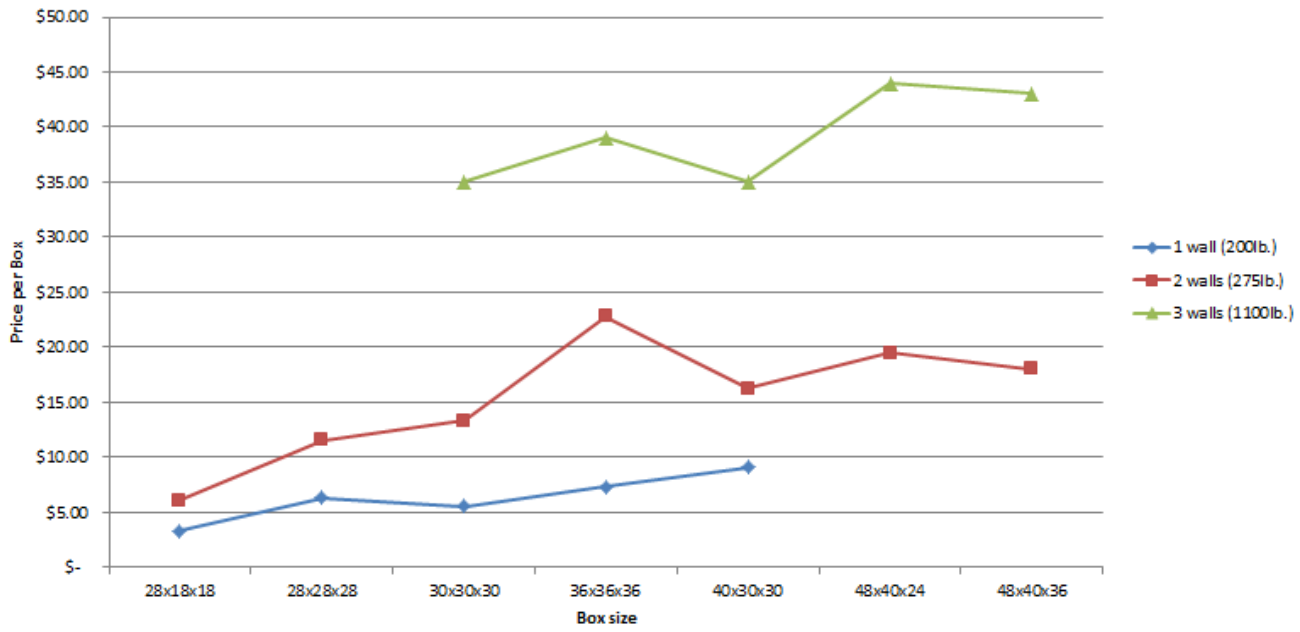


Figure 2 "Comparison of prices of different boxes"

5.6 Returnable Packaging

Returnable packaging comes with a lot of benefits for both sides. Aside from the large investments upfront, it will help save a lot of packaging cost in the long term and helps to reduce the environmental footprint. However, returnable packaging is not eligible if third party carriers like UPS, FedEx, etc. are used. If a SUPPLIER foresees an opportunity to utilize returnable packaging, DEUTZ will try to offer its support and will cooperate with the SUPPLIER as needed. Feel free to contact our Packaging Specialist to discuss the possibilities of returnable packaging with us.

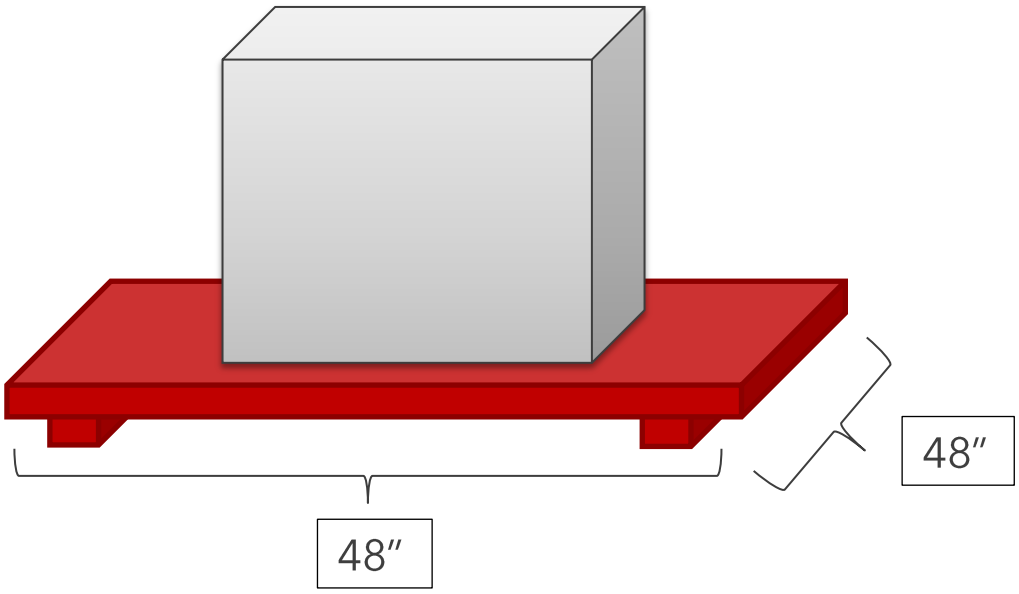
5.7 Wooden Material

Since September 16, 2015 ISPM 15 specifies that all wooden material imported to the US is subject to regulation. Material that does not comply will be rejected. It is the supplier's responsibility to ensure all wood packaging material (from the pallet to wood dunnage, etc.) is ISPM-15 compliant. ISPM-15 requires all wood material used for packaging to be debarked and then heat treated or fumigated with methyl bromide and stamped or branded with a mark of compliance. For more information visit www.ippc.com. If a SUPPLIER fails to comply with these ISPM-15 rules, they are responsible for any costs and fines incurred by DEUTZ.

Figure 3 "IPPC ISMP-15 stamp on a pallet"

5.8 Pallets

Due to limited capacity in the racks of our warehouse, it is imperative to use pallets that are within our size limitation. Pallets that exceed these limitations cause a serious safety issue at upper rack levels. Our limitations (including dimensions of pallet and goods) are:



Only use pallets in good condition, meaning they should not have any broken or missing wood beams or large cracks. Furthermore make sure to only use strong pallets that can be stacked to a stack of 4 (including loads).

5.9 Shipping Quantities

One of our main goals is to sync the quantities needed in our work processes with the shipped quantities. Quantities that are not the same as our needs at the Supermarket or at the production line can result in extensive workload for repackaging. Before planning the package, make sure that the provided quantities are the exact quantities by DEUTZ. It is also imperative to always use the same shipping quantity. Packages that come with discrepancies, *e.g.* packages that are sometimes with 4 parts and sometimes shipped with 6 parts included, will no longer be accepted.

5.10 Cleanliness

The majority of parts received by DEUTZ are repackaged into returnable containers, so the cleanliness of shipped goods plays a vital role in the DEUTZ logistics processes. Remove dust and dirt as much as possible from your goods and packages before shipping them to DEUTZ. If the parts come lubricated or contaminated with any other liquids, make sure to shrink-wrap them before shipping. If parts are cleaned with water, please make sure to fully dry the parts before packaging. Corrosion can cause major quality problems and is easy to prevent. See DTS 147 for more information about part cleanliness at DEUTZ and the Appendix at the end of this manual for corrosion prevention.

Due to repackaging in containers that might not provide the necessary cleanliness, parts with cleanliness requirements (e.g. Turbo hoses) have to be wrapped separately in order to provide cleanliness until assembly.

6. Best practice

The following pictures give examples of what DEUTZ considers the best practices for packaging. It is not necessary to use the exact packaging methods shown, however, please consider these methods when choosing your own packaging.

- Instead of shipping equal parts in separate boxes, try to ship them in one single box and if possible in a reusable container. This saves money, space, time and reduces the amount of waste.

- Half slotted containers with a removable lid that is not taped or strapped are preferred when shipping high quantities.

- Shipping with an external carrier does not guarantee that a shipment will not be stacked. Instead, use stackable packaging material.

- If heavy parts are shipped, make sure to use strong cardboard with three layers of corrugated cardboard. Edge enforcement and straps may be allowed for shipping, however the box must be strong enough for warehouse handling without these enforcements.

- Broken or weak pallets must not be used for shipment. Make sure to always use pallets that are in a good condition. This means they do not have any visible cracks, missing nails or any other deterioration.

7. Appendix - Notes on Corrosion Protection

7.1. Issues with corrosion

Time and again, corrosion on components leads to complaints and difficulties, particularly during the months from October to May, which are typically more corrosive in nature. The reasons for corrosion are discussed in detail, analyzed and the causal agent is sought depending on the individual case. Additionally, recurrent errors in the handling of the components and corrosion protection are explained and recorded. 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 unclear 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, *i. e.* 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.

7.2. Causes and formation of corrosion

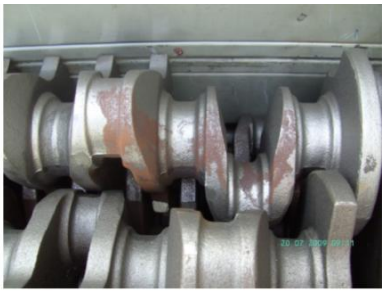
Corrosion according to DIN EN ISO 8044 is defined as follows: "Corrosion is the interaction between a metal and its environment which results in changes in the properties of the metal and which may often lead to impairment of the function of the metal, the environment, or the technical system of which 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. Most importantly, corrosion changes the chemical and physical structure of the metal.

7.3. Types of corrosion

Types of frequently occurring corrosion:

Overall corrosion / general rust "flash rust"





The surfaces are discolored 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 the surface has been "eaten", and are usually irreparable, however stress corrosion cracking, crystalline corrosion, crevice corrosion, and contact corrosion have not yet been determined as a damaging characteristic in the area of transport and packing.

7.4. 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):

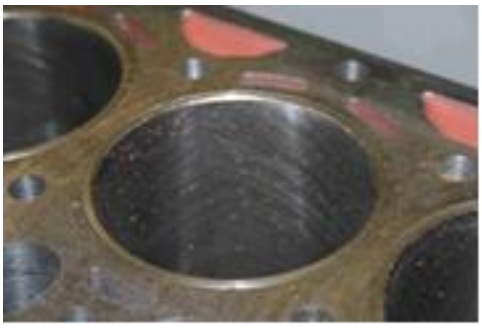
The components were exposed to the weather without protection before and/or during shipping. The short-term preservation was consequently washed off and massive corrosion resulted in a short time due to air and moisture.
Cause: Effects of the weather

Measures: Dry, protected storage and transport

Condensation (climate)

The component was 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: In 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 area, additional packaging material, *e.g.* film.

7.5 Corrosion Protection Measures

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. Galvanization (*e.g.* chrome plating, nickel plating, zinc plating, chromating) and painting (*e.g.* priming, rust protection coat, paint coat, stove enamel, finishing oil, blackening) are examples of ways to treat metallic surfaces to help prevent corrosion.

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 against corrosion from ambient influences (air humidity and the harmful materials it contains) for several weeks. The prerequisite for an ideal environment 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 under 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 utilized 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 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 chemical 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 bag ("Silica Gel")

Such agents are not corrosion protection but only serve to absorb the air humidity in a package for a limited period of time. Many desiccant bags are produced on a mineral salt basis and can promote corrosion when stored or transported for longer periods. Desiccant bags whose filling is made from alumina are safe, but only for absorbing air humidity.
Release for application: Only as additive in packing instructions.

Dry preservation with VCI paper or VCI film

VCIs 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 volatilizes 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.

Dry conservation 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 many years when stored in the open air. The effect of Intercept does not volatilize when opening or closing the package. 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 (Comptrade / 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.

8. FAQ

1. **We are currently planning the packaging. Who is our counterpart at DEUTZ if we have any questions?**
    - If you have any questions regarding your packaging, feel free to contact our DEUTZ Packaging Specialist Daniell Lee. Contact info provided below.

2. **We already shipped goods to DEUTZ and my packaging has not been reviewed by DEUTZ yet. Do we have to make a packaging proposal for the existing packages as well?**
    - No, every part that has been shipped to DEUTZ before this manual was published, does not require a packaging proposal. However, DEUTZ can ask you to change your packaging if it does not fulfill our requirements.

3. **From this point forward, do we have to use the exact template for our packing slips for DEUTZ?**
    - No. The DEUTZ packing slip template only shows you the information that we need and that has to be on the packing slip. Layout and apperance can differ from the template.

4. **Do we have to use the exact DEUTZ label that is provided with this manual?**
    - Only if you use the same label size and also use BarTender as your labeling software. Otherwise please provide at least the shown information on your label.

9. Addresses and Contacts

DEUTZ Corporation Warehouse Norcross
3883 Steve Reynolds Blvd.
Norcross, Georgia 30093
United States of America

DEUTZ Corporation Production Site Pendergrass
1409 Valentine Industrial Parkway
Pendergrass, Georgia 30567
United States of America

DEUTZ Packaging Specialist
Daniell Lee
lee.d@deutzusa.com
Tel. (404)-314 3991

10. Imprint

Published by
DEUTZ Corporation
3883 Steve Reynolds Blvd
Norcross, Georgia 30093
www.deutzamericas.com

11. Forms & Attachments

DEUTZ provides several forms and informational sheets that are all essential to be reviewed by you before first shipment.

Form No.	*Description*	*Page*
DPF001	Packing slip template	25
DPF002	Packaging suggestion form	seperately
DPF003	Package Quantity Request	seperately
DTS147	Cleanliness, Packaging and Preservation	seperately

12. Literature Recommendations

- **CTU Code**
  - International standards for packaging
  - Available at: unece.org/fileadmin/DAM/trans/doc/2014/wp24/CTU_Code_January_2014.pdf
- **ISPM15 for wood materials**
  - Mandatory standards for any wooden packaging or pallet in case of exports of goods
  - Available at: ispm15.com/ISPM15_Revised_2009.pdf
- **UPS Packaging Guidelines**
  - Not only for SUPPLIERS that use UPS as a carrier, but also for every other SUPPLIER
  - Available at: ups.com/content/us/en/resources/ship/packaging/guidelines.html
- **ASTM Packaging Standards**
  - ASTM's paper and packaging standards are instrumental in the evaluation and testing of the physical, mechanical, and chemical properties of various pulp, paper, and paperboard materials that are processed primarily to make containers, shipping boxes and parcels, and other packaging and labeling products.
  - Available at: https://www.astm.org/Standards/paper-and-packaging-standards.html

Vendor Logo

PACKING SLIP

Number: **Date:**

TO:

DEUTZ Corporation
3883 Steve Reynolds Boulevard
Norcross, GA 30093

Contact:

Phone: (555) 123 -4567
Fax: (555) 123 -4567

SHIP TO:

Invoices
DEUTZ Corporation
3883 Steve Reynolds Boulevard
Norcross, GA 30093

Contact:

Phone: (555) 123 -4567
Fax: (555) 123 -4567

FROM:

XYZ Corporation
1234 Customstreet
Customville, GA, 30123
United States of America

Contact:

Phone: (555) 123 -4567
Fax: (555) 123 -4567

PO-Number	*Release Number*	*Bill of Lading*
1234567	1234567	1234567

DEUTZ Partnr.	*Customer Partnr.*	*Description*	*Shipped Quantity*
33001234	11001234	Part XYZ	123
33005678	11001234	Part XYZ	123

Leave blank for DEUTZ

Stamp:

Inbound Delivery Nr:

MIGO: