Guidelines for Packing
ABB AG – Electrification Distribution Solutions
Medium Voltage Products
Guidelines for Packing

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1 Introduction
Guidelines for Packing

1 Introduction

This packing guidance shall give you an overview over the various possibilities of packing of our products.

The packing guideline explains ABB general terms which will be considered for the packing.

The packing complies with regular packing-standards and is based on HPE.

Packing appropriate to the type of duty will be chosen according to the latest technologies and the best quality of packaging means.

The packing method considered the various demands depending on the type and the way of transport defines the choice of the packing method.
Guidelines for Packing

1 Introduction

A safe and easy handling with current ground conveyors or kind of loading is given by adequate construction characteristics of the packing.

Weights and dimensions comply with the valid freight standards.

The packages will be marked according to international regulations / instructions and customers request.

The type of packing is fundamentally determined through:

- Dimensions, weight, centre of gravity
- Sensibility
- Base surface area
- Kind of transport and storage period
- Intended transit method and storage requirements
Guidelines for Packing

1 Introduction

To increase the health and safety at work, all wooden components are screwed together and not nailed at the Ratingen plant.

- Screwing the timber beams with the base of crate or pallet for securing the goods against slipping for all types of transport trucks / air and sea freight
- Screwing the timber beams with the box sides to secure the goods against slipping and jumping
- Screwing square timber under cover to guarantee the possibility of stacking
- Screwing the sides and cover
- Screwing of squared timber for blocking and wedging the goods in case of container stuffing for a safe transport

Used screws depending on type of application and requirements

- Screw partial thread, ribs under head, zinc plated DIN EN 14592:2008
  TORX-head TX30 length 60 up to 140 mm
- BIT-TX30-1/4ZO-L25MM
2 Standards and regulations
Guidelines for Packing

2 Standards and regulations

The type of packing is based on the following rules and standards:

HPE (Organisation for wood packing, pallets and export packing)

DIN EN ISO 9001 quality management

Dangerous goods regulations for

- Air freight (IATA)
- Sea freight (IMDG, GGV See)
- Truck (GGVS/ KVO/ ADR)
- Train (GGVE/ EVO/ RID)

Regulations for wood packing of the IPPC (ISPM 15)
3 Packaging specifications
Guidelines for Packing

3 Packaging specifications

- Gas-insulated switchgear type ZX
- I₃-Limiter panel
- Vacuum circuit-breaker
- Embedded Poles
- Vacuum interrupters
- Components
- Ring Main Unit (RMU)
Guidelines for Packing

3.1 Gas-insulated switchgears type ZX / I₅-Limiter panel

3.1.1 Unpacked switch gears for truck transport (without reloading) - suitable for domestic transport only

Does not apply for ZX0 switchgears.

Dimensions
• Variable depending on the size of the panel

Type of packing
• Unpacked, without dust protection
• Unpacked, optional with PE foil for dust protection

Unloading
• Only by crane

Storage
• Outdoor-storage not possible
3.1 Gas-insulated switchgears type ZX / I₅-Limiter panel

3.1.2 Pallet for direct truck transport (without reloading) - suitable for domestic transport only

Dimensions
• Variable depending on the size of the panel

Typ of packing
• Pallet type 4-way entry, Floor 24 mm
• Alternative in case of high weights 8 x 10 vats, number of vats depending on the width, floor 24 mm
• Securing of the panels on the pallet with longitudinal and cross timbers against slipping in all direction
• Fastening with textile strap

Unloading:
• By crane, forklift or pallet truck (depending on the package)

Storage:
• Outdoor-storage not possible
• No dust protection
Guidelines for Packing

3.1 Gas-insulated switchgears type ZX / I₅-Limiter panel

3.1.3 Pallet for direct truck transport (without reloading) – with Poly protective cover
with poly protection cover suitable for domestic transport only

Type of packing as described under 3.1.2

Variation
• Optional the panels can be provided with a poly protection cover
to prevent as dust protection

Unloading
• By crane, forklift or pallet truck (depending on the package)

Storage
• Outdoor-storage not possible
Guidelines for Packing

3.1 Gas-insulated switchgears type ZX / I₅-Limiter panel

3.1.4 Pallet protect with paperboard for the direct truck transport (without reloading) - within Europe

Dimensions
- Variable depending on the size of the panel

Type of packing
- Single or double packing (see paragraph 3.1.8)
- Pallet type 4-way entry, Floor 24 mm
- Alternative in case of high weights 8 x 10 vats, number of vats depending on the width, floor 24 mm
- Securing of the panels on the pallet with longitudinal and cross timbers against slipping in all direction
- Poly protection cover to prevent as dust protection
- Additional physical protection with cardboard
- Fastening with textile strap

Unloading and storage
- By forklift or pallet truck (depending on the package)
- Outdoor-storage not possible
Guidelines for Packing

3.1 Gas-insulated switchgears type ZX / I₅-Limiter panel

3.1.2 / 3.1.3 / 3.1.4 Pallet without preservation for transport by truck - packaging structure

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<td>Fastening with textile strap 1 or 2 depending on the weight</td>
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3.1 Gas-insulated switchgears type ZX / I₅-LIMITER panel

3.1.5 Pallet covered with paperboard for the sea transport in containers belonging to the shipping company (20’ und 40’ box containers and 40’ high cube containers, only FCL / FCL deliveries possible)

Dimensions
• Variable depending on the size of the panel

Type of packing
• Single or double packing (see paragraph 3.1.8)
• Pallet type 4-way entry, Floor 24 mm
• Alternative in case of high weights 8 x 10 vats, number of vats depending on the width, floor 24 mm
• Securing of the panels on the pallet with longitudinal and cross timbers against slipping in all direction
• Standard preservation in aluminium foil for a transport and storage time of 12 month from the date of packing. Extension of the preservation time to 18 - 24 month possible
• Additional physical protection with cardboard
• Fastening with textile strap

Unloading and storage
• By forklift or pallet truck (depending on the package)
• Outdoor-storage not possible
Guidelines for Packing

3.1 Gas-insulated switchgears type ZX / I₅-Limiter panel

3.1.5 Pallet covered with cardboard for the sea transport in containers - packaging structure

- Panel placed on pallet
- Desiccant placed
- Aluminium and foam foil placed on pallet
- Foam foil on top of the panel
- Securing of the panels on pallet with timbers against slipping in all direction
- Panel welded in aluminium foil as preservation for corrosion
- Panel covered with cardboard for the sea transport in containers
- Fastening with textile strap 1 or 2 depending on the weight
- Additional physical protection with cardboard
- Installation of indicators and basic marks
Guidelines for Packing

3.1 Gas-insulated switchgears type ZX / $I_5$-Limiter panel

3.1.6 Sea freight in a shipper’s own container (new or second-hand) with CSC tag
(20’ und 40’ box containers and 40’ high cube containers)

- Suitable for outside storage
- Under-roof storage recommended
- Storage: Same as for cases for conventional sea freight

Packages as described under 3.1.5
- Under the consideration that packages remain in the bought container boxes outside storage is possible in accordance with agreed preservation time.
Guidelines for Packing

3.1 Gas-insulated switchgears type ZX / I₅-Limiter panel

3.1.7 Case for the conventional sea freight - optional can be stacked up to 1,000 kg / top cover surface

Dimensions
- Variable depending on the size of the panel

Type of packing
- Single or double packing (see paragraph 3.1.8)
- Longitudinal and cross timbers, bottom 24 mm
- Plywood DW100 water-resistant
- Cover lumbers
- Fastening with longitudinal and cross timbers
- The interior fitting is strengthened by pillars and longitudinal (stacking pressure)
- Preservation in aluminium foil for a transport and storage time of 12 month from the date of packing
- Extension of the preservation time to 18 - 24 month possible

Unloading and storage
- By crane or forklift
- Outdoor-storage possible
- Under-roof storage recommended
Guidelines for Packing

3.1 Gas-insulated switchgears type ZX / I₅-Limiter panel

3.1.7 Case for the conventional sea freight - packaging structure

- Panel placed on pallet
- Desiccant placed
- Foam foil and aluminium placed on pallet
- Securing of the panels on pallet with timbers against slipping in all directions
- Side panels of plywood screwed
- Panel welded in aluminium foil as preservation for corrosion and covered with foam foil
- Mounting fixing timber
- Fixing timber screwed
- Optional: Timber under the lid screwed
Guidelines for Packing

3.1 Gas-insulated switchgears type ZX / I₅-Limiter panel

3.1.7 Case for the conventional sea freight - special option solid wooden case (standard for Australia)

- Desicant placed
- Panel placed on pallet
- Foam foil and aluminium placed on pallet
- Foam foil on top of the panel
- Securing of the panels on pallet with timbers against slipping in all direction
- Side panels of plywood screwed
- Mounting fixing timber
- Panel welded in aluminium foil as preservation for corrosion and covered with foam foil
- Solid wooden case

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Guidelines for Packing

3.1 Gas-insulated switchgears type ZX / I₅-Limiter panel

3.1.8 Case for the conventional sea freight - Single- or Double panel packing

I. Single panel packing
gross weight up to approx. 2.5 tons

II. Double panel packing
gross weight up to approx. 4.5 tons
3.1.8 Double panel packing

Gross weight up to approx. 4.5 tons

- The standard packing price is calculated for the single packing.
- ABB will use double panel packing only after customers approval.

The double panel packing provides the following advantages
- Saving potential in packing costs which will be granted to the customer.
- Increase of the stability in the packaging unit.
Guidelines for Packing

3.1 Gas-insulated switchgears type ZX

3.1.9 Case with cardboard for transport by airfreight

Dimensions
• Variable depending on the size of the panel

Type of packing
• Single panel packing
• Cardboard 2-waves with wooden boards for reinforcing
• Pallet type 4-way entry, Floor 24mm
• Securing of the panels on the pallet with longitudinal and cross timbers against slipping in all direction and fastening with textile strap
• Standard preservation in aluminium foil for a transport and storage time of 12 month from the date of packing. Extension of the preservation time to 18 - 24 month possible

Unloading and storage
• By forklift or pallet truck (depending on the package)
• Outdoor-storage not possible
• Not stackable
Guidelines for Packing

3 Packaging specifications

- Gas-insulated switchgear type ZX
- Iₚ-Limiter panel
- Vacuum circuit-breaker
- Embedded Poles
- Vacuum interrupters
- Components
- Ring Main Unit (RMU)
Guidelines for Packing

3.2 Vacuum circuit-breakers

3.2.1 Euro-pallet for the domestic truck transport

Dimensions
- 120 x 80 cm (Euro dimension) or
- 120 x 100 cm
- Height variable depending on type of vacuum circuit-breaker

Type of packing
- Fastening with textile strap and frames against slipping
- Provided with a poly protection cover to protect against dirt (dust protection)
- Alternatively, additional protection with pallet collars

Unloading
- By forklift or pallet truck (depending on the package)

Storage
- Outdoor-storage not possible
- Not stackable
Guidelines for Packing
3.2 Vacuum circuit-breakers

3.2.2 Carton on Euro-pallet for air and truck transport (Europe)

Dimensions
- 120 x 80 cm (Euro dimension) or
- 120 x 100 cm
- Height variable depending on type of vacuum circuit-breaker

Type of packing
- Fastening with textile strap and frames against slipping
- Alternatively, additional protection with pallet collars

Content
- 1 - 4 vacuum circuit-breakers depending on type of breaker

Unloading
- By forklift or pallet truck (depending on the package)

Storage
- Outdoor-storage not possible
- Not stackable
3.2 Vacuum circuit-breakers

3.2.3 Carton on Euro-pallet for air and truck transport (Europe), optional stackable

- To enable the stacking of the packages, the boxes will be strengthened with longitudinal and angle woods
- The pallets can be stacked twice one upon the other
Guidelines for Packing

3.2 Vacuum circuit-breakers

3.2.4 Case for transport in containers, for FCL and LCL deliveries, stackable up to 1,000 kg / top cover surface

Dimensions
- Variable, optimized for a beneficial container load

Type of packing
- Plywood DW100 water-resistant, longitudinal and cross timbers, cover lumbers
- Inside of the case the circuit-breaker will be fixed on the bottom. The circuit-breaker will be stuffed against each other. Compression woods prevent from lengthwise movements.
- Standard preservation in aluminium foil for a transport and storage time of 12 month from date of packing
- Extension of the preservation time to 18 - 24 month possible

Content
- 1 - 8 circuit-breakers depending on the type of breaker

Unloading
- By forklift or crane

Storage
- Outdoor-storage possible
- Under-roof storage recommended
Guidelines for Packing

3 Packaging specifications

- Gas-insulated switchgear type ZX
- $I_s$-Limiter panel
- Vacuum circuit-breaker
- Embedded Poles
- Vacuum interrupters
- Components
- Ring Main Unit (RMU)
Guidelines for Packing

3.3 Embedded Poles (Indoor)

3.3.1 Reusable case for air, truck and sea transport in containers, for FCL and LCL deliveries, stackable up to 1,000 kg / top cover surface

Dimensions
- 120 x 80 x 64 cm
- 120 x 80 x 89 cm
- 151 x 83 x 102 cm

Type of packing
- Case 6 mm plywood, full non-wood type
- Packing of the poles with special ethafoam inserts (upper and base parts)
- Preservation for overseas transport in aluminium foil for a transport and storage time of 6 month from date of packing

Loading and unloading
- By forklift or pallet truck (depending on the package)

Storage
- Under-roof storage
Guidelines for Packing

3.3 Embedded Poles (Outdoor)

3.4.1 Reusable case for air, truck and sea transport in containers, for FCL and LCL deliveries, stackable up to 1,000 kg / top cover surface

Dimensions
- 151 x 83 x 102 cm

Type of packing
- Packing of the OP-poles with special ethafoam inserts (upper and base parts)
- Locking with a special plywood cover for protection against slipping (prefabricated pattern)

Loading and unloading
- By forklift or pallet truck (depending on the package)

Storage
- Outdoor-storage possible
- Under-roof storage recommended
Guidelines for Packing

3 Packaging specifications

- Gas-insulated switchgear type ZX
- I₃-Limiter panel
- Vacuum circuit-breaker
- Embedded Poles
- Vacuum interrupters
- Components
- Ring Main Unit (RMU)
Guidelines for Packing

3.5 Vacuum interrupters

3.5.1 Reusable case for air, truck and sea transport in containers, for FCL and LCL deliveries, stackable up to 1,000 kg / top cover surface

Dimensions
- 120 x 80 x 89 cm

Type of packing
- Case 6 mm plywood, full non-wood type
- Packing of the vacuum interrupters with special ethafoam inserts
- Separate shrinking of the chambers with dryers
- Preservation for overseas transport in aluminium foil for a transport and storage time of 6 month from date of packing

Loading and unloading
- By forklift or pallet truck (depending on the package)

Storage
- Under-roof storage
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3 Packaging specifications

- Gas-insulated switchgear type ZX
- I₃-Limiter panel
- Vacuum circuit-breaker
- Embedded Poles
- Vacuum interrupters
- Components
- Ring Main Unit (RMU)
Guidelines for Packing

3.6 Components

3.6.1 Carton on pallet for air and truck transport, not stackable

Dimensions
- 120 x 80 cm (Euro dimension) or
- 120 x 100 cm

Type of packing
- Small parts will be packed additionally in cartons
- If necessary, the components will be protected with stacking bags, airbags, bubble wrap, polystyrene, foam-pack or paper stuffing
- Alternatively, additional protection with pallet collars

Content
- Components

Loading and unloading
- By forklift or pallet truck (depending on the package)

Storage
- Outdoor-storage not possible
Guidelines for Packing

3.6 Components

3.6.2 Carton on Euro-pallet for air and truck transport (Europe), optional stackable

- To enable the stacking of the packages, the boxes will be strengthened with longitudinal and angle woods
- The pallets can be stacked twice one upon the other
Guidelines for Packing

3.6 Components

3.6.3 Case for transport in containers, for FCL and LCL deliveries, stackable up to 1,000 kg / top cover surface

Dimensions
- Variable
- Optimized for a beneficial container load

Type of packing
- **Plywood** DW100 water-resistant, longitudinal and cross timbers, cover lumbers
- If necessary the components will be protected with stacking bags, airbags, bubble wrap, polystyrene, foam-pack or paper stuffing
- If applicable a pre-packing of the components in cardboard boxes occurs
- Preservation in aluminium foil for a transport and storage time of 12 month from date of packing
- Extension of the preservation time to 18 - 24 month possible

Loading and unloading
- By forklift or crane

Storage
- Outdoor-storage possible
- Under-roof storage recommended
Guidelines for Packing

3.6 Components

3.6.3 Case for accessories standard measurements - packaging structure

Every part labelled with
- Order-no.
- Position
- Quantity
- Material number
- Material description
- Delivery note number

Heavy or bulky materials (e.g. floor frames, metal sheets) are packed on the floor and protected with cardboard and foam foil.

Sensitive materials are additional packed in foam foil and separated from other materials by cardboard (e.g. lacquered materials).
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3.6 Components

3.6.3 Case for accessories standard measurements - packaging structure

- Protect with foam foil
  - Adding desiccant
  - Welding in aluminum foil

Standard measurements
- 1770 mm x 1440 mm x 900 mm
- 1770 mm x 1440 mm x 650 mm

Packing list at the front under a cover
Guidelines for Packing

3.6 Components

3.6.3 Case for accessories individual measurements - packaging structure

Heavy or bulky materials (e.g. floor frames, endcover, transformer) are packed on the floor and protected with cardboard and foam foil.

Protect with foam foil adding desiccant welding in aluminum foil.
Guidelines for Packing

3.6 Components

3.6.3 Case for accessories individual measurements - packaging structure

Sensitive materials are additional packed in foam foil and separated from other materials by cardboard (e.g. lacquered materials)

Securing and fixing with timber and textile strap. Timber under the lid for stacking
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### 3.6 Components

#### 3.6.3 Pre-packing of sensibler components / $I_s$-Limiter inserts - packaging structure

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<td>Prepackaging in special carton box</td>
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<td>Foam molding Top</td>
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<td>Insert UFES in molded part and secure with counterpart</td>
<td>Ethafoam on the top</td>
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<tr>
<td>Closing the box</td>
<td>Closing the box</td>
<td>Closing the box</td>
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3 3 Packaging specifications

- Gas-insulated switchgear type ZX
- $I_s$-Limiter panel
- Vacuum circuit-breaker
- Embedded Poles
- Vacuum interrupters
- Components
- Ring Main Unit (RMU)
Guidelines for Packing

3.7 Ring Main Unit (RMU)

3.7.1 Pallet for direct truck transport (without reloading) - with VCI-cover

Dimensions
- Variable depending on the size of the panel-unit

Type of packing
- Single panel-unit packing
- 4-way pallet, handling with forklift or pallet truck
- RMU screwed to the pallet
- Standard preservation with VCI-cover and 1 bag of desicant

Unloading and storage
- By forklift or pallet truck (depending on the package)
- Outdoor-storage not possible
- Not stackable
4 Securing of packages in containers
Guidelines for Packing

4 Securing of packages in containers

The packages will be secured in the container with timbers on the bottom against slipping in lengthwise and crosswise direction and on the sides with special stuffing bags and textile strap.
5 Securing of packages on trucks
Guidelines for Packing

5 Securing of packages on the truck

The tie-down will be made as follows

1. Tension belts against upright movements
   - number of belts depends on the width of the package, preferably 1 belt per package

2. Rubber under the pallets against horizontal movements

3. Stuffing bags for cushioning against each other, if necessary

4. Edge protection for the tie-down with tension belts, if necessary (e.g. RMU)
6 Unload instructions
Guidelines for Packing

6 Unload instructions

Principles of unloading by using forklift and pallet truck

1. Check before unloading, if the using forklift truck is suitable
   • Enough load capacity of the using forklift truck
   • The forklift truck has to be maintained regularly and inspected for deficiencies
   • The proper conditions of the tyre are important to ensure an evenly transportation
2. Requirement unloading staff
   • Only competent and trained staff is allowed to do the unloading
   • The driver must have the legal driving age, be in a good constitution and spiritual condition and a written commission
   • The driver must have an unobstructed view and if necessary a second person has to give instructions
   • When driving the stability of the truck has to be guaranteed
   • Driving with appropriate speed, no turning and driving angular on incline routes, transport the weights on the forks in a low rise position, observe the underground of the lane
3. The length of the forks has to be min. 70% of the length of the package which should be unloaded
4. If the package is shifted or damaged this has to be documented by photo before unloading
   Later registration of complaint of transport damage are unaccepted
Guidelines for Packing

6 Unload instructions

Principles of unloading by using forklift and pallet truck

1. Drive under the package as far as possible and distribute the weight evenly on the forks; if necessary pick up the package again
2. The centre of gravity has to be centrally arranged to the vehicle
   If the centre of gravity is not in the middle of the package it will be marked on the package
3. Only lift the weights immediately before the unloading while standing and braked trailer
4. Immediately upon leaving the load area the packaging has to be lower
   If the weight is rise on the fork lifter you are not allowed to leave the fork lifter
   The stay under and directly besides the lifted package is prohibited
5. The same evenly distribution of the weight and the centre of gravity are also to observe by using lifting cart (electrical/ manually)
Guidelines for Packing

6 Unload instructions

Principles of unloading by crane

For unloading the panels by crane, there are windows for lashing points into the cardboard. It is absolutely necessary to use only the pre-assembled lashing points as well as the cable run correctly by a four-strand chain.
7 Examples of markings
Guidelines for Packing

7 Examples of markings
8 Packaging options
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8 Packaging options

1. U-iron - underneath
   - Used for heavy cases

2. Steel angles - above
   - Used for high and / or heavy cases
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8 Packaging options

3. Additional coverfoil - outside
   - For better protection against moisture

4. IPPC Standard ISPM 15
   - Special heat treated wood
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8 Packaging options

5. Tilting indicator
6. Shock indicator
7. Ethafoam bottom
   - For shock absorption (high protection)
9 Advantages and disadvantages of the packing types
### Guidelines for Packing

9 Advantages and disadvantages of packing types

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<th>Advantages</th>
<th>Disadvantages</th>
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<td>• Less expensive</td>
<td>• Low protection against manual and corrosion damages</td>
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<tr>
<td></td>
<td>• Reduces packing time</td>
<td>• Transport and loading have to be done carefully, expenditure of time</td>
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<td>Packing in cases (non-returnable)</td>
<td>• Safe protection</td>
<td>• More expensive</td>
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<tr>
<td></td>
<td>• Easy handling for the haulier</td>
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<tr>
<td></td>
<td>• Outdoor-storage possible</td>
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<td></td>
<td>• Stackable</td>
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<td>• Optimal capacity utilization for truck and container under consideration of dimensions</td>
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<td>Packing in cases (returnable)</td>
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<td>• Logistical expense through returning of cases</td>
</tr>
<tr>
<td></td>
<td>• Easy handling for the haulier</td>
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<td></td>
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<td>• Economical and ecological</td>
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<tr>
<td>Container packing</td>
<td>• Safe protection against mechanical damages</td>
<td>• No outdoor-storage possible with containers of the shipping company, as they have to be returned after unloading immediately.</td>
</tr>
<tr>
<td></td>
<td>• Less expensive</td>
<td>• Alternatively shipper’s own containers (second-hand or new) could be bought, in which the packages could remain according to their preservation, to allow an outdoor-storage for this packaging type.</td>
</tr>
</tbody>
</table>