STANDARDIZED PACKAGING OF WHEELS FOR PASSENGER CARS AND TRUCKS

ES 4.05

SPECIFICATIONS CONCERNANT LE SISTEME STANDARD DE PALETTES POUR ROUES DE VEHICULES TOURISME ET DE POIDS LOURDS

PFLICHTENHEFT FÜR EIN LADUNGSTRÄGERSYSTEM ZUR EINHEITLICHEN VERPACKUNG VON PKW- AND LKW-SCHEIBENRÄDERN

➔ ***General introductory note***

Presently this paper shows the revised text version of the EUWA norm ES-4-05 – that replaces the previous issue 'October 1997' - but still with the old drawings, since the new ones are under preparation. In any case, the drawing documents may be required contacting the Chairman of the EUWA Logistic Commission Mr. Uwe Teuchert (see address below)

EUROPEAN WHEEL PALLET SYSTEM (EWPS)

This recommendation was prepared with the intention of creating a standardized system of carriers each comprising a base pallet, top frame and intermediate tiers for use by all European automobile and wheel manufacturers in order to transport passenger-car and truck wheels made of steel or light alloy.

Essential technical aspects became apparent as part of co-operation between the Logistic Commission of the European Wheel Association (EUWA) and the VDA's ad hoc Work Group for Wheel Pallets

Although the base pallets, top frames and intermediate tiers described in previous 1997 editions of ES-4.05 can continue to be used, they no longer form part of this edition.

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Main changes compared to the last issue:

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1 INTRODUCTION

The EUWA standard ES-4.05, corresponding to the VDA Recommendation 4503, is applicable to passenger-car wheels sized from 13" to 20", as well as drop-centre wheels sized 17.5", 19.5", 22.5" and tapered-bead-seat wheels sized 20" for trucks.

This recommendation is intended to specify functions and requirements for the related wheel carriers. System elements are to be developed, designed and constructed by the respective manufacturers in compliance with relevant safety standards and regulations.

EWPS elements employed prior to the issue of the current recommendation (for example, pilot series) remain compatible with it even if deviating in terms of certain details.

The manufacture of system elements (base pallets, top frames and plastic intermediate tiers) according to this recommendation is to be governed by a certification procedure qualified by the VDA. Extraneous components without an EWPS label or approval number cannot be incorporated into the EWPS delivery cycle.

Note: All dimensions are stated in millimetres, unless specified otherwise.

2 OBJECTIVES

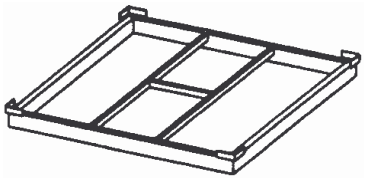
The general aim of EWPS development is to specify standard dimensions and configurations in order to reduce the diversity of currently available packaging and optimize logistical processes for manufacturers and customers. Optimization is achieved through:

- standardized components, European-wide pooling
- low system costs, low product-cost proportions
- high degree of protection against product damage
- long service life
- maximum utilization of freight area, freight capacity and empties
- low intrinsic volume, low weight
- ergonomic design, also with a view to manual handling
- standard interfaces for continuous automation in manufacture and handling
- low recycling and down-cycling costs
- easy reparability

3 SYSTEM ELEMENTS

Loading units for transport and storage in EWPS comprise a
- base pallet
- intermediate tiers configured according to wheel size
- top frame

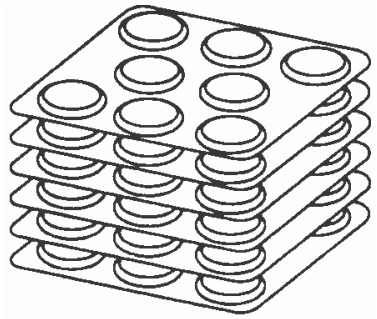
Top frame



- Dimensions identical to those of steel base pallets

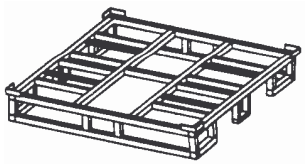
- Serving as a cover, stacking aid and for securing the central wheels against twisting. To be used as required.

Intermediate tiers



- Dimensions identical to those of base pallets
- Serving as load-bearing and securing elements in a loading unit
- Deep-drawn PE-sheets 2.5-3.5 mm thick; soft underside for LM wheels, + 0.7 mm
- Individual configuration in accordance with wheel diameter

Steel base pallet



Rated dimensions:

1200 x 1100 (size 1) for 13" and 14" passenger-car wheels

1360 x 1145 (size 2) for 15" - 20" passenger-car wheels

1210 x 1210 (size 3) for 17.5", 19.5" and 22.5" drop-centre wheels and 20" tapered-bead-seat wheels on trucks

4 HANDLING

EWPS elements are designed ergonomically and can be handled easily by hand (lightweight).

All elements can be handled mechanically / automatically by means of simple gripper systems.

The pallets, intermediate tiers and top frames are designed so as to permit a formation of self-securing loading units whose height can be adjusted in accordance with the effective height of the employed transport receptacle (truck, wagon, container). In accordance with the stresses expected to arise during transport, the loading units are secured by means of appropriate elements (harnessing bands, foils etc.).

Packaged units have a maximum permissible stacking height of 5 m.

5 IDENTIFICATION, DIFFERENTIATION BY COLOUR

5.1 Type designations

Type designations for EWPS elements are explained in Appendix 1 and furnished as follows:

- Indicated on the type plate of base pallets and top frames
- Indicated in grey (RAL 7032) on painted / surface-finished metallic components
- Imprinted on intermediate tiers

5.2 Identification aids

To facilitate identification, intermediate tiers are furnished with coloured, extruded strips (PE-HD) with a minimum width of 100 mm.

- Quality and design must comply with the specifications in Appendix 6.

Wheel diameter / wheels per tier	Steel wheels Basic colour: Anthracite, like RAL7016 * new 22.5" basic grey colour like RAL 7032	Light-alloy wheels Basic colour, top: Anthracite, like RAL 7016 Basic colour, bottom: Black
...	**Strip colour, top, lateral**	**Strip colour, top, central**
13” / 9	Blue like RAL 5015	Blue like RAL 5015
14” / 8	Green like RAL 6018	Green like RAL 6018
15” / 8	No strips	Grey like RAL 7032
16” / 6	Blue-purple like RAL 4005	Blue-purple like RAL 4005
17” / 5	Orange like RAL 2008	Orange like RAL 2008
18” / 5	Red like RAL 3002	Red like RAL 3002
19” / 5		Medium yellow like RAL 1018, 2 strips
20” / 4		Medium pink like RAL 3015, 2 strips
17,5” / 5 DC 1)	Yellow like RAL 1012	Yellow like RAL 1012
19,5” / 4 DC 1)	Blue like RAL 5015	Blue like RAL 5015
22,5” / 4 DC 1)	No strips; grey basic colour like RAL 7032	
20” TBS / 4 2)	Green like RAL 6018	

1) DC = drop-centre wheel

2) TBS = tapered-bead-seat wheel

6 GENERAL REQUIREMENTS

The system and its components should

- reduce pallet diversity
- be capable of pooling
- permit continuous application ranging from wheel manufacturer to customer
- permit profitable use of all common transport facilities / chains
- permit continuous application as part of automatic loading / unloading systems
- guarantee damage-free transport, storage and handling
- permit smooth integration into material flow processes involving storage, production and assembly
- possess an ergonomic design and permit easy manual handling
- be resistant to soiling, easy to clean, as resistant as possible to extraneous factors and recyclable

All system elements must be patent-free.

7 REQUIREMENTS FOR BASE PALLETS AND TOP FRAMES

7.1 Dimensions

7.1.1 External dimensions

Refer to the table in Appendix 1

7.1.2 Base pallet entrance sizes

	EWPS square-pipe design Type		
	BP 1	BP 2	BP 3
Free entrance sizes [1]			
- Maximum height	95	95	115
- Maximum width	790	1030	840
- Centre foot width	220	220	220
Under-run apertures [2]			
- Maximum height	130	130	150
- Maximum width	670	615	670

[1] 4-sided longitudinal and lateral entry must be ensured, also when stacked.

[2] 2-sided, free under-run must be ensured.

7.2 Loads and weights

7.2.1 Payload

1000 kg.

The payload of 1000 kg must be transportable and storable by means of all specified floor conveyors, continuous conveyors and storage equipment. No cracks or permanent deformations must occur in this process. Given proper handling, loads should not slip from the pallets as a result of sag or deformation.

7.2.2 Superimposed load

Maximum stacking height of packed units: 5000 mm
Maximum permissible superimposed load: 30 kN (surface-borne)

7.3 Sag

According to BGR 234 (Appendix 2): $d_{max} \leq L/200, W/200$

7.4 Identification

Base pallets and top frames are to be identified durably according to BGR 234.

Allocation according to Appendix 1, configuration according to related drawings.

7.5 Conveyance techniques

7.5.1 Roller tracks

With normal and shelf rollers.

Roller diameter 89
Roller division 175 (max. 210)

Longitudinal transport under all circumstances; lateral transport under certain circumstances.

7.5.2 Chain conveyors

Longitudinal and lateral conveyance (point-to-point loading).

7.6 Storage techniques

Floor storage: Stacking height of 5000 mm and BGR 234.

Rack storage: Storage on standard commercial racks such as those for wooden pallets according to DIN 15146 T2 and T3 must be possible.

Sag: Max. L/200

No permanent indentations or deformations at a storage temperature of 60°C over a period of 30 days.

7.7 System functionality

Pallets must be constructed to meet the following requirements:

- The top edge of a pallet provides a form fit with the bottom of the intermediate tiers.
- Pallets can be stacked on top of each other easily and securely.
- Top frames can also be stacked on pallets.
- Pallets / top frames can be stacked with or without intermediate tiers.
- Empties can be stored without harnessing elements wherever possible.
- Empties can be transported without any additional securing elements wherever possible.
- Loading units on load runs can be secured by means of plastic harnessing bands or stretch / shrink foils.
- Crane handling by means of cargo gear is ensured.
- Simple gripper systems can be used for handling.

Additional design / construction requirements:

- All edges and corners are slightly rounded.
- Smooth surface.
- No recesses; minimal number of openings.
- No dispersal of liquids during cleaning or storage outdoors.
- Storage of pallets and top frames outdoors is possible over extended periods (corrosion protection).
- Efficient air drying (easy to clean).
- Economical (in terms of manufacture, repair and recycling).

7.8 Ambient conditions

It should be possible to transport, handle and store EWPS elements in the entire European climatic zone.

EWPS elements must fulfil these requirements at temperatures ranging from -25°C to 70°C.

7.9 Materials

Materials must fulfil the requirements of this recommendation (refer to the appendices) as regards resistance to breakage, abrasion, deformation, impact and shock.

Fire loads should be minimized.

The materials should be resistant to weather and embrittlement.

The materials should be environmentally compatible and recyclable / reusable at low cost.

8 REQUIREMENTS FOR INTERMEDIATE TIERS

Intermediate tiers serve to support the wheels in the EWPS system. These tiers safeguard and secure the wheels in the loading units. The requirements to be fulfilled here are described next.

8.1 General requirements

- Protection and securing of wheels in the TUL process; also applicable to painted
- surfaces in the vicinity of the wheels' storage locations.
- Ergonomic design for manual handling.
- Pallets, top frames and intermediate tiers should permit handling by one and the same
- gripper system.
- Resistance to soiling; easy cleaning.
- Economical recyclability, reusability and environmentally-friendly disposal.

8.2 Construction

8.2.1 An intermediate tier should also perform the function of a cover. The bottom of a base pallet should fit the top of the intermediate tier of the underlying loading unit (stacked element).

8.2.2 Full units should be stackable without harnessing elements.

8.2.3 Empty units should be stackable without harnessing elements.

8.2.4 The following requirements should be fulfilled to the greatest possible extent:

- Form-fit positioning
- Minimum slippage of payload on intermediate tiers
- Safe transport on conveyors
- Safe re-stacking of intermediate tiers (traction surfaces)

8.2.5 Securing of transport units

- Recyclable plastic bands, stretch / shrink foils.
- No damage to intermediate tiers by transport fasteners if used as intended.

8.3 Ambient conditions

8.3.1 Temperatures from -25°C to 75°C: Durable resistance to deformation.

8.3.2 Colour-fastness; resistance to UV radiation and weather.

8.3.3 Resistance to oil, petrol, acid, alkalis and coolants.

8.3.4 Outdoor storage of intermediate tiers should be possible (no scoop-shaped openings).

8.3.5 Other properties

- Easy to clean
- Smooth surface
- No recesses; minimal number of openings
- Efficient air drying

8.4 Materials

- Minimum fire load
- Suitable for regeneration, preferably for automotive applications
- Recyclable / reusable
- Resistant to breakage, abrasion, deformation, impact and shock in accordance with specifications
- Environmentally friendly

9 PATENTS AND TRADEMARKS

The system should be patent-free.

10 ECONOMICALLY VIABLE SOLUTIONS IN TERMS OF DESIGN, PRODUCTION, MATERIALS AND ENVIRONMENTAL COMPATIBILITY

11 OPERATING CONDITIONS, TRAFFIC AND REPLACEMENT

11.1 User pool

By virtue of its design and common application, the EWPS system offers a wide range of rationalization options in the field of logistics.

Joint application of the EWPS system in accordance with this recommendation provides an opportunity to form a user pool.

- Oriented toward this recommendation, the EWPS user pool is based on bilateral agreements and de-centralized administration.
- Circulating inventories required for goods movement are specified by the involved partners.
- Suppliers are responsible for procurement.
- By deploying EWPS inventories procured for goods movement, wheel suppliers become pool participants.
- The nominal ownership of pool participants is monitored bilaterally.
- Losses in ownership are replaced by pool participants themselves.
- To ensure pooling capability, the system operator pledges to use exclusively system elements with an approval number (refer to 11.5).
- Prerequisites are comprehensive and correct administration of contributed inventories as well as a consistent and correct approach by pool participants.
- The cost distribution model is agreed bilaterally.

11.2 Traffic and exchange

EWPS designation

For transport beyond plants, the freight / delivery documents must include the EWPS type number and customer-specific carrier number.

Control and monitoring

- Continuous account management between partners, including at least one monthly account adjustment.
- EWPS recipients check incoming / outgoing quantities of EWPS components.
- Outgoing quantities serve as bookkeeping figures for senders and recipients, unless any differences are reported immediately by the recipient (applies to full and empty consignments).
- Clarification of differences and matching of accounts will take place without delay.
- Only undamaged elements must be dispatched.
- Maintenance measures will be initiated / implemented by the wheel manufacturers.
- On the basis of empirical data, 2% to 3% of the quantity of any packaged component currently in circulation can be assumed to make up the spare part requirement resulting from wear and damage.

11.3 Quality assurance and testing

According to the quality requirements specified in this recommendation, **manufacturers** of EWPS elements will conduct tests which are to be documented; the documentation is to be made available to the user and - on request - to the VDA or an appointed third party.

Manufacturers of EWPS components are responsible for ensuring constant component quality.

Quality assurance and testing for base pallets and top frames

The requirements mentioned below need to be met for assuring EWPS quality standards.

Tests in the uncoated / unpainted state

Dimensions

Tolerances for dimensions not specified explicitly in any of the drawings are to comply with tolerance class B as defined by DIN EN ISO 13920.

Test criteria for ground frames

- External dimensions over stack elements
- External dimensions of the ground frame
- Total height with and without stack elements
- Strut spacing (refer to the test dimensions in the EWPS drawings)
- Diagonal dimensions
- Evenness (measured on a straightening plate, for example, by means of a feeler gauge: max. 0.25% of the ground frame's length)

Test criteria for top frames

- External dimensions over stack elements
- External dimensions of the pipe frame
- Total height with stack elements
- Strut spacing (refer to the test dimensions in the EWPS drawings)
- Diagonal dimensions
- Evenness (measured on a straightening plate, for example, by means of a feeler gauge: max. 0.25% of the ground frame's length)

The dimensions in EWPS drawings are to serve as a basis for testing.

Welding

Welded joints are to be assignable to accuracy class C according to DIN EN 25817.

Test criteria

- Welded joint quality
- Welded joint completeness
- Projection of welded joints at the top and bottom (grinding)

Stacking capacity

Stacking capacity is to be tested through alternate stacking of head and ground frames.

Documentation

Dimension test record

Conducted tests are to be documented in a record.

Structure / minimum contents of the test record:

No.	Test attribute	Setpoint value	Tolerance	Actual value	Comment

Test record for welding quality / stacking capacity

Structure / minimum contents of the test record:

Test attribute	Rating	Detected faults
	OK: yes ☐ / no ☐	

Tests of welding quality and stacking capacity will also be documented in a record. The test results will be rated as "OK" or "not OK".

Scope of random sampling

5% of the manufactured base pallets and top frames are to undergo random sampling.

Tests in the painted / powder-coated state

Base pallets and top frames are to receive high-quality surface-finishing. Electrostatic powder-coating should be used preferentially here, also for reasons of environmental compatibility. Shot-blasting is an ideal technique of pre-treating the employed materials (2-layer solvent-free paint or powder coating).

Test criteria

Layer thickness

Layers must be at least 45 µm thick. A layer-thickness measuring device must be used to verify values.

Adhesion

Tests here are to be conducted using the grid technique according to DIN EN ISO 2409. A characteristic grid value of 1 must be observed.

Scope of random sampling

5% of the manufactured base pallets and top frames are to undergo random sampling.

11.4 Procedures

- Quality regulations and material specifications forming part of the VDA / EUWA recommendation are included as appendices.
- Appendices are maintained by the Work Group for Wheel Pallets and the Logistic Commission.
- VDA / EUWA are to receive feedback from system operators for the purpose of exchanging of know-how.

11.5 Certification

Prerequisites for certification as a supplier of base pallets and top frames

- Preparation of a sample batch of 20 ground frames and head frames per size
- 4 ground frames and head frames (set) from each size-specific batch are to be submitted to an independent test institute (tests according to item 11.3, accompanied by sag tests according to BGR 234).
- Successful testing is to be followed by examination in-situ, as described under item 11.6.
- Manufacturers of welded products must comply with class-B requirements of DIN 18800, part 7. This includes fulfilment of requirements according to DIN EN 729-3.
- Welding staff must be qualified for fillet-joint welding, I-joint welding and vertical-joint welding as part of DIN EN 287-1.
- Manufacturers must be able to demonstrate the availability of appropriate welding templates at the respective production facilities.
- To demonstrate compliance with DIN EN ISO 9001, suppliers must submit a corresponding certificate from an accredited test institute.

Prerequisites for certification as a supplier of plastic intermediate tiers

For ensuring lasting adherence to the described quality standards and compatibility of intermediate tiers to be produced or already in existence, the following procedures apply to manufacturers of such tiers:

- Comprehensive evidence of exclusive use of material rated as OK through the issue of a test certificate for semi-finished products by an approved test institute.
- Preparation of a sample batch of 50 serviceable plastic intermediate tiers to be tested in terms of shrinkage dimensions on the basis of this recommendation.
- Examination by the test institute of the compatibility of intermediate tiers already in use.
- Function tests / container acceptance tests in co-operation with the ad hoc Work Group for Wheel Pallets and participating manufacturers of vehicles and/or wheels (for example, outfitting of at least 5 complete loading units comprising a ground frame, head frame, plastic intermediate tiers, and conduction of transport / driving tests).

Certification is always granted separately for each dimension. The VDA certifies suppliers and determines test conditions in agreement with approved test institutes according to this recommendation. Costs of testing are borne by the suppliers.

The current list of certified suppliers is available from the VDA / EUWA on request.

11.6 Annual inspections

Annual inspections are to be performed by an independent test institute appointed by the VDA. Test fees will be paid proportionally by the suppliers.

Annual inspections will cover the following items:

- Validity of drawings
- Validity of VDA Recommendation 4503 and EUWA ES 4.05
- Records of conducted tests
- Product measurements (according to item 11.3)
- Welding template tests
- Validity of manufacturer qualification according to DIN 1880, part 7
- Validity of welding staff qualification according to DIN EN 287-1
- Validity of certification according to DIN EN ISO 9000 cont.

Deviations:

On the occurrence of a deviation, the supplier must prove within 90 days that the cause of the deviation has been remedied. This can be done by submitting appropriate documents to the test institute.

11.7 Utility / function tests

Utility and function tests for detecting signs of damage as described in Appendices 4 and 5 will be conducted by the pool participants in order to preserve functional transport chains existing between these participants.

11.8 Modifications

All recommendations for modifying EWPS system elements are to be submitted in writing to the VDA / EUWA work groups, who will examine the recommendations and accordingly also issue written approvals for introduction or modification. All changes come into effect two months after the date of approval. A different settlement is possible in individual cases.

12 QUALITY TEST REQUIREMENTS

Items manufactured in accordance with the VDA / EUWA recommendation must fulfil the functions specified by it as well as the quality requirements stipulated below. Fulfilment of these requirements is monitored by means of procedures defined by the VDA / EUWA.

12.1 Scope of validity

The quality requirements apply to all EWPS components including:

- base pallets
- top frames
- intermediate tiers

12.2 Quality requirements

12.2.1 Materials, colouring of intermediate tiers and dimensions

Only polyethylene with the characteristics specified in the table in Appendix 6 further below is approved for systems whose quality is assured in accordance with the VDA / EUWA recommendation.

All components' dimensional and material characteristics must comply with relevant drawing details, as well as any colour codes specified in the drawings.

Valid drawings can be obtained from the VDA or EUWA at the following addresses:

Verband der Automobilindustrie e.V. (VDA)
Westendstraße 61
D-60325 Frankfurt / Main

Dr. Rüdiger Meier
Phone: 0049-69-975070
Fax: 0049-69-97507300

Hayes Lemmerz Holding GmbH
Ladestraße
D-53639 Königswinter

Achim Vorbeck
Phone: 02223-71561
Fax:02223-71142

12.2.2 Materials and properties of base pallets and top frames

All system requirements are specified in the relevant drawings.

12.2.3 Adherence to quality specifications

Samples submitted by EWPS manufacturers to EWPS users will be accompanied by a certificate in which a neutral consultant (Appendix 7) verifies that the raw materials used for production meet the mechanical and thermal requirements specified in the tables in Appendix 6, that material-specific, dimensional and design-related parameters comply with all details in the relevant component drawings, and that manufacture has taken place in accordance with the specified process conditions.

If tests of initial samples and serial samples yield positive results, the EWPS user will accordingly notify the VDA / EUWA so that an approval number can be issued and the EWPS manufacturer included in a corresponding list managed by the VDA / EUWA.

13 USAGE AND MAINTENANCE

Wheel suppliers are responsible for cleaning the components of the EWPS system.

All elements forming part of the cycle need to remain clean. After intermediate tiers have been unloaded, it is necessary to ensure that they are transferred to the next user in a fully functional state, i.e. without any dirt deposits or signs of damage.

EWPS elements must not be furnished directly with stickers or inscriptions, as this might result in multiple labelling which would give rise to erroneous information and impair pooling capability. Furthermore, remnants of adhesive paper impair recyclability.

Other than that, cleaning of intermediate tiers and assumption of costs are to be settled bilaterally based on the technical facilities at the system users' disposal.

Repairs of base pallets and intermediate tiers are governed by Appendices 4 and 5.

To ensure that the EWPS transport chains function without any hindrances, damaged elements must be withdrawn from circulation by the user who first detects the damage.

System users pledge to monitor the quality and serviceability of the EWPS, introduce only fully functional elements into the goods traffic cycle, and submit damaged EWPS elements for processing as described in Appendices 4 and 5 regarding damage types.

Appendices

Appendix 1 EWPS wheel pallet components

Type designations and dimensions

System components	Wheel diameter (inches)	Design / weight	EWPS type designation	Drawing number	Dimensions 2) Length	Width	Height 1)
Base pallets	13; 14	Square pipe 26 kg ± 10 %	1 BP	8461	1208	1118	195
	15; 16; 17 18, 18; 20	Square pipe 26 kg ± 10 %	2 BP	8463	1358	1153	195
	17,5; 19,5 20 TBS; 22,5	Square pipe 26 kg ± 10 %	3 BP	8465	1208	1206	215
Intermediate tiers for steel wheels PE-HD	13		13 S	8467	1195	1105	59,5
	14		14 S	8468	1195	1105	59,5
	15		15 S	8469	1360	1145	59,5
	16		16 S	8488	1360	1145	60,2
	17		17 S	8474	1360	1145	59,5
	18		18 S	8475	1360	1145	59,5
	18						
	20						
	7) 17.5 DC		17,5 S	8471	1210	1210	72,5
	7) 19.5 DC		19,5 S	8472	1210	1210	72,5
	7) 22.5 DC		22,5 S	8499	1210	1210	72,5
	6) 20 TBS		20 S	8477	1210	1210	40
Intermediate tiers (PE-stop) for light-alloy wheels PE-HD	13		13 L	8478	1195	1105	60,2
	14		14 L	8479	1195	1105	60,2
	15		15 L	8480	1360	1145	60,2
	16		16 L	8487	1360	1145	60,2
	17		17 L	8482	1360	1145	60,2
	18		18 L	8484	1360	1145	60,2
	19		19 L	8497	1360	1145	60,2
	20		20 L	8498	1360	1145	60,2
Top frames	13; 14	Square pipe 11 kg ± 10 %	1 TP	8507	1208	1118	70
	15; 16; 17 18; 19; 20	Square pipe 11 kg ± 10 %	2 TP	8509	1358	1153	70
	17,5; 19,5 20 TBS; 22,5	Square pipe 11 kg ± 10 %	3 TP	8495	1208	1208	110

1) Height including stack corners; stack corner height: 30 mm
Intermediate tier spacing when empty and stacked (PE-HD) = 10 + 1 mm; PE-stop = 10.7 + 1 mm
2) Refer to the drawings for dimensions
6) TBS = tapered-bead-seat
7) DC = drop-centre

If any enquiries or updating requirements arise, valid drawings can be obtained from the VDA or EUWA at the addresses specified in 12.2.1

Appendix 1 EWPS wheel pallet components

Type designations, explanations of abbreviations

1. **Component designations for steel base pallets and top frames**

Example:	**E W P S - 1 - B P**	
Position:	**1 2 3 4 - 5 - 6 7**	
Positions 1 to 4:	EWPS, system name, European Wheel Pallet System	
Position 5:	Rated size	1 = 1200 x 1100 2 = 1360 x 1145 3 = 1210 x 1210
Position 6:	Component ID	B = Base-Pallet T = Top-Frame
Position 7:	Design	P = Square-pipe version

2. **Component designations for intermediate tiers**

Example:	**E W P S - 1 3 - L**	
Position:	**1 2 3 4 - 5 6 - 7**	
Positions 1 to 4:	As above	
Positions 5 and 6:	Rated wheel diameter in inches	
Position 7:	Intended application, suitable for:	S = Steel wheel L = Light-alloy wheel

Appendix 2 EWPS wheel pallets

Scope of tests for certifying base pallets and top frames (initial approval)

General

a) Only finished products made by means of serial tools and equipment should be certified and tested (no prototypes or hand samples).

b) Certification and testing must be completed prior to commencement of serial production.

c) Test scopes and results are to be documented in reports.

Minimum test scope

a) Raw materials are to be tested for compliance with steel quality, dimensions, technical delivery conditions according to DIN 2395 parts 1 + 2 (or later standards).

b) Visual checks of general workmanship (straightness, welded joints etc.)

c) Checks of construction drawings for adherence to this recommendation's requirements concerning functionality and operating dimensions.

d) Checks of welded joints according to DIN / EN 25817 guidelines concerning secondary performance tests.

e) Checks of paint quality, pre-treatment and paint-coat thickness.

f) Submission of structural (static) analysis.

Appendix 3 EWPS wheel pallets

Scope of tests for certifying plastic intermediate tiers (initial approval)

General

a) Only finished products made by means of serial tools and equipment should be certified and tested (no prototypes or hand samples).

b) Certification and testing must be completed prior to commencement of serial production.

c) Test scopes and results are to be documented in reports.

Minimum test scope

a) Checks of blank board material against certificates submitted by the manufacturer, in accordance with the technical specifications in Appendix 6.

b) Checks of construction drawings for compliance with this recommendation's requirements concerning functionality and operating dimensions.

c) Visual checks of general workmanship.

Appendix 4 EWPS wheel pallets

Types of damage on base pallets and top frames

Sequential number	DAMAGE TYPE	Recycling	Restricted use or repair by agreement
1.	Visible cracks		**X**
2.	Missing functional corners and edges, for example:		
2.1	Damaged stack corners		**X**
2.2	Damaged pallet base		**X**
2.3	Damaged function struts, top		**X**
2.4	Damaged function struts, bottom		**X**
2.5	Damaged external contours		**X**
3.	Permanent soiling	**X**	
4.	Permanent deformation	**X**	
5.	Soiling		**X**
6.	Excessive rusting	**X**	
7.	Missing type plates		**X**

Appendix 5 EWPS wheel pallets
Types of damage on intermediate tiers

Sequential number	DAMAGE TYPE	Return	Restricted use by agreement
1.	Visible cracks	**X**	...
2.	Missing functional corners and edges, for example:		
2.1	Damaged protective pots	**X**	
2.2	Damaged grip holes	**X**	
2.3	Damaged positive holding cams	**X**	
2.4	Damaged negative holding cams	**X**	
2.5	Damaged external contours	**X**	
2.6	PE-stop, damaged surface	**X**	
2.7	Embrittlement	**X**	
3.	Permanent deformation	**X**	
4.	Permanent soiling	**X**	
5.	Soiling		**X** Cleaning

Manufacturers are obliged to take back damaged PE intermediate tiers and recycle / dispose of them in accordance with legal regulations.

Appendix 6 EWPS wheel pallets
General technical data on intermediate tiers

General technical data regarding PE-HD material of blank boards for intermediate tiers for steel wheels (passenger-cars) as well as 17.5", 19.5" and 20" TBS steel wheels (trucks).

Properties	**Standard**	**Unit**	**Value**
Distinguishing properties Material thickness	DIN EN ISO 527	mm	2,5 ± 0,1
Density	DIN 53479	G / cm^3	0,95 ± 0,01
Mechanical properties			
Tensile E-modulus	DIN EN ISO 527	N / mm^2	1000 ± 100
Yield stress	DIN EN ISO 527	N / mm^2	> 18 (min.)
Elongation at break	DIN EN ISO 527	%	> 50 (min.)
Impact strength at r.t.	DIN EN ISO 179 / eU	KJ / M^2	k B
Surface hardness	DIN 53505 – D9	Shore D	65 ± 2
Thermal & other properties			
Vicat VST B/50	DIN EN ISO 306	°C	68 (min.)
Long-term operating temperature		°C	-25 to +75

Resistant to: Diluted acids, alkalis, petrol and water

Not resistant to: Oxidizing acids, ketones, aromatic and chlorinated hydrocarbons, certain types of detergent

General technical data regarding PE-HD material of blank boards for intermediate tiers for 22.5" steel wheels (trucks).

Properties	Standard	Unit	Value
Distinguishing properties Material thickness	DIN EN ISO 527	mm	3,5 ± 0,1
Density	DIN 53479	G / cm^3	0,95 ± 0,01
Mechanical properties			
Tensile E-modulus	DIN EN ISO 527	N / mm^2	1300 ± 100
Yield stress	DIN EN ISO 527	N / mm^2	> 23 (min.)
Elongation at break	DIN EN ISO 527	%	> 50 (min.)
Impact strength at r.t.	DIN EN ISO 179 / eU	KJ / M^2	K B
Surface hardness	DIN 53505 – D9	Shore D	64 ± 2
Thermal & other properties			
Vicat VST B/50	DIN EN ISO 306	°C	71 (min.)
Long-term operating temperature		°C	-25 to +75

Resistant to: Diluted acids, alkalis, petrol and water

Not resistant to: Oxidizing acids, ketones, aromatic and chlorinated hydrocarbons, certain types of detergent

General technical data regarding PE-HD material of blank boards for intermediate tiers for aluminium wheels

Properties	Standard	Unit	Tolerance min. max.
Material thickness Coating	DIN EN ISO 527	mm	3.2 ± 0,1 0,7 ±0,1
Density	DIN 53479	g/cm^3	0,94 ± 0,01
Mechanical properties			
Tensile E-modulus	DIN EN ISO 527	N / mm^2	900 ± 100
Yield stress	DIN EN ISO 527	N / mm^2	> 18 (min.)
Elongation at break	DIN EN ISO 527	%	> 50 (min.)
Impact strength	DIN EN ISO 179 eU	KJ / m^2	k B
Surface hardness	D 53505 – D9	Shore D	52 ± 2
Friction coefficient	PA 03031		0,75 ± 0,15
Abrasion coefficient	PA 03020		0,4 ± 0,1
Thermal & other properties			
Vicat VST B/50	DIN EN ISO 306	°C	68 (min.)
Long-term operating temperature		àC	-25 to +75

Resistant to: Diluted acids, alkalis, petrol and water

Not resistant to: Oxidizing acids, ketones, aromatic and chlorinated hydrocarbons, certain types of detergent

Test conditions for determining material properties

Properties	Standard	Contents
Friction coefficient	PA 03031	Aluminium on soft layer or carrier material Aluminium surface roughness: Ra = 0.91 Rt = 8.90 (roughness depth values)
Abrasion coefficient	PA 03020	The abrasion coefficient represents the loss in mass experienced by the investigated sample in comparison with a reference sample (HDPE carrier material in this case) when the investigated sample's coating is blasted with quartz sand at high pressure under defined ambient conditions.

Appendix 7 EWPS wheel pallets
List of approved test centres

1. Tests centres for EWPS steel components

- SGS Germany GmbH
  Contact: Dipl.-Ing. Bernd Hönow
  E-mail: Bernd_Hoenow@sgs.com

  Raboisen 28 D-20095 Hamburg

  Phone: 0049-040-30101191
  Fax: 0049-040-30101964

- Incos GmbH
  Ingenieurbüro
  Am Galgenberg 9 D-85135 Titting

  Phone: 0049-8423-991914
  Fax: 0049-8423-991955

2. Test centre for plastic materials

   SKZ - TeConA GmbH

   Süddeutsches Kunststoff Zentrum
   Testing, Consulting, Approval
   Contact: Dipl.-Ing. B. Nöth
   E-mail: B.Noeth@skz.de

   Frankfurter Str. 15 – 17 D-97082 Würzburg

   Phone: 0049-931-4104203
   Fax: 0049-931-4104207

   Homepage: www.skz.de

(The current list of approved test centres can be obtained from the EUWA or the VDA.)

Appendix 8 EWPS wheel pallets

Initial sample test report for EWPS components
Tests conducted according to VDA 4503 and EUWA ES 4.05

Component designation: Drawing number:

Base pallet EWPS
Intermediate tier EWPS
Top frame EWPS

Manufacturer, address:

Production site, branch, affiliate:

Test location: Date:
Test institute. address: VDA approval number:

1 Material test according to Appendix 6
Result: Passed Failed

2. Dimensional tests

Dimension	Base pallet		Intermediate tier		Top frame	
(see rear side)	OK	NOK	OK	NOK	OK	NOK
1						
2						
3						
4						

Result: Passed Failed

3. Date of master element function test:

Company: Location:

Stacking capability OK NOK
Holding cam shape OK NOK
Cover shape OK NOK
Labelling fields OK NOK

Result: Passed Failed

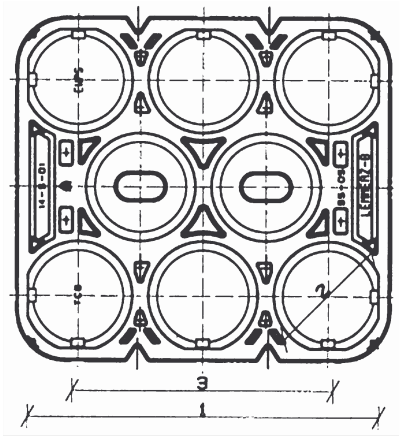
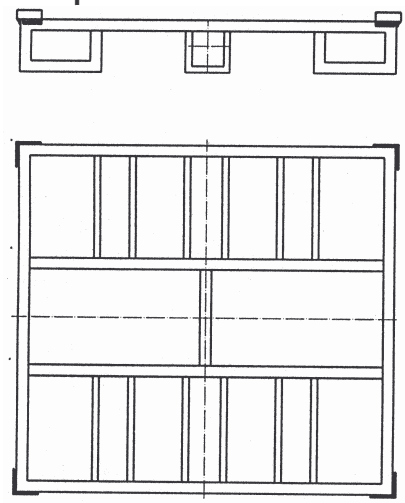
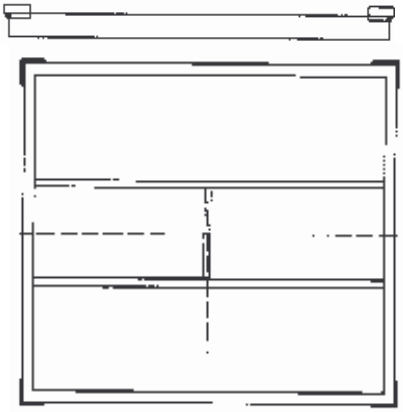
4. Tests of remaining dimensions

Result: Passed Failed

5. Approval granted Yes No

Issued at: Date: Name of tester:

Appendix 8 EWPS wheel pallets

Intermediate tiers 	**Intermediate tier** Operational dimensions highlighted on the drawing 1 External dimensions length / width 2 Wheel mount Diameter 3 Fixing marker for base pallet 4 Thickness Note: Dimensional tests no earlier than 24 hours after manufacture Object temperature of roughly 20 °C.
Base pallet 	**Base pallet** 1 External dimensions See drawing ⬭ 2 Diagonals See drawing ⬭ 3 Fixing marker for intermediate tier See drawing ⬭ 4 Thickness
Top frame 	**Top frame** 1 External dimensions: See drawing ⬭ 2 Diagonals See drawing ⬭ 3 Position dimensions of the struts See drawing ⬭ 4 Thickness