

Factory Standards LAP GmbH Laser Applikationen

Factory Standards

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1 Purpose

This factory standard should be viewed as a supplement to the current standards for technical drawings. It closes gaps which are not covered by the Geometrical Product Specifications (GPS) or rather prescribes how drawings by LAP GmbH Laser Applikationen should be read. The factory standard also defines general tolerances, as well as general prescriptions and expectations of manufacturing procedures and delivery conditions, unless otherwise agreed.

2 General

2.1 Scope of validity

The factory standard is structured according to the following hierarchy:

1. Indications on drawings above
2. Part-specific agreements above
3. Factory standards above
4. GPS standards

2.2 Language

The document language is German. If there are multilingual indications on drawings, the German version takes precedence in the event of contradictions.

2.3 Export formats

Export formats such as STEP files, IGES, DXV or DWG which are included in delivery are included on request as a gesture of goodwill. The associated drawings form the contractual basis. In the case of deviations between the export format and the drawing, the indications on the drawing take precedence. It is therefore recommended that you check the export formats against the drawing before use.

2.4 Material requirements

LAP GmbH Laser Applikationen expects that, during manufacture and in order to manufacture the parts ordered by LAP GmbH Laser Applikationen, materials which conform to the European ordinances RoHS (2011/65/EU) and REACH (EC 1907/2006) are exclusively used.

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3 Measurements and tolerances

3.1 Expectations for tolerance indications

LAP GmbH Laser Applikationen expects that, for measurement tolerance indications, the production process is adjusted to a defined position within the tolerance. To enable this, the process parameters 'diffusion' and 'position' must fulfil the minimum requirements and be appropriately monitored and regulated.

The requirements in Section 3.7 apply to designated testing dimensions.

3.2 General tolerances

The following lists the general tolerances which apply to all dimensions in drawings without explicit tolerance indications and all non-specified shape and position tolerances. The tolerances comply with DIN ISO 2768-1 and 2768-2. Metrologically, the measurements are determined by means of two-point measurement. If not specified otherwise, the independence principle applies to all parameters. If the norms DIN ISO 2768-1 and 2768-2 are withdrawn, LAP expects that the general tolerances are observed according to the factory standard.

3.2.1 Measurements of length

Tolerance class	Limit deviations in mm for nominal dimension range in mm									
	< 0.5	0.5 to 3	over 3 to 6	over 6 to 30	over 30 to 120	over 120 to 400	over 400 to 1000	over 1000 to 2000	over 2000 to 4000	over 4000 to 8000
f (fine)	± 0.05	± 0.05	± 0.05	± 0.10	± 0.15	± 0.2	± 0.3	± 0.5	-	-
m (medium)	± 0.10	± 0.10	± 0.10	± 0.20	± 0.30	± 0.5	± 0.8	± 1.2	± 2	± 3
c (coarse)	± 0.15	± 0.15	± 0.20	± 0.50	± 0.80	± 1.2	± 2.0	± 3.0	± 4	± 5

3.2.2 Curve radius and bevel heights

Tolerance class	Limit deviations in mm for nominal dimension range in mm					
	to 0.5	over 0.5 to 3	over 3 to 6	over 6 to 30	over 30 to 120	over 120 to 400
f (fine)	± 0.2	± 0.2	± 0.5	± 1.0	± 2.0	± 4.0
m (medium)						
c (coarse)	± 0.4	± 0.4	± 1.0	± 2.0	± 4.0	± 8.0

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3.2.3 Angle dimensions

Tolerance class	Deviation limits in angle units for nominal dimension range of the shortest side in mm				
	to 10	over 10 to 50	over 50 to 120	over 120 to 400	over 400
f (fine)	± 1°	± 30'	± 20'	± 10'	± 5'
m (medium)					
c (coarse)	± 1° 30'	± 1°	± 30'	± 15'	± 10'

3.2.4 Straightness and evenness

Tolerance class	General tolerances for straightness and evenness in mm for nominal dimension range mm					
	to 10	over 10 to 30	over 30 to 100	over 100 to 300	over 300 to 1000	over 1000 to 3000
H	0.02	0.05	0.1	0.2	0.3	0.4
K	0.05	0.1	0.2	0.4	0.6	0.8
L	0.1	0.2	0.4	0.8	1.2	1.6

3.2.5 General tolerances for perpendicularity

Tolerance class	General tolerances for perpendicularity in mm for nominal dimension range mm			
	to 100	over 100 to 300	over 300 to 1000	over 1000 to 3000
H	0.2	0.3	0.4	0.5
K	0.4	0.6	0.8	1
L	0.6	1	1.5	2

3.2.6 Symmetry

Tolerance class	General tolerances for symmetry in mm for nominal dimension range mm			
	to 100	over 100 to 300	over 300 to 1000	over 1000 to 3000
H	0.5			
K	0.6		0.8	1
L	0.6	1	1.5	2

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3.2.7 Radial and axial run-out

Tolerance class	General tolerances for radial and axial run-out in mm
H	0.1
K	0.2
L	0.5

3.2.8 Roundness

The general tolerance for roundness is the minimum of the diameter tolerance and the general tolerance for the run-out.

3.2.9 Parallelism




The general tolerance for parallelism is the maximum of the measurement tolerance and the general tolerance for straightness / evenness.

3.2.10 General tolerances for threads

Thread indications in drawings without tolerance indications should be produced in accordance with DIN ISO 965-1 (medium quality). This means for external threads without indication = 6g and internal threads without indication = 6H.

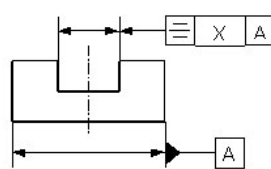
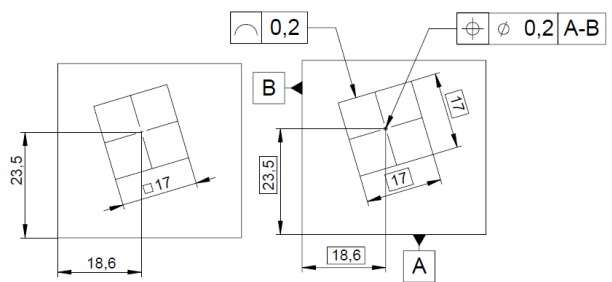
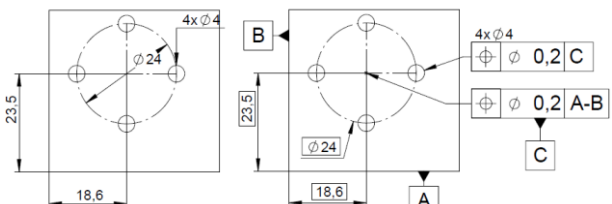
3.3 Dimensioning symbols

LAP uses symbols which are not DIN-compliant for drilling indications. The symbols have the following meanings:

Symbol	Description
	Indication for counterboring in a cylindrical shape. The diameter prescribes the target measurement.
	Indication for counterboring. The diameter indicates the counterbore diameter.
	Depth of the previously indicated feature

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3.4 Positional tolerance for indications on drawings

Symbol	Description	Outline
Symmetry line	The main dimension for the symmetry level is reference A. The symmetrical elements may deviate in their position X by max. 0.5 mm from the symmetry line.	
Square symbol	The square symbol defines a profile tolerance of max. 0.2 mm for the square outline in relation to a central axis with a position tolerance of max. 0.2 mm. The references for the central axis are defined by the dimensioning.	
Bolt circle	The central axis (reference A) of the bolt circle has a position tolerance of max. 0.2 mm. The elements on the bolt circle have a position tolerance of max. 0.2 mm to reference A.	

3.5 Common tolerances and tolerance zones

Symbol	Description
Solid dimension extension line	Two elements which are indicated using solid extension lines and the label 2x have a common tolerance CT.
Square symbol	All elements which are defined by the square symbol have a common tolerance zone CZ.
Bolt circle	All elements which are defined by a bolt circle have a common tolerance zone CZ.

3.6 Fits with envelope requirements

Fits which require compliance with the envelope requirement (E) should be checked with a plug gauge in accordance with DIN 2245. The depth of inspection corresponds to 2/3 of the indicated drilling depth or the entire depth in the case of through holes. The plug gauges must be listed in the supplier's inspection equipment monitoring and must be indicated in the test plan for the workpiece and regularly checked. On request, the identification number and calibration date of the inspection equipment must be named to LAP.

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3.7 Test dimensions

In the manufacture drawings, the important inspection features must be labelled in accordance with DIN 406 T10 by a frame consisting of two parallel lines which are connected at both ends by semicircles.

No.	Value	Frequ ency
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Test dimensions must display a short-term machine capability (C_m , C_{mk}) of at least 1.33 and a process capability (C_p , C_{pk}) of at least 1.0. Proof of capability must be provided at LAP's request.

3.8 Measuring technology

3.8.1 Reference system

In case of doubt, the largest surface is reference level A and is determined by three grid points which are as far away from each other as possible. Reference level B is the largest surface perpendicular to A and is determined by two grid points. Reference surface C is perpendicular to A and B and is the larger surface of the two. It is determined by a grid point.

For round parts, reference A is the central axis and reference B is the larger front surface.

For drawings with coordinate measurements, the surfaces with the coordinate 0 are the reference levels. Reference surface A with 3 grid points is the largest surface, and reference surface B with 2 grid points is the second largest.

3.8.2 Shape tolerances

General shape tolerances are to be evaluated after averaging references A-C.

- Roundness and cylindrical shape

The roundness should be determined using an appropriate number of measuring points (at least 20), distributed across the circumference. For substitute calculation of the circle, the least square circle (LSCI) should be used. If the associated measurement is labelled \textcircled{E} , the circle should be evaluated according to the envelope requirement (MCCI) for a wave, and according to the maximum inscribed circle (MICI) for a hole.

For cylindrical shapes, the measuring points must be recorded on at least 3 levels.

As a rule of thumb for the minimum number of measuring points to be recorded, the following values are defined. Significant deviations from this guideline must be agreed in advance with LAP:

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Size of the diameter (mm)	Minimum number of measuring points (roundness)	Minimum number of measuring points (cylindrical form)
≤ 10	12	30
< 10 ≤ 30	24	60
< 30 ≤ 100	36	90
< 100 ≤ 400	72	180
< 400	144	360

- Flatness

The evenness should be captured using a suitable number of measuring points, dependent on the surface to be measured, distributed across the surface to be measured. The points must be distributed over at least three lines and must be distributed across the entire dimensions of the surface.

As a rule of thumb for the minimum number of measuring points to be recorded, the following values are defined. Significant deviations from this guideline must be agreed in advance with LAP:

Size of the surface	Minimum number of measuring points
up to 100 mm ²	10
up to 1,000 mm ²	40
up to 5,000 mm ²	50
up to 10,000 mm ²	60
over 10,000 mm ²	80

3.9 Dimensioning for more than one feature of size

Geometrical features that can be connected, associated or assigned unequivocally by means of an extension line, construction line or symmetry line do not need to be identified by a specification/modification symbol "number x" according to DIN EN ISO 14405.

Dimensions and their tolerances that apply to more than one feature of size are therefore taken to apply to all features e.g. if the features are connected by an extension line.

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4 Surfaces

4.1 Roughness and roughness indications

The indications Ra and Rz in LAP's drawings should be understood as follows.

Value in the drawing	Meaning – DIN EN ISO 4287 and EN ISO 1302d	Description
Ra 10 or Rz 60		Cut edge without requirements. For laser-cut parts, scale-free and bump-free.
Ra 6.3 or Rz 40	Limit length wave $\lambda_c = 2.5$ mm Filter = FALG (area, linear, Gauss)	Cut edge with connecting slide grinding.
Ra 3.2 or Rz 20	Limit length wave $\lambda_c = 2.5$ mm; for workpiece features < 17.5 mm, the number of measuring sections must be adjusted. Filter = FALG (area, linear, Gauss) Rmr0 5% / Rmr(5) 50%	Machining with a uniform processing technique for surfaces without decorative aspects.
Ra 1.6 or Rz 10	Limit length wave $\lambda_c = 0.8$ mm; for workpiece features < 5.6 mm, the number of measuring sections must be adjusted. Filter = FALG (area, linear, Gauss) Rmr0 5% / Rmr(2) 60%	Machining with a uniform processing technique for surfaces with decorative aspects or functional surfaces
Ra 0.8 or Rz 6.3	Limit length wave $\lambda_c = 0.8$ mm; for workpiece features < 5.6 mm, the number of measuring sections must be adjusted. Filter = FALG (area, linear, Gauss) Rmr0 5% / Rmr(1) 70%	Finish-smoothed for functional surfaces with fitting or running characteristics
Ra 0.2 or Rz 2.5	Limit length wave $\lambda_c = 0.8$ mm; for workpiece features < 5.6 mm, the number of measuring sections must be adjusted. Filter = FALG (area, linear, Gauss) Rmr0 5% / Rmr(0.6) 80%	Finish-smoothed for functional surfaces with fitting or running characteristics for high demands
Rz 0.1	Limit length wave $\lambda_c = 0.08$ mm; for workpiece features < 0.56 mm, the number of measuring sections must be adjusted. Filter = FALG (area, linear, Gauss) Rmr0 5% / Rmr(0.02) 80%	Polished surfaces, e.g. for precision waves

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4.2 Impression-dependent surfaces

4.2.1 Anodised layers

If not indicated otherwise in the drawing, the following guidelines apply to coating:

1. Classification according to DIN 17611.
2. Surface processing before anodising E6 with the expectation that the same amount will be stripped as the layer thickness to be reapplied.
3. Layer thickness of oxide layer Class 20. This corresponds to $20\mu\text{m} \pm 4\mu\text{m}$. The measurements in the drawing apply to the part after coating.
4. For sealing, LAP requires hot sealing. If other processes are used, they must be indicated in the master sample approval.
5. Contact and support points must be agreed with LAP; visible surfaces and fitting surfaces must not be used for contact. Parts may not be deformed by clamping.
6. Blind holes with diameter < 3.5 mm must be closed. This is to avoid stains caused by insufficient rinsing.
7. The designation 'matt' means that the surface is to obtain a homogeneous appearance by means of shot blasting.
8. Colouring: 'silver' or 'natural' corresponds to C-0 (EV1); 'black' corresponds to C-35.
9. Processing residues must be completely removed. All holes must be free of salts and other deposits.
10. See also the section 'impression-dependent surfaces' with regard to the requirements of colour appearance, imperfections, scratches etc.

4.2.2 Powder coating

If not indicated otherwise in the drawing, the following guidelines apply to coating :

1. Classification, designations and test conditions according to DIN 55633.
2. Corrosiveness category C2, interior application, unheated, atmosphere with low contamination.
3. The coating is for decorative purposes; the expected protection duration is short (2-5 years).
4. The measurements in the drawing apply to the part after coating and hardening.
5. The colour is indicated on the drawing or in the order text.

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6. The following table applies to the coating thicknesses and pre-treatment on various materials:

Material	Pre-treatment *	Powder coating [µm] Base	Powder coating [µm] Top
Steel	Sa 2.5 blasting	40	40
Galvanised steel	Sweep blasting		80
Stainless steel	Sa 2.5 blasting		80
Aluminium	Sa 2.5 blasting		80

As acceptance criteria for the dry coating thickness, the standard values apply: the average value from all the measurements must be at least equal to or greater than the agreed target coating thickness. All individual values of the dry coating thickness must be equal to or greater than 80% of the target coating thickness. Max. 20% of the measuring values may fall below the target coating thickness. No value may exceed the specified maximum coating thickness. The maximum coating thickness is 3x the target coating thickness.

7. Threads must always be free of coating material.
8. As contact points, use threaded holes where possible. If no threads are available, the alternative contact points must be agreed with LAP.
9. The surface structure of the decorative colour coating should be matt.
10. See also the section 'impression-dependent surfaces' with regard to the requirements of colour appearance, imperfections, scratches etc.

4.2.3 Varnish

If not indicated otherwise in the drawing, the following guidelines apply to varnishing:

1. Classification, designations and test conditions according to DIN EN ISO 12944.
2. Corrosiveness category C2, interior application, unheated, atmosphere with low contamination.
3. The coating is for decorative purposes; the expected protection duration is short (2-5 years).
4. The measurements in the drawing apply to the part after coating and hardening.
5. The colour is indicated on the drawing or in the order text.

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6. The following table applies to the coating thicknesses and pre-treatment on various materials:

Material	Pre-treatment	Powder coating [μm] base	Powder coating [μm] top
Steel	Sa 2.5 blasting	40	40
Galvanised steel	Sweep blasting	---	80
Stainless steel	Sa 2.5 blasting	---	80
Aluminium	Sa 2.5 blasting	---	80

As acceptance criteria for the dry coating thickness, the standard values apply: the average value from all the measurements must be at least equal to or greater than the agreed target coating thickness. All individual values of the dry coating thickness must be equal to or greater than 80% of the target coating thickness. Max. 20% of the measuring values may fall below the target coating thickness. No value may exceed the specified maximum coating thickness. The maximum coating thickness is 3x the target coating thickness.

7. Threads must always be free of coating material.
8. The surface structure of the decorative colour coating should be matt with a rough structure.
9. See also the section 'impression-dependent surfaces' with regard to the requirements of colour appearance, imperfections, scratches etc.

4.2.4 Blackening

Two procedures are admissible for blackening copper and copper alloys:

1. Potassium persulfate stain for a matt deep black surface.
2. 'Black burning' with copper(II) nitrate. This 2nd procedure makes the surfaces powdery black; the parts may be heated to max. 320°C

4.2.5 Nickel plating

Unless otherwise indicated in the drawing, nickel plating should be carried out according to DIN EN ISO 1456 'Metallic and other inorganic coatings – galvanised nickel coatings...'.

The term 'nickel plating' corresponds to E-0-E of DIN EN ISO 4042 (nickel – no layer thickness prescribed – no colour gloss level blank).

4.2.6 Zinc coating

Unless otherwise indicated in the drawing, zinc coating should be carried out by means of galvanic zinc coating (ISO 4042, DIN EN ISO 19598). For welding groups, zinc coating should be carried out by hot-tip galvanising according to DIN EN ISO 1461. The zinc coating should be executed in silver.

1. Pre-treatment, coating thicknesses and test procedures should comply with the standard.
2. The term 'cut surfaces' on the drawing indicates that the parts to be coated can be punched, water jet cut or laser cut.

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3. It must be agreed with LAP whether processing into rack or barrel goods is to be carried out. Possible necessary support points must be agreed with LAP; visible surfaces and fitting surfaces must not be used for attachment.

4.3 Tolerable features

To evaluate impression-dependent surfaces, a test film (see picture) can be ordered from Qualitätsgemeinschaft Industriebeschichtungen QIB e.V.; this enables the features tolerated by LAP to be evaluated.

On the drawing, this is indicated on the specification of the coating as point: defect size x.x mm² / max. Y units, where x.x corresponds to the defect class on the test film. If no indication is given, the defect size 0.75 mm² / max. 7 units applies.

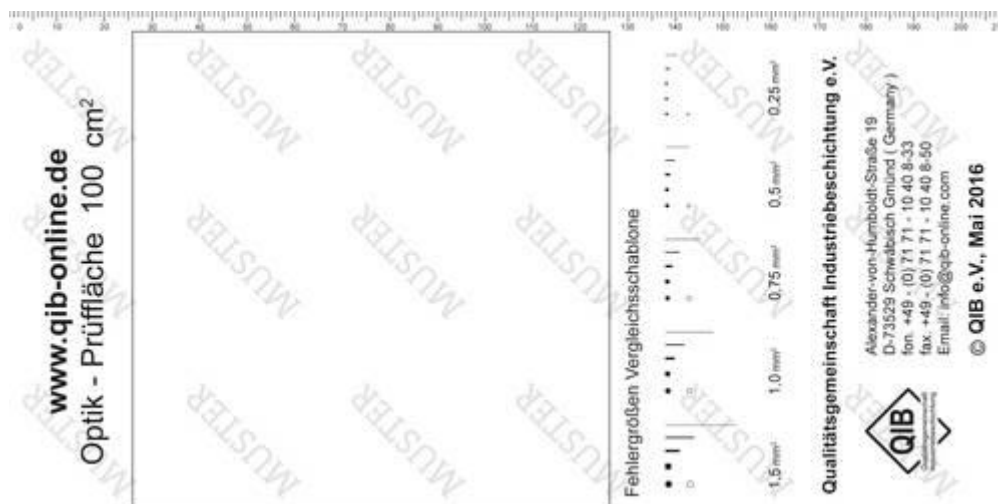


Figure 1 Test film by Qualitätsgemeinschaft Industriebeschichtung, basis of the features tolerated by LAP GmbH for impression-dependent surfaces

To coordinate the surfaces, a sample piece should be created which is approved as a reference sample by LAP after inspection. The test is carried out in diffuse daylight.

The following measurable features are evaluated:

- | | | |
|-----------------------|----------------------------|------------------|
| 1. Bubbles | 6. Stains | 11. Weak points |
| 2. Craters | 7. Gloss level differences | 12. Orange skin |
| 3. Impressions | 8. Scratches | 13. Spots/inlays |
| 4. Tears | 9. Runners | 14. Pores |
| 5. Colour differences | 10. Lenses | |

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4.4 Surface treatment

4.4.1 Slide machining (smooth grinding, barrel finishing)

The term 'smooth grinding' on the drawing indicates that the component should be smooth ground, whereby LAP does not specify the procedure, granulate, additives, number of workpieces per load or retention time. LAP's expectation is that the parts achieve the edge condition indicated in the drawing by means of smooth grinding and that the parts are not damaged by processing (scratches, bumps, deformations). The process must be determined by the supplier and approved using a sample. After that, LAP expects this approved process/process parameter to be applied when reordering.

4.4.2 Brushing

The term 'brushing', without further explanation, requires the generation of a uniform, matt deco structure on aluminium surfaces. A uniform surface appearance without visible grooves, scratches, cavities, inlays or other surface defects according to DIN 17611 / E4 and E6 must be achieved. The deco structure should be generated by the following tool:

- Tool: Fleece lamella grinder with shaft
- For pre-processing: Graining A104/80
- For final processing: Graining A104M

Non-ferrous metals and ferrous materials may not be processed with tools and machines which are used to generate the deco structure. The processing direction is defined in the drawing. On request, LAP will provide reserve samples.

4.4.3 Blasting

The term 'glass bead blasted' on the drawing indicates that the visible surface of the component is processed for decorative purposes. The main focus is on removing surface defects and creating a homogeneous, matt appearance. The glass bead blasting must be carried out before further surface processing (such as anodising). The choice of ball size is the responsibility of the supplier. The surface qualities achieved must be approved using a sample. After that, LAP expects this approved surface to be achieved when reordering.

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5 Delivery instructions

5.1 General

The delivery instructions apply to all articles for which there are no special agreements on packaging and state of delivery.

The supplier guarantees the application of packaging materials which grant the object of delivery sufficient protection against external, quality-reducing influences. This applies in particular to surface-coated goods, or goods with enhanced requirements concerning decorative properties.

The introduction of returnable packaging should be tested from an ecological and economical point of view and is preferred by LAP. The concept of such packaging must, however, be agreed with LAP in advance.

Insofar as goods are not ordered explicitly as an assembly group, they must be delivered separately according to type, i.e. only the same parts may be contained in a packaging unit. Mixed packaging of different parts (e.g. including left and right types) is not permitted!

The packaging must be labelled with the following information:

- LAP article number and variant index
- LAP order number
- Amount per packaging item

The delivery note must be included with the freight documents or be visible from outside and be attached to the packaging in a way that is protected from damage and soiling.

If goods are delivered as bulk material, they should be additionally packaged in tear-resistant fabric or PE bags so that they do not get lost if the outer packaging is damaged.

All delivered goods must be free from contamination and processing residues. Direct contact of the goods with uncoated packaging materials is not permissible (contamination of the goods).

If the goods are delivered on exchangeable pallets or in pallet cages, the exchange criteria defined by the European Pallet Association e.V. must be fulfilled by the empty containers used (www.epal-pallets.de).

5.2 Mechanics

Purchased parts which tend towards corrosion during transport or storage must be protected by the supplier by suitable corrosion protection agents agreed with LAP. During storage in an air-conditioned environment, corrosion protection for at least 12 months must be guaranteed.

Conserved component parts must be wrapped in foil bags or oiled paper so that the outer packaging does not become contaminated by the preserving agent.

The packaging must be sufficiently stable to protect the goods and must not contaminate the goods.

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Component parts with decorative or functional surfaces must be separated and packaged in such a way that damage from transport and storage is not possible.

Distortion-sensitive component parts must be protected by special outer packaging against the impact of mechanical force.

5.3 Optical system

It is not permissible to roll or wrap up multiple component parts in a strip of optical paper. Glass panes must be wrapped in paper individually for handling reasons.

Blister packaging which form-fits to the optical elements is preferred. This packaging must, however, guarantee a non-slip fit of the optical systems when opening and closing. Returnable packaging and disposable blister packaging must be agreed with LAP before being introduced.

For cleanliness reasons, the use of the following materials for direct packaging of optical systems is not permitted:

- Cardboard
- Foam
- Gel packs

The optical elements must be cleaned before packaging, insofar as the drawing does not indicate any explicit requirements for this.

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6 Cleanliness

The following chapter describes the requirements for technical cleanliness and the appropriate testing. The cleanliness levels are defined on the drawing next to the Factory standards. If no cleanliness level is defined on the drawing, cleanliness level 2 applies.

6.1 Cleanliness level RS0

RS0 applies to

- all optical components of a laser (individual parts and/or optical assemblies).
- mechanical components directly adjacent to high-intensity laser light in the 400-460 nm range.

Examples: lenses, achromatic lenses, mirrors, optical filters

These components must be free of the following types of contamination (the list is not exhaustive), which can be detected using the methods described under Test:

- dust,
- shavings, abrasion debris, loose particles of any origin,
- oil, grease, cooling lubricant,
- water or other liquids,
- galvanising residues,
- washing and rinsing residues,
- packaging and auxiliary materials residues,
- corrosion,
- tinder,
- flux,
- other foreign matter in or on the product (e.g. adhesive labels, unless they are expressly specified in a technical drawing, product specification etc.),
- and must not have an odour that is NOT specific to the material.

The cleanliness is specified on the drawing according to ISO 10110 (optics) or VDA volume 19 part 1 (mechanical components).

The surface must be typical for the material and the type of processing.

Test: contactless visual inspection using transmitted or reflected light, if necessary with magnification

Testing room: class 6 clean room according to ISO 14644-1 (corresponds to “class 1.000” FS209E)

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6.2 Cleanliness level RS1

RS1 applies to

- components in the direct or indirect vicinity of laser light.

Examples: light-generating and -guiding components (e.g. focus unit)

These components must be free of the following types of contamination (the list is not exhaustive), which can be detected using the methods described under Test:

- dust,
- shavings,
- oil, grease, cooling lubricant,
- water or other liquids,
- galvanising residues,
- washing and rinsing residues,
- packaging and auxiliary materials residues (e.g. in the form of abrasion debris),
- corrosion,
- tinder,
- flux,
- blasting media residues,
- other foreign matter in or on the product (e.g. adhesive labels, unless they are expressly specified in a technical drawing, product specification etc.).

The surface must be typical for the material and the type of processing. Discolouration resulting from thermal treatment is acceptable.

Test: wipe test with white, abrasion-resistant paper or lint-free cleaning swabs, plus visual inspection (under magnification, if necessary)

Testing room: low-dust environment

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6.3 Cleanliness level RS2

RS2 applies to

- components and assemblies not in the immediate vicinity of, or in direct contact with, laser light

and/or

- components and assemblies that are brought up to cleanliness level RS1 through additional cleaning measures and are hence qualified for more sophisticated use.

Examples: secondary or peripheral components not in the vicinity of laser light

(base plate, housing etc.)

These components must be free of the following types of contamination (the list is not exhaustive), which can be detected using the methods described under Test:

- dust (persistent, i.e. not removable with compressed air or by other mechanical means),
- shavings and other gross contamination or manufacturing residues,
- oil, grease, cooling lubricant,
- galvanising residues,
- packaging and auxiliary materials residues (e.g. in the form of abrasion debris),
- corrosion,
- flux.

The surface must be typical for the material and the type of processing. Discolouration resulting from thermal treatment and dust that can be blown off or easily removed by other mechanical means before/during installation/use are acceptable.

Test: visual inspection (with/without magnification)

6.4 Cleanliness level RS3

RS3 applies to

- components and assemblies before cleaning.

Test: visual inspection

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7 Standard directory

Standard marking	Section no.	Title
DIN ISO 2768-1	3.2	General tolerances; tolerances for linear and angular dimensions without individual tolerance entry;
DIN ISO 2768-2	3.2	General tolerances; tolerances for shape and position without individual tolerance entry
DIN ISO 965-1	3.2.10	Metrical ISO thread for general application – tolerances – Part 1: Principles and Basics
DIN 2245-1	3.6	Geometrical product specification (GPS) – plug gauges – Part 1: For drillings from 1 mm to 40 mm nominal diameter
DIN 2245-2	3.6	Geometrical product specification (GPS) – plug gauges – Part 2: For drillings from 40 mm to 65 mm nominal diameter
DIN 406 T10	3.7	Technical drawings; measurement entry; terms, general principles
DIN ISO 3951-1	3.7	Procedure for the sample inspection based on quantitative properties (variable inspection) – Part 1: Specification for simple sample inspection instructions for testing by batch, ordered according to the acceptable quality level (AQL) for a simple quality feature and simple AQL
DIN EN ISO 14405	3.9	Geometrical product specifications (GPS) - dimensional tolerancing
DIN EN ISO 4287	4.1	Geometrical product specification (GPS) – surface quality: profile method – designations, definitions and parameters of surface quality
DIN EN ISO 1302	4.1	Geometrical product specification (GPS) – surface quality indication in the technical product documentation
DIN 17611:2011	4.2.1	Anodic oxidised products made of aluminium and aluminium wrought alloys – technical conditions of delivery
DIN 55633	4.2.2	Coating substances – corrosion protection of steel constructions by powder coating systems – evaluation of the powder coating systems and execution of the coating
DIN EN ISO 12944	4.2.3	Corrosion protection of steel constructions by finishes and coatings; general information, terms, corrosion stresses
DIN EN ISO 1456	4.2.5	Metallic and other inorganic coatings – galvanised coatings made of nickel, nickel plus chrome, copper plus nickel and copper plus nickel plus chrome
DIN EN ISO 4042	4.2.5	Connecting elements – galvanised coatings
DIN EN ISO 1461	4.2.6	Zinc coatings applied by hot-dip galvanising on steel (piece by piece galvanising) – requirements and tests
DIN EN ISO 19598	4.2.6	Metallic coatings – galvanised zinc and zinc alloy coatings on ferrous material with additional Cr(VI)-free treatments
ISO 14644-1	4.5	Cleanrooms and associated controlled environments -- Part 1: Classification of air cleanliness by particle concentration
ISO 10110	4.6	Optics and photonics -- Preparation of drawings for optical elements and systems

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Change index

Old version	New version	Date	Description	Who
	1	02/05/2018	Factory standard revised	ALa
1	2	05/09/2018	<ul style="list-style-type: none">• Point 3.7 adapted.• Added point 3.9.• Added point 6.• Added standards under point 7	ALa