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TECHNICAL DELIVERY CONDITIONS FOR TURNED PARTS

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Content

1 Introduction

1.1. Scope

These technical delivery conditions are applicable in addition to the customer drawing in the case of missing or unclear drawing details. In this case, these technical delivery conditions have to be regarded as applicable documents. Drawing details and, if relevant, applicable documents provided by the customer always have priority.

1.2. Valid Specifications

We point out, that we assume no liability for requirements going beyond these technical delivery specifications that are not notified explicitly by the customer.

The binding production document is always the 2D drawing, but not a 3D data set. Drawings are not checked for congruence with the dataset.

If the use of data from a 3D data set is explicitly requested, it is assumed that the dimensions contained therein are always designed to a nominal size.

As far as features must be deduced from a data set, the general tolerances according to chapter 2.1 apply.

2 Implementation

2.1. Dimension Tolerances, Impact Marks

For dimensions without tolerance specification DIN ISO 2768-m applies. As far as dimensions below 0.5 mm without tolerance specification are present, they are also handled according to DIN ISO 2768-m (such as dimension 0.5 – 3 mm).

The wrapping condition (DIN 7167, ISO 8015, ISO 14405) is excluded, unless it is explicitly requested.

Since, as long as nothing to the contrary is agreed, the delivered parts are bulk material, the parts may feature handling-related impact marks and clamping marks, as long as the tolerances specified on the drawing are not violated. Impact and clamping marks remain without consideration in process capability studies.

2.2. Form and Position Tolerances

According to DIN ISO 2768-K.

For unregulated general tolerances of concentricity, that are not described in DIN ISO 2768, table 4, DIN ISO 2768-K, general tolerances for runout is used equivalently.

Wrench flats, hexagons, slots, cross holes, etc., are not manufactured aligned to each other if angular specifications are missing.

2.3. Angular Tolerances

A tolerance of ± 5° is applicable for all angles without tolerance specification.
An angular tolerance of ± 5° is applicable for chamfers and edge breaks with edge lengths ≤0.5 mm.

The following length tolerances are applicable for chamfers and rounded edges without tolerance specification:

Nominal size up to 0.2 mm	→+/- 0.1 mm
Nominal size above 0.2 to 0.5 mm	→+/- 0.2 mm
Nominal size above 0.5 to 1.0 mm	→+/- 0.3 mm
Nominal size above 1.0 mm	→+/- 0.4 mm

2.4. Undimensioned Workpiece Edges, Bore Hole Transitions

2.4.1. Workpiece Edges

Applicable for all undimensioned workpiece edges:

Outer edges - 0.2 mm

Inner edges + 0.4 mm

Refer to DIN ISO 13715.

Edge descriptions such as "sharp-edged free of burrs", "sharp-edged" and "free of burrs" are assumed according to DIN ISO 13715 with ± 0.05 mm, i.e. both a minimal material removal as well as a minimal burr may be present.

2.4.2. Bore Hole Transitions

Merging bore holes, e.g. bore hole transitions on cross bores, can have a max. burr of +0.1 mm. If a burr-free transition is required, then the size of the chamfer is not defined.

If bore holes are to be manufactured in uneven surfaces and the bore hole edges are to be chamfered. The minimum size of the chamfer will be 0.1 mm at the smallest point.

2.5. Test Conditions for Fits

Outer fits are always tested indicative. One measuring point is tested per feature.

Inner fits are tested with plug gauges. According to common practice, when inspecting fit bores the no-go side of a gauge may be able to be inserted slightly in the bore of the workpiece to be inspected due to insertion aids or slight wear on the gauge or chamfers or radii on the bore of the workpiece to be inspected (not described in DIN 7150-2). It must not be able to be inserted into the bore under any circumstances.

If fits become out of round due to the lability of the workpiece, inner fits are checked at the smallest point of the runout, outer fits are checked at the largest point of the runout. The specified tolerances are applied at these points.

2.6. Threads

2.6.1. Manufacturing Process, Checking, Tolerancing

Threads may optionally be cut, chased, grooved, rolled, milled or whirled.

The no-go plug gauge may be screwed in max. two revolutions into female threads. For male threads, the no-go ring gauge may be screwed onto max. two revolutions (see also DIN ISO 1502).

If details are missing, male threads are manufactured with the thread tolerance 6g, female threads with the thread tolerance 6H (see DIN 13).

2.6.2. Thread Run-ins and Run-outs, Chamfering

The design of thread run-ins and run-outs is dependent on the production process, usually they are chamfered.

For male threads the smallest dimension for the thread chamfer is calculated as follows:

Smallest root diameter size –5% of nominal thread size, at least however 0.1 mm below the smallest root diameter size.

For female threads the largest dimension for thread chamfering is calculated as follows:

Largest outside diameter size +5% of nominal thread size, at least however 0.1 mm above the largest outside diameter size.

The chamfer angle usually is 45° ±5°.

Thread run-outs to the collar are manufactured based on DIN 76 Form A, normal length.

2.7. Milling

Milled surfaces can be manufactured optionally plunged or through milled

With plunge milled surfaces or slots an arched slot base may occur depending on the tool. Drawing dimensions refer to the shortest point.

The tolerances of wrench flats are defined in EN ISO 4759.

2.8. Drilled Holes

The form and the angle of the drill tip can be chosen at will.

The transition between two axially parallel holes or bores on the same axis can be manufactured with a random angle. The edge transition is carried out according to chapter 2.4.

2.9. Surface Quality

2.9.1. General Surface Quality

The surface has an average roughness value of Ra 3.2 acc. to DIN EN ISO 1302 and an averaged roughness depth of Rz 25, as long as the measurement length is sufficient for the determination.

If only the term "polished" specifies a surface finish, a surface quality of Rz 2 is manufactured.

Impact marks, as mentioned in 2.1, have no influence on the result of the determination of the surface quality.

The outdated roughness specifications according to DIN 140 ("triangles") are converted according to DIN EN ISO 1302 / Series 2 / value Ra.

Measurement paths are determined according to DIN EN ISO 4288 and DIN EN ISO 3274.

Chamfers, rounded edges, knurled surfaces, thread surfaces are not defined with regard to their surface quality.

2.9.2. Surface quality in drilled holes and on milled surfaces

Tolerance Range acc. DIN ISO 286-1	Roughness
without ISO fit tolerances	Ra 12.5
Fits IT 11, e.g. H11	Ra 6.3
Fits IT 10, IT 9, IT 8	Ra 3.2

2.10. Cut-off Burrs

If the removal of cut-off burrs is not explicitly required on the drawing, the manufactured turned parts may have cut-off burrs on their end faces (flat surfaces). This also applies in the case of a generally valid machining symbol in or on the title block.

The size of the cut-off burr is defined in DIN 6785.

2.11. Raw Material

Tolerance of the outside dimension for bar-, ring- and coil material: h11 according to DIN EN 10277. The tolerance is measured on the smooth bar, i.e. surface defects such as pores, pull- and feed score marks, etc., are tolerated acc. DIN EN 10277, Table 3, Quality Class 1.

Unless specified otherwise, the raw material is not subject to any special tests, such as ultrasonic test, eddy current test, X-ray inspection, etc.

2.12. Provided Material

The following regulations apply for the machining of parts provided by the customer:

For the machining allowances the rules of DIN ISO 8062 apply. On cylindrical bodies or bodies with opposing surfaces the machining allowance has to be doubled.

The incoming goods inspection for the provided material is limited to an inspection for identification and integrity, as well as random sampling with regard to important features for the further processing (see chapter 3.1). An end check is carried out by the customer before provision of the material.

The supplier's pricing is based on the assumption that the structure is free of defects (cavities, inclusions, etc.). Defects in the structure may lead to price alterations.

If defective parts are detected during machining by chance, the supplier can sort the parts and return the defective parts separately. A 100% inspection for defects is not carried out. If structural defects of any kind lead to damage of tools and/or machines, compensation can be demanded from the provider of the material.

Sprue rests on castings must be ground off flush with the surface and be within the machining allowance.

Based on the origin of the dimensioning or the dimensioning system respectively, machined bores/millings are not necessarily centric to holes already existing on the unmachined part.

During machining, existing radii may be cut and are then no longer fully intact.

For non-toleranced features between a machined and an unmachined surface, the tolerances for the unmachined raw part apply.

2.13. Heat Treatment / Surface Treatment

2.13.1. Dimensional Variations due to Heat- and Surface Treatments

For all sizes, the layer thickness of the subsequent surface treatment has to be taken into consideration. The same applies for dimensional variations due to heat treatments. Standard dimensions predetermined by the raw material are excluded from this regulation, unless otherwise specified in the drawing.

Liability limitations of the executing subcontractors may apply.

2.13.2. Case Hardening Depths, Edge Layer Hardening Depths

If the part must be ground / reworked after case hardening, the case depth refers to this area. In other areas the depth is exceeded by the relevant allowance.

2.13.3. Hydrogen Expulsion

Hydrogen expulsion after heat- and surface treatment is only performed for workpieces with a tensile strength Rm ≥ 1000 N/mm^2 (310 HV10 acc. to EN ISO 18265). Hydrogen expulsion for workpieces of lower tensile strength has to be agreed separately.

2.13.4. Condition after Heat Treatment

At areas that are not machined after heat treatment, discolouration or an oxide-/scale layer may occur.

2.13.5. Salt Spray Tests

Contrary to the definitions in DIN EN ISO 2081:2009-05, salt spray tests are carried out according to DIN EN ISO 9227:2006-10.

2.14. Shipping Condition

If the parts are cleaned before delivery, slight discolouration or staining is permissible after the cleaning process.

Due to the metal cutting process of machined parts, isolated chips may still be present on or in the parts, even after washing.

On request, parts made from low-alloyed materials ca be lightly corrosion protected before shipping.

If no special handling is required, the parts are handled as bulk material. Small impact marks are permitted, as long as these do not violate drawing tolerances (see also chapter 2.1).

The shipping is carried out in disposable cardboard packaging. The quantity tolerance of the delivery quantity can be up to ±10% of the p.o. quantity.

3 Quality

3.1. Inspections

Generally the zero defects target is striven for.

For serial production the product quality is verified by random sampling, unless a 100% inspection is explicitly agreed.

The process capability for correspondingly marked special features is verified by common statistical methods. It should be noted, that with the application of statistical methods for the determination of the product quality, a minor error rate may be possible.

Unless noted explicitly in the drawing or applicable documents, the ordered parts are only subject to a random dimensional inspection. Additional tests with regard to the properties of the ordered parts (e.g. tensile test, hardness test, decarburisation test, re-annealing test, head impact test, pressure test, notch impact test, torsion test, leak test, inspection of the technical cleanliness, functional tests, salt spray test, etc.) require a separate agreement.

The observance of quality assurance agreements, supplier guidelines, etc. can only be confirmed with mutual written contract conclusion and in the version valid at contract conclusion.

We assume an incoming goods inspection at the customer's premises according to § 377 HGB (Commercial Law Code).

3.2. Quality Certificates, Sampling

Written quality certificates are prepared in German language and only supplied on request. The documentation of measured values is carried out for selected and/or pre-agreed features. The archiving of the quality documentation is carried out by the supplier.

Unless specified otherwise, the initial sample report will be carried out according to VDA 2, submission stage 1 with 3 initial samples, cover sheet, measurement report, positioned drawing and material certificate. Test certificates for primary materials are realised in the form of test certificates 2.2., alternatively 3.1. according to DIN EN 10204.

Samplings comprise all features specified on the drawing, but no additional features that have to be deduced from a data set. Dimensions in brackets and theoretical dimensions are not included in the sample report.

Special features:

- Centre holes (e.g. DIN 332) and standardized recesses (e.g. DIN 76, DIN 509) are not sampled with individual dimensions, as long as these are only specified in the drawing with a standard symbol. Merely an inspection by attributes is carried out.
- For generic chamfers (e.g. according to DIN ISO 13715) and general specifications for radii and chamfers, only one measuring point per drawing detail is sampled.
- For the general surface quality, only one measuring point per drawing detail is sampled.

FMEA documents are prepared by the supplier upon request by the customer, and remain there for inspection.

Requalification tests are only carried out on the basis of special agreement.

3.3. Complaints

Complaints can only be accepted if the supplier is responsible for the fault, and if the parts are in the delivered condition.

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These Technical Delivery Conditions of Burgtec Systemlösungen GmbH & Co. KG are based on the Technical Delivery Conditions For Turned Parts published by „Verband der Deutschen Drehteile-Industrie“, Leostrasse 22, 40545 Düsseldorf.
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