Technical delivery conditions for turned parts from SDN Präzisionstechnik

Created: BC / QMB
Released: KO July 01, 2021

Contents

1. Introduction

1.1. Scope

These technical delivery conditions apply in the case of missing or unclear drawing specifications as a supplement to the customer drawing. In the aforementioned case, these technical delivery conditions are to be considered as another valid document. Drawing specifications and any other valid documents provided by the customer always have priority.

1.2. Valid specifications

Note that we assume no liability for requirements going beyond these technical delivery conditions which were not clearly communicated by the customer.
The binding production document is always a 2D drawing, but not a 3D data set.
Drawings are not checked for agreement with the data set.
If the use of data from a 3D data set should be expressly desired, it is to be assumed that the dimensions contained in this are always designed to nominal dimensions.
If features have to be derived from a data set, the general tolerances according to chapter 2.1 are always applied to these.

2. Design

2.1. Dimensional tolerances, points of impact

DIN ISO 2768-m applies to dimensions without tolerance specifications. If there are dimensions below 0.5 mm without a tolerance specification, they are also treated according to DIN ISO 2768-m (like dimensions 0.5 – 3 mm).
The envelope requirement (DIN 7167, ISO 8015, ISO 14405) is excluded as far as it is not explicitly required.
Since the delivered parts are bulk material, as far as not otherwise agreed upon, the parts may have points of impact and chuck marks from handling, as long as the tolerances specified on the drawing are not violated. Points of impact and chuck marks are not taken into consideration in the process capability studies.

2.2. Shape and position tolerances

According to DIN ISO 2768-K.
The general tolerance for concentricity not regulated in DIN ISO 2768 conforms analogously with table 4, DIN ISO 2768-K, general running tolerances.
Key surfaces, hexagons, slots, transverse bores, etc. are not made aligned with one another if angle specifications are missing.

2.3. Angular tolerances

For all angles without a tolerance specification, ± 5° applies.
For chamfers and edge breaks with edge lengths less than 0.5 mm, an angular tolerance of ± 5° applies.
For chamfers and fillets without a tolerance specification, the following length tolerances apply:

Nominal dimension up to 0.2 mm	→ +/- 0.1 mm
Nominal dimension over 0.2 up to 0.5 mm	→ +/- 0.2 mm
Nominal dimension over 0.5 up to 1.0 mm	→ +/- 0.3 mm
Nominal dimension over 1.0 mm	→ +/- 0.4 mm

2.4. Undimensioned workpiece edges, borehole transitions

2.4.1. Workpiece edges

The following applies to all undimensioned workpiece edges:
Outer edges - 0.2 mm
Inner edges + 0.4 mm
See also DIN ISO 13715.
Edge designations such as "sharp-edged, burr-free", "sharp-edged" and "burr-free" are assumed to have tolerances of ± 0.05 mm in accordance with DIN ISO 13715, i.e., there may be both a minimal amount of ablation as well as a minimal burr.

2.4.2. Borehole transitions

Boreholes which transition into each other, e.g. borehole transitions at transverse bores, can have a burr of max. +0.1 mm. If a burr-free transition is required, the chamfer size is not defined.
If boreholes are to be put into uneven surfaces and the borehole edges are to be chamfered, these chamfers are to be countersunk so deeply that the chamfer is at least 0.1 mm wide at the smallest place.

2.5. Test conditions for fits

Outer fits are always checked with a display. One measuring point per feature is checked.
Inner fits are checked with plug gauges. According to standard practice, the no-go end of a plug gauge may be slightly inserted when checking fits due to insertion aids or minor signs of wear on the gauge or chamfer or radii on the bore of the workpiece to be checked (not described in DIN 7150-2). But it must not be able to be inserted into the borehole under any circumstances.
If fits should become non-round due to the fragility of the workpiece, inner fits are checked at the smallest point of the non-round, and outer fits at the greatest point of the non-round. The specified tolerances are applied at these points.

2.6. Threads

2.6.1. Manufacturing method, testing, fits

Version either cut, chased, grooved, rolled, milled or whirled.
For inner threads, the no-go plug gauge may be able to be screwed in max. two thread turns.
Analogously, for outer threads, the no-go ring gauge may be able to be screwed on max. two thread turns (see also DIN ISO 1502).
If not specified, outer threads are produced with the thread tolerance 6g, and inner threads with the thread tolerance 6H (see DIN 13).

2.6.2. Thread lead-ins and run-outs, chamfers

The design of thread lead-ins and run-outs depends on the production process, usually chamfered.
The minimum dimension for thread chamfers for male threads is:
Minimum core diameter dimension –5% of nominal thread dimension, but at least 0.1 mm below the minimum core diameter dimension.
The maximum dimension for thread chamfers for female threads is:
Maximum outer diameter dimension +5% of nominal thread dimension, but at least 0.1 mm above maximum outer diameter dimension.
The chamfer angle is usually 45°±5°.
Thread run-outs to the collar are designed to be normal length based on DIN 76 Form A.

2.7. Milled areas

Milled surfaces can either be plunge-milled or continuously milled.
In the case of plunge-milled surfaces or slots, there is an arc-shaped slot bottom, depending on the tool.
Drawing dimensions refer to the shortest place.
The tolerances of key surfaces come from EN ISO 4759.

2.8. Boreholes

The form and angle of the drill tip are arbitrary, unless this is defined on the drawing.
The transition between two bores which are axis-parallel or axis-identical can be realized at any angle.
The edge transition conforms with chapter 2.4.

2.9. Surface quality

2.9.1. General surface quality

The surface has an average roughness value of Ra 3.2 in accordance with DIN EN ISO 1302 and an average roughness depth of Rz 25, as far as the measuring distance for determination is sufficient.

If the surface term "polished" is specified on a drawing without further specification, a surface quality of Rz 2 is executed.

Points of impact, as named in 2.1, have no influence on the result of the surface quality determination.

The roughness information according to DIN 140 ("triangles"), which are meanwhile invalid, are converted according to DIN EN ISO 1302 / series 2 / measured value Ra.

Measuring distances are determined in accordance with DIN EN ISO 4288 and DIN EN ISO 3274.
Chamfers, roundings, knurls, and thread surfaces are not defined with regard to their surface quality.

2.9.2. Surface quality in boreholes and on milled surfaces

Tolerance field in acc. with 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
Fits IT 7, IT 6, IT 5	Ra 0.8

2.10. Scrap

If the drawing does not expressly demand the removal of turning scrap, the manufactured turned parts can have turning scrap on its front sides (end faces). This also applies to the case of a generally valid machining mark in or on the title block.
The size of the scrap is calculated according to DIN 6785.

2.11. Preliminary material

If not otherwise specified, the preliminary material is not subjected to special tests, such as ultrasonic testing, eddy current crack testing, x-ray testing, etc.

2.12. Provided material

The following applies in the case of machining the provided blanks:
The rules of DIN ISO 8062 apply to machining allowances. In the case of cylindrical bodies or for opposite-lying surfaces, the machining allowance should be doubled.
The scope of the incoming goods inspection for the provided material at the supplier only includes identification and intactness, as well as a random check (see chap. 3.1) of features which are important for further processing , since it is assumed the provider performed an outgoing goods inspection.

In the calculation, the supplier assumes that the structure is free of defects (cavities, inclusions, etc.). Defects in the structure can result in price changes.

If visually obvious structural defects are noticed during machining, the supplier can sort out the parts and return them separately. A 100% check for defects is only done after written approval of the provider. The supplier reserves the right to bill for this.

If structural defects result in severe damage to tools and/or machines, compensation for damages can be demanded.

Existing radii might be cut during machining and can then no longer be completely retained.
In the case of non-tolerated features between a machined and unmachined surface, the corresponding tolerances of the blank manufactured without chips apply.

2.13. Heat treatment / surface treatment

2.13.1. Dimensional changes due to heat and surface treatments

For all dimensions, the layer thickness of the surface to be subsequently applied is to be considered in the given case. The same applies to dimensional changes due to heat treatments.
Excluded here are customary dimensions defined by the original material, as far as no reference is specifically made to them in the drawing.

2.13.2. Case hardness depth, surface hardness depth

If grinding or rework should be required after case hardening, the case hardness depth is with regard to this range. In other areas, the depth is exceeded by the corresponding allowance.

2.13.3. Hydrogen expulsion

Hydrogen expulsion after heat and surface treatment is generally only performed for workpieces with a tensile strength Rm greater than 1000 N/mm^2 (310 HV10 in acc. with EN ISO 18265).

If hydrogen expulsion is to be performed for lower workpiece strengths, this must be agreed upon separately.

2.13.4. Condition after heat treatment

In areas which are no longer machined after heat treatment, there might be discolorations or an oxide/scale layer, depending on the process used.

2.13.5. Salt spray tests

Salt spray tests, contrary to the definitions in DIN EN ISO 2081:2009-05, are generally performed according to DIN EN ISO 9227:2006-10.

2.14. Shipping condition

If the parts are cleaned before delivery, slight discolorations or stains after part cleaning are permissible. Since these are cut parts, despite part cleaning, there could still be occasional chips on or in the parts.

Parts made of low-alloy materials can be lightly preserved before shipping.
If no special handling should be prescribed, the parts are handled as bulk goods.
Small points of impact are permissible as long as the drawing tolerances are not violated as a result (see also chapter 2.1).
As standard, shipping is done in disposable boxes. The piece number tolerance of the delivered quantity can be up to ±10% of the ordered amount.

3 Quality

3.1. Tests

Generally, the zero defect goal is strived for.

In the case of series production, the product quality is checked based on random sampling, as far as a 100% check is not explicitly agreed upon.
The process capability for special features marked accordingly should be able to be verified based on the customary statistical methods. Here, $c_{pk} \geq 1.33$.
Note that when using statistical methods to determine part quality, a small defect rate might have to be expected.

If not expressly noted on the drawing or other valid documents, the ordered parts are subjected only to a random-sampled dimensional inspection. Additional testing with regard to the properties of the ordered parts (e.g., tensile test, hardness test, decarburization test, restart attempt, head soundness test, pressure test, notch impact test, torsion test, leak test, technical cleanliness test, function tests, salt spray test, etc.) require a separate agreement.
Compliance with quality assurance agreements, supplier guidelines, etc. can only be assured if there is a mutual written conclusion and for the version valid at the conclusion.
We assume there will be an incoming goods inspection at the customer according to § 377 of the code of commercial law.

3.2. Quality certification, sampling

Written quality certification is issued in German and is included in delivery only on request.

Measured values are documented on selected features, possibly to be agreed upon. The supplier archives the quality documentation.

If not otherwise specified, the initial sample test report is created in acc. with VDA 2, submission level 1, with 3 initial samples, cover sheet, measurement report, itemized and stamped drawing and material certificate.

Test certificates for preliminary materials are issued in the form of factory certifications 2.2, alternatively 3.1, according to DIN EN 10204.
Samplings include all features specified on the drawing, but not additional features which have to be derived from a data set. Dimensions in brackets and theoretical dimensions are not sampled.
Particularities:
· Centering bores (e.g., DIN 332) and DIN undercuts (e.g., DIN 76, DIN 509) are not sampled with the individual dimensions, if these are only specified in the drawing with the standard symbol. There will only be an attributive test for existence.
· In the case of general edge ablation (e.g., according to DIN ISO 13715) and general information about radii and chamfers, only one measurement point per drawing specification is sampled.
· In the case of the general surface quality, only one measuring point per drawing specification is sampled.

FMEA documents are created by the supplier if the customer demands them accordingly, and will remain there for viewing.
Requalification tests will only be performed based on special agreement.

3.3. Complaints

Complaints can only be recognized if the supplier is to blame and the parts are in their delivered condition.