

Technical terms and conditions for turned parts

1. Scope

These technical terms and conditions for the delivery of turned parts apply in addition to the customer's drawing in case of missing or unclear specifications. In this case these technical terms and conditions are to be considered as an integral part of the contract. Drawing specifications and any other applicable documents provided by the customer always have priority.

We declare that we do not assume responsibility for any customer requirements going beyond these technical terms, unless these requirements have been specified clearly by the customer.

2. Technical description

2.1. Dimensional tolerances, bulk commodity

For dimensions without tolerance indication, DIN ISO 2768-m applies. Dimensions smaller than 0.5 mm, which lack tolerance indication, will also be treated according to DIN ISO 2768-m, in the array of 0.5 – 3.0 mm.

Unless otherwise specified, the delivered parts are bulk commodity. Therefore, nicks and dents are permissible, as long as they do not exceed the tolerances in the drawing. The nicks and dents do not influence the values taken for process capability studies.

2.2. Form and positional tolerances

See DIN ISO 2768–K.

Flats, hexagons, slots, cross drillings, etc., will not show a defined position to one another, unless there is an angular specification.

2.3. Angle tolerances

A tolerance of $\pm 2^\circ$ applies to all angles without tolerance indication in the drawing.

An angle tolerance of $\pm 5^\circ$ applies to chamfers with a length of ≤ 0.5 mm.

The following length tolerances apply to chamfers without tolerance indication:

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. Component edges without dimensional indications

The following regulations apply in case of missing specifications for edges, based on DIN ISO 13715:

Outer edges: – 0.2 mm

Inner edges: + 0.4 mm

For specifications such as “sharp edge, free of burrs”, “sharp edge”, and “free of burrs” edge transitions/chamfers with max. ± 0.05 mm are assumed according to DIN 6784; resulting in either a minimal edge breakage or a minimal burr.

Edges at intersecting bores, for example at cross drillings, may have a maximum burr of + 0.1 mm. If a transition free of burrs is required, the size of the chamfer is not defined.

2.5. Checking conditions for fits

According to general practice (e.g. minimal signs of wear) a minimal insertion of the no-go gauge may be tolerated at the entry of the fit.

If the TIR shows roundness deviations due to variation of the turned part, which may be caused by O.D.-I.D. ratios close to 1, inner fits are tested at the smallest, outer fits at the largest point of the runout. The specified tolerances are applied for these points.

2.6. Threads

2.6.1. Manufacturing process, inspection

Threading can be manufactured by cutting, forming, single-pointing, milling or whirling.

Because the dimensional accuracy of threads only starts with the third pitch, the no-go gauge may be inserted or screwed on up to this length. (with reference to DIN ISO 1502)

2.6.2. Thread ends, chamfers

Thread ends are depending on the manufacturing process, usually chamfered.

The minimum dimension for thread chamfers on bolts can be defined as follows:

Min. size of the core diameter – 5% of the nominal size of the thread, min. 0,1 mm below the LSL of the core diameter.

The maximum dimension for thread chamfers on nuts can be defined as follows:

Max. size of the O.D. of the thread + 5% of the nominal size of the thread, min. 0,1 mm above the USL of the O.D. of the thread.

The usual angle of the thread chamfer is $45^{\circ} \pm 5^{\circ}$

According to DIN 76 Form A, thread run-outs towards shoulders are manufactured with normal length.

2.7. Milled flats

Flats with shoulders can be either plunged or through-feed milled.

2.8. Surface quality

2.8.1. General Surface finish

The average surface finish is Ra 3.2 (see DIN EN ISO 1302), and the average roughness depth is Rz 25, provided that the length of the section measured is sufficient for an evaluation.

Nicks and dents, as described in 2.1, do not influence the value of the surface finish.

The specifications of roughness as per DIN 140 (“triangles”), which have become obsolete in the meantime, will be converted according to the Ra-value as per DIN EN ISO 1302-2.

2.8.2. Surface quality in drillings

Tolerance zone according to DIN ISO 286-1	Roughness
Drillings without ISO-fits	Ra 12.5
Fits IT 11, for example H11	Ra 6.3
Fits IT 10, IT 9, IT 8	Ra 3.2
Fits IT 7, IT 6, IT 5	Ra 0.8

2.9. Cut-off burr

If the removal of cut-off burr is not required expressly in the drawing, the turned part can bear cut-off burrs on its faces. This also applies in case of a machining sign in or close to the legend of the drawing.

The size of the burr is defined in DIN 6785.

2.10. Raw material, provided material

The tolerance of the O.D. for bar, ring and coil stock is h11 according to DIN EN 10277, tested at the smooth surface. Surface flaws such as pores and/or feeding and drawing grooves are acceptable according to DIN EN 10277-1 Class 1.

2.11. Heat treatment/Surface treatment

2.11.1. Dimensional changes due to heat and surface treatment

If necessary, the coating thickness of the surface treatment must be considered for all dimensions. The same applies to dimensional changes caused by heat treatment.

This is not true for standard dimensions predetermined by the raw material, unless otherwise stated in the drawing.

2.11.2. Case depth

If grinding or any other secondary operations are necessary after case hardening, the case depth refers to this machined area. In other areas the depth is exceeded by the corresponding allowance.

2.11.3. Expulsion of hydrogen

An expulsion of hydrogen will only be carried out for parts with a tensile strength $R_m \geq 1000 \text{ N/mm}^2$ (310 HV10 according to EN ISO 18265:2003). If a hydrogen expulsion is required also for parts with a lower tensile strength, an additional agreement will be necessary.

2.11.3. Salt spray tests

Salt spray tests will not be carried out as described in DIN EN ISO 2081:2009-05, but always according to DIN EN ISO 9227:2006-10

2.12. Transport conditions

Turned parts made of low-alloy/non-alloy material and without surface treatment are lightly oiled before shipment.

Transport is made in non-returnable cartons.

3. Quality

3.1. Inspections

In general the zero-defect aim is being pursued.

At serial production the product quality is inspected by means of random sample tests - provided that a 100 % control has not explicitly been agreed. Process capability should be verifiable by means of the current statistical methods. We would like to point out that in case of the application of statistical methods for determination of part quality a slight error rate must be taken into account.

If not specified expressly in the drawing or in any other applicable document, finished parts will only be inspected dimensionally, using random samples before shipping.

Any additional tests concerning the properties of the ordered parts (e.g. tensile strength tests, hardness tests, decarburization tests, tempering tests, pressure tests, impact tests, torsion tests, leak tests, inspection for technical cleanliness, functional tests, etc.) must be agreed separately.

We can only confirm to act according to customers' quality control guidelines, logistics guidelines or any other guidelines for suppliers if the eligible release of these contracts has been submitted to us and mutually agreed in writing between both parties, the customer and the supplier.

We assume that the customer arranges for an incoming inspection of goods according to § 377 HGB (German law).

3.2. Documentation for Quality Control

Any documentation for quality control will only be submitted upon request.

Inspection certificates for raw material are issued in the form of test reports 2.2 according to DIN EN 10204, unless otherwise agreed.