MÄHLERS

GENERAL TECHNICAL REQUIREMENTS

Article number 10041065

Change log

Current version	1.o

New version	Date	Affected	Description of change

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Introduction

This document, together with the Supplier Handbook and How to deliver to Mählers, is the core of Mählers initiative to clarify and guide our suppliers on what we are expecting of the products and components we purchase and what we expect of the collaboration with our suppliers. These documents in the latest versions are available on www.mahlers.se

The General technical requirements functions as the baseline for technical requirements and dictates the minimum expectations of the products and components purchased by Mählers. Some requirements are valid for all products and components while others are divided into sections based on production method, material and function.

The requirements included in this document applies, if not otherwise stated in item-specific drawings or otherwise agreed upon in writing.

General requirements

Mählers expects the supplier to make sure all products and components delivered to Mählers are produced according to the drawings or cutting file of the latest accepted revision. Furthermore, the supplier shall make sure that the material used meets the requirements specified in the product/part drawings or cutting file.

Where applicable, fixtures and jigs for welding and machining are to be used and if possible be based on the same date point. Serial deliveries are expected to maintain the same quality and finish as approved outturn samples. Deviations from the outturn samples must be approved by Mählers.

100% visual inspections must be performed of all products and components delivered to Mählers.

Upon request from Mählers, the supplier is expected to be able to show that the requirements included in this document are fulfilled.

Documentation

When Mählers requires measurement protocols, they shall be clearly marked and enclosed with the shipments.

Marking requirements

Mählers expects all purchased products and components to be clearly marked to enable traceability and handling on non-conformities and claims. Preferably, the marking of the product should not be done manually. The marking area is specified on the drawings and the maximum dimensions of the marking area are **30mmx80mm**. The marking requirements specified below are the minimum requirements from Mählers, the suppliers are free to add other information if needed as long as it fits within the marking area.

Abbreviations

- Supplier (SS)
- Date, Year Week (YYWW)
- Mählers item number and drawing version (Art,- A)

The marking shall be in the form below

SS YYWW Art,-A

Production method specific requirements

Machining requirements

Unless otherwise specified, machining must be done in accordance with the latest accepted revision.

There must be established procedures for inspections and measurements.

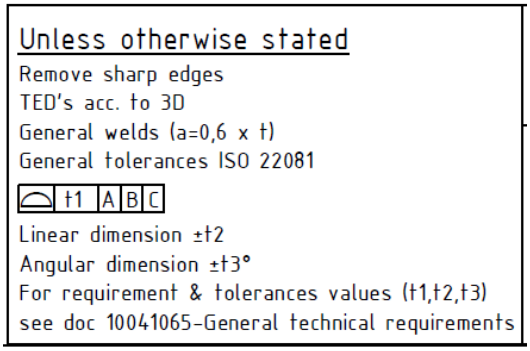
Holes and shaft hubs with set tolerances must have a surface smoothness of **Ra 3.2** or finer.

Delivered items shall be free from burrs and sharp edges.

Drawings & general tolerances

All machining drawings produced by Mählers going forward are in accordance with **SS-EN ISO22081**.
The now expired standard **ISO2768-2** is still valid for already produced drawings that refer to it. What standard the drawings are drawn up after is marked on the drawing.

As orientation, all drawings produced in accordance with **SS-EN ISO22081** will be marked with below picture.



Reading instructions for the drawing legend:

- TED (Theoretical Exact Dimensions) is found in the 3D models if not stated on the drawing
- All tolerances are stated together with the surface profile
- For general tolerances, the drawing legend refers to below tables in this document. All measurements are given in mm.

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Surface profile tolerances:

ISO 22081 Surface profile (t1)						
Nominal linear dimmension	≤ to 6	6 < S ≤ 10	10 < S ≤ 25	25 < S ≤ 50	50 < S ≤ 100	100 < S ≤ 250
Tolerance values	0,2	0,3	0,4	0,5	0,6	0,75

ISO 22081 Surface profile (t1)				
Nominal linear dimmension	250 < S ≤ 500	500 < S ≤ 1000	1000 < S ≤ 2000	2000 <
Tolerance values	1,5	2	3	4

Given tolerances in above tables represents the total tolerance span, e.g. 0.2 equals ±0.1

Linear tolerances:

ISO 22081 Surface profile (t1)						
Nominal linear dimmension	≤ to 6	6 < S ≤ 10	10 < S ≤ 25	25 < S ≤ 50	50 < S ≤ 100	100 < S ≤ 250
Tolerance values	± 0,1	± 0,2	± 0,3	± 0,4	± 0,5	± 0,75

ISO 22081 Surface profile (t1)				
Nominal linear dimmension	250 < S ≤ 500	500 < S ≤ 1000	1000 < S ≤ 2000	2000 <
Tolerance values	± 1	± 1,5	± 1,8	± 2

Angular tolerances:

ISO 22081 Surface profile (t1)					
Nominal linear dimmension	≤ to 10	10< S ≤ 50	50 < S ≤ 120	120 < S ≤	400 < S
Tolerance values	± 1º	± 0º30’	± 0º20’	± 0º10’	± 0º5’

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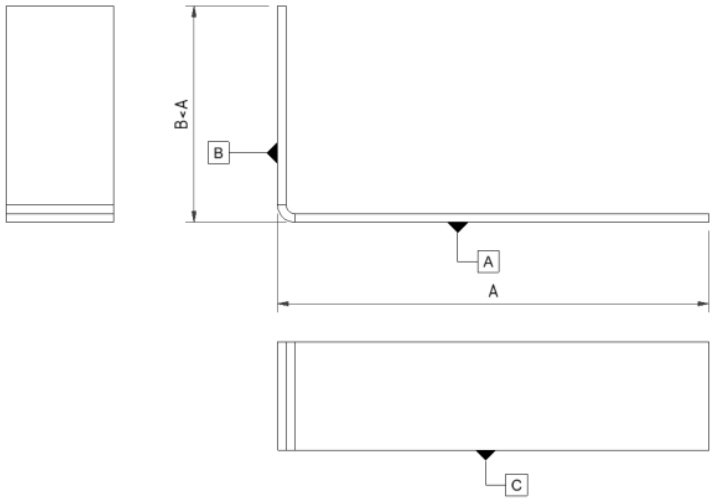
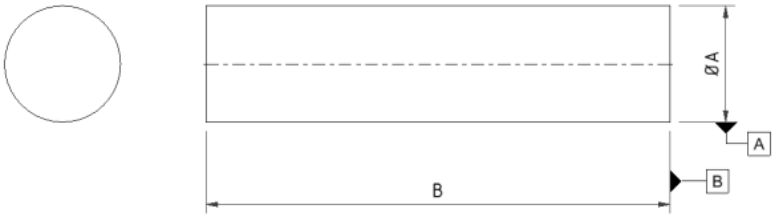
Drawings datum and datum systems

If no datum is placed on the drawing it shall be interpreted according to below

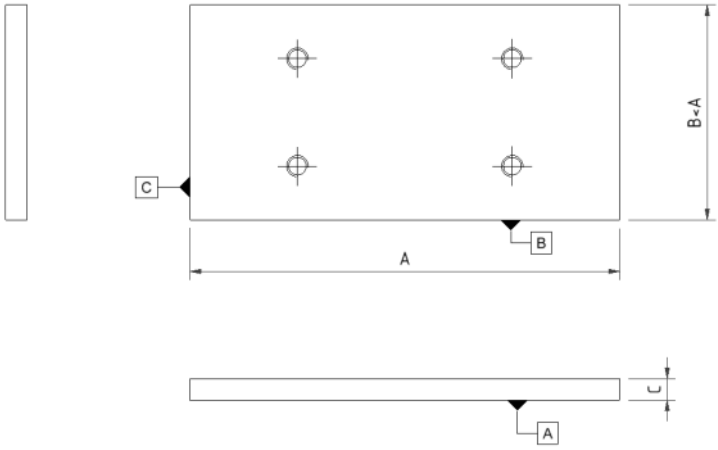
Bent sheet metal



Cylinder



Plate



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Casting requirements

Unless otherwise specified, castings shall be in accordance with **ISO 8062-Dimensional Casting Tolerance Grade 10 (DCTG10)** or lower. Regarding casting defects all castings shall be in accordance with **SS 114060.** Unless otherwise specified on the drawings, all surface zones **(Defect class 1)** are considered marked areas with **Defect level 5** as requirement.

Fettling/Cleaning shall be carried out in a way so that major visible areas that won´t be machined afterwards are free from marks of cleaning tool.

Feeder placement shall be decided together with Mählers Design.

Welding requirements

Personnel requirements

All welding personnel doing manual welding must be qualified according ISO 9606-1 and welding operators, that operates welding robots, according to ISO 14732. At a minimum, welders must have passed fillet weld tests. Certificates for all welding personnel must be available upon request.

Joint preparation

Joint preparation may be specified in the drawing, but it is up to the supplier to form joints that ensure the right quality is achieved. Joint preparation are to be performed according to **ISO 9692-1**.

Welding datasheet WPS / WPQR

WPS / WPQR may be required by the supplier upon request from Mählers.

Weld execution Preferably

1.2mm (138) cored wire should be used.

Welds must be executed to **ISO 5817 D** standards apart from the items below:

- Dimension (a) too small (C)
- Dimension (a) too large (C)
- Incorrect fillet weld edge (C)

For manual welding max 5 x dimension (a) permitted in one bead, dimension (a) from 6 mm must be welded with a minimum of 2 beads, from 8 mm with a minimum of 3 beads.
All intersections between two plates are to be welded if not otherwise stated. All welds with no specific welding instructions given on the drawings shall be welded according to the general reference (a=0,6 x t), which refers to the thinner plate in the joint.
Weld bead structure, weld direction and weld joint order must be selected so that the welds generate a minimum of inherent tension and deformations.

Support plates and reinforcements shall be used for all corners. Avoid starting and finishing welds close to corners. Welding on mill scale is not permitted.

Welding spatter must be removed so that the surface finish enable further treatment such as painting.

Steel intended for welding must have the same temperature as the surrounding environment before welding is initiated, to avoid condensation issues.

If tack welds form part of the final weld, the same requirements apply as for the weld.

If tack welds do not form part of the final weld, they must be carried out in such a manner or ground sufficiently for them to be fully molten during welding.

Remaining tack welds must be at least 50 mm long or four times the coarsest material thickness if it is thinner than 50 mm. Temporary welds (lifting lugs, start and stop plates etc.) must be removed in such a way that they do not affect strength and finish.

Cutting

If not specified on the 2D drawing, a thermal cut shall be in compliance with **ISO 9013** of range **5** for perpendicularity or angularity tolerance, range **4** for mean height of the profile and class **2** for limit deviations for nominal dimensions.

No sharp edges may remain on completion of welding.

Welding on high-strength steel

Aspects to pay special attention to when welding high-strength steel:

- Risk of cold cracks, hydrogen cracking
- It may be necessary to raise the working temperature.

Welding inspections

Suppliers are expected to have procedures for welding inspections and tests in place. Procedures should be available for presentation upon request from Mählers.

100% of welds are expected to be visually inspected throughout the welding process.

Surface treatment requirements wet paint

Non-machined surfaces must be sand blasted to Sa 2.5 as per **ISO 8501-1** before painting. Exception for components that cannot be blasted. Wasching with alkaline deagreaser is also permitted—this treatement need premission from Mählers.

Blasting sand must be removed before painting. The surface must be free from dust.
Painted surfaces must be free from contaminants such as mill scale, grease and rust.
Machined surfaces and threads must be free of paint unless otherwise specified on the drawing.

Machined surface refers only to machining carried out on completed products (not partially machined components).

The paint shall be preformed according to **ISO 12944**. Mählers minimun reqirement is:

- C3 Medium

- Paint shine shall be 60 according to **ISO 2813**

- All masking must be removed before delivery to Mählers.

100% visual inspections must be performed.

Surface treatment requirements powder coating

Non-machined surfaces must be sand blasted to Sa 2.5 as per **ISO 8501-1** before painting. Exception for components that cannot be blasted. Surfaces shall be free from dust and grease

Mählers minimun reqirement is:

- C3 Medium **ISO 12944** or equivaqlent quality

- Powder paint must contain ployester

- Pre treatment skall be iron phosphate

- All masking must be removed before delivery to Mählers.

- Paint shine shall be 60 according to **ISO 2813**

Paint requirements

For the parts supplied to Mählers already painted, it is crucial that the color is correct. Below is a list of colors used by Mählers that are defined according to internationally accepted color standards. Color standard cards are used for all colors and all painted components shall be visually controlled against these cards prior to delivery. The cards are supplied by Mählers with the order of a trial batch for new products or upon request by the supplier. Mählers will visually inspect all painted parts using the mentioned color standard cards.
Mählers defined colors:

- Black RAL 9005 Shine 25-35
- Mählers red NCS S1580-Y90R
- Scania grey NCS S8502-B

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Electronics

All electronics delivered to Mählers shall be approved according to the local standards (e.g. CE, UL, FCC) for the respective markets. Upon request, Mählers will provide information regarding what markets the products will be present on. The supplier shall provide 3D and STEP-files for all electric components, if not developed by Mählers, supplied to Mählers.

Mählers expects the supplier to provide Mählers with data sheets specifying below details for all electric components, if not developed by Mählers, before first delivery.

1) Geometrical dimensions
   Chemical resistance
2) Random vibration
3) Operating shock
4) Operating temperature
5) Storage temperature
6) Operating Humidity
7) Electromagnetic compatibility
8) Operating Voltage
9) Expected life
10) IP classification
11) What standards it has been tested by

In general it is, if not otherwise stated on the drawings, up to the supplier to ensure that type and dimensions of sleeves, PVC-tubing, and protective- and shrink tubing match the requirements of the intended application.

Tolerancing

General tolerances for cable lengths

Cable lengths < 300 mm: +10 mm / -0
Cable lengths 300mm – 1 500mm: + 20mm / - 0mm
Cable lengths 1 500mm – 3 000mm: + 50mm / - 0mm
Cable lengths 3 000mm – 10 000mm: + 100mm / - 0mm
Cable lengths >10 000mm: + 2% / - 0%

Protective tubing

Placement of protective tubing is specified on the drawings. The measurements are specified for extended cables, the measurement will vary when the cable is rolled up.

Shrink tubing

In general two types of shrink tubing is used, with or without glue. If not stated on the drawings it is up to the supplier to ensure that the, for the purpose, appropriate tubing type is used.

Oils & Chemicals

All suppliers of chemicals to Mählers shall follow REACH regulation (EC 1907/2006). Suppliers are encouraged to register chemicals supplied to Mählers in the database for chemicals: www.ecoonline.se.

Plastics requirements

Flammability and UV-resistance is of main concern when it comes to plastic components.

Regarding flammability, all plastic components supplied to Mählers shall live up to **UL94-V0** as well as **ISO 9773** for plastics in general and **ISO 9772** for cellular plastics.

For all externally mounted plastic components supplied to Mählers, UV-stabilized material shall be used. Whether the component is externally mounted will be specified on the drawings.