1. Scope and purpose

Electropolishing of the inner surfaces of recipients is required for machines with high vacuum requirements (desorption, final pressure, cleanliness, etc.), especially for HV / UHV machines.

The following properties should be achieved:

- Smooth, crack-free and shiny surfaces
- Surfaces free of burrs, flakes and gas inclusions
- Removal of damaged material layers so that the real properties of the surfaces can be utilized
- Reduction of pump-down times by reducing adsorption and desorption
- Reduction of the adhesion of impurities

2. Applicable standards and guidelines

- DIN EN ISO 15730
- DIN 8590

3. Process description

3.1. Treatment of the base material

- Sheets are sanded on one or both sides according to the drawing
- The designated surfaces of the cut-outs for the inside of the recipient or door must be surface sanded
- Sanding must be carried out dry, without any sanding or polishing additives
- The surface must be carefully cleaned of grease and organic contaminants such as adhesive residue from protective films before sanding
- The sanding must reach into the base of the material and remove macro defects. Depending on the initial roughness and the layer thickness to be removed, it is therefore necessary to start with a correspondingly coarse grain size in the preliminary sanding stage
- Sanding should be carried out in several steps with increasingly finer grit until the desired roughness is achieved. It is important that the subsequent sanding completely removes the structures of the previous sanding. The gradation of grit sizes for the individual sanding operations should not be greater than two steps. The complete removal of the previous sanding is easy to check if the sanding direction is changed with each pass (cross sanding). Any remaining structures from the previous sanding can then be easily recognized visually
- Do not use glue-bonded abrasives for sanding
- Use sharp sanding belts
- The sanded surfaces must have a certain Ra value. *Table 1 provides an overview.* These values are guidelines and can vary depending on the material, abrasive and machining process
- The dry sanding (grit sizes used) and the surface roughness value achieved must be certified in a report
- The sanded surfaces must be protected from scratching with new, clean, oil-free, dry packaging material (e.g. corrugated cardboard)
- Careful handling and the use of intermediate layers must ensure that neither scratches nor indentations occur on the material surface during transport

Table1: Surface roughness values

Pre-sanding	sanded	electropolished
Grain size	**Ra**	**Ra**
60	**2,0 - 3,5**	**1,0 - 1,7**
80	**1,2 - 2,5**	**0,6 - 1,2**
120	**1,0 - 1,8**	**0,5 - 0,9**
180	**0,8 - 1,5**	**0,4 - 0,7**
240	**0,6 - 1,2**	**0,3 - 0,6**
320	**0,4 - 0,75**	**0,2 - 0,4**

3.2. Assembly and welding

- Clean the sanded surfaces with ultra-pure alcohol (purity > 99%), especially in the area of the weld seams
- The small parts to be welded into the recipient interior must be sanded before installation (see chapter 2) and also cleaned thoroughly with ultra-pure alcohol (purity > 99%)
- Leak test of the cooling channels
- TIG / MAG weld seams do not need to be sanded afterwards

3.3. Deburring and cleaning after mechanical manufacturing

- Deburring the components
- Cleaning with steam jet using city water and degreasing agent
- Rinsing with city water

3.4. Electropolishing in the bath

- Electropolishing the inside surfaces of the recipients
- Material removal during electropolishing **20 µm**, unless different specification on the drawing
- Electropolishing according to the electropolishing plan.
  The electropolishing plan can be found in Appendix A

4. Information in design documents

In the drawings, the electropolished partial surfaces must be labelled according to the surface marks.

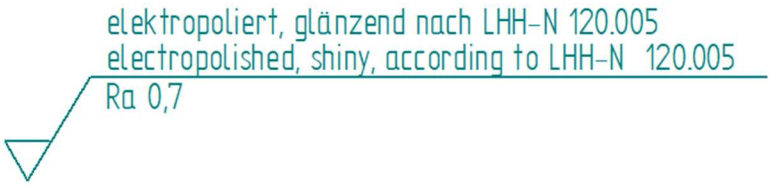
Specification: Electropolished according to LHH-N120.005

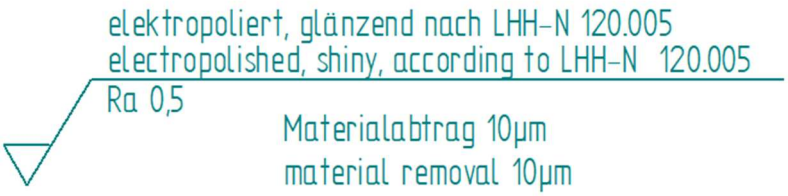
Matt / glossy

Roughness depth in Ra after electropolishing

Material removal in µm if not 20µm

Examples:





Appendix A

Electropolishing process description

for the treatment of austenitic Cr-Ni steels

1. Degreasing (if required) with mild alkaline degreaser
2. Rinsing with city water under high pressure (approx. 160 bar)
3. Pickling by immersion or spraying with pickling chemicals based on hydrofluoric and nitric acid, acid-resistant surfactants, chloride-free
4. Rinsing with city water under high pressure (approx. 160 bar)
5. Electropolishing with electrolyte
   - Composition: Phosphoric acid, sulphuric acid
   - Polishing time: Depends on the desired removal, material and gloss level.
   - Current density 1000 - 2000 A/m²
6. Rinsing with city water
7. Passivation (nitric acid-based)
8. Rinsing with city water under high pressure (approx. 160 bar)
9. Final rinsing with demineralised water
10. Drying at ambient temperature
11. Packaging for transport (at least seal all openings)