1. Application and Purpose

This standard applies to the vacuum components defined in the standard LHH-N 120.001. It describes methods used to obtain and maintain a suitable vacuum surface quality, in particular with regard to surface cleanliness.

The standard contains data and information for the design, production, packaging, transport, inspection and assembly of the parts.

2. Measures

2.1 Surface structure

The surface structure results from the surface roughness given in the drawings and the additional details with regard to surface processing and treatment. Blasting may be required depending on the quality of the component and its application during the process. Details can be found in the standard LHH-N 120.030.

2.2 Surface cleanliness

To obtain a clean surface, the following cleaning routines shall be observed.

3. Cleaning routines

Cleaning routines in accordance with this standard shall be carried out **after** manufacturing and checking of the component.

3.1 Degreasing

- Materials prone to corrosion (e.g. steel)	:	alkaline bath
- Non-corrosive materials (CrNi steel, Al, Al-alloys, non-ferrous metals, plastics)	:	acid bath
All hardened components (e.g. gear wheels)	:	cleaning with e.g. Esol-NA (Fa. Sondermann, Dortmund) Mixture of Isoparafine Hydrocarbons
- Supporting measures	:	ultrasonic bath

3.2 Rinsing

Rinsing SW	:	Water (drinking water)
Rinsing DIW	:	Deionized water

3.3 Drying

Dry with **oil-free** compressed air or hot air.

3.4 Heat treatment

Heat treatment shall be used to correct impurities occurring during manufacturing.
The component shall be heated for 2 to 3 hours in a vacuum oven at a pressure of <1 mbar and a temperature of 250 to 300°C.

3.5 Blasting

Depending on the wanted effect either cleaning, hardening or roughing blasting is used. See LHH-N 120.030!

3.6 High pressure cleaning

- High pressure cleaning with pulsating water jet by town water
- Small parts alternatively can be cleaned in ultrasonic bath

3.7 Ultrasonic bath shall be used depending on the material (see 3.1).

3.8 Bake-out

Bake-out procedure is only necessary for parts used in vacuum ranges HV2 and UHV in order to obtain hydrocarbon-free surfaces

The bake-out procedure takes place in a vacuum oven. The following parameters are set:

Final pressure of oven	:	< $1x10^{-3}$ mbar at 250 to 300°C
HV pumps allowed	:	Roots pumps, turbo molecular pumps, cryo pumps
Pressure at bake-out	:	< $1x10^{-2}$ mbar
Temperature during bake-out	:	250 to 300°C
Duration	:	2 to 3h

4. Cleaning routines

Different routines are necessary depending on the vacuum ranges the vacuum components are intended to be used (determined in accordance with standard LHH-N 000.320). These are specified in the following table subject to material and blasting treatment.

Vacuum range	Material	Blasting	Without Blasting
GV / FV	Steel, ferrite and others	Degrease Rinse SW Dry Blasting	Degrease Rinse SW Dry
HV1	Steel, ferrite	Degrease Rinse SW Dry Blasting	Degrease Rinse SW Dry
	Others	Degrease Rinse SW Dry Blasting Rinse SW Dry	Degrease Rinse SW Dry
HV2	Steel, ferrite	–	–
	Others	Degrease Rinse SW Dry Blasting High pressure cleaning, Small parts alternatively cleaned by Ultrasonic bath Rinse DIW Dry Wipe test 5)	Degrease Rinse SW Rinse DIW Dry
HV3	Steel, ferrite	–	–
	Others	Degrease Rinse SW Dry Heat treatment 1); 4) Blasting Ultrasonic bath Rinse DIW Dry Wipe test 5) Bake-out 2);4)	Degrease Rinse SW Rinse DIW Dry Heat treatment 1); 4) Bake-out 2);4)
UHV	Steel, ferrite	–	–
	Others	Degrease Rinse SW Dry Heat treatment 1); 4) Blasting Ultrasonic bath Rinse DIW Dry Bake-out 3)	Degrease Rinse SW Rinse DIW Dry Heat treatment 1); 4) Bake-out 3)

1) Optional, if necessary to remove impurities arising during the manufacturing process
2) Optional if particular emphasis is laid on hydrocarbon-free component surface
3) Bake-out is always required
4) Optional details on drawings
5) Wipe test with ethanol impregnated white kerchief, holes and threads with ethanol impregnated
   cotton bud. No visible residues on kerchief or cotton bud allowed.

5. Packaging, transport, checking, final assembly

After cleaning, the GV, FV and HV1 components shall be packed in dust-proof plastic film or similar material. After cleaning, HV2, HV3 and UHV components may only be touched with clean gloves. If necessary, they shall be cooled, packed in plastic film and hermetically sealed or kept under vacuum.

The components shall be prepared so that they and their packaging are protected from damage during transport.

The handling procedures described above shall also apply for checking of parts.
During assembly, the components shall also be handled so that they cannot be contaminated in any way, i.e. the components shall remain packed as long as possible. When unpacked, gloves shall be worn when handling HV2 and UHV components.

6. Information in drawings

In addition to surface roughness and leak rate information, the surface cleanliness shall be included in the drawing in the form of a cleaning note in accordance with this standard. The respective vacuum range shall be stated and reference made to the standard. Bake-out and blasting treatment details shall also be given if these routines are required.

Example 1: Cleaning a steel vacuum component for use in the HV1 range.

Information: **HV1-cleaned LHH-N 120.002**

Example 2: Cleaning a CrNi steel vacuum component for use in the HV3 range with additional heat treatment, bake-out and blasting treatment to strengthen the surface.

Information: **HV3-cleaned LHH-N 120.002**
- heat treatment
- bake-out

The information shall be positioned near the drawing header!

7. References to other standards

LHH-N 000.320	Leak rates of Parts and Assemblies
LHH-N 120.001	Terms and properties of vacuum components
LHH-N 120.030	Blasting