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MPS/ML/SPEC 74-1 - Rev.1

20 August 1974
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(English version)

SPECIFICATION FOR WELDED STAINLESS STEEL VACUUM CHAMBERS OF THE PS

IMPORTANT NOTE

This document is a translation made in order to facilitate the interpretation of the French specification for the firms of English language. Nevertheless, we have to underline that the French text remains the official version of the specification.

TABLE OF CONTENTS

1. GENERALITIES

The apparatus, object of the present specification (tubes, boxes, tanks of different shapes, etc.) are in general components of vacuum systems of various accelerators operating at a pressure of about 10^{-7} Torr.

2. GUARANTEE

The manufacturer must guarantee that the material and workmanship conform to this specification as well as to the attached drawings. In the case of non-conformity, the manufacturer will take all necessary steps to repair the defects as quickly as possible. In case of urgency, but only with the agreement of the manufacturer, CERN can effect the necessary repairs and charge the costs to the manufacturer's account.

3. MANUFACTURING AND MATERIAL

3.1 General requirements

Even though the components are submitted at CERN to a certain number of tests (see Chapter 9) a representative of CERN may, at any time, visit the factories for inspections, checks and tests.

In that case all measuring tools and leak testing equipment should be supplied by the manufacturer. If the closing covers are not included in the order, the manufacturer should provide means for the temporary closing of the openings (metal or perspex plates, rubber joints, etc.).

If the manufacturer does not possess the leak test equipment (helium leak detector, ultra vacuum pumps, etc.) special arrangements should be made with CERN at the time of the order.

3.2 Steel

All parts covered by this specification must be made from stainless steel of the type AISI 304L, 316L or 316LN as specified in the list of parts. These alloys are austenitic, amagnetic, stainless steels, with a very low carbon content, stabilized or not, in nitrogen.

4. TOLERANCES

The allowed dimensional tolerances are shown on the drawings and must be respected, (see Chapter 9, acceptance tests).

5. SURFACE FINISH

Bearing in mind that the components will serve as high vacuum chambers, surface finish of the non-machined steel sheets must correspond to the roughness class N7 or better. The non-machined surfaces exposed to high vacuum must be smooth, without traces of oxidation, scratches or cavities. Any traces of roughness and visible imperfections must be eliminated by the process agreed upon with CERN (by scraper, grinding stone, emery cloth according to the case and always without any additive such as grease, abrasive paste, etc.).

6. WELDING

6.1 Vacuum tight welds

The welds must be clean, continuous and free from porosities. These should be made in such a way that the intensity of arc minimizes the extent of the heat affected zone adjacent to the weld, thus avoiding excessive thermal stresses being set up, and alterations to the structure of the material. Special care has to be taken to ensure that all welding edges and their surroundings are carefully cleaned of metal oxides and grease prior to welding.

The vacuum tight welds should be realised by the argon welding process (T.I.G., argon-arc or similar). In the case of welds of very thin wall pieces (bellows, windows, etc.) plasma welding would be desirable and in this case will be specified on the drawings.

A welding process currently used at CERN and recommended here, is the following: in case of tubes or similar chambers, if the welding is done at the outside, and is full penetration, a circulation of argon inside the tube or chamber assures an improved protection against the risk of cracks and oxidation.

6.2 Structural welds

The structural welds which are intended to transmit mechanical efforts and which are usually in addition to vacuum tight welds, are in general, interrupted. If welds must be continuous for reasons of

mechanical strength, a groove must be made along the developed length of the weld, and holes made to permit the passage of helium for leak-tests of the vacuum tight weld. During the work a free flow of gas must be assured. Preferably, these welds should be made using the same welding methode (Argon-arc, T.I.G., etc.) as described in Chapter 6.1.

6.3 Stress relieving heat treatment

Once the welding assembly has been completed, a stress relieving heat treatment at 400 ÷ 450°C for three hours is highly recommended by CERN and must be foreseen for all complicated and closely toleranced structures.

7. CLEANING

The interior surfaces of all parts must be degreased and cleaned to permit the necessary inspection and above all the vacuum tests. Cleaning with cloth and solvents such as freon, alcohol, etc., represents an acceptable solution for normal cases.

In special cases, defined on the orders, the cleaning process required will be as follows:

a. chemical cleaning with perchlorythylene vapour;
b. cleaning in an alcaline hot detergent (pH 8.5);
c. rinsing in demineralized water;
d. drying with hot air at 130÷150°C.

Drying can be replaced by a rinsing with alcohol if the safety conditions will permit this. It is recommended to clean the parts before welding in order to eliminate any traces of grease and to avoid porosities.

8. PACKING AND TRANSPORT

All tube openings should be closed and flanges suitably protected against transport damages. The tubes and chambers must be delivered in suitably constructed containers or wooden cases. For special cases, which will be indicated on the order, CERN may ask for the expedition of chambers partially evacuated or filled with dry nitrogen or with dry air (with deshydratants).

9. ACCEPTANCE TESTS

CERN will carry out the following tests :

9.1 Mechanical tests

All parts will be checked for dimensional accuracy, surface finish and cleanliness. A thorough inspection of all welds will be made.

9.2 Leak test

All parts will be subjected to a leak test, using a helium leak detector, with a sensitivity of 2.10^{-10} Torr l/s. No trace of leakage should be detected. For many parts the test will be carried out at a temperature of 100 to 140°C.

9.3 Cycling of parts

The components that are subject to severe deformation under the influence of atmospheric pressure (i.e., oval vacuum chambers) or the components that are foreseen to support dynamic effects (i.e., valve housings, beam stopper housings, etc.) will be submitted to cycles that simulate the real working conditions. All vacuum tight welds will be tested after a definite number of cycles.

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CERN reserves the right to refuse any component that is not strictly in accordance with this specification.

In case of doubt about the interpretation of this specification, the drawings or otherwise, the person who is technically responsible for the order should be contacted. His name and internal telephone number at CERN are indicated on the order.

LEYBOLD-HERAEUS
Werksgruppe
Vakuum-Verfahrenstechnik

PRÜFUNGSZERTIFIKAT

(Werksabnahmezeugnis in Anlehnung an DIN 50049/3.1 B)

Nr. o514
WMF-315/5

Prüfungsart Vakuum **Prüfling** Kammer

Kunde CERN/Genf **Auftr.-Nr.** 35o 16 129

Zeichng.-Nr. 5.331-4774/o
Anzahl 1
Werkstoff 1.4541

Prüfbedingungen gemäß Spezifikation
Druck $1,5.1o^{-7}$ mbar ≈ $1 \cdot 125 \times 10^{-7}$ Torr Dauer 6o Std. Pumpzeit
Temperatur RT Medium Helium
Max. zulässige Leckrate $Q_{He} = 1 \cdot 1o^{-8}$ Torr . l . s^{-1} (integral)
Verfahren / Umfang
Hüllentest

Verwendete Prüfgeräte ULTRATEST "B", TESTLECK $Q_{He} = 1,9 \cdot 1o^{-8}$ Torr.l.s^{-1}
UHV-Pumpstand Turbovac 15oo (S eff= 36o l . s^{-1}), Linienschreiber

Prüfungsergebnis

siehe Diagramm

$Q_H < 3 \cdot 1o^{-1o}$ Torr , l . s^{-1} (integral)

Bemerkung Abnahme im Beisein des Kunden,
Herren Waddup, Losset

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Prüfer Heyn, [illegible]

Hanau, den 14.6.1977

Leybold-Heraeus G.m.b.H. u. Co. KG
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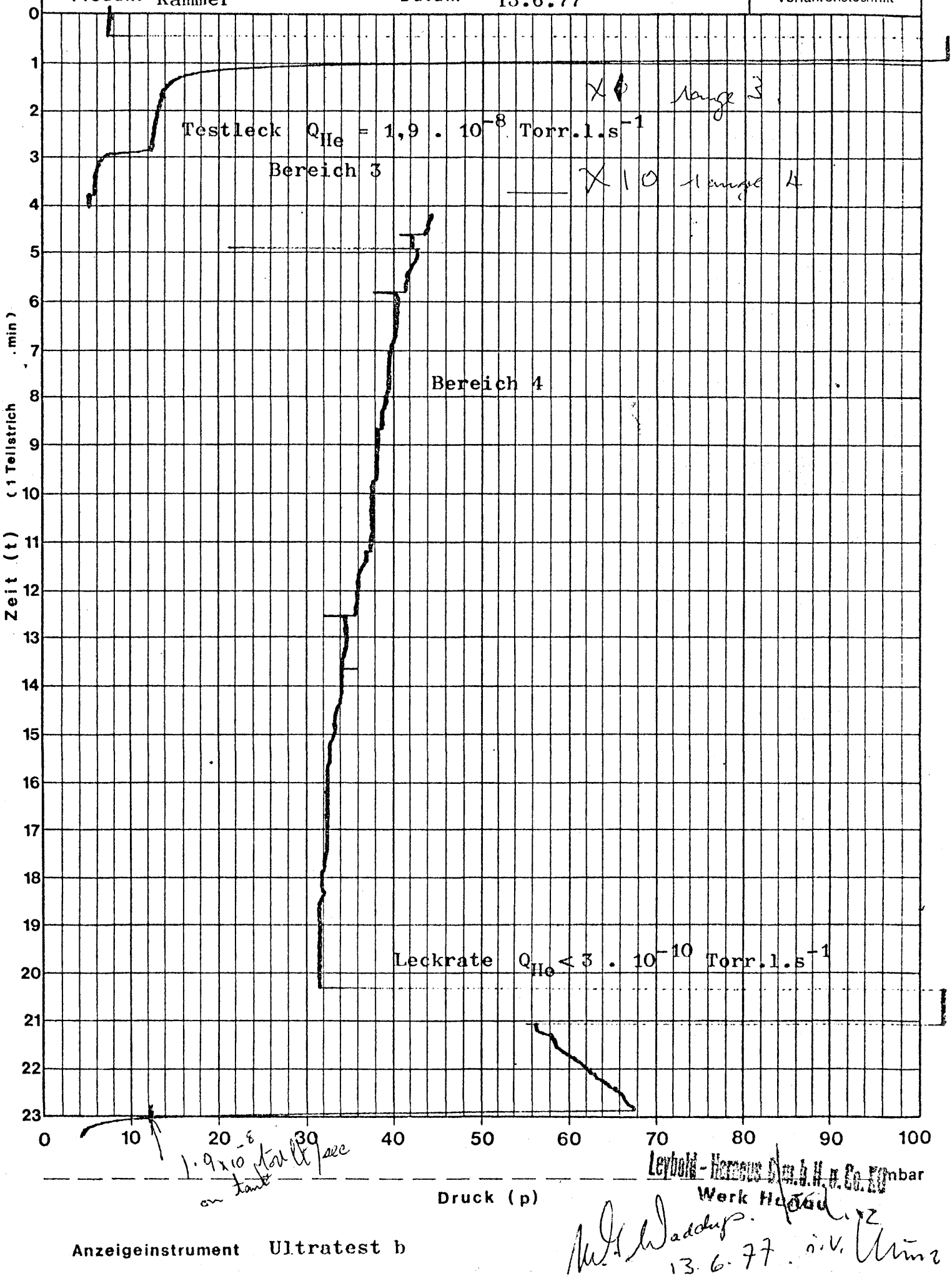

Anzeigeinstrument Ultratest b

13.6.77 i.V.