

 <b>LINDE AG</b> Process Engineering and Contracting Division	Technical Purchase Specification <b>Ultrasonic Test of Steel Plates and Forgings</b> acc. to DIN/EN and ASME-Code		LINDE STANDARD  <b>003-01</b>
	Orig.: PLQ/Sk.	Checked: PAP/Ca.	Appr.: PLQ/Sk.

LS-Class: BM

Descriptors: US-Test-TPS, Forging, Plate, Steel

Replaces

Issue 09.81

## 1 Scope

This Technical Purchase Specification (TPS) shall apply to the ultrasonic testing of steel plates and forgings acc. to EN/DIN and ASME-Code. Statements made in the Purchase Order (P.O.) shall have priority over the requirements of this specification.

## 2 Applicable Codes and Standards

The following codes and standards shall be applied besides those mentioned in the P.O. Issues valid at the time of placement of order shall govern.

AD-Merkblätter B5, W9, W13  
 ASME-Code Sec. VIII Div. 1, UW 13  
 SEL 072-77 (Stahl-Eisen Lieferbedingung)  
 SEP 1921 (Stahl-Eisen Prüfblatt)  
 EN 473 / SNT-TC-1A  
 LINDE Standard 001-02

## 3 Requirements

- The requirements for ultrasonic testing acc. to ASME-Code Sec. II Part A and/or ASME-Code Sec. VIII Div. 1 are fulfilled by observing the following requirements and inspection criteria.

### 3.1 Test personnel

- Qualification acc. to EN 473, Level 2 or SNT-TC-1A, Level II

### 3.2 Time of testing

- The tests shall be performed after the heat treatment, in the condition as delivered.

### 3.3 Ultrasonic test of plates

- Performance acc. to Stahl-Eisen-Lieferbedingung 072-77.

#### 3.3.1 Plates

- Scanning with perpendicular grid lines of a length of 200 mm or acc. to a system of straight test lines in a distance of 100 mm and edge scanning area in a width of at least 50 mm in a zone near to the cutting edges
- Inspection criteria according to SEL 072-77: Scanning acc. to Table 1, Class 3; edge scanning area according to Table 2, Class 2.
- In addition, test areas with a loss of the back reflection  $\geq 50\%$  (6dB) shall be tested with other test frequencies and other directions of incidence. Indications with a loss of the back reflection  $\geq 50\%$  shall be evaluated acc. to the criteria "max. admissible size of the indications ( $\text{cm}^2$ )" and shall be considered for the admissible occurrence of the indications.

#### 3.3.2 Plates for flat heads with welding hub

- Welding seam areas with stress direction vertical to the sheet metal plate surface shall be tested acc. to AD-Merkblatt B5 and/or ASME-Code Sec. VIII Div. 1 UW 13 and are indicated in the purchase order/drawing.
- Test area: 3 x plate thickness, however at least a width of 50 mm.
- Inspection criteria according to SEL 072-77 according to Table 2, Class 1.
- In addition, test areas with a loss of the back reflection  $\geq 50\%$  (6dB) shall be tested with other test frequencies and other directions of incidence. Indications with a loss of the back reflection  $\geq 50\%$  shall be evaluated acc. to the criteria "max. admissible size of the indications ( $\text{cm}^2$ )" and shall be considered for the admissible occurrence of the indications.

### 3.4 Ultrasonic test of forgings

- Scope: forgings and forged flanges
- Performance acc. to SEP 1921, test group 3
- Inspection criteria:

**Table 1: Allowable Limit Values of the Indications**

Wall Thickness (mm)	Registration Limit KSR (mm)	Indications without Extension KSR (mm)	Indications with Extension KSR (mm)	Maximum Extension (mm)
≤ 50	2	3	2	30
> 50 ≤ 100	3	4	3	30
> 100 ≤ 150	4	5	4	40
> 150	5	6	5	60

**Table 2: Allowable Occurrence of the Indications**

Wall thickness (mm)	Number of Indications without Extension	Number of Indications with Extension
≤ 50	2	1
> 50 ≤ 100	4	2
> 100 ≤ 150	8	4
> 150	16	8

- In addition, test areas with a loss of the back reflection  $\geq 50\%$  (6dB) shall be tested with other test frequencies and other directions of incidence. Indications with a loss of the back reflection  $\geq 50\%$  shall be evaluated acc. to the criteria "max. admissible size of the indications (cm<sup>2</sup>)" and shall be considered for the admissible occurrence of the indications "Number of Indications with Extension".

## 4 Certification, Marking

See purchase order, LS 001-02 shall be observed.

- The ultrasonic test shall be confirmed in the inspection certificate by stating the purchase specification/test procedure.
- If a test report on the ultrasonic testing is required in the purchase order, it shall contain the following: data of the test piece and LINDE P.O. Number (see purchase order), details of the test procedure, type of test device and type of probe, condition of areas to be tested, couplant, extent of testing acc. to the test groups and/or -classes, registration limit and acceptance level as well as the test results.

In addition to the marking in accordance with the code, a stamp shall be punched into the part verifying the performed ultrasonic test (e.g. U or UT).

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