technische universität
dortmund

Fakultät
Bauwesen

Lehrstuhl
Tragkonstruktionen
Univ.-Prof. Dr.-Ing. Atilla Ötes

August-Schmidt-Straße 8
44227 Dortmund
Telefon +49 (0)231 755.5320
Telefax +49 (0)231 755.3420
www.bauwesen.tu-dortmund.de

WADIT-Sealant
for
Sheet Piling Walls

- Documentation of experiments for water-tightness -

Dipl.-Ing. Th. Topp

February 2008

CONTENTS

This report covers 32 pages including the cover page and the annexes.

1. PURPOSE

By order of WALL-PROFILE GMBH, München, a series of experiments has been carried out on water tightness of steel piles sealed with WADIT [1].

The tests were carried out by FRICKE STAHLPROFILBAU GMBH, Dortmund, in its assembly hall on the site of HOESCH SPUNDWAND UND PROFIL GMBH (HSP) / THYSSENKRUPP GFT - BAUTECHNIK GMBH, Dortmund. The Chair of Structural Design of the Dortmund University of Technology was instructed with the documentation of the tests.

2. TEST PROGRAMME

2.1. OBJECTIVES AND PROCEDURE

The objective of the tests was to identify the water flow through a sheet piling sealed with WADIT and to quantify the corresponding seepage resistance according to DIN EN 12063: 1999-05, [2].

2.2. TEST SETUP

In [2] no specific method is prescribed for testing the water lightness of interlocking connections of sheet piles. In this test series a procedure was applied which HSP had used in previous investigations.

The test setup for the installation of the test specimens is shown in Figure 1. As shown in Figure 2 specimens of 1 m length were installed into the test setup.

With the fixation of the test specimens and placement of an upper cover plate a watertight chamber was formed behind the specimen. This chamber was filled with water enabling the application of water pressure into the specimen. Pressure control was performed using a pressure manometer shown in Figure 3.

Figure 1:
Test setup
without specimen
a) Front view
b) Side view
c) Rear view

Figure 2:
Test Setup
with specimen
a) Specimen
b) Front view
c) Side view

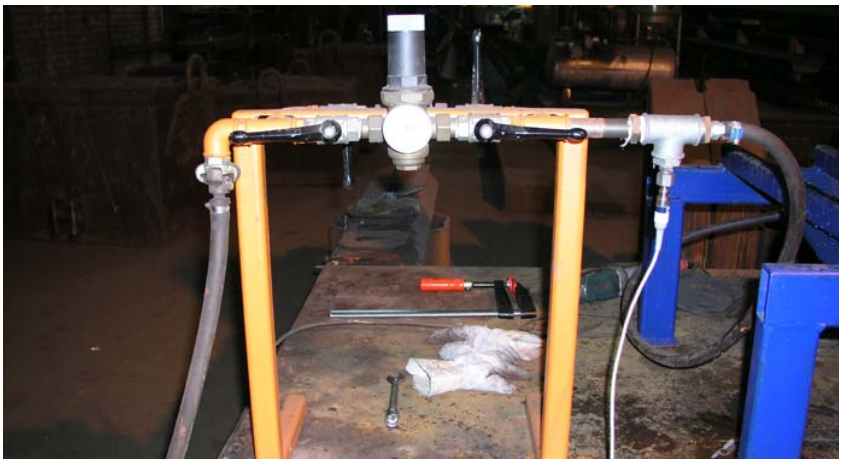


Figure 3:
Pressure control system
with manometer

The measuring equipment consisted of a pressure manometer[1] for water pressure, a temperature gauge[2] and measurement amplifier[3] with PC for data acquisition.

To collect the water flowing through the interlocking connections a tank was provided. For the measurement of the collected water measuring cups were foreseen.

2.3. SPECIMENS

LARSSEN- (Figure 4) and PZ-Sheeting Piles (Figure 5) with three interlocking configurations in total were investigated:

- LARSSEN Middle Interlock
- LARSSEN Site Threading Interlock
- PZ Site Threading Interlock(„Ball and Socket“)

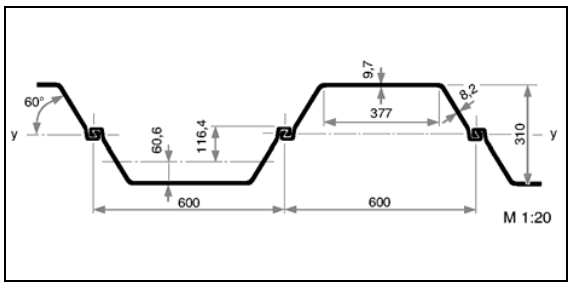


Figure 4:
LARSSEN-Sheet pile (Type 603)
with interlocking type 1 according to [3]

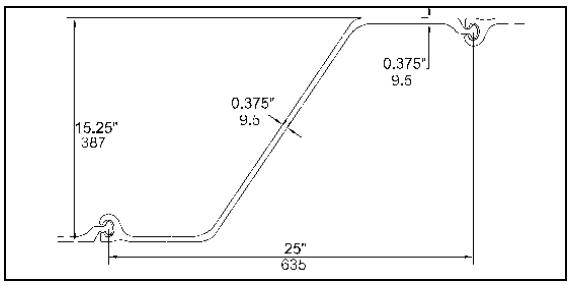


Figure 5:
PZC Sheet pile (Type PZC 18)
with „Ball and Socket“ interlocking

[1] Instrument Type: HBM P8AP / 10 bar

[2] Instrument Type: PT100

[3] Instrument Type: HBM Spider8

2.3.1. Application of WADIT

For the application Sealant WADIT was heated in a bitumen cooker using a Bunsen burner (Figure 6).

Figure 6: Bitumen cooker with bunsen burner

WADIT was applied with a pot on horizontally placed lock chambers, see Figure 7.

Figure 7: Application
a) LARSSEN Middle Interlock, b) LARSSEN Site Threading Interlock, c) PZ Site Threading Interlock("Ball and Socket")

The application of WADIT was performed during two days. The temperature of the sealant, measured by an infrarot-thermometer[4], is given in Table 1.

	August 13th, 2007	January 14th, 2008
Pile- / Air temperature	16 °C	13 °C
WADIT in the oven	154 °C	158 °C
WADIT in the pot	146 °C	139 °C
Locking type (symbol of specimen)	LARSSEN Middle Interlock (A), (C), (D) LARSSEN Site Threading Interlock (G1) PZ Site Threading Interlock (B1)	LARSSEN Site Threading Interlock (F, G2) PZ Site Threading Interlock (B2, E)

Table 1: Temperature during the application process

Filling height of the interlocks was (see Figure 7):

- LARSSEN Middle Interlock:: flush
- LARSSEN Site Threading Interlock: 9 ... 13 mm
- PZ Site Threading Interlock: 20 ... 22 mm (appr. 0,7 " Schlosshöhe[5])

[4] Instrument Type: TESTO 830-T2

[5] Filling height according to the treatment specification of WADIT

2.3.2. Insertion ot the panels

The panels of the site threading interlocks were inserted into the interlocks with a chain, see Figure 8.

Figure 8:
Insertion of the panels
(LARSSEN Interlock)

3. RESULTS

For each interlock configuration three specimens were tested.

The water pressure in the test setup was increased successively till 5 bar, see Figure 9.

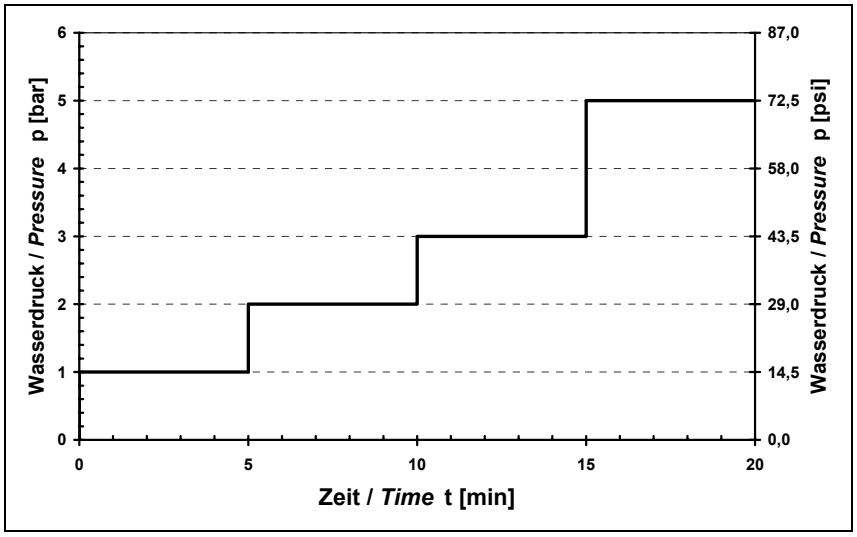


Figure 9:
Intended pressure control

The individual tests are documented in the Annexes and the results are summarized in Table 2.

Schloss ***Interlock***	**Test** ***Test***	**Ergebnis** ***Result***
LARSSEN **Mittelschloss** ***Middle Interlock***	(A)	Kein Wasserdurchfluss / *No Water Flow*
	(C)	Kein Wasserdurchfluss / *No Water Flow*
	(D)	Kein Wasserdurchfluss / *No Water Flow*
LARSSEN **Baustellen-Fädelschloss** ***Site Threading Interlock***	(F)	Kein Wasserdurchfluss / *No Water Flow*
	(G1)	Kein Wasserdurchfluss / *No Water Flow*
	(G2)	Kein Wasserdurchfluss / *No Water Flow*
PZ („ball and socket“) **Baustellen-Fädelschloss** ***Site Threading Interlock***	(B1)	Kein Wasserdurchfluss / *No Water Flow*
	(B2)	Kein Wasserdurchfluss / *No Water Flow*
	(E)	Kein Wasserdurchfluss / *No Water Flow*

Table 2: Test results

As the results show, on the specimens assembled according to Chapter 2.3 no water flow could be observed under the testing conditions applied.

4. REFERENCES

[1] Wall-Profile GmbH:
Produktinformation zu WADIT; Juni 2006
Product Information, June 2006

Standards

[2] DIN EN 12063:1999-05
Ausführung von besonderen geotechnischen Arbeiten (Spezialtiefbau) - Spundwandkonstruktionen
Execution of special geotechnical works - Sheet-pile walls

[3] DIN EN 10248-2:1995-08
Warmgewalzte Spundwandbohlen aus unlegierten Stählen
Teil 2: Grenzabmaße und Formtoleranzen
Hot rolled piling of non alloy steels - Part 2: Tolerances on shape and dimensions

[4] DIN 18130-1: 1998-05
Bestimmung des Wasserdurchlässigkeitsbeiwerts - Teil 1: Laborversuche
Determination of the coefficient of water permeability - Part 1: Laboratory tests

5. ANNEXES

Anlage 1: LARSSEN Middle Interlock | Documentation

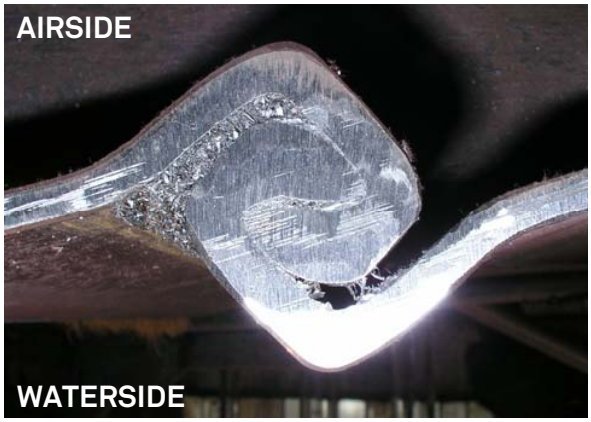
Anlage 2: LARSSEN Site Threading Interlock | Documentation

Anlage 3: PZ Site Threading Interlock („Ball and Socket“) | Documentation

Annex 1: LARSSEN Middle Interlock | Documentation

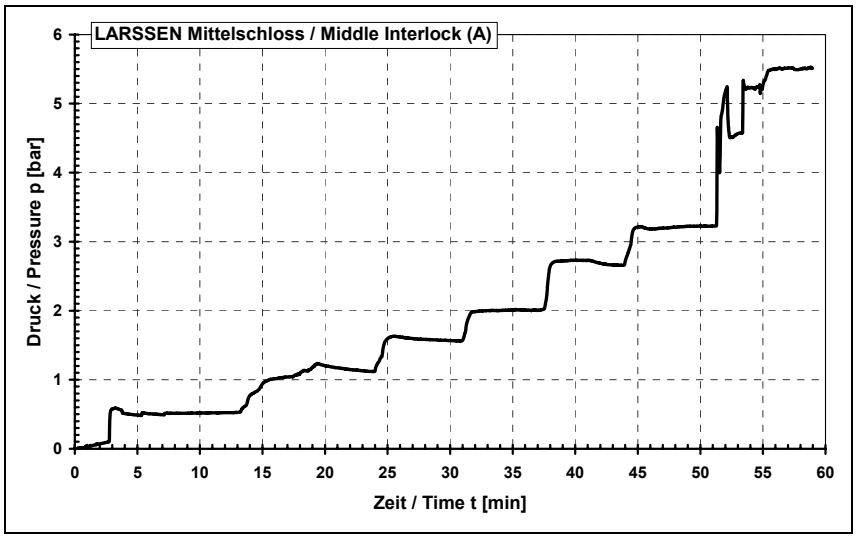
TEST (A)

Specimen: **LARSSEN Middle Interlock** (#1)
998 × 275 mm



Documentation of experiments for water-tightness

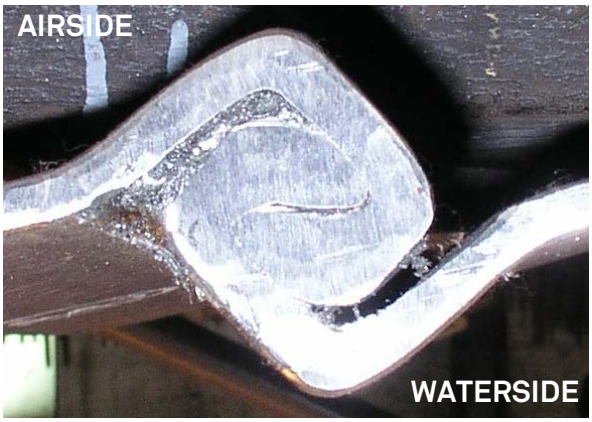
Test Flow:



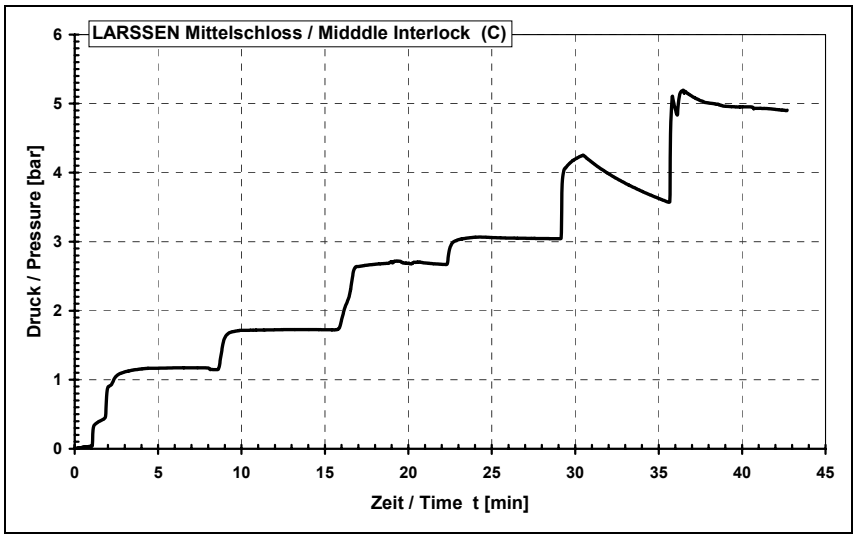
Temperature:	18 °C / 64 °F
Test Result:	No water flow

TEST (C)

Specimen: **LARSSEN Middle Interlock** (#3)
998 × 276 mm



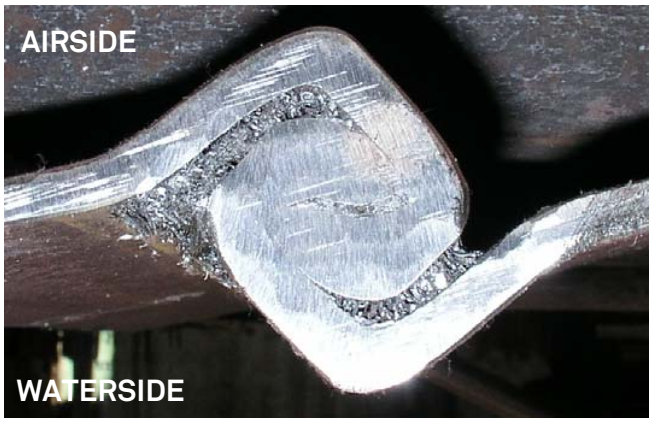
Test Flow:



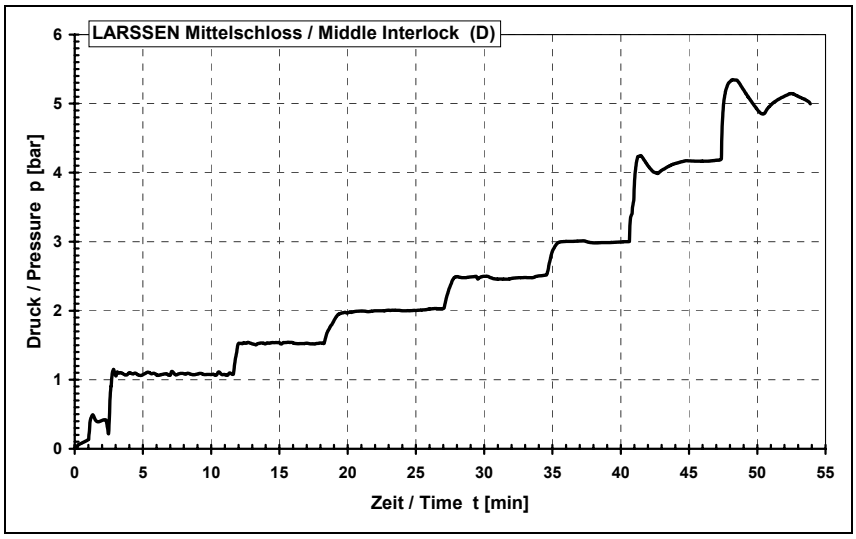
Temperature:	16 °C / 61 °F
Test Result:	No water flow Sealant material is strongly pressed down and shows a surface with texture.

TEST (D)

Specimen: **LARSSEN Middle Interlock** (#2)
997 × 287 mm



Test Flow:



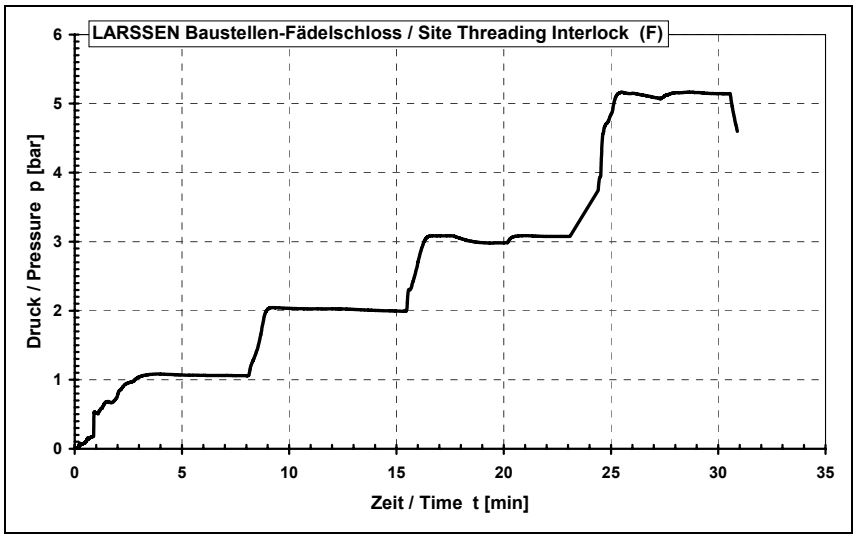
Temperature:	16 °C / 61 °F
Test Result:	No water flow. Sealant material is slightly pressed down, even surface still maintaining.

Annex 2: LARSSEN Site Threading Interlock | Documentation

TEST (F)

Specimen: **LARSSEN Site Threading Interlock**
997 × 263 mm

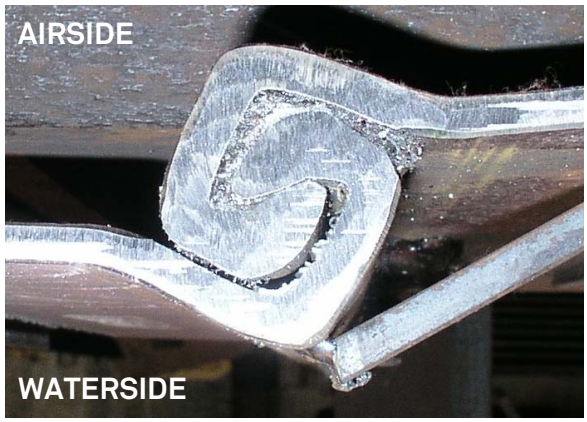
Test Flow:



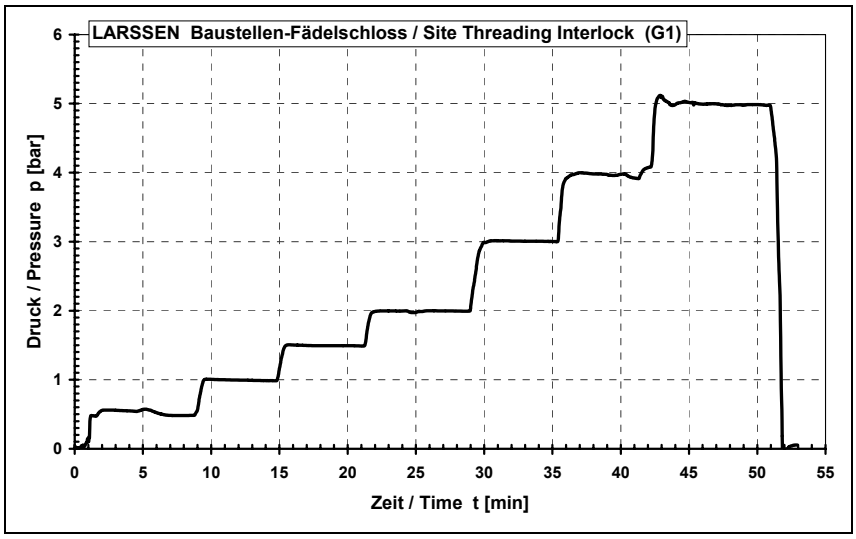
Temperature:	15 °C / 59 °F
Test Result:	No water flow

TEST (G1)

Specimen: **LARSSEN Site Threading Interlock**
997 × 260 mm



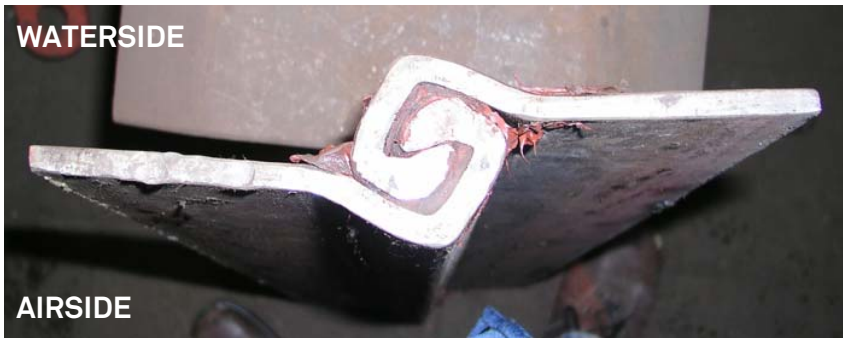
Test Flow:



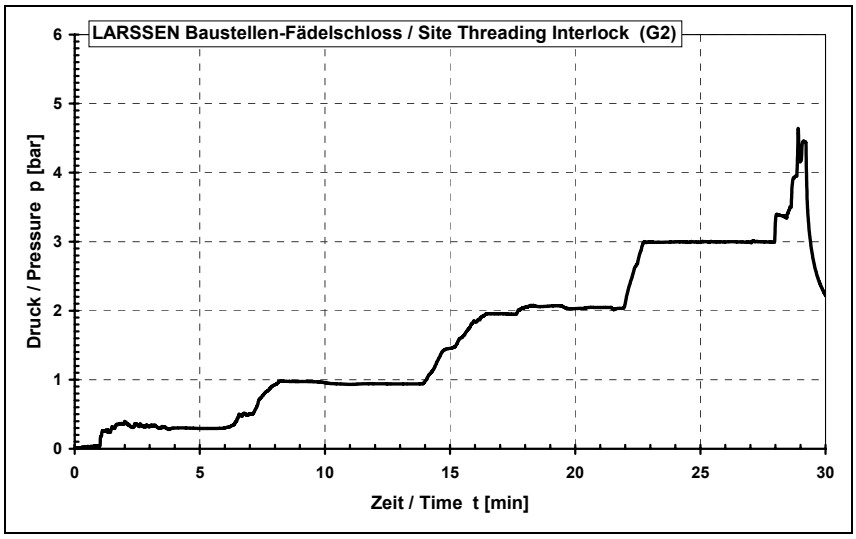
Temperature:	16 °C / 61 °F
Test Result:	No water flow

TEST (G2)

Specimen: **LARSSEN Site Threading Interlock**
997 × 260 mm



Test Flow:

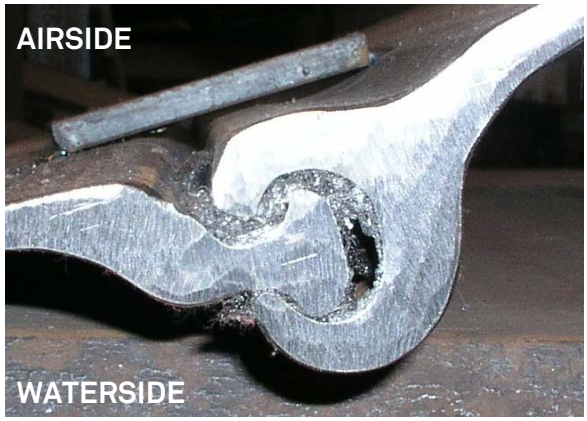


Temperature:	15 °C / 59 °F
Test Result:	No water flow

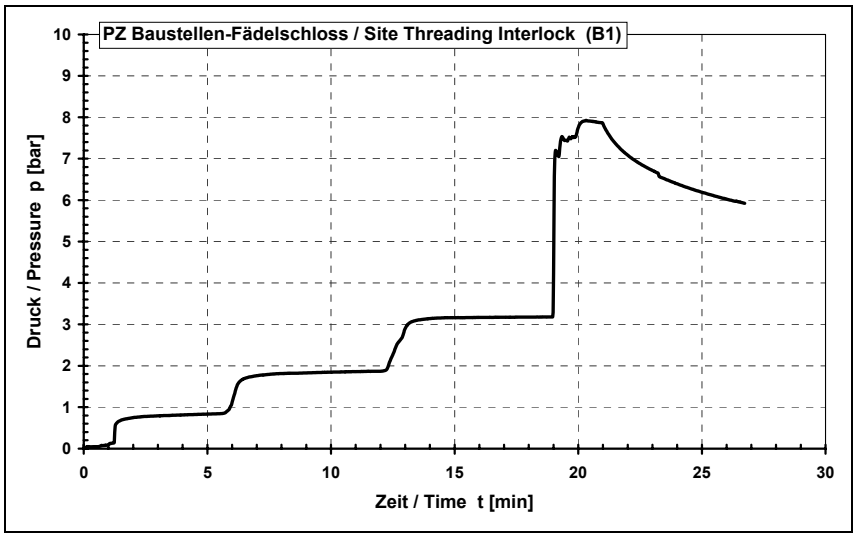
Annex 3: PZ Site Threading Interlock („Ball and Socket“) | Documentation

TEST (B1)

Specimen: **PZ Site Threading Interlock („Ball and Socket“)**
997 × 310 mm



Test Flow:

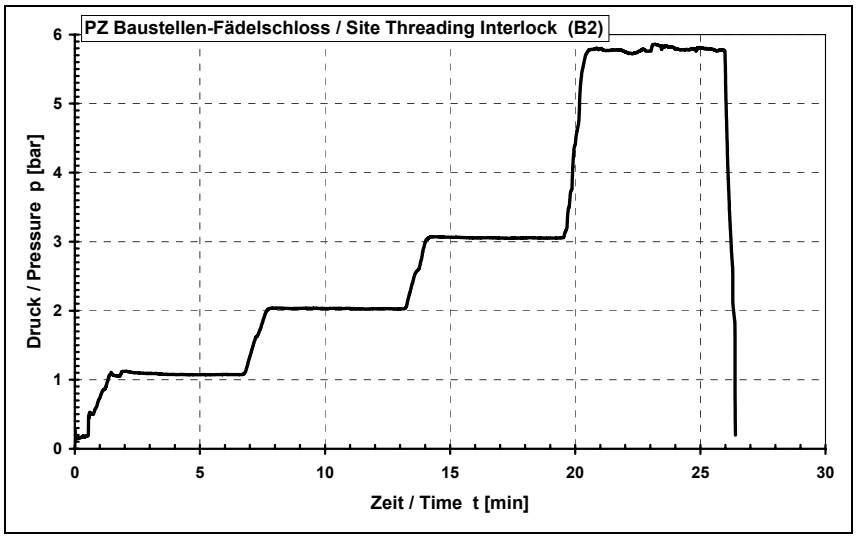


Temperature:	20 °C / 68 °F
Test Result:	No water flow

TEST (B2)

Specimen: **PZ Site Threading Interlock („Ball and Socket“)**
997 × 310 mm

Test Flow:



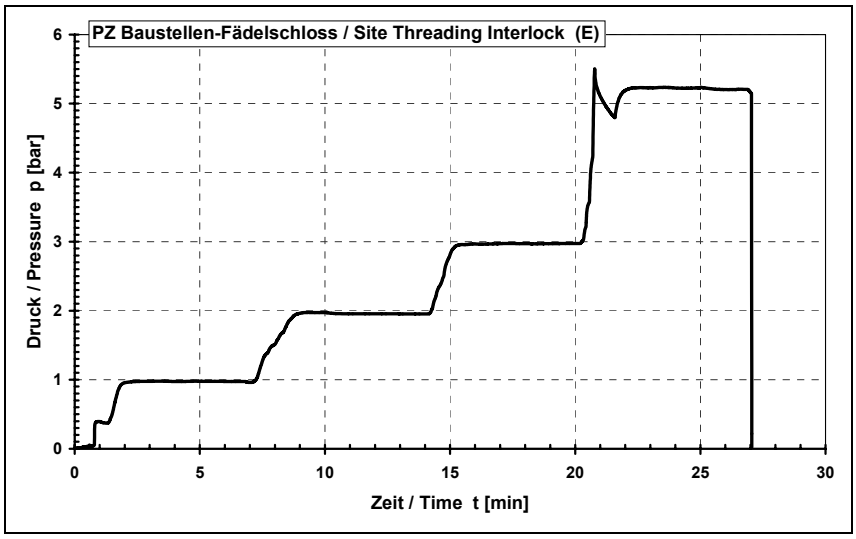
Temperature: 15 °C / 59 °F

Test Result: No water flow

TEST (E)

Specimen: **PZ Site Threading Interlock („Ball and Socket“)**
1000 × 312 mm

Test Flow:



Temperature:	15 °C / 59 °F
Test Result:	No water flow