

Test report no. 120074/16

Certification No. 1108-5913

Customer: Aquaform AG
Gewerbestraße 16
4105 Biel-Benken
SWITZERLAND

Order: Tests on multi-range couplings HymaxGrip® PN16,
(single-screw), according to SVGW guideline ZW 163
(January 2016) including DIN EN 14525:2005-02

Summary of test results: see item 5

Letter of: 2016-05-09 **Ref:** Mr. Matteucci

Receipt of samples: see item 2 **Sampling:** -

Test period: from 2016-06-03 to 2016-10-19

This test report comprises 11 pages and 1 annex of totally 14 pages.

Würzburg, 2016-10-27
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i. V.

Dr. Anton Zahn



i. A.

Dipl.-Ing. Tobias Bauer

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1 Order

By its letter of 9 May 2016 company Aquaform AG, Gewerbestraße 16, 4105 Biel-Benken, Switzerland, instructed SKZ - Testing GmbH to perform tests on multi-range couplings HymaxGrip® PN16 (single screw) according to SVGW-guideline ZW 163 (January 2016) including DIN EN 14525:2005-02.

2 Test material

On 11 May 2016 SKZ – Testing GmbH received following samples for testing:

Sample No.	Designation	Dimension	Marking [FZ = company's logo]
1.1	Multi-range coupling HymaxGrip PN16	DN 100	<p>HYMAX GRIP DN 80 FZ KRAUSZ FZ Aquaform AG CH-4015 Biel-Benken Tel.41(0)61 7266400 Aquaform www.aquaform.ch FZ HYMAX GRIP DN 80 Druckmessbereich / Tolerances: 80-106mm für 80 – 95 Einsatzbereit für 94-106 inneren Dichtring entfernen</p> <p>Dichtung EPDM Betriebsdruck (bar) 16 Drehmoment (NM) 70 ¹⁾ Beschichtung Revetement Epoxy Patent Pending 06/15</p> <p>Dichtring Keine Angabe (nicht Ausbaubar)</p> <p>Eingegossen in Körper KRAUSZ HYMAX 4.17" YY3412 GGGI KRAUSZ HYMAX DN 80-103</p> <p>Eingegossen in Spannbacken FZ KRAUSZ GRIP 3.15"-4.17" WGB NO.01 06/03/15 FZ KRAUSZ GRIP DN 80-106</p> <p>Schrauben 4 Spannschrauben M12x45 , 2 Spannschrauben M14x155</p>
1.2	Steel pipe, turned off	DN 80/OD 88.9	---
1.3	Cast iron	DN80/OD 98	---
1.4	Pipe PE100	OD 90, SDR11	---
1.5	Pipe PE100	OD 90, SDR17	---
1.6	Sleeves made of stainless steel	DN 90	---

¹⁾ Customer informed that torque was increased to 90 nm.

Multi-range couplings are manufactured by:

Krausz Industries Ltd
6 Hapatish Street
66559 Tel-Aviv
ISRAEL

Multi-range couplings are sold by:

Aquaform AG
Gewerbestraße 16
4105 Biel-Benken
SWITZERLAND

3 Test procedure

Usually we carry out tests according to standards for which we have an accreditation. The list of all standards for which we are accredited is shown on the homepage at www.skz.de.

If not otherwise noted, all tests were performed at standard atmosphere 23/50, class 2, according to DIN EN ISO 291:2008-08 "Climates and their technical application; standard climates" and after a storage of at least 88 hours in this climate.

Tests were performed according to guideline ZW 163 (January 2016) "Pipe couplings, transition and large range couplings including repair couplings" of SVGW (Swiss Gas and Water Industry Association) including DIN EN 14525:2005-02 "Ductile iron wide tolerance couplings and flange adaptors for use with pipes of different materials: Ductile iron, grey iron, steel, PVC-U, PE, fibre-cement" .

Tests were performed on cast iron pipes DN80/OD88.9 as well as on steel pipes DN80/OD98 including DN150/OD169 which had been made available by the customer as well as on pipes made of PE 100, SDR 11 (PFA 16 bar) and SDR 17 (PFA 10 bar), OD 90 which were made available by SKZ – Testing GmbH. As there were no pipes made of PE, PFA 6 bar, available on the market, appropriate pipes made of PE100, SDR17, PFA 10 bar, were used alternatively as test accessories.

Individual tests are listed in following table:

Test	Requirements according to ZW 163 (January 2016), par.	Execution according to
Hygienic non-toxicity	4.7	ZW 163 (January 2016), par. 4.7
Materials	4.3.1	DIN 86128-1
Joint gap and insert depth	4.3.2	DIN EN 14525
Diameter groups	4.3.3	DIN EN 14525
Movable joints	4.3.4	DIN EN 14525
Movable axial joints	4.3.5	DIN EN 14525
Tightness against positive internal pressure	4.3.6	DIN EN 14525
Tightness against negative internal pressure	4.3.7	DIN EN 14525
Tightness against dynamic internal pressure	4.3.8	DIN EN 14525
Product data	4.3.9	DIN EN 14525
Corrosion protection	4.5	ZW 163 (January 2016), par. 6.5
Assembly and operating instruction	4.6	ZW 163 (January 2016), par. 6.6
Factory production control	4.8	ZW 163 (January 2016), par. 6.7
Third-party inspection	4.9	ZW 163 (January 2016), par. 6.8

4 Test results

4.1 Hygienic non-toxicity

There are following test reports for gasket "EPDM-825-c" contacting drinking water:

- Test report according to DVGW-work sheet W 270 (11/2007) from TZW, file ref. MO 096/14 of 12.06.2014 (valid until 31.12.2016).
- Test report according to KTW-recommendations of Federal Office for Environment, from TZW, file ref. KA 0170/14 (valid until 31.12.2016).

4.2 Materials

The customer informed that multi-range couplings consist of following materials:

Part	Material designation
Basic body	Ductile cast iron, ASTM A536 type 65-45-12
End rings	Ductile cast iron, ASTM A536 type 65-45-12
Gasket	EPDM
Gasket bridge	Stainless steel type 304
Bolts and nuts	Stainless steel type 304
Distance plate	Stainless steel type 304
Coating	Epoxid resin (250 µm)

4.3 Joint gap and insert depth

Upon consulting the customer as well as Mr. Ebner from SVGW it was agreed to calculate the joint gap. Minimum insert depth mentioned is specified in the mounting instruction.

4.4 Diameter groups

Within this approval test the functioning of the joints of diameter ranges outside diameter 40 to 140 was tested on one diameter representing each diameter range.

4.5 Movable joints

Irrelevant.

4.6 Movable axial joints

Present multi-range couplings are appropriate for axial joints. Supporting sleeves are not required for using pipes made of steel – cast iron or PE100. Using pipes made of PE require supporting sleeves.

4.7 Tightness against positive internal pressure

Sample no.	Test condition	Test pressure [bar]	Testing time [min]	Remark
1.1 / 1.2	Tightness with 3 ° deflection	29 bar	≥ 120	tight
1.1 / 1.2	Tightness with shear load	29 bar	≥ 120	tight
1.1./ 1.3	Tightness with 3 ° deflection	29 bar	≥ 120	tight
1.1./ 1.3	Tightness with shear load	29 bar	≥ 120	tight
1.1 / 1.4 / 1.6	Tightness	29 bar	≥ 120	tight
1.1 / 1.5 / 1.6	Tightness	20 bar	≥ 120	tight

4.8 Tightness against negative internal pressure

Sample no.	Test condition	Test pressure [bar]	Testing time [min]	Remark
1.1 / 1.2	Tightness with shear load	- 0.8	≥ 120	Difference in pressure < 0.08 bar Without any complaint
1.1./ 1.3	Tightness with shear load	- 0.8	≥ 120	Difference in pressure < 0.08 bar Without any complaint
1.1 / 1.5	Tightness	- 0.8	≥ 120	Difference in pressure < 0.08 bar Without any complaint

4.9 Tightness against dynamical internal pressure

Sample no.	Test condition	Test pressure [bar]	Testing time [min]	Remark
1.1 / 1.2	24.000 cycles Tightness with shear load	9 / 18	≥ 120	tight
1.1./ 1.3	24.000 cycles Tightness with shear load	9 / 18	≥ 120	tight
1.1./ 1.5	24.000 cycles Tightness with shear load	6 / 12	≥ 120	tight

4.10 Product data

Marking (see item 2)

According to ZW 163 marking shall be cast or embossed. Parts of marking are legible and permanently fixed by labels.

According to DIN EN 14525, following information was missing in marking of presented samples:

- Standard DIN EN 14525 ¹⁾
- Maximum joint gap ²⁾

- 1) The customer confirmed that standard "EN 14525" will be added on label. SVGW will be informed accordingly.
- 2) Upon consulting the customer as well as Mr. Ebner from SVGW it was agreed to calculate the joint gap. Minimum insert depth is specified in the mounting instruction.

4.11 Corrosion protection

Epoxid resin covers metal parts contacting water thus ensuring corrosion protection. There are following test report for epoxid coating:

- Test report according to DVGW-work sheet W 270 (11/1999) from Hygiene Institut des Ruhrgebietes, ref. W-211795e-11-SI of 22.12.2011 (valid until 15.02.2017).
- Test report according to Guideline for Coating of the Federal Office for Environment, from Hygiene Institut des Ruhrgebietes, ref. K-235947-01-Ko of 22.12.2011 (valid until 15.02.2017).

4.12 Mounting

Multi-range couplings were packed with a clear comprehensible mounting and operating instruction.

4.13 Factory production control

There is a certificate no. 10128 according to ISO 9001:2008 (issued by QS Zürich AG) for company Aquaform AG. This certificate is valid until 12 November 2016.

An inspector of SKZ – Testing GmbH performed an audit with a positive result at company Krausz Industries Ltd., Hapatish Street, 66559 Tel-Aviv, Israel, on 3 April 2016.

There is a certificate IL-49307, valid until 5 February 2017, (issued by IQNet and SII, Israel) for company Krausz Industries Ltd..

4.14 Third-party inspection

A draft of the third-party inspection contract was issued while writing this test report.

5 Assessment of test results

Within performed third-party tests, presented multi-range couplings HymaxGrip® PN16 (single screw) have met the requirements of SVGW-guideline ZW 163 (January 2016) including DIN EN 14525: 2005-02.