

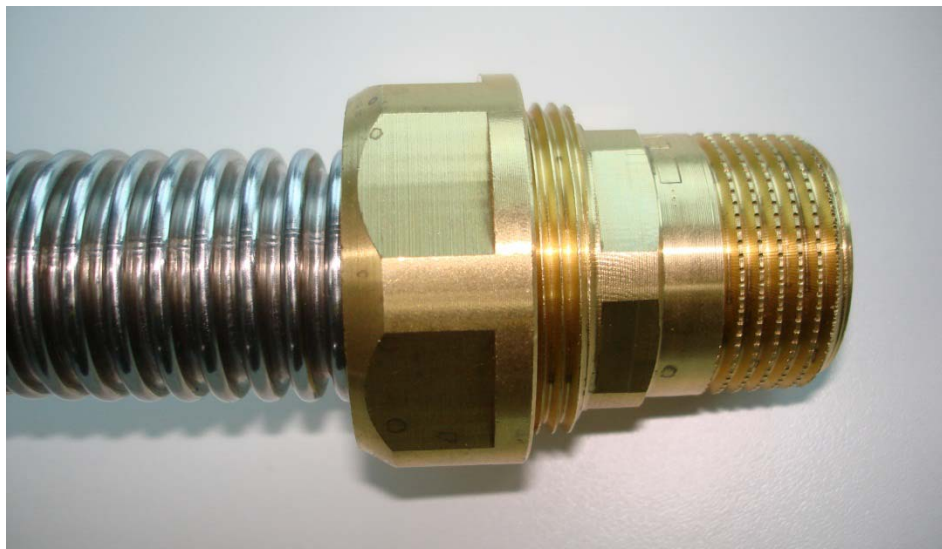
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Certificate and test report Nr. J147CON

Coupling system for solar thermal applications.
Test according to SPF test procedure: Test class A1



BEULCO SKS2
Fast coupling system for corrugated stainless steel pipes

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1. Description of the sample

1.1 Product information and technical description

| | |
|--------------------------|---|
| Manufacturer: | Beulco GmbH & Co. KG |
| Model: | BEULCO SKS2 |
| Tested sample(s): | SKS2 |
| Connection Type: | Fast coupling system for corrugated pipes |
| Application range | Pipework for solar thermal installations. |
| Nominal fitting length: | n.a. |
| Nominal diameter(s): | DN16, DN20, DN25 |
| Description of sample: | Metallic coupling system for connecting corrugated stainless steel tubes |
| Materials* | Screw-down nut CW617N; Clamping collar CW617N; Casing CW617 or CW602N |
| Heat transfer media* | not specified |
| Application limitations* | 220 °C |

*(manufacturer information)

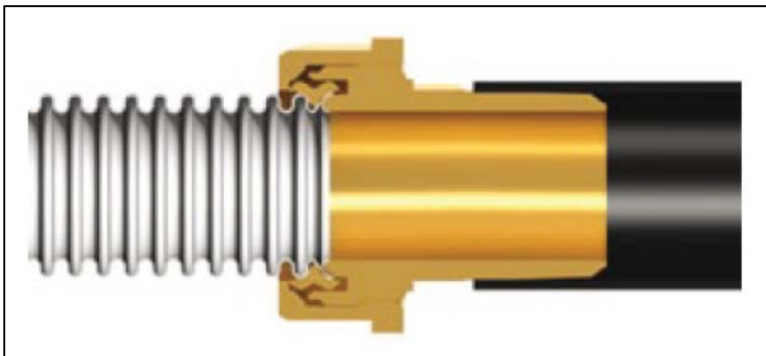


Fig. 1 Cross section of the mounted fitting system

2. Test methods and results

2.1 General remarks

The test procedure is intended to assess the resistance of the connection system against the assumed thermal load encountered during the lifetime of a typical solar installation with state-of-the-art solar collectors (selective absorber coating, solar glazing). The test concerns only the “fast coupling system for corrugated stainless steel pipes connectors”, i.e. only the connection of the corrugated stainless steel tube. Different couplings are available to connect corrugated s/s tubes to copper tubes, soldered spigots, corrugated tubes, and other male or female standard connection components. As long as the tested “fast coupling system for corrugated stainless steel pipes connectors” is used, the test J147 is valid for all these types as it concerns only the connection of the corrugated tube.

Three pipe-work samples of different dimensions (DN16, DN20, DN25) each mounted to a different product of a corrugated stainless steel tube have been tested. The samples have been assembled by the manufacturer in a professional manner.

The test procedure does not cover the corrugated tube itself. The connector system is not intended to be used as compensator between solar thermal collectors.

2.2 Test procedure and test parameters

Test according to SPF standard. Test Class A1.

Three test samples are tested in parallel. None of the samples is allowed to fail for passing the test. During the test the samples are flowed through with a water glycol mixture at a pressure of 10 bar. The test samples are installed with a well-defined misalignment corresponding to the selected test class (A, B, or C).

The test procedure is split in three phases:

Phase 1: 450 cycles, full stroke (see below)
Phase 2: 5000 cycles, half stroke (see below)
Phase 3: 50 cycles, full stroke (see below)

Full stroke

The temperature of the fluid is increased up to the maximum temperature T_{high} . Upon stabilisation of the temperature the maximum dynamic load according to the selected test class (1, 2 or 3) is applied. At maximum mechanical and thermal load a temperature shock is applied by flushing the sample with fluid at T_{low} . The decay time of this temperature shock is less than 5 seconds. The time required for one cycle is in the range of 15 minutes.

The full stroke cycles reflect the conditions that are encountered when flushing a solar thermal system in stagnation.

Half stroke

For the half stroke cycles the dynamic loads are reduced to 50% of the limits given by the selected test class. The fluid is kept at ambient temperature. The half stroke cycles reflect the normal operating conditions of a solar thermal system.

2.3 Test parameter

2.3.1 Static deformation (installation tolerance), SPF Class A

The test samples are installed with a static deformation as follows:

$S_{axial} < 5 \text{ mm}$ axial misalignment

$S_{lateral} < 4 \text{ mm}$ lateral (radial) misalignment

$S_{angular} < 1^\circ$ angular misalignment

For this test the static misalignment is not relevant as the sample length is in the range of 300 mm.

2.3.2 Dynamic deformation, SPF Class 1

Dynamic load realised during the testing of the sample:

$D_{axial} < 8 \text{ mm}$ axial dynamic load

$D_{lateral} < 4 \text{ mm}$ lateral (radial) dynamic load

2.3.3 Thermal and pressure load

Thermal load realised during the testing of the sample.

$T_{low} = < 80^\circ\text{C}$

$T_{high} = 180^\circ\text{C} (\pm 5^\circ\text{C})$

Decay time = 5 sec (± 1 sec)

Test pressure = 10 bar

2.3 Photographs of test samples

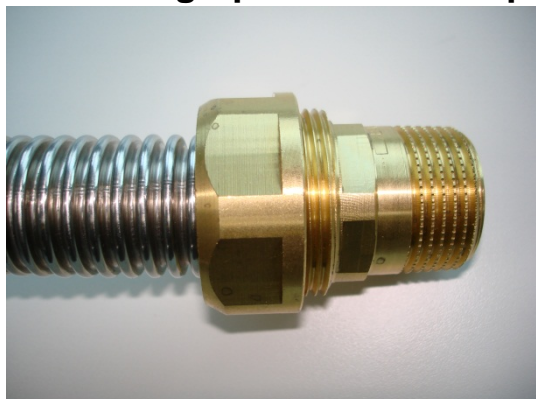


Figure 2: (before test start)
Fast coupling system before installation.

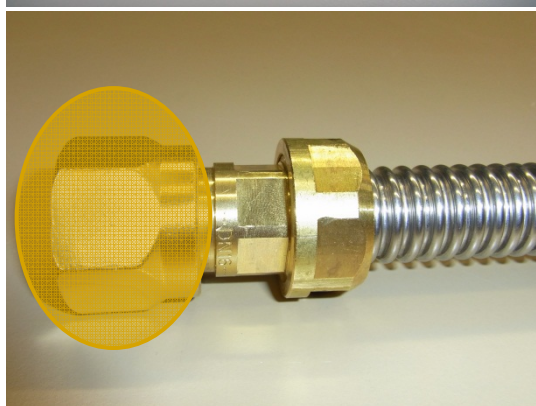


Figure 3: (before test start)
For the installation of the samples on the test rig additional adapters (orange circle) made by another manufacturer have to be applied. These un-plated brass adapters are not part of the test samples.



Figure 4: (before test start)
Three different sizes were tested using different brands of corrugated tubes.
P1: DN16 (Rattay HR I/S-W)
P2: DN20 (Solar Kurt Birnbreier, MF015 500)
P3: DN25 (Radio Frequency Systems, PW025-AFL)



Figure 5: (before test start)
Test samples installed on the test rig.

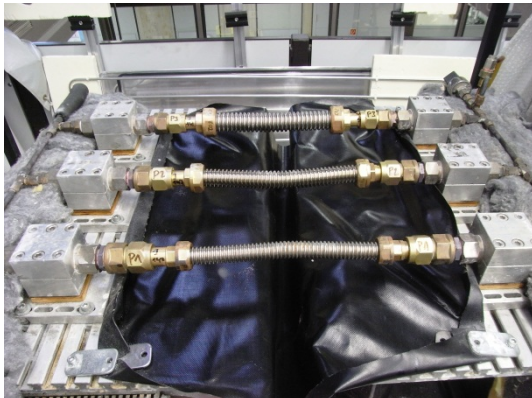


Figure 6: (after the test)

Tests samples on the test rig, after the test procedure has been accomplished. No leakage was observed. The deformation of the tubes is a result of the test procedure and does not affect the result of the test.



Figure 7: (after the test)

Test samples removed from the test rig. The deformation of the test tubes is permanent. No visible damage of the samples.

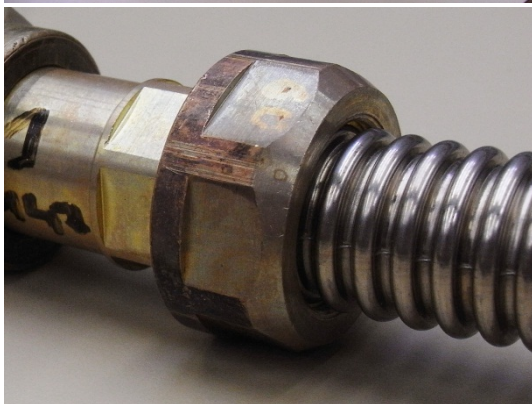


Figure 8: (after the test)

Close look at sample P1: DN16. Slight discoloration of the samples due to the permanent overheating. No signs of leakage

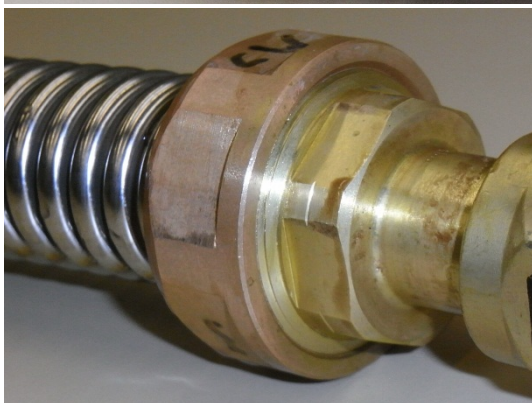


Figure 9: (after the test)

Close look at sample P3: DN25. Slight discoloration of the samples due to the permanent overheating. No signs of leakage.

2.4 Notes

The test results and the certificate are valid for fluids in the liquid phase. The behaviour of the fitting for vaporous heat transfer media as well as evaporation and condensation effects are not assessed with the present test procedure.

The fittings must be used together with corrugated stainless steel tubes which are able to absorb the mechanical movements caused by thermal elongations, mechanical misalignment and similar.

2.5 Result

No leakage, deficiency and no other failures have been observed during the test. The “fast coupling system for corrugated stainless steel pipes” is therefore considered as suitable for the use in solar thermal installations.

The “fast coupling system for corrugated stainless steel pipes” in the tested dimension therefore fulfils the requirements of the SPF test procedure class A1 and is certified under the SPF number J147CON.

The certificate is valid for 5 years.

3 Remarks

This report must not be copied except in full.
The test results only refer to the tested sample.

Rapperswil, 26.10.2013



Dr. Andreas Bohren
Head SPF Testing



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Responsible for the testing