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Certificate and test report Nr. J108HOS

Connections for solar thermal systems.

Test according to SPF test procedure: Test class A1



Solar Tecnica: Tubo Solar-Flex 2, DN-12

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1. Description of the sample

1.1 Product information and technical description

Manufacturer:	Solar Tecnica
Model:	Solar-Flex
Connection Type:	Hose
Application range	Pipework for solar thermal installations.
Nominal fitting length:	n.a.
Nominal diameter:	12.5 mm (internal) and 16.5 mm (external)
Description of sample:	Corrugated metal pipe. Two pipes enclosed in a twin-chamber flexible elastomeric hose for thermal insulation.
Connection and seal:	Special system provided by the manufacturer. 1/2"
Materials*	Inox (X6 Cr Ni Ti 18-10) and HT/Armatwin
Heat transfer media*	not specified
Application limitations*	175 °C

*(manufacturer information)

2. Test methods and results

2.1 General remarks

The test is intended to assess the resistance of the tubes against an assumed mechanical and thermal load encountered during the lifetime of a typical solar installation. As a representative sample for a typical pipe, pieces of approx. 30 cm have been tested.

The test does not include the testing of the insulation material used to enclose the tubes. It is assumed that the elastomeric hose (HT/Armatwin) is tested against weathering and UV-irradiation.

The test samples have been submitted by the manufacturer.

2.2 Test procedure

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 6 bars. 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 under stagnation of the solar thermal system.

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

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 = 6 bar

2.4 Photographs of test samples

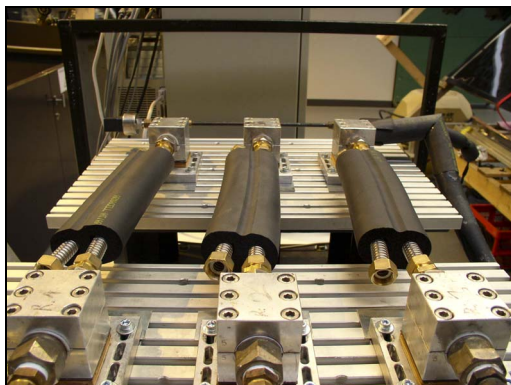


Figure 1: (before test start)
Test samples installed before start of testing.

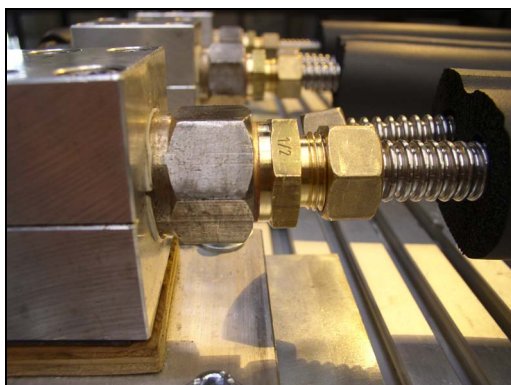


Figure 2: (before test start)
Detail of installed test samples before testing.

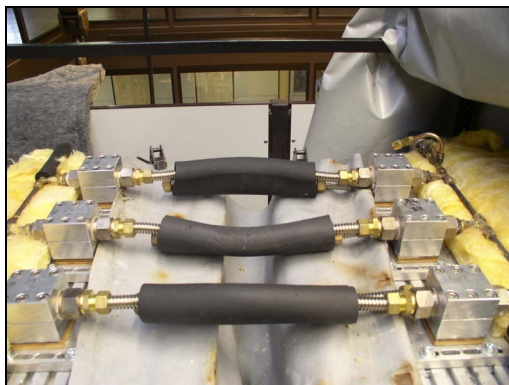


Figure 3: (after test)
Test samples on test stand after completion of test.



Figure 4: (after test)
Test sample ready for inspection.



Figure 5: (after test)
Corrugated pipe taken out of insulating tube.



Figure 6: (after test)
Close look at the connectors of the test sample.

2.5 Result

No leakage, deficiency and no other failure has been observed during the test.

The tube **Solar-Flex-2, DN-12** therefore fulfils the requirements of the SPF test procedure class A1 and is certified under the SPF number J108HOS.

3 Remarks

This report must not be copied except in full.

The test results only refer to the tested sample.

Rapperswil, 14.02.2006



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