FERNWÄRME-FORSCHUNGSINSTITUT
IN HANNOVER E.V.

Report No. 704E4633

Determination of thermal conductivity on a preinsulated polymer pipe in jacket pipe construction with the dimension 50/125

Tests following "AGFW Richtlinie FW 420 Teil 1"
(AGFW guideline FW 420 part 1)

Order from

Thermaflex Isolatie bv, Veerweg 1, 5145 NS WAALWIJK, NETHERLANDS

from 21.06.2005

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1 Proceedings and problem definition

The Fernwärme-Forschungsinstitut in Hannover e.V. (FFI) gets the order to determine the thermal conductivity and the foam density of the used insulation agent "foam made of polyethylene" (PE-foam) on a preinsulated polymer pipe in jacket pipe construction with the dimension 50/125 from the firm Thermaflex Isolatie bv, Veerweg 1, 5145 NS WAALWIJK, NETHERLANDS. An EN-standard is not available for flexible pipes. Therefore the tests are done following "AGFW Richtlinie FW 420 Teil 1" (AGFW guideline FW 420 part 1). FW 420 Teil 1 refers to EN 253 and EN ISO 8497.

2 Test material

The FFI received the pipe described below on 21.06.2005:

test piece number	1613
System	PMR
dimension	50/125
medium pipe material	PB
medium pipe length [mm]	3.002
medium pipe outer diameter [mm]	50,0...50,4
medium pipe wall thickness [mm]	4,5...4,7
jacket pipe material	PE
jacket pipe length [mm]	2.700
jacket pipe outer diameter [mm]	111,0...126,0
jacket pipe wall thickness [mm]	1,0
insulation agent material	PE-foam
insulation thickness [mm]	25,0...26,0

The pipe is a not aged factory insulated pipe. This kind of pipe has not any interconnection between medium pipe, insulation agent and jacket pipe. The jacket pipe is profiled.

3 Running of tests

The tests are done in the testing lab of the FFI, which is equipped with a climatic chamber. "AGFW Richtlinie FW 420 Teil 1" (AGFW guideline FW 420 part 1) refers to EN 253:2003 resp. "DIN EN 253, Stand Juni 2003" (DIN EN 253 from June 2003) and EN ISO 8497. So the tests are carried out following these standards. The measuring method with protection heating units is used. The tests follow the operating sequence described below:

1. Documentation of state after supply and assignment of a test piece number
2. Preparation of the test piece for the test with protection heating units
3. Placing the test piece in the climatic chamber
4. Adaptation of measuring technique and heating units to dimension
5. Installation of measuring technique and heating units
6. Starting of f measuring technique, heating units and climatic chamber
7. Test run (3-point-measurement) and control
8. Deinstallation of measuring technique and heating units
9. Removing of the test piece out of the climatic chamber
10. Measurement of foam density
11. Evaluation of data, documentation of measured values thermal conductivity λ_{50} and foam density ρ in this report

FW 420 Teil 1 allows for the thermal conductivity λ_{50} a maximum value of 0,033 $W \cdot m^{-1} \cdot K^{-1}$ at 80 °C ±10 K media pipe temperature; it allows for the foam density ρ a minimum value of 40 $kg \cdot m^{-3}$ for each measured value. These limits are only defined for flexible pipe systems with a media pipe made of polymer with an insulation made of polyurethane foam (PUR-foam), those are produced as

compound pipe systems. Any limit does not exist in FW 420 Teil 1 for flexible pipe systems with a media pipe made of polymer with an insulation made of PUR-foam.

4 Results

The thermal conductivity λ_{50} of the insulation agent (PE-foam) at 50°C middle temperature ϑ_m is calculated out of the measurements on the test piece. The foam density ρ is determined through weighing and volume measurement. The following values are determined:

	λ_{50} [W·m^{-1}·K^{-1}]	mean ρ [kg·m^{-3}]
pipe 1613	**0,031**	40,2

5 Conclusion

The determined values for thermal conductivity λ_{50} and foam density ρ of the used insulation agent PE-foam are within the limits, those are defined in FW 420 Teil 1 for PUR-foams used in compound pipe systems.