

Test Report

No. 20150553/Bio 19

Applicant: BIO-EX S.A.S.
Z.I. La Petite Olivière
69770 Montrottier, France

Manufacturer: BIO-EX S.A.S.
Z.I. La Petite Olivière
69770 Montrottier, France

Application date: April 2nd, 2015

Application: Test of a foam concentrate for conformity
with EN 1568-3 : 2008

**Name of the fire
extinguishing medium:** **ECOPOL F3 HC**

**Foam concentrate grade
according to Annex A of
EN 1568:** Synthetic foam concentrate (S)

Receipt of sample: April 23th, 2015

Test laboratory: MPA Dresden GmbH
Official test laboratory for fire extinguishing media and fire
extinguishers
Fuchsmühlenweg 6F, 09599 Freiberg, Germany



This report comprises 13 pages, inclusive 2 annexes.

General information:

Only equipment and materials detailed in this report have been subjected to the tests. Test results apply to the tested samples only.

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Summary:

The synthetic foam concentrate **ECOPOL F3 HC** has been tested in accordance with the standard EN 1568

- part 3 (low expansion foam for application to water immiscible liquids).

The tested foam concentrate with the identification **ECOPOL F3 HC** meets the requirements of the standard EN 1568-3, issue 2008.

Extinguishing performance class and burnback resistance level:

EN 1568 part	Usage concentration	by use of	
		potable water	simulated sea water a
3	3 %	I A	I A

Information:

1. Pseudo-plastic foam concentrate.
This concentrate can require special proportioning equipment.

30 July 2015



Grad. Eng. Dittrich
Laboratory Manager



1. General

Tests have been carried out in accordance with the requirements of the standard EN 1568-3 (low expansion foam/ application to water-immiscible liquids).

2. Chemical composition

Information about the chemical composition of the foam concentrate has not been submitted by the manufacturer to the laboratory.

3. Submitted documents

- /1/ Product Data sheet dated 29/07/15, ECOPOL F3 HC Fluorcompound Free Foam Concentrate, bio-ex s.a.s. Montrottier
- /2/ Safety Data Sheet (REACH Regulation (EC) n° 1907/2006 – n° 2015/830) Version 1.2 dated 24/06/2015, ECOPOL F3 HC, BIO-EX SAS Montrottier
- /3/ Marking label draft



4. Results of tests

4.1 Laboratory tests - characteristics

4.1.1 General characteristics of the foam concentrate (clauses 4 to 6 of EN 1568)

Characteristic	Requirement EN 1568	Declaration of manufacturer	Reference dimension of laboratory	Requirement met (yes/no)
pH Value (20°C)	6.0 – 9.5	7.5 ± 1.0	7.7	Yes
Density g/cm ³ (20°C)	–	1.03 ± 0.02	1.013	1)
Dyn. viscosity mPa·s (20°C) (0°C) (-5°C)	– – –	– – –	157 ²⁾ 174 187	1) 3)
Refraction index n_{20}^D	–	–	1.3622	1)
Freezing point °C	–	- 5	- 8	1)
Sediment Vol % before ageing after ageing	≤ 0.25 ≤ 1.0	< 0.1 –	0 0	Yes Yes
Sample through a 180 µm - sieve dispersible (yes/no)	Yes	–	Yes	Yes
Infrared spectrogram	–	–	Annex 1	1)

4.1.2 Temperature conditioning (annex E of EN 1568)

Is the foam concentrate adversely affected by storage at -30°C (declaration of manufacturer)	(yes/no)	No
Low temperature conditioning according to annex E.2	(yes/no)	Yes
High temperature conditioning according to annex E.3	(yes/no)	Yes
Storage of temperature conditioned samples at $20 \pm 5^\circ\text{C}$ minimum 48 h and maximum 72 h after conditioning According to annex E.2 / E.3	(yes/no)	Yes
Actual storage duration in days		3
Division of temperature conditioned samples according to annex E.4	(yes/no)	Yes

1) That is not to assess because the standard doesn't require a limit for this characteristic.

2) Measured values of the dynamic viscosity see annex 2.

3) The transport container shall be marked according clause 11 m) of the standard EN 1568.



4.1.3 Surface tension and spreading coefficient of the 3 per cent foam concentrate solution (clauses 7 and 8 of EN 1568)

Characteristic		Requirement EN 1568	Reference dimension of laboratory
Surface tension (mN/m) (procedure: with ring)	Untreated sample	–	25.0
	Sample conditioned according to annex E.2 and E.3 of EN 1568		
	Top sample	0.95 to 1.05 times	24.9
	Bottom sample	0.95 to 1.05 times	25.0
Requirement according to clause 7 of EN 1568 met (yes/no)			Yes
Interface tension (mN/m)	Untreated sample	–	1.3
	Sample conditioned according to annex E.2 and E.3 of EN 1568		
	Top sample	–	1.2
	Bottom sample	–	1.3
Spreading coefficient ¹⁾ (mN/m)	Untreated sample	²⁾	- 0.7
	Sample conditioned according to annex E.2 and E.3 of EN 1568		
	Top sample	²⁾	- 0.5
	Bottom sample	²⁾	- 0.8
Requirement according to clause 8 of EN 1568 met (yes/no)			Yes



¹⁾ Surface tension – cyclohexane $T_C = 25.54 \text{ mN/m}$

²⁾ The foam concentrate is not declared as "film-forming". No requirement.

4.1.4 Expansion and drainage of foam (clause 9 of EN 1568-3)

Usage concentration of foam concentrate recommended by the manufacturer: 3 %

Usage concentration of foam concentrate for the test: 3 %

4.1.4.1 Low expansion foam (clause 9 of EN 1568-3)

Expansion values by using of potable water

Characteristic		Reference dimension
Expansion value	Untreated sample	8.8
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-3		
Expansion value	Top sample	8.3
	Bottom sample	9,3
Requirement according to clause 9.2 a) of EN 1568-3 met ¹⁾ (yes/no)		Yes

Expansion values by using of simulated sea water

Characteristic		Reference dimension
Expansion value	Untreated sample	8.7
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-3		
Expansion value	Top sample	9.1
	Bottom sample	9.8
Requirement according to clause 9.2 c) of EN 1568-3 met ¹⁾ (yes/no)		Yes



¹⁾ Expansion values of temperature conditioned samples are not allowed to differ more than 20% of the value obtained with the untreated sample from each other or from the value obtained with the untreated sample.

25%- drainage time by using of potable water

Characteristic			Reference dimension
25%- drainage time	(min:s)	Untreated sample	19:48
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-3			
25%- drainage time	(min:s)	Top sample	20:06
		Bottom sample	20:54
Requirement according to clause 9.2 b) of EN 1568-3 met ¹⁾ (yes/no)			Yes

25%- drainage time by using of simulated sea water

Characteristic			Reference dimension
25%- drainage time	(min:s)	Untreated sample	10:45
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-3			
25%- drainage time	(min:s)	Top sample	11:03
		Bottom sample	11:18
Requirement according to clause 9.2 d) of EN 1568-3 met ¹⁾ (yes/no)			Yes



¹⁾ The 25% drainage time of temperature conditioned samples are not allowed to differ more than 20% of the value obtained with the untreated sample from each other or from the value obtained with the untreated sample.

50%- drainage time (without assessment according to the standard)

Characteristic		Reference dimension
50%- drainage time <i>Potable water</i>	(min:s) Untreated sample	29:00
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-3		
50%- drainage time <i>Potable water</i>	(min:s) Top sample	30:18
	Bottom sample	30:00
50%- drainage time <i>Simulated sea water</i>	(min:s) Untreated sample	15:50
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-3		
50%- drainage time <i>Simulated sea water</i>	(min:s) Top sample	16:00
	Bottom sample	15:49



4.2 Test fire performance of low expansion foam for application to water-immiscible liquids (clause 10 of EN 1568-3)

4.2.1 Test results obtained with forceful application

Characteristic	Reference dimension			
Usage concentration	3 %			
Air temperature	10 °C			
Test object size	4.52 m ²			
Fuel / quantity	144 l heptane			
Fuel temperature	15 °C			
Water temperature	15 °C			
Foam solution temperature	18 °C			
Wind speed	0 to 0.5 m/s			
Burning time	60 s			
	Test 1	Test 2	Test 3	Test 4
	Potable water	Simulated sea water	Simulated sea water	Simulated sea water
90 % control time (min:s)	0:50	0:56	0:42	1:03
99 % control time (min:s)	1:28	1:14	1:05	1:33
Extinguishing time (min:s)	1:43	1:40	1:53	2:41
Foam application time (s)	180	180	180	180
25 % burnback time (min:s)	18:11	8:30	11:07	10:04
Extinguishing performance class in accordance with clause 10 of EN 1568-3 reached ¹⁾ (yes/no)	Yes	Yes	Yes	Yes
Burnback resistance level in accordance with clause 10 of EN 1568-3 reached ¹⁾ (yes/no)	Yes	No	Yes	Yes

¹⁾ See table 1 EN 1568-3.



4.2.2 Test results obtained with gentle application

Characteristic	Reference dimension		
Usage concentration	%		
Air temperature	°C		
Test object size	4.52 m ²		
Fuel / quantity	144 l heptane		
Fuel temperature	°C		
Water temperature	°C		
Foam solution temperature	°C		
Wind speed	m/s		
Preburning time	60 s		
	Test 1	Test 2	Test 3
	Potable water	Simulated sea water	
90 % control time (min:s)			
99 % control time (min:s)			
Extinguishing time (min:s)			
Foam application time (s)			
25 % burnback time (min:s)			
Extinguishing performance class and burnback resistance level in accordance with clause 10 of EN 1568-3 reached ¹⁾ (yes/no)			



¹⁾ See table 1 EN 1568-3.

4.2.3 Extinguishing performance class and burnback resistance level in accordance with table 1 of EN 1568-3

Usage concentration 3 %

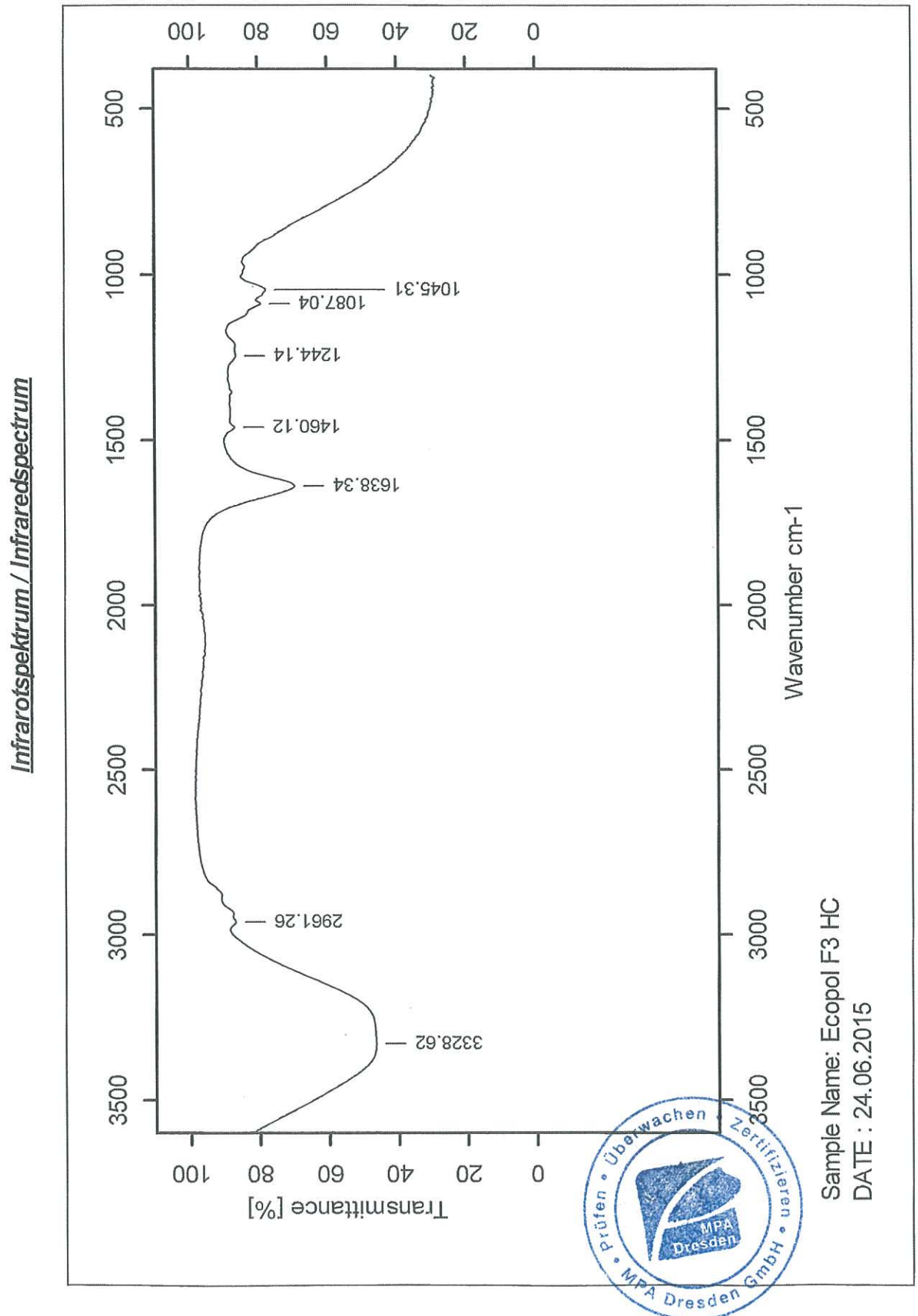
Test by using of	Potable water	Simulated sea water
Extinguishing performance	I	I
Burnback resistance level	A	A

5. Container marking (clause 11 of EN 1568)

The by the applicant submitted label draft for marking of the packaging or transport container /3/ is in conformity with the requirements of clause 11 of EN 1568.



Annex 1: Infrared spectrogram of the foam concentrate



Annex 2: Rheological data of the foam concentrate ¹⁾

Shear rate (s ⁻¹)	75	150	225	300	375	450	525	600
Test temperature (°C)	20							
Shear stress (Pa)	52.5	56.5	57.3	58.9	58.9	60.5	60.5	62.0
Viscosity (mPa·s)	699.6	376.4	254.5	196.2	156.9	134.3	115.2	103.4
Shear rate (s ⁻¹)	75	150	225	300	375	450	525	600
Test temperature (°C)	0							
Shear stress (Pa)	55.7	58.9	62.0	63.6	65.2	66.8	70.0	73.2
Viscosity (mPa·s)	742.0	392.3	275.7	212.1	173.9	148.5	133.3	121.9
Shear rate (s ⁻¹)	75	150	225	300	375	450	525	600
Test temperature (°C)	-5							
Shear stress (Pa)	54.1	58.9	62.0	66.0	70.0	76.4	79.5	394.76
Viscosity (mPa·s)	720.8	392.3	275.7	220.0	186.6	162.6	145.5	132.5



¹⁾ Method: EN ISO 3219 with BROOKFIELD cone-plate-viscometer, model HBDV-II + PRO, spindle CPE-51