

Test Report

No. 20170920/Eau 92

Applicant: EAU et FEU SA
Zone industrielle Sud-Est
Rue Aloys Senefelder, B.P.1008
51683 Reims Cedex 2, FRANCE

Manufacturer: EAU et FEU SA
Zone industrielle Sud-Est
Rue Aloys Senefelder, B.P.1008
51683 Reims Cedex 2, FRANCE

Application date: 2017-06-26 / 2017-08-08

Application: Test of a foam concentrate for compliance with
EN 1568-1, -2, -3, -4 : 2008

**Name of the fire
extinguishing medium:** **FOAM MASTER 3F 3/3 SP**

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

Receipt of sample: 2017-06-29 / 2017-07-28

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



This report comprises 22 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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Publications of test reports and information on tests for publicity purposes require the written approval of the laboratory in every isolated case.

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Summary:

The synthetic alcohol resistant foam concentrate foam concentrate **FOAM MASTER 3F 3/3 SP** has been tested in accordance with the standards EN 1568

- part 1 (medium expansion foam for application to water immiscible liquids),
- part 2 (high expansion foam for application to water immiscible liquids),
- part 3 (low expansion foam for application to water immiscible liquids) and
- part 4 (low expansion foam for application to water miscible liquids).

The tested foam concentrate with designation **FOAM MASTER 3F 3/3 SP** meets the requirements of the standards EN 1568-1, EN 1568-2, EN 1568-3 and EN 1568-4, issue 2008.

Extinguishing performance class and burnback resistance level:

EN 1568 part	Usage concentration	by use of	
		potable water	simulated sea water a
1	3 %	Requirements for medium expansion foam are fulfilled (no classification according to EN 1568-1)	
2	3 %	Requirements for high expansion foam are fulfilled (no classification according to EN 1568-2)	
3	3 %	I A	I A
4 (acetone)	3 %	I A	I A
4 (isopropanol)	3 %	II B	II A

Special information:

1. The information according to clause 11 of EN 1568 for container marking shall be stated on the packaging or transport container.
2. Clause 9.2 of the EN 1568 can not be evaluated in the most cases. The measurements of drainage of foam were then terminated after 60 min due to the high stability of foam.
3. Pseudo plastic foam concentrate. This concentrate can require special proportioning equipment.

12th September 2017

Grad. Eng. Dittrich
Laboratory Manager



Grad. Eng. Walter
Official

1. General

Tests have been carried out in accordance with the requirements of the standards:

- EN 1568-1 (medium expansion foam / application to water-immiscible liquids),
- EN 1568-2 (high expansion foam / application to water-immiscible liquids),
- EN 1568-3 (low expansion foam/ application to water-immiscible liquids) and
- EN 1568-4 (low expansion foam/ application to water-miscible liquids).

2. Chemical composition

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

3. Submitted documents

/1/ Safety Data sheet dated 2016-02-15, 6 pages



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 - 9	7,45	Yes
Density g/cm ³ (20°C)	–	1,02 - 1,04	1,024	1)
Dyn. Viscosity mPas (20°C)	–	–	120,89 ²⁾	1) 3)
(0°C)	–	–	212,08	
(-5°C)	–	–	316,01	
(-10°C)	–	–	455,98	
Refraction index n _D ^D ₂₀	–	–	1,3622	1)
Freezing point °C	–	≤ - 5	- 12	1)
Sediment Vol %				
before ageing	≤ 0,25	–	0	Yes
after ageing	≤ 1,0	–	0	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 ± 5°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⁾ No assessment because of no requirements for these characteristics in the standard

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	—	27,14
	Sample conditioned according to annex E.2 and E.3 of EN 1568		
	Top sample	0,95 to 1,05 times	27,01
	Bottom sample	0,95 to 1,05 times	26,94
Requirement according to clause 7 of EN 1568 met (yes/no)			Yes
Interface tension (mN/m)	Untreated sample	—	0,68
	Sample conditioned according to annex E.2 and E.3 of EN 1568		
	Top sample	—	1,47
	Bottom sample	—	1,08
Spreading coefficient ¹⁾ (mN/m)	Untreated sample	²⁾	-2,28
	Sample conditioned according to annex E.2 and E.3 of EN 1568		
	Top sample	²⁾	-2,94
	Bottom sample	²⁾	-2,48
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 isn't declared as film-forming. No requirement according to EN 1568.



4.1.4 Expansion and drainage of foam (clause 9 of EN 1568-1, -2, -3, -4)

By the manufacturer recommended usage concentration: 3%

Usage concentration of foam concentrate for the test: 3%

4.1.4.1 Medium expansion foam

Expansion values by using of potable water

Characteristic		Reference dimension
Expansion value	Untreated sample	61,77
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-1		
Expansion value	Top sample	28,73
	Bottom sample	37,70
Requirement according to clause 9.2 a) EN 1568-1 met ¹⁾ (yes/no)		Yes

Expansion values by using of simulated sea water

Characteristic		Reference dimension
Expansion value	Untreated sample	30,48
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-1		
Expansion value	Top sample	31,06
	Bottom sample	26,62
Requirement according to clause 9.2 c) EN 1568-1 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	> 60 (23 ml at 60 min)
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-1		
25%- drainage time (min:s)	Top sample	> 60 (802 ml at 60 min)
	Bottom sample	> 60 (579 ml at 60 min)
Requirement according to clause 9.2 b) EN 1568-1 met ¹⁾ (yes/no)		can not be evaluated

25 %- drainage time by using of simulated sea water

Characteristic		Reference dimension
25%- drainage time (min:s)	Untreated sample	21:08
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-1		
25%- drainage time (min:s)	Top sample	23:09
	Bottom sample	23:43
Requirement according to clause 9.2 d) EN 1568-1 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	
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-1		
50%- drainage time <i>Potable water</i>	(min:s) Top sample	
	Bottom sample	
50%- drainage time <i>Simulated sea water</i>	(min:s) Untreated sample	
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-1		
50%- drainage time <i>Simulated sea water</i>	(min:s) Top sample	
	Bottom sample	



4.1.4.1 High expansion foam (clause 9 of EN 1568-2)

Expansion values by using of potable water

Characteristic		Reference dimension
Expansion value	Untreated sample	345,8
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-2		
Expansion value	Top sample	385,5
	Bottom sample	392,5
Requirement according to clause 9.2 a) of EN 1568-2 met ¹⁾ (yes/no)		Yes

Expansion values by using of simulated sea water

Characteristic		Reference dimension
Expansion value	Untreated sample	729,9
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-2		
Expansion value	Top sample	716,3
	Bottom sample	629,7
Requirement according to clause 9.2 c) of EN 1568-2 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)	Untreated sample	> 60 (95ml at 60 min)
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-2		
25%- drainage time (min)	Top sample	> 60 (97ml at 60 min)
	Bottom sample	> 60 (100ml at 60 min)
Requirement according to clause 9.2 b) of EN 1568-2 met ¹⁾ (yes/no)		can not be evaluated

25 %- drainage time by using of simulated sea water

Characteristic		Reference dimension
25%- drainage time (min:s)	Untreated sample	> 60 (118ml at 60 min)
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-2		
25%- drainage time (min:s)	Top sample	> 60 (110ml at 60 min)
	Bottom sample	> 60 (113ml at 60 min)
Requirement according to clause 9.2 d) of EN 1568-2 met ¹⁾ (yes/no)		can not be evaluated



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	
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-2		
50%- drainage time <i>Potable water</i>	(min:s) Top sample	
	Bottom sample	
50%- drainage time <i>Simulated sea water</i>	(min:s) Untreated sample	
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-2		
50%- drainage time <i>Simulated sea water</i>	(min:s) Top sample	
	Bottom sample	



4.1.4.2 Low expansion foam

Expansion values by using of potable water

Characteristic		Reference dimension
Expansion value	Untreated sample	8,53
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-3, -4		
Expansion value	Top sample	8,31
	Bottom sample	8,54
Requirement according to clause 9.2 a) of EN 1568-3, -4 met ¹⁾ (yes/no)		Yes

Expansion values by using of simulated sea water

Characteristic		Reference dimension
Expansion value	Untreated sample	8,01
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-3, -4		
Expansion value	Top sample	7,50
	Bottom sample	6,83
Requirement according to clause 9.2 c) of EN 1568-3, -4 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	42:04
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-3, -4		
25%- drainage time (min:s)	Top sample	> 60 (16 ml at 60 min)
	Bottom sample	> 60 (16 ml at 60 min)
Requirement according to clause 9.2 b) of EN 1568-3, -4 met ¹⁾ (yes/no)		can not be evaluated

25%- drainage time by using of simulated sea water

Characteristic		Reference dimension
25%- drainage time (min:s)	Untreated sample	40:02
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-3, -4		
25%- drainage time (min:s)	Top sample	25:00
	Bottom sample	> 60 (37 ml at 60 min)
Requirement according to clause 9.2 d) of EN 1568-3, -4 met ¹⁾ (yes/no)		can not be evaluated



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	
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-3, -4		
50%- drainage time <i>Potable water</i>	(min:s) Top sample	
	Bottom sample	
50%- drainage time <i>Simulated sea water</i>	(min:s) Untreated sample	
Sample conditioned in accordance with annex E.2 and E.3 of EN 1568-3, -4		
50%- drainage time <i>Simulated sea water</i>	(min:s) Top sample	
	Bottom sample	



4.2 Test fire performance of medium expansion foam (clause 10 of EN 1568-1) usage concentration 3%

Characteristic	Reference dimension		
Usage concentration	3 %		
Air temperature	20 °C		
Test object size	1,73 m ²		
Fuel / quantity	55 l Heptane		
Fuel temperature	15 °C		
Water temperature	15 °C		
Foam solution temperature	18 °C		
Wind speed	0 m/s		
Preburning time	60 s		
	Test 1	Test 2	Test 3
	Potable water	Simulated sea water	Simulated sea water
90 % control time (min:s)	1:39	1:24	1:30
99 % control time (min:s)	1:49	1:36	1:38
Extinction time (min:s)	1:54	1:58	1:56
Foam application time (s)	120	120	120
1 % burnback time (min:s)	> 10 min	> 5 min	> 5 min
Extinction time and 1 % burnback time in accordance with clause 10 of EN 1568-1 reached ¹⁾ (yes/no)	Yes	Yes	Yes



¹⁾ maximum of extinction time ≤ 120 s; 1% burnback time ≥ 30 s

4.3 Test fire performance of high expansion foam (clause 10 of EN 1568-2)

Characteristic	Reference dimension		
Usage concentration	3 %		
Air temperature	18 °C		
Test object size	1,73 m ²		
Fuel / quantity	55 l heptane		
Fuel temperature	18 °C		
Water temperature	18 °C		
Foam solution temperature	18 °C		
Wind speed	0,5 m/s		
Burning time	60 s		
	Test 1	Test 2	Test 3
	Potable water	Simulated sea water	Simulated sea water
90 % control time (min:s)	1:25	1:30	1:28
99 % control time (min:s)	1:36	1:42	1:48
Extinguishing time (min:s)	2:01	2:05	2:12
Foam application time (s)	120	120	120
Extinguishing time in accordance with clause 10 of EN 1568-2 reached ¹⁾ (yes/no)	Yes	Yes	Yes

¹⁾ Maximum of extinguishing time ≤ 150 s.



4.4 Test fire performance of low expansion foam (clause 10 of EN 1568-3)

4.4.1 Test results obtained with forceful application, usage concentration 3%

Characteristic	Reference dimension		
Usage concentration	3 %		
Air temperature	19 °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	1 m/s		
Preburning time	60 s		
	Test 1	Test 2	Test 3
	Potable water	Simulated sea water	Simulated sea water
90 % control time (min:s)	1:42	1:39	1:39
99 % control time (min:s)	2:15	1:54	1:48
Extinction time (min:s)	2:17	2:35	2:52
Foam application time (s)	180	180	180
25 % burnback time (min:s)	22:25	11:50	12:08
Extinguishing performance and burnback resistance level in accordance with clause 10 of EN 1568-3 reached ¹⁾ (yes/no)	Yes	Yes	Yes



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

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



4.5 Test fire performance of low expansion foam for application to water miscible liquids (acetone / isopropanol) (clause 10 of EN 1568-4)

4.5.1 Test results, usage concentration 3 %

Characteristic	Reference dimension			
Usage concentration	3 %			
Air temperature	13 - 19 °C			
Test object size	1,73 m²			
Fuel / quantity	125 l acetone / 125 l isopropanol			
Fuel temperature	18 °C			
Foam solution temperature	17 °C			
Wind speed	0 - 1 m/s			
Preburning time	120 s			
	Test 1 acetone	Test 2 Isopropanol	Test 3 acetone	Test 4 isopropanol
	Potable water	Potable water	Simulated sea water	Simulated sea water
90 % control time (min:s)	1:01	2:23	0:28	2:26
99 % control time (min:s)	1:07	2:25	0:39	2:48
Extinction time (min:s)	1:12	3:02	0:53	3:08
Foam application time (s)	180	300	180	300
25 % burnback time (min:s)	> 20	10:11	> 30	> 18
Extinguishing performance class and burnback resistance level in accordance with clause 10 of EN 1568-4 reached ¹⁾ (yes/no)	Yes	Yes	Yes	Yes



¹⁾ See table 1 EN 1568-4.

4.5.2 Extinguishing performance class and burnback resistance level in accordance with table 1 of EN 1568-4 (acetone)

Usage concentration 3 %

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

4.5.3 Extinguishing performance class and burnback resistance level in accordance with table 1 of EN 1568-4 (isopropanol)

Usage concentration 3 %

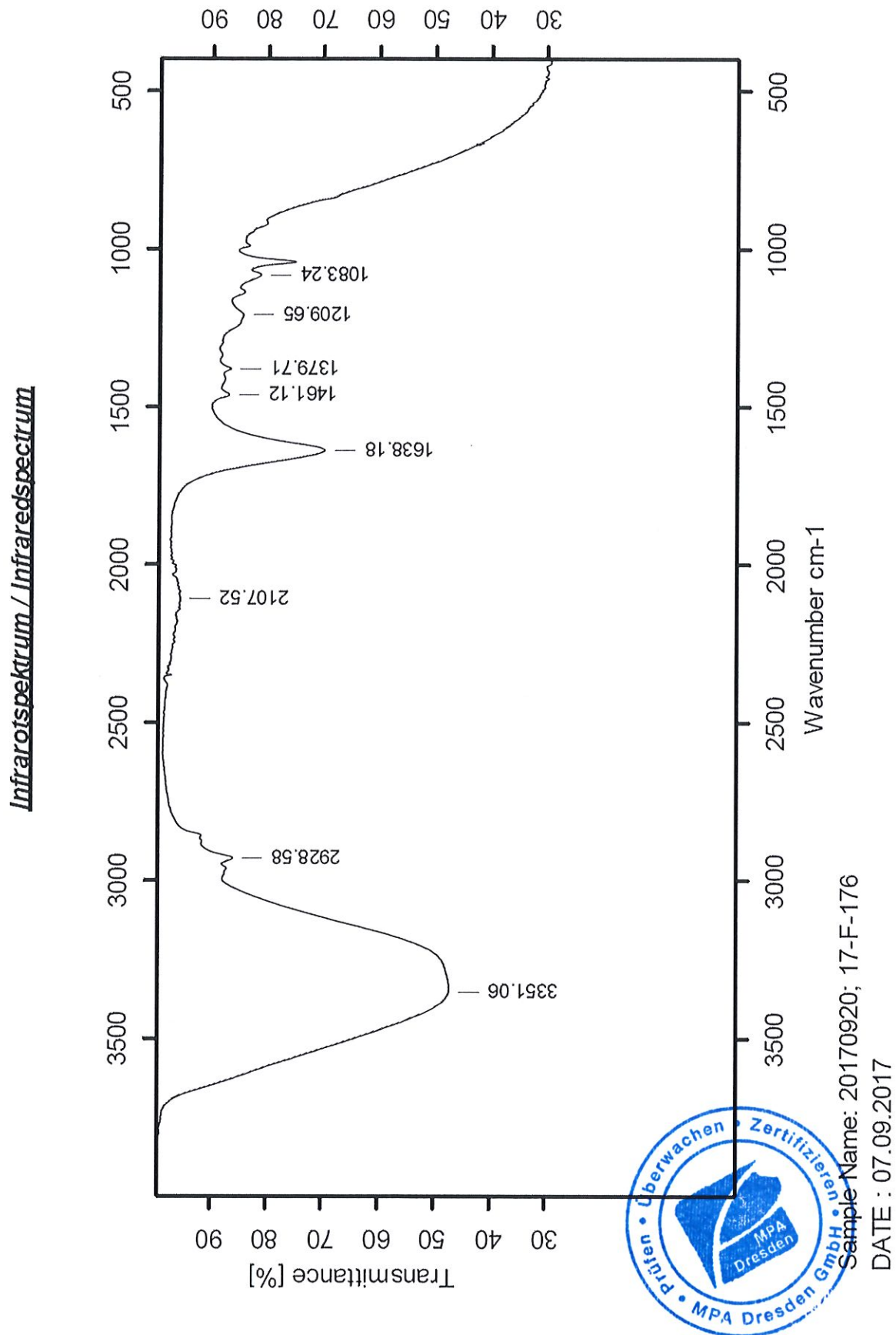
Test by using of	Potable water	Simulated sea water
Extinguishing performance	II	II
Burnback resistance level	B	A

5. Container marking (clause 11 of EN 1568)

A label draft for marking of the packaging or transport container has not been submitted.
Note the information on page 2 of this test report.



Annex 1: Infrared spectrogram of foam concentrate FOAM MASTER 3F 3/3 SP



Annex 2: Rheological data of the foam concentrate FOAM MASTER 3F 3/3 SP ¹⁾

Shear rate (s ⁻¹)	75	150	225	300	375	450	525	600
Test temperature (°C)	20							
Shear stress (Pa)	25,45	22,26	36,99	41,36	45,34	49,31	53,29	55,67
Viscosity (mPas)	339,19	222,65	162,59	137,85	120,89	109,57	101,52	92,76
Shear rate (s ⁻¹)	75	150	225	300	375	450	525	600
Test temperature (°C)	0							
Shear stress (Pa)	45,34	55,67	64,43	72,38	79,53	85,9	92,26	97,83
Viscosity (mPas)	604,19	371,09	286,30	243,74	212,08	190,87	175,76	162,00
Shear rate (s ⁻¹)	75	150	225	300	375	450	525	600
Test temperature (°C)	- 5							
Shear stress (Pa)	66,81	83,51	96,24	106,58	118,51	125,67	134,42	143,16
Viscosity (mPas)	890,38	534,14	427,67	355,23	316,01	279,23	256,06	238,53
Shear rate (s ⁻¹)	75	150	225	300	375	450	525	600
Test temperature (°C)	-10							
Shear stress (Pa)	100,21	123,28	217,13	155,89	171,00	183,72	192,48	211,56
Viscosity (mPas)	1335,6	821,70	632,67	519,59	455,98	408,24	366,67	352,49

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

