



REPORT

issued by an Accredited Laboratory



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Fire extinguishing media – Foam concentrate

Tests for compliance with EN-1568:2000, parts 3 & 4 (2 enclosures)

The department of Fire Technology at SP Swedish National Testing and Research Institute has on your request performed tests of foam concentrate according to EN 1568:2000, parts 3 & 4.

Designation of foam concentrate:	Fomtec ARC 3x3 UL
Type of foam concentrate:	Synthetic AFFF/AR
Samples:	2 x 25 L cans, batch No M25H
Manufactured by:	Dafo Fomtec AB
Date of arrival at SP:	October 30, 2003
Date of tests:	October-December, 2003

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Total results

Compliance with EN-1568:2000, parts 3 & 4: Yes*

Obtained extinguishing performance class: I (hydrocarbon)

Obtained extinguishing performance class: I (polar fuel)

Obtained burnback resistance level: B (hydrocarbon)

Obtained burnback resistance level: C (polar fuel)

* The technical requirements are fulfilled. However, no examination of the foam concentrate has been conducted considering the ecotoxicological properties.

**SP Swedish National Testing and Research Institute
Fire Technology, Fire Protection**

Hans Wetterlund
Technical Manager

Magnus Bobert
Technical Officer

- Enclosures:**
1. Test results
 2. IR-spectrum

Test results

Numbering according to corresponding clause in the standard.

Suppliers's recommendations and characteristic values

According to the supplier the foam concentrate is intended for use with fresh and sea water for low expansion foam with an admixture ratio of 3 %.

According to the manufacturer the foam concentrate is freeze protected.

Lowest temperature for use (LUT): -11 °C

Introduction

No examination of the foam concentrate has been conducted.

In order to fulfil the requirements, the foam concentrate shall be examined according to the directions given in the EC Directives 67/548/EEC, 76/464/EEC and 88/379/EEC.

4, 6, 7, 8 Chemical-physical examination

Parameter	Clause in the standard	Before temperature conditioning	After temperature conditioning, Top sample	After temperature conditioning, Bottom sample
Sedimentation, vol%	4.1-4.2	< 0.05*	--	--
Dispersible through 180- μ m-sieve	4.1-4.2	Yes*	--	--
pH-value at +20 °C	6	7.7	--	--
Surface tension cyclohexane (Tc), mN/m	--	25.9	25.9	25.9
Surface tension, 3 % admixture (Ts), mN/m	7	16.9	17.3	17.1
Interfacial tension (Ti), mN/m	8	3.6	3.6	3.7
Spreading coefficient (S=Tc-Ts-Ti), mN/m	8	5.4	5.0	5.1

* Before and after conditioning for 24 h at 60 °C.

-- Not included in the standard.

5.2. Viscosity of the foam concentrate

The foam concentrate is pseudoplastic.

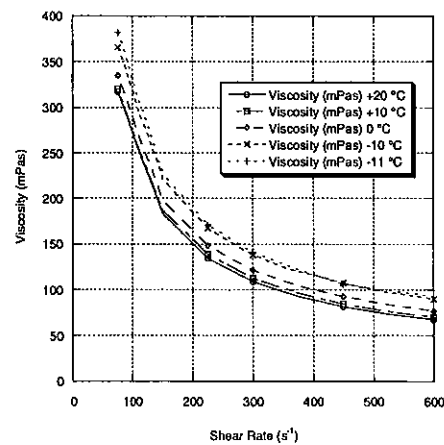
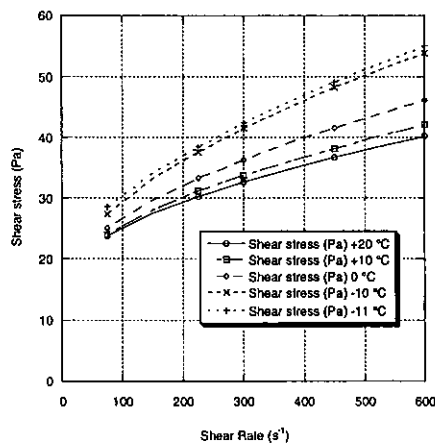
The viscosity was measured with a Physica UDS 200 Rheometer. A cone and plate geometry, MK23 (50 mm diameter, 2° cone), was used.

Test procedure:

1. Cooling/heating of the peltier element.
2. Setting of the gap
3. Application of the sample
4. 10 minutes waiting period
5. 1 minute pre-shearing at 600s⁻¹
6. 1 minute waiting period without shearing
7. 8 measuring points in steps increasing shear rate. 10 seconds measuring time at each measuring point.

The results are presented in a table and diagrams.

Shear rate (s ⁻¹)	Shear stress (Pa)					Viscosity (mPas)				
	Temperature (°C)					Temperature (°C)				
	+20	+10	0	-10	-11	+20	+10	0	-10	-11
75	23.8	24.0	25.1	27.4	28.6	317	320	335	365	381
150	27.5	28.1	29.7	33.2	34.2	183	187	198	221	228
225	30.3	31.2	33.3	37.6	38.5	135	139	148	167	171
300	32.7	33.8	36.3	41.5	42.4	109	113	121	138	141
375	34.8	36.1	39.1	45.0	45.8	92.8	96.3	104	120	122
450	36.7	38.2	41.6	48.2	48.1	81.6	84.9	92.4	107	107
525	38.5	40.2	43.9	51.1	52.1	73.3	76.6	83.6	97.3	99.2
600	40.2	42.1	46.1	53.8	55.0	67.0	70.2	76.8	89.7	91.7



9. Expansion and drainage of foam

For foam generation the following types of water were used:

Fresh water; tap water taken from the municipal waterworks of Borås.

Sea water has been prepared by tap water and additives as specified in the standard.

Test conditions: Ambient temperature: 18 °C-19 °C

Premix temperature: 18 °C-19 °C

Fresh water, 3 % admixture, before conditioning				
Test No.	1	2	3	Mean value
Expansion ratio	7,9	7,8	7,8	7,8
Drainage 25 %, min:s	05:18	05:26	05:23	05:22
Drainage 50 %, min:s	09:03	09:19	09:13	09:12

Fresh water, 3 % admixture, top sample after conditioning				
Test No.	1	2	3	Mean value
Expansion ratio	8,1	8,0	8,1	8,1
Drainage 25 %, min:s	05:24	05:29	05:27	05:27
Drainage 50 %, min:s	09:13	09:18	09:12	09:14

Fresh water, 3 % admixture, bottom sample after conditioning				
Test No.	1	2	3	Mean value
Expansion ratio	8,3	8,1	8,2	8,2
Drainage 25 %, min:	05:28	05:24	05:17	05:23
Drainage 50 %, min:s	09:17	09:09	08:58	09:08

Sea water, 3 % admixture, before conditioning				
Test No.	1	2	3	Mean value
Expansion ratio	7,6	7,8	8,0	7,8
Drainage 25 %, min:s	05:19	05:13	05:11	05:14
Drainage 50 %, min:s	09:31	09:19	09:14	09:21

Sea water, 3 % admixture, top sample after conditioning				
Test No.	1	2	3	Mean value
Expansion ratio	7,3	7,6	7,7	7,5
Drainage 25 %, min:s	05:06	05:05	05:06	05:06
Drainage 50 %, min:s	09:03	09:00	09:00	09:01

Sea water, 3 % admixture, bottom sample after conditioning				
Test No.	1	2	3	Mean value
Expansion ratio	7,7	7,5	7,7	7,6
Drainage 25 %, min:s	05:00	04:58	04:53	04:57
Drainage 50 %, min:s	08:54	08:45	08:39	08:46

**Comments to the chemical- physical examination and the expansion and drainage tests**

The surface tension after conditioning, top and bottom sample, is within ± 5 % of the value obtained before conditioning. The spreading coefficient before and after conditioning, top and bottom sample, is positive.

The requirements for the chemical- physical properties are fulfilled in accordance with the standard.

The expansion ratio after conditioning, top and bottom sample, do not differ from each other or from the value obtained before conditioning by more than 20 %. The 25 % drainage time after conditioning, top and bottom sample, do not differ from each other or from the value obtained before conditioning by more than 20 %.

The requirements for the expansion and drainage of foam are fulfilled in accordance with the standard.

The foam concentrate is not temperature sensitive.

10. Test fire performance EN 1568-3:2000 (annex H)

All fire tests were conducted indoors in the fire hall of SP.

Forceful application (part 3, annex H.3)

Designation	Unit	Test No 1	Test No 2	Test No 3
Type of foam, expansion grade		Low	Low	Low
Date of test	y-m-d	2003-12-02	2003-12-03	2003-12-03
Admixture	%	3	3	3
Type of water		Fresh water	Sea water	Sea water
Foam nozzle, UNI-86	L min ⁻¹	11.4	11.4	11.4
Air temp.	°C	18	17	17
Fuel temp.	°C	16	17	17
Water temp.	°C	18	18	18
Foam solution temp.	°C	19	18	19
Wind speed	m/s	< 1	< 1	< 1
Extinction				
Application method		Forceful	Forceful	Forceful
Type of fuel		Heptane	Heptane	Heptane
Preburn time	min	1	1	1
Application rate	L m ⁻² min ⁻¹	2.5	2.5	2.5
Start foam application	min:s	00:00	00:00	00:00
90 % control	min:s	00:42	00:43	00:42
99 % extinguished	min:s	01:41	01:43	01:34
Extinguished	min:s	01:47	01:49	01:56
Stop foam application	min:s	03:00	03:00	03:00
Burnback				
Waiting period	min	5	5	5
Start burnback	min:s	00:00	00:00	00:00
Burnback, >25 %*	min:s	01:57	02:50	02:24
Final burnback, >25 %		13:35	13:00	12:48
Extinguishing class		I	I	I
Burnback level		Not obtained	Not obtained	Not obtained

* Burnback caused by flare up



Gentle application (part 3, annex H.2)

Designation	Unit	Test No 1	Test No 2	Test No 3
Type of foam, expansion grade		Low	Low	Low
Date of test	y-m-d	2003-12-03	2003-12-03	2003-12-03
Admixture	%	3	3	3
Type of water		Fresh water	Sea water	Sea water
Foam nozzle, UNI-86	L min ⁻¹	11.4	11.4	11.4
Air temp.	°C	17	17	17
Fuel temp.	°C	16	17	17
Water temp.	°C	16	18	18
Foam solution temp.	°C	18	19	19
Wind speed	m/s	< 1	< 1	< 1
Extinction				
Application method		Gentle	Gentle	Gentle
Type of fuel		Heptane	Heptane	Heptane
Preburn time	min	1	1	1
Application rate	L m ⁻² min ⁻¹	2.5	2.5	2.5
Start foam application	min:s	00:00	00:00	00:00
90 % control	min:s	00:38	00:42	00:40
99 % extinguished	min:s	01:30	02:38	03:30
Extinguished	min:s	01:37	03:33	04:07
Stop foam application	min:s	05:00	05:00	05:00
Burnback				
Waiting period	min	5	5	5
Start burnback	min:s	00:00	00:00	00:00
Burnback, >25 %	min:s	22:58	20:42	21:20
Extinguishing class		-	-	-
Burnback level		B	B	B



10. Test fire performance EN 1568-4:2000 (annex H)

Designation	Unit	Test No 1	Test No 2	Test No 3
Type of foam, expansion grade		Low	Low	Low
Date of test	y-m-d	2003-12-02	2003-12-02	2003-12-02
Admixture	%	3	3	3
Type of water		Fresh water	Sea water	Fresh water
Foam nozzle, UNI-86	L min ⁻¹	11.4	11.4	11.4
Air temp.	°C	18	17	18
Fuel temp.	°C	16	17	17
Foam solution temp.	°C	19	19	19
Wind speed	m/s	< 1	< 1	< 1
Extinction				
Application method		Gentle	Gentle	Gentle
Type of fuel		Acetone	Acetone	Acetone
Preburn time	min	2	2	2
Application rate	L m ⁻² min ⁻¹	6.6	6.6	6.6
Start foam application	min:s	00:00	00:00	00:00
90 % control	min:s	00:50	00:38	00:41
99 % extinguished	min:s	01:32	00:59	01:06
Extinguished	min:s	01:38	01:05	01:14
Stop foam application	min:s	03:00	03:00	03:00
Burnback				
Waiting period	min	5	5	5
Start burnback	min:s	00:00	00:00	00:00
Burnback, >25 %	min:s	08:24	09:50	08:20
Extinguishing class		I	I	I
Burnback level		C	C	C

**11. Marking**

Marking of the containers shall be made according to clause 11 in the standard in order to fulfil the requirements and shall be approved by the certification body.

Complementary tests for evaluation of approval in accordance with the requirements "Certification rules for fire extinguishing media-foam concentrates", SPCR 129, dated September 2001

Parameter	Result
Water content, % by weight	64
Density, kg/ m ³	1065
Refractive index, nD ₂₀	1.384
IR-spectrum	Enclosure No. 2

PERKINELMER 995

DATE 03.11.27

SAMPLE S-856B ALUMINA

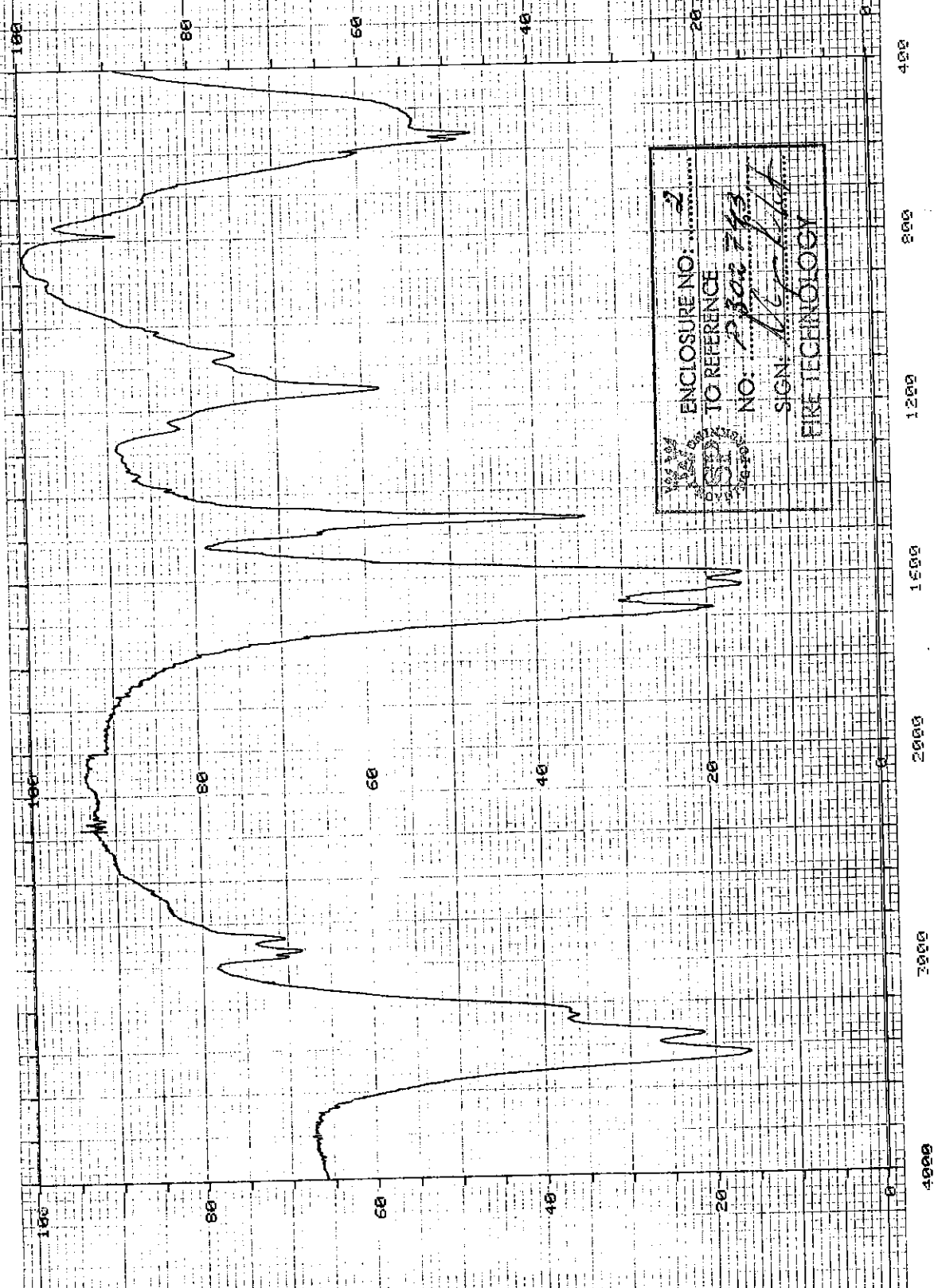
P. 33091 ind. fill coated milled
OPERATOR J. H. H. 1067

REPLOTTED SPECTRUM

SCAN MODE 4
 NOISE FILTER 1
 RESOLUTION 3.0
 ORIGIN MODE %T
 ABEX 1.0
 RANGE 4000.0-400.0
 ABSC. SCALE 0.50

PEAK THRESHOLD 2 %T

CM-1	%T
3439.0	10.29
3346.0	13.84
2924.0	44.11
2868.0	45.48
1678.0	12.55
1624.0	10.31
1597.0	10.34
1462.0	22.15
1155.0	37.90
798.0	57.21
573.0	31.21
559.0	30.12



ENCLOSURE NO. 2
 TO REFERENCE
 NO. P 33091
 SIGN: J. H. H.
 FIRE TECHNOLOGY