Trusted above all.


# Classification of flammable liquids & protection of liquid storage areas

Date: 31.01.2024

Speaker: Christian Breidenbach (Technical Support Foam/Water)

Place: POLIG Conference, Warszawa

# Classification of flammable liquids

## Properties of Flammable and Combustible Liquids

**Flash Point**

**The minimum temperature of a liquid where enough vapor is being expelled to form an ignitable mixture with the air close to the surface of the liquid or with in area in which the fuel is contained.**

**Boiling Point**

**The temperature at which a substance changes from a liquid to a gas. This happens due to reaching the temperature at which the vapor pressure of the liquid is equal to the atmospheric pressure of the area where it is.**

**As lower both points are, as higher is the fire risk.**

# Classification of flammable liquids

## Flammable Liquids

- Class IA Liquid
  Flash Point < 22.7 C, Boiling Point < 37.7 C
- Class IB Liquid
  Flash Point < 22.7 C, Boiling Point > 37.7 C
- Class IC Liquid
  Flash Point > 22.7 C but < 37.7 C

→ General, cannot be extinguished with water!

→ Typical economical methods for extinguishing flammable liquids with fixed water-based system is some kind of foam system.

## Combustible Liquids

- Class II Liquid
  Flash Point > 37.7 C but < 60 C.
- Class IIIA Liquid
  Flash Point > 60 C but below 93 C.
- Class IIIB Liquid
  Flash Point > 93 C.

→ Can be extinguished with water due to high flash point!

→ The fire must be attacked early before the fuel becomes heated and starts to emit vapors at a faster rate.

→ If the fire is not attacked early, it needs protection like a flammable liquid fire.

# Classification of flammable liquids

**There are different treatments in the design rules:**

**The FM Global protection approach seperates by flash points. (Tables in FM DS 7-29 aso.)**

- Higher flash point with water
- Lower flash point with approved foam sprinkler system acc. to FM DS 4-12

**EN12845 seperates by flash point but allows only metal containments (risk mitigation)**

- The use of foam is only suggested and AFFF foam is preferred

**VDS CEA 4001 treats all liquids with flash point as flammable liquids**

- The use of a tested foam concentrate is required

# Protection of liquid storage areas with foam in sprinkler systems

-

# Choosing the right foam concentrate

# Current foam ratings as proof of effectiveness according to EN1568 Part 1, 2, 3, 4

**Determination of the extinguishing performance class acc to EN 1568**

**Result:**
**Rating from 1A – 3D**

Forceful application

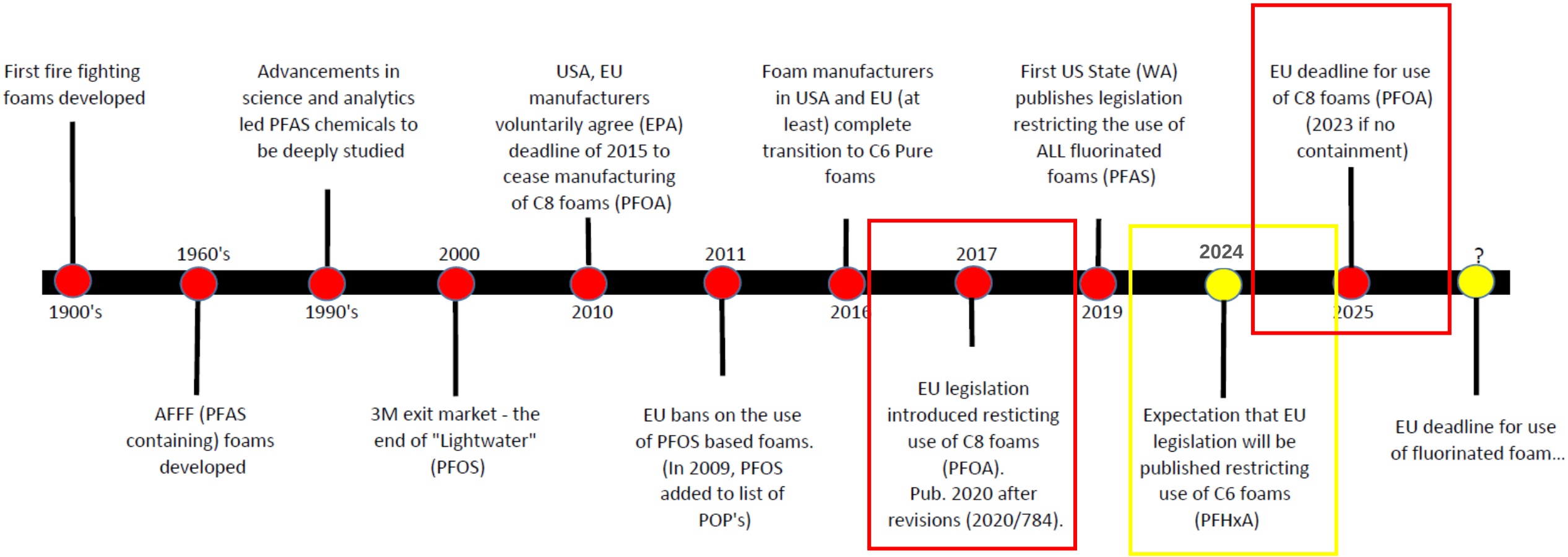
Gentle application

**EN 1568 Part 3 – Hyrdrocarbon fuel**
**2,5 lpm/m² @ 5bar**
**Forceful & gentle application**

**EN 1568 Part 4 - Polar Solvents**
**6,5 lpm/m² @ 5bar**
**Only gentle application !!!**

Burnback test

# The demise of fluorinated foam? – Coming EU regulations

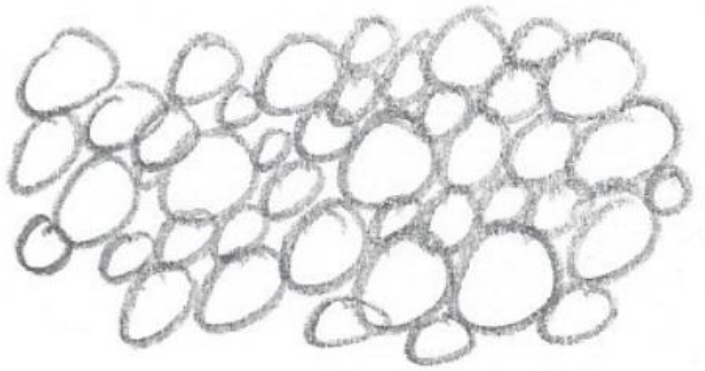


## Special point about using foam in sprinkler systems

EN1568 Part 3 or 4 fire test using UNI86 foam nozzle @ 5bar

Certified quality with rating from: 1A – 3D


Representation of the foam quality through an UNI86 nozzle (example)



**Foam quality = Expansion rate (x : 1) and Distruction rate (25% in x seconds)**

# Understanding the transition to PFAS free foam

## Special point about using foam in sprinkler systems

EN1568 Part 3 or 4 fire test using UNI86 foam nozzle @ 5bar

Certified quality with rating from: 1A – 3D


Different product to produce foam

Foam quality unchanged?

**Water application density for foam enhanced sprinkler systems are often set at about 12mm/m²**

# Special point about using SFFF (fluorine free foam) in sprinkler systems

Certified quality with rating from: 1A – 3D


MPA Dresden

Test Report

No. 2013-F-2767/Fm 13

Applicant: Dafo Fomtec AB, Garnisonsgatan 47 A, 254 66 Helsingborg, SWEDEN

Manufacturer: Dafo Fomtec AB, Garnisonsgatan 47 A, 254 66 Helsingborg, SWEDEN

Application date: 2013-06-10

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

Type designation: Enviro 3x3 Ultra

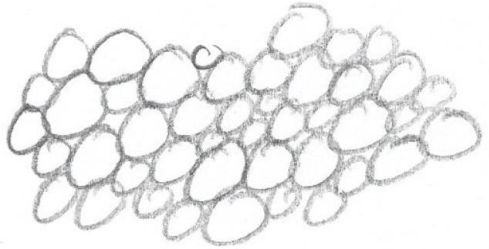
Foam concentrate grade according to Annex A of EN 1568: Synthetic alcohol -resistant foam concentrate (S-AR)

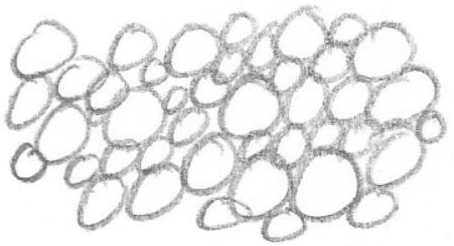
Receipt of sample: 2013-05-17 / 2013-08-28

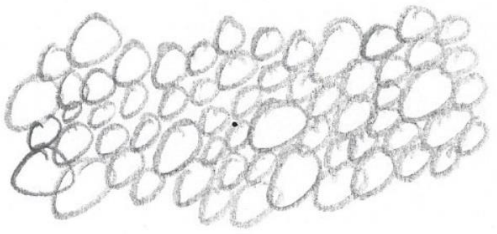
Test laboratory: MPA Dresden GmbH, Official laboratory for fire extinguishing media and fire extinguishers, Fuchsmühlenweg 8F, 09599 Freiberg, GERMANY

This report comprises 15 pages inclusive 2 annexes.

Different product to produce foam







# Proof of effectiveness - *Foam enhancement (Spk./Nozzle) vs. low expansion foam system*

**Different applications require adapted proof of effectiveness!**

**EN1568 fire test with a well foaming foam nozzle**

**Sprinkler(Nozzle) fire test FM5130 & since 2022 VDS3896**

# Challenges when using or changing to SFFF

## Some important points to check and question:

**Is the proportioning device usable?**

- Is it able to handle the foam viscosity?
- Is the flow range acc. to datasheet or not?
- Is the pressure loss the same?

# Difference in viscosity

**AFFF and Class A (Plastics) Foam concentrate**

# Difference in viscosity

**SFFF for burnable liquids**

# Some important points to check and question:

**Is the proportioning device usable?**

**Are the foam producing components (Sprinkers/Nozzles) tested with the used foam?**

- Is the a proof of effectiveness available by independent party or foam manufacturer?
- Does the test data match the design parameters like pressure, hight, desity aso.?

## Some important points to check and question:

**Is the proportioning device usable?**

**Are the foam producing components (Sprinkers/Nozzles) tested with the used foam?**

**Is the water supply capacity sufficient enough?**

- Approved desity/pressure might require bigger pump.
- Proportioning system and piping might need revision.
- Higher density might require a bigger water.

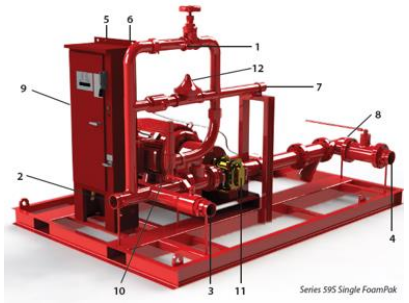
# Tested Viking foam system solutions

# Viking Fluorine Free Foam Systems

Overview of products tested and approved for use with Fluorine Free Foam (SFFF)

## Proportioning Options

Bladder Tank, Ratio Controllers and Wide Range Proportioners



Foam Pump Skids

Water Driven Proportioning Pump

## Discharge Devices

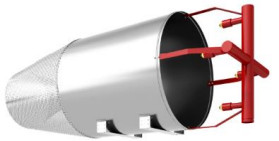
Deluge Sprinkler Foam Nozzles

Foam Makers

Closed Head Foam Sprinklers

Grate Nozzles*

Manual & Oscillating Monitors



High Expansion Generators (XMAX)

Foam Chambers

# Viking Fluorine Free Foam Systems – *Design guidelines*



VIKING® **TECHNICAL DATA** — **APPROVED SPRINKLERS FOR USE WITH FOAM CONCENTRATES**

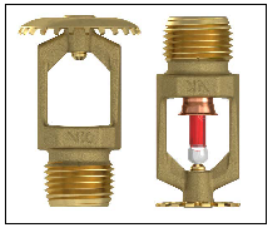
The Viking Corporation, 210 N Industrial Park Drive, Hastings MI 49058
Telephone: 269-945-9501 Technical Services: 877-384-5464 Fax: 269-818-1680 Email: techsvcs@vikingcorp.com
Visit the Viking website for the latest edition of this technical data page www.vikinggroupinc.com

## 1. DESCRIPTION

Viking Pendent and Upright Foam-Water Sprinklers are non-aspirated foam discharge devices. Viking Pendent and Upright Foam-Water Sprinklers are FM Approved and UL Listed in both closed sprinkler (with bulb or fusible element) and open sprinkler (bulb or element removed) configurations.

Features:

- Tested, Listed and Approved as Foam-Water Sprinklers with specific Foam Concentrates.
- K-factors available: K5.6 (K80), K8.0 (K115), K11.2 (K161), K16.8 (K242)
- For use in high risk applications such as warehouses, aircraft hangers, oil and chemical loading areas, generator rooms, petro-chemical, pharmaceutical and alcohol production plants.



## 2. LISTINGS AND APPROVALS

Viking Foam Water Sprinklers are FM Approved and/or UL Listed as part of a fire extinguishing system combining designated foam concentrates, bladder tanks and proportioning devices. Approved and Listed system components can be found at **www.approvalguide.com** and **https://iq.ulprospector.com**

FM Approved – Low Expansion Foam Systems (FM5130)

UL Listed – GFGV.EX27255 (UL162)

"SFFF compatible" refers to this product as being part of a SFFF Foam system that has been tested to recognized standards. Not all configurations are available. Please consult technical data and/or the Approval/Listing for usage requirements.

Refer to the FM Approval and UL Listings tables in this document for technical performance data.

## 3. TECHNICAL DATA

Refer to the applicable sprinkler's data page for product data.

## 4. SCOPE OF DELIVERY

Ensure that all components are complete and in good condition.

Viking Foam/Water Sprinklers are supplied boxed with protective shield or cap.

## 5. AVAILABILITY

Please contact Viking for further information.

**EMEA:**
Viking S.A.
21, Z.I, Haneboesch
L-4562 Differdange / Niederkorn
Tel.: +352 58 37 37 – 1
Fax: +352 58 37 36
vikinglux@viking-emea.com

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69 Tuas View Square
Westlink Techpark, Singapore 637621
Tel: (+65) 6 278 4061
Fax: (+65) 6 278 4609
vikingAPAC@vikingcorp.com

## 6. PRODUCT VARIANTS

Please refer to relevant sprinkler data page.

## 7. SCOPE OF DELIVERY

Ensure that all components are complete and in good condition. Viking Foam/Water Sprinklers are supplied boxed with protective shield or cap.

Form No. F_091316 Rev 01 September 2022

**FM APPROVALS: JET A1[1]**

| VIKING Foam Concentrate | Nominal K-factor | | Sprinkler Identification Number (SIN) | | Height | | | | Listed[2] Foam Design Density | | Water Discharge Density | | Tested[3] Sprinkler Pressure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Minimum | | Maximum | | | | | | | |
| | U.S. | Metric[4] | Upright | Pendent | Ft. | m | Ft. | m | gpm/ft² | Lpm/m² | gpm/ft² | Lpm/m² | PSI | bar |
| USP 3% | 5.6 | 80.6 | -- | VK1021, VK3021 | 8.5 | 2.6 | 44 | 13.4 | 0.2 | 8.1 | 0.3 | 12.2 | 13 | 0.89 |

**FM APPROVALS: HYDROCARBONS[1]**

| VIKING Foam Concentrate | Nominal K-factor | | Sprinkler Identification Number (SIN) | | Height | | | | Listed[2] Foam Design Density | | Water Discharge Density | | Tested[3] Sprinkler Pressure | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Minimum | | Maximum | | | | | | | |
| | U.S. | Metric[4] | Upright | Pendent | Ft. | m | Ft. | m | gpm/ft² | Lpm/m² | gpm/ft² | Lpm/m² | PSI | bar |
| ARK 3% | 5.6 | 80.6 | VK1001 VK3001 | -- | 6 | 1.8 | 24.8 | 7.6 | 0.3 | 12.2 | 0.3 | 12.2 | 29 | 1.99 |
| | 5.6 | 80.6 | -- | VK1021 VK3021 | 6 | 1.8 | 20 | 6.1 | 0.3 | 12.2 | 0.3 | 12.2 | 29 | 1.99 |
| | 8.0 | 115.2 | VK200 VK204 VK350 VK351 | -- | 9 | 2,7 | 45 | 13,7 | 0.4 | 16,3 | 0.4 | 16,3 | 25 | 1,72 |
| | 8.0 | 115.2 | -- | VK2021 VK2022 VK3521 VK3522 | 8.5 | 2,6 | 44 | 13,4 | 0.3 | 12,2 | 0.3 | 12,2 | 14 | 0,97 |
| | 11.2 | 161.3 | VK530 VK531 | -- | 9 | 2,7 | 45 | 14 | 0.4 | 16,3 | 0.4 | 16,3 | 13 | 0,89 |
| | 11.2 | 161.3 | -- | VK377 VK536 | 6 | 1.8 | 25.2 | 8 | 0.4 | 16.3 | 0.4 | 16.3 | 13 | 0.89 |
| USP 3% | 5.6 | 80.6 | VK1001 VK3001 | -- | 6 | 1.8 | 24.8 | 7.6 | 0.2 | 8.1 | 0.3 | 12.2 | 13 | 0.89 |
| | 5.6 | 80.6 | -- | VK1021 VK3021 | 6 | 1.8 | 44 | 13.4 | 0.2 | 8.1 | 0.3 | 12.2 | 13 | 0.89 |
| | 8.0 | 115.2 | VK200 VK204 VK350 VK351 | -- | 9 | 2.7 | 45 | 13.7 | 0.3 | 12.2 | 0.3 | 12.2 | 14 | 0.96 |
| | 8.0 | 115.2 | -- | VK2021 VK3521 VK3522 VK2022 | 8 | 2.4 | 44 | 13.4 | 0.3 | 12.2 | 0.3 | 12.2 | 14 | 0.96 |
| | 11.2 | 161.3 | -- | VK377 VK536 | 6 | 1.8 | 25.2 | 8 | 0.3 | 12.2 | 0.3 | 12.2 | 7 | 0.48 |

# Thank you!

Dziękuję za uwagę

**Viking SupplyNet Sp. z o.o.**

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