

Version 1.0	draft, never published
Version 1.1	first published version
Version 1.2	spelling corrections
Version 3.0	adding cylinders with pressure gauge and electronic sensors, changing the branded name NOVEC to technical name FK-5-1-12, small wording corrections

1) Product Description

The AMFE line is a stand-alone automatic miniature fire detection and suppression device. For details about intended use, product sizing (suitable protected volumes) please refer to the latest product manual available from JOB.

The AMFE product comprises two individual units, which need to be assembled prior to use:







Activation head



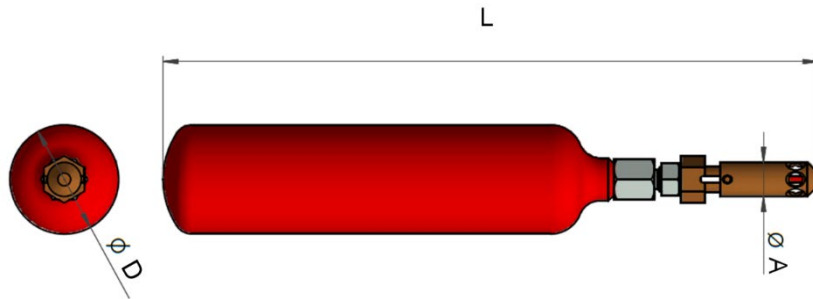
Extinguishing agent cylinder

The head is available in 4 different activation temperatures, the agent cylinder is available in 6 different sizes.

- 68°C / 155°F (red) 
- 79°C / 175°F (yellow) 
- 93°C / 200°F (green) 
- 141°C / 286°F (blue) 

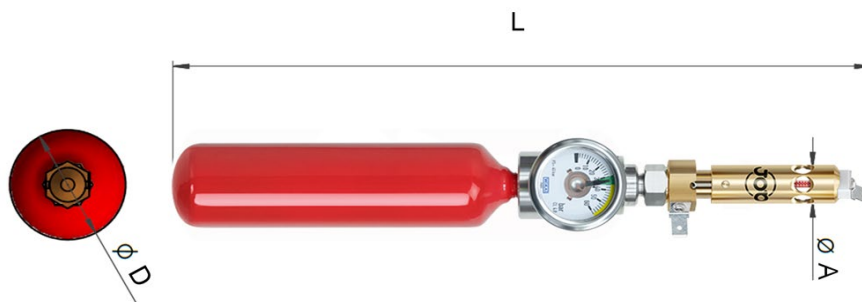
2) Dimensions and Weights

a. Standard cylinders



AMFE head with cylinder size	Metric [mm]			Imperial [inch]			Approximate weight	
	L	D	A	L	D	A	kg	lbs
0	194,5	22,0	16	7,66	0,87	0,63	0,25	0,55
1	210,0	35,0	16	8,27	1,38	0,63	0,44	0,97
2	240,5	40,0	16	9,47	1,58	0,63	0,63	1,39
3	307,0	50,8	16	12,09	2,00	0,63	1,23	2,71
4	392,0	50,8	16	15,44	2,00	0,63	1,70	3,75
5	438,0	60,3	16	17,25	2,38	0,63	2,70	5,96

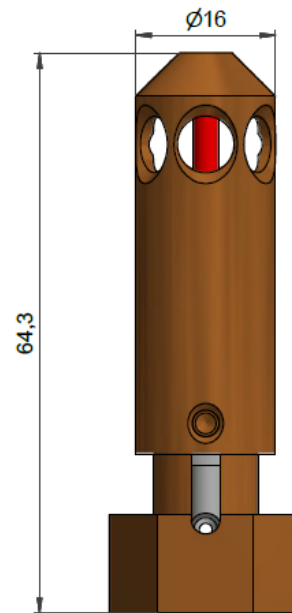
b. Cylinders with pressure gauge and electronic sensor



AMFE head with cylinder with gauge/sensor	Dimensions [mm]			Weight
	L	D	A	Kg (aprox.)
Size 0	264,5	22,0	16	0,45
Size 1	280,0	35,0	16	0,64
Size 2	310,5	40,0	16	0,83
Size 3	377,0	50,8	16	1,43
Size 4	462,0	50,8	16	1,90
Size 5	508,0	60,3	16	2,90



Size comparison of the 6 sizes (cylinder with gauge)



AMFE activation head dimensions

The weight of the R-AMFE initiation head is 78g.

The connection threading of the initiation head to the cylinder is M11 (M19 wrench).

3) Extinguishing agent

The cylinder is filled with FK-5-1-12 engineered extinguishing agent fluid and compressed nitrogen (N₂) as the propellant agent. The Material Safety Data Sheet of the extinguishing agent cylinders is attached in the addendum of this data-sheet.

The amount of FK-5-1-12 per cylinder size is as listed in the table below:

- Size 0 24ml
- Size 1 72ml
- Size 2 120ml
- Size 3 241ml
- Size 4 360ml
- Size 5 603ml

The ~ 10% propellant gas N₂ is compressed (<60bar).

The sizing and selection rules of the manufacturer apply (see product manual).

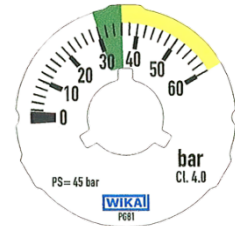
4) Data for pressure sensor and pressure gauge readings

a) Version with pressure gauge



The gauge display is in bar.

The cartridge with manometer is designed for an operating temperature range of $T_{Environment} = -20^{\circ}C \dots +65^{\circ}C$.



The extinguishing agent cartridge must not be operated at ambient temperatures above $+65^{\circ}C$ on site to avoid any mechanical damage to the manometer!

The nominal range (green) for the internal pressure is

$$P_{nom} = 30 \text{ bar} \dots 36 \text{ bar} (@ T_{Environment} = 20^{\circ}C)$$

The gauge displays correctly in the following ambient temperature range

$$T_{min} = 15^{\circ}C$$

$$T_{max} = 30^{\circ}C$$

Beyond these temperature limits, the displayed value will deviate from the nominal value, and is not suitable for an inspection. In this case, the extinguishing unit must be cooled down or heated up to a temperature value within the temperature range specified above, to get a qualitative conclusion on the internal pressure. It must be waited for the extinguishing agent cartridge to be completely heated up to this temperature range (recommended: $t_{Waiting\ time} \geq 30 \text{ min}$) as otherwise the pressure indicator is not meaningful.

In the extinguishing unit's normal operation, the pressure indicator can be in the green and yellow display range. With increasing temperature at the installation site (e.g. when operating a protected control cabinet), the extinguishing unit's internal pressure will rise and display above the green range. This is the normal operational behavior.

b) Version with electronic sensor and cable:

Cable output (shielded)



Description	Color Code	Explanation
$U_{operation}$	brown (bn)	positive measure contact
0 V	blue (bl)	negative measure contact
n.a.	black (bk)	no function
and shield		

- Wires: 3 x 0.14 mm²
- Cable diameter: 4.3 mm
- Cable length: 2 m
- Measuring range: 0 ... 60 bar (max. double overload capacity)
- Auxiliary voltage: 8 ... 30 V DC
- Electric resistance: ≤ (auxiliary power – 8 V) / 0.02 A
- Measuring signal: 4 ... 20 mA analog output signal
- Current output: corresponds to the measuring signal (max. 25 mA)
- Overvoltage protection: 36 V DC
- Short-circuit resistance: 750 V DC
- MTTF: >100 years

The pressure sensor must be supplied via an energy-limited circuit according to 9.4 of the UL/EN/IEC 61010-1 or LPS according to UL/EN/IEC 60950-1 or Class 2 according to UL1310/UL1585 (NEC or CEC).

The normal value range of the extinguishing agent cartridge's pressure is:

$$P_{\text{nom}} = 30 \text{ bar} \dots 36 \text{ bar} \text{ (@ } T_{\text{Environment}} = 20^{\circ}\text{C)}$$

The normal value range for the version with electronic pressure sensor (electrical) is:

$$I_{\text{nom}} = 12 \text{ mA} \text{--} 13.6 \text{ mA}$$

The operating temperature range of the cartridge with pressure sensor (cable) is:

$$T_{\text{Environment}} = -30^{\circ}\text{C} \dots +100^{\circ}\text{C}$$

The functional temperature range is:

$$T_{\text{functional}} = -30^{\circ}\text{C} \dots +85^{\circ}\text{C}$$

Note: At temperatures of over 85°C, the sensor indicates a non-defined current value of 25 mA.

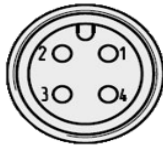
The maximum temperature value up to which an evaluable current indicator is available is $T_{\text{Max}} = +85^{\circ}\text{C}$. Everything above this is always 25 mA.

c) Version with electronic sensor and plug:

The electric data are the same as listed in subchapter b)

The connections are:

Connector (male) Output



See manual for details!

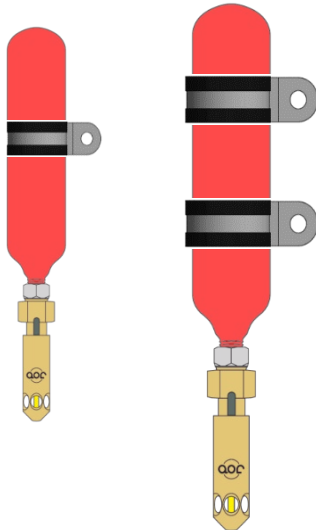
Description	Pin Number	Erläuterung
U_{operation}	1	positive measure contact
0 V	3	negative measure contact
n.a.	2 and 4	no function

5) Holding brackets

Standard Application – normal vibration and shock robustness requirements
(Non-mobile applications, e.g. electrical cabinets, server racks, machines)

Size 0..2

Size 3..5

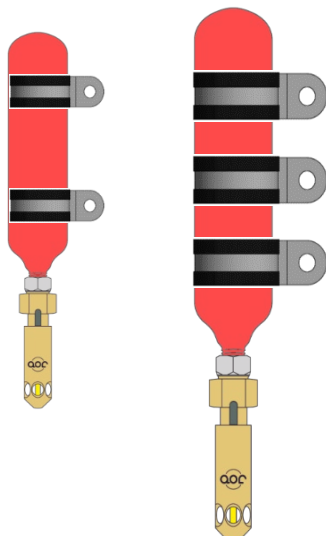


Part #	Name	for cylinder size	Reccomended number of brackets per cylinder
100651	AMFE mounting bracket set	0	1
100652	AMFE mounting bracket set	1	1
100653	AMFE mounting bracket set	2	1
100654	AMFE mounting bracket set	3 & 4	2
100655	AMFE mounting bracket set	5	2

Demanding Application – strong and permanent vibration, high shock robustness requirements
(Mobile applications, e.g. marine, rail, automotive or semi-mobile equipment and machinery)

Size 0..2

Size 3..5



Part #	Name	for cylinder size	Reccomended number of brackets per cylinder
100651	AMFE mounting bracket set	0	2
100652	AMFE mounting bracket set	1	2
100653	AMFE mounting bracket set	2	2
100654	AMFE mounting bracket set	3 & 4	3
100655	AMFE mounting bracket set	5	3

6) Part numbers and nomenclature

For a complete system, both an initiation head and a cylinder are required. Assembly is to be done in accordance with the instructions in the operating manual for the AMFE line.

AMFE initiation head ('SR' indicates a metric threading for the FK-5-1-12 cylinders)

- AMFE SR3 68°C # 100575
- AMFE SR3 79°C # 100576
- AMFE SR3 93°C # 100577

Extinguishing agent cylinders (standard)

- Cylinder FK-5-1-12 / 24ml Size 0 # 100708
- Cylinder FK-5-1-12 / 72ml Size 1 # 100709
- Cylinder FK-5-1-12 / 120ml Size 2 # 100710
- Cylinder FK-5-1-12 / 241ml Size 3 # 100711
- Cylinder FK-5-1-12 / 360ml Size 4 # 100712
- Cylinder FK-5-1-12 / 603ml Size 5 # 100713

Extinguishing agent cylinders with pressure gauge

- Cylinder FK-5-1-12 / 24ml Size 0 # 100772
- Cylinder FK-5-1-12 / 72ml Size 1 # 100773
- Cylinder FK-5-1-12 / 120ml Size 2 # 100774
- Cylinder FK-5-1-12 / 241ml Size 3 # 100775
- Cylinder FK-5-1-12 / 360ml Size 4 # 100776
- Cylinder FK-5-1-12 / 603ml Size 5 # 100778

Extinguishing agent cylinders with electronic sensor (2m / 6ft6" cable)

- Cylinder FK-5-1-12 / 24ml Size 0 # 100779
- Cylinder FK-5-1-12 / 72ml Size 1 # 100780
- Cylinder FK-5-1-12 / 120ml Size 2 # 100782
- Cylinder FK-5-1-12 / 241ml Size 3 # 100783
- Cylinder FK-5-1-12 / 360ml Size 4 # 100784
- Cylinder FK-5-1-12 / 603ml Size 5 # 100785

Extinguishing agent cylinders with electronic sensor (M12 plug)

- Cylinder FK-5-1-12 / 24ml Size 0 # 100787
- Cylinder FK-5-1-12 / 72ml Size 1 # 100788
- Cylinder FK-5-1-12 / 120ml Size 2 # 100789
- Cylinder FK-5-1-12 / 241ml Size 3 # 100790
- Cylinder FK-5-1-12 / 360ml Size 4 # 100791
- Cylinder FK-5-1-12 / 603ml Size 5 # 100792

7) Disclaimer

The AMFE is “Made-in-Germany”.
The AMFE is REACH/RoHS conform.

JOB GmbH
Kurt-Fischer-Str 30
D-22926 Ahrensburg
Germany

Trade name: Cylinder filled with FK-5-1-12

Current version: 3.3.0, issued: 13.07.2023

Replaced version: 3.2.0, issued: 13.07.2023

Region: GB

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Trade name

Cylinder filled with FK-5-1-12

1.2 Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses of the substance or mixture

Fire Extinguishing Cylinder
Extinguishing Agent

Uses advised against

No data available.

1.3 Details of the supplier of the safety data sheet

Address

Job GmbH
Kurt-Fischer-Str. 30
22926 Ahrensburg
GERMANY

Telephone no. +49 (4102) 2114 - 0
Fax no. +49 (4102) 2114 - 70
e-mail Sales@job-bulbs.com

Information provided by / telephone

+49 (0) 4102 2114 - 0

Advice on Safety Data Sheet

Sales@job-bulbs.com

1.4 Emergency telephone number

No data available.

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification in accordance with Regulation (EC) No 1272/2008 (CLP)

Aquatic Chronic 3; H412

Classification information

This product is assessed and classified using the methods and criteria below referred to in Article 9 of Regulation (EC) n° 1272/2008:

Physical hazards: determined through assessment data based on the methods or standards referred to in part 2 of Annex I to CLP

Health hazards and environmental hazards: determined through toxicological and ecotoxicological assessment data based on the methods or standards referred to in Part 3, 4 and 5 of Annex I to CLP.

2.2 Label elements

Labelling according to Regulation (EC) No 1272/2008 (CLP Regulation)

Hazard pictograms



GHS04

Signal word

-

Hazard statement(s)

H412

Harmful to aquatic life with long lasting effects.

H280

Contains gas under pressure; may explode if heated.

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Precautionary statement(s)

P273 Avoid release to the environment.
P501 Dispose of contents/container to a facility in accordance with local and national regulations.
P410+P403 Protect from sunlight. Store in a well-ventilated place.

Labelling information

This Material Safety Data sheet refers to the product contained within the pressurized cylinder.

2.3 Other hazards

No data available.

SECTION 3: Composition/information on ingredients

3.1 Substances

Not applicable. The product is not a substance.

3.2 Mixtures

Hazardous ingredients

No	Substance name		Additional information	
	CAS / EC / Index / REACH no	Classification (EC) 1272/2008 (CLP)	Concentration	%
1	1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone			
	756-13-8 436-710-6 606-108-00-X -	Aquatic Chronic 3; H412	>= 90.00	wt%
2	nitrogen			
	7727-37-9 231-783-9 - -	Press. Gas; H280	<= 10.00	wt%

Full Text for all H-phrases and EUH-phrases: pls. see section 16

3.3 Other information

Steel cylinder filled with CAS-No 756-13-8 and charged with nitrogen. The data subject of this Material Safety Data sheet refer to the mixtures contained in this product.

SECTION 4: First aid measures

4.1 Description of first aid measures

General information

No special measures necessary.

After inhalation

No data available.

After skin contact

When in contact with the skin, clean with soap and water.

After eye contact

Remove contact lenses. Rinse eye thoroughly under running water keeping eyelids wide open and protecting the unaffected eye (at least 10 to 15 minutes). Seek medical assistance.

After ingestion

Rinse the mouth thoroughly with water.

4.2 Most important symptoms and effects, both acute and delayed

No data available.

4.3 Indication of any immediate medical attention and special treatment needed

No data available.

SECTION 5: Firefighting measures

Trade name: Cylinder filled with FK-5-1-12

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Region: GB

5.1 Extinguishing media

Suitable extinguishing media

The product contains an extinguishing agent and is not combustible.

Unsuitable extinguishing media

No data available.

5.2 Special hazards arising from the substance or mixture

Hydrogen fluoride (HF)

5.3 Advice for firefighters

Use self-contained breathing apparatus. Wear protective clothing. Heat causes increase in pressure and risk of bursting. Cool endangered containers with water spray jet.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel

Refer to protective measures listed in sections 7 and 8. Ensure adequate ventilation.

For emergency responders

No data available. Personal protective equipment (PPE) - see Section 8.

6.2 Environmental precautions

Do not discharge into the drains/surface waters/groundwater. Do not discharge into the subsoil/soil.

6.3 Methods and material for containment and cleaning up

Pick up with absorbent material (e.g., sand, kieselguhr, acid binder, universal binder, sawdust) and send for disposal.

6.4 Reference to other sections

No data available.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling

No special measures necessary if stored and handled as prescribed.

General protective and hygiene measures

No special procedures required if used and handled properly. Avoid product contact with skin, eyes and clothing

7.2 Conditions for safe storage, including any incompatibilities

Technical measures and storage conditions

Keep container dry in a cool, well-ventilated place. Protect of heat. Protect from direct sunlight.

Requirements for storage rooms and vessels

Keep in original packaging, tightly closed.

Incompatible products

None known

7.3 Specific end use(s)

No data available.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

No parameters available for monitoring.

8.2 Exposure controls

Appropriate engineering controls

No data available.

Personal protective equipment

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Respiratory protection

If workplace exposure limits are exceeded, a respiration protection approved for this particular job must be worn. In case of dust, aerosol and mist formation, take appropriate measures for breathing protection in the event workplace threshold values are not specified.

Eye / face protection

No special measures required.

Hand protection

Not necessary, if processed under regular conditions. Sufficient protection is given wearing suitable protective gloves checked according to i.e. EN 374, in the event of risk of skin contact with the product.

Environmental exposure controls

No data available.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

State of aggregation	
liquid	
Form	
cylindrical shape	
Colour	
colourless	
Odour	
No data available	
pH value	
No data available	
Boiling point / boiling range	
Value	-196 °C
Reference substance	nitrogen
Value	49.2 °C
Reference substance	CAS 756-13-8
Melting point/freezing point	
Value	-210 °C
Reference substance	nitrogen
Decomposition temperature	
No data available	
Flash point	
Comments	not flammable
Ignition temperature	
No data available	
Explosive properties	
Product does not present an explosion hazard.	
Flammability	
The product contains an extinguishing agent.	
Lower explosion limit	
No data available	
Upper explosion limit	
No data available	
Vapour pressure	
No data available	

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Relative vapour density	
No data available	
Relative density	
No data available	
Density	
No data available	
Solubility in water	
Value	0.2 g/l
Reference substance	nitrogen
Solubility	
No data available	
Partition coefficient n-octanol/water (log value)	
No data available	
Kinematic viscosity	
No data available	
Particle characteristics	
No data available	

9.2 Other information

Other information
No data available.

SECTION 10: Stability and reactivity

10.1 Reactivity

No data available.

10.2 Chemical stability

Stable under recommended storage and handling conditions (See section 7).

10.3 Possibility of hazardous reactions

No data available.

10.4 Conditions to avoid

Protect from heat and direct sunlight. Protect from light.

10.5 Incompatible materials

None known.

10.6 Hazardous decomposition products

Hydrogen fluoride

SECTION 11: Toxicological information

11.1 Information on hazard classes as defined in Regulation (EC) No 1272/2008

Acute oral toxicity			
No	Substance name	CAS no.	EC no.
1	1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	436-710-6
LD50	>	2000	mg/kg bodyweight
Species	rat		
Acute dermal toxicity			
No	Substance name	CAS no.	EC no.
1	1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	436-710-6
LD50	>	2000	mg/kg bodyweight
Species	rat		

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Acute inhalational toxicity			
No	Substance name	CAS no.	EC no.
1	1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	436-710-6
LC50	>	1227	mg/l
Duration of exposure		4	h
State of aggregation	Gas		
Species	rat		

Skin corrosion/irritation			
No	Substance name	CAS no.	EC no.
1	1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	436-710-6
Species	rabbit		
Evaluation	non-irritant		

Serious eye damage/irritation			
No	Substance name	CAS no.	EC no.
1	1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	436-710-6
Species	rabbit		
Evaluation	non-irritant		

Respiratory or skin sensitisation			
No	Substance name	CAS no.	EC no.
1	1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	436-710-6
Route of exposure	Skin		
Species	guinea pig		
Evaluation	non-sensitizing		

Germ cell mutagenicity			
No data available			

Reproduction toxicity			
No data available			

Carcinogenicity			
No data available			

STOT - single exposure			
No data available			

STOT - repeated exposure			
No data available			

Aspiration hazard			
No data available			

Delayed and immediate effects as well as chronic effects from short and long-term exposure			
By appropriate use of the product no health damage is known.			

11.2 Information on other hazards

Endocrine disrupting properties

No data available.

Other information

No data available.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish (acute)			
No	Substance name	CAS no.	EC no.

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1	1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	436-710-6
LC50	>	1200	mg/l
Duration of exposure		96	h
Species	Zebra fish		

Toxicity to fish (chronic)

No data available

Toxicity to Daphnia (acute)

No	Substance name	CAS no.	EC no.
1	1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	436-710-6
EC50	>	1200	mg/l
Duration of exposure		48	h
Species	Daphnia magna		

Toxicity to Daphnia (chronic)

No data available

Toxicity to algae (acute)

No	Substance name	CAS no.	EC no.
1	1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone	756-13-8	436-710-6
EC50		7.7	mg/l
Duration of exposure		72	h
Species	Green algae		

Toxicity to algae (chronic)

No data available

Bacteria toxicity

No data available

12.2 Persistence and degradability

No data available.

12.3 Bioaccumulative potential

No data available.

12.4 Mobility in soil

No data available.

12.5 Results of PBT and vPvB assessment

No data available.

12.6 Endocrine disrupting properties

No data available.

12.7 Other adverse effects

No data available.

12.8 Other information

Other information

Do not let enter the product into drains or waterways and do not store on public depositories.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Allocation of a waste code number, according to the European Waste Catalogue, should be carried out in agreement with the regional waste disposal company.

Packaging

Trade name: Cylinder filled with FK-5-1-12

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Residues must be removed from packaging and when emptied completely disposed of in accordance with the regulations for waste removal. Incompletely emptied packaging must be disposed of in the form of disposal specified by the regional disposer.

SECTION 14: Transport information

14.1 Transport ADR/RID/ADN

Class	2
Classification code	5A
UN number	UN2037
Proper shipping name	RECEPTACLES, SMALL, CONTAINING GAS
Tunnel restriction code	E
Label	2.2

14.2 Transport IMDG

Class	2
UN number	UN2037
Proper shipping name	RECEPTACLES, SMALL, CONTAINING GAS
EmS	F-D, S-U
Label	2.2

14.3 Transport ICAO-TI / IATA

Class	2.2
UN number	UN2037
Proper shipping name	Receptacles, small, containing gas
Label	2.2

14.4 Other information

No data available.

14.5 Environmental hazards

Information on environmental hazards, if relevant, please see 14.1 - 14.3.

14.6 Special precautions for user

No data available.

14.7 Maritime transport in bulk according to IMO instruments

Not relevant

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

EU regulations

Regulation (EC) No 1907/2006 (REACH) Annex XIV (List of substances subject to authorisation)

According to the data available and/or specifications supplied by upstream suppliers, this product does not contain any substances considered as substances requiring authorisation as listed on Annex XIV of the REACH regulation (EC) 1907/2006.

REACH candidate list of substances of very high concern (SVHC) for authorisation

According to available data and the information provided by preliminary suppliers, the product does not contain substances that are considered substances meeting the criteria for inclusion in annex XIV (List of Substances Subject to Authorisation) as laid down in Article 57 and article 59 of REACH (EC) 1907/2006.

Regulation (EC) No 1907/2006 (REACH) Annex XVII: RESTRICTIONS ON THE MANUFACTURE, PLACING ON THE MARKET AND USE OF CERTAIN DANGEROUS SUBSTANCES, MIXTURES AND ARTICLES

The product is considered being subject to REACH regulation (EC) 1907/2006 annex XVII.	No 3
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Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances

This product is not subject to Part 1 or 2 of Annex I.

15.2 Chemical safety assessment

A chemical safety assessment has not been carried out for this mixture.

Trade name: Cylinder filled with FK-5-1-12

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Region: GB

SECTION 16: Other information

Sources of key data used to compile the data sheet:

Regulation (EC) No 1907/2006 (REACH), 1272/2008 (CLP) as amended in each case.

Directives 2000/39/EC, 2006/15/EC, 2009/161/EU, (EU) 2017/164.

National Threshold Limit Values of the corresponding countries as amended in each case.

Transport regulations according to ADR, RID, IMDG, IATA as amended in each case.

The data sources used to determine physical, toxic and ecotoxic data, are indicated directly in the corresponding section.

Creation of the safety data sheet

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This information is based on our present knowledge and experience.

The safety data sheet describes products with a view to safety requirements.

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